ADVANCED RENEWABLE

ADVANCED BIOFUELS & RENEWABLE ELECTRICITY

MUHAIMIN IQBAL

ADVANCED RENEWABLE

Advance Biofuels & Renewable Eectricity

By

MUHAIMIN IQBAL

Foreword

This book is the result of a compilation of my writings in English on the Renewable Energy Expert – Linkedin group (https://www.linkedin.com/groups/2635374/), which I have written almost every day in the last few months. The point is to share all the ins and outs related to renewable energy, especially those that fall into the Advanced Renewable category.

The use of the term Advanced Renewable was inspired by the term introduced by the European Union in the Renewable Energy Directive 2 (RED 2). In this directive, the European Union, among other things, encourages the development of two things, the first is what they call Advanced Biofuels, and the second is Renewable Electricity.

Advanced Biofuels are biofuels that no longer compete with food, feed, agricultural land, forests, do not damage the environment, and are part of the circular economy. All forms of agricultural, plantation, forestry and urban solid organic waste, all fall into the feedstocks referred to in the Advanced Biofuels.

The Renewable Electricity is electricity that is produced from renewable sources. This of course includes the biomass or feedstocks used in the Advanced Biofuels above, and also includes other energy sources such as wind, water, sunlight etc.

What we share with the members of the Renewable Energy Experts community are the results of our research and development, which we see as useful for the world community at large, including so that experts can improve on the deficiencies that exist in the progress we have achieved.

These writings are not intended as scientific articles, so they do not mention references that are generally found in scientific articles. All this because these writings are made short, into treatises that are easily understood by ordinary people who are not even energy experts. This is important because decision makers at the corporate and government levels – it doesn't have to be energy export, while they are also our target in sharing.

Even without mentioning the writing references, I can confirm that what is in this book is not science fiction. The majority of writing comes from what we research and develop ourselves, or what has been researched and developed by other experts before.

We do not mention in detail a number of matters relating to property rights, such as those related to catalysts, pressure, temperature, reactants and the like – so that as a whole the writings in this book can be freely disseminated without prejudice to the rights of the relevant property rights holders.

The structure of this book is not sorted per subject but based on the order of publication, the most recent articles are placed at the front, then backward in flashback. This is to make it easier for those of you who don't want to read all the posts but just the most recent one – so you can start at the front. Continue on to the following pages if you are interested to

know further and so on, or based on the titles of the posts you are interested in base on the table of contents.

It is hoped that this book can become a bridge in science and technology for all of us who live as neighbors on this earth. We all have an interest in keeping our place of residence from heating up, staying cool and sustainable. This can happen if we are not mutually reluctant to share.

Greater Jakarta, January 2023/ Rajab 1444 H

Table of Content

Foreword 2
Table of Content 4
Decarbonization Nation 9
Biochar : Carbon Neutral and Carbon Negative Feedstocks 10
CHPF Mini Plant - Independent Energy System. 11
Greener Faster With Biochar 12
The Story of 2 Hydrocarbons 13
Waste To Energy Tree 14
Simple Stored Energy for Advanced Biofuels 15
Roadmap to Advanced Biofuels 16
12 Centuries Since the First Flight 17
Advanced Feedstocks for Green Industry 4' Briefing 18
As Clear As Water, As Burns As Oil 19
Survival Fuels 20
From Waste to Fuels and Power 21
Appearance of Green Universal Feedstocks Machine 22
Solution for FEW Trilemma 23
Once Throwing a Stone, Four Birds Hit 24
Biochar as Multipurpose Feedstocks 25
Appearance of Universal Feedstocks for Advanced Renewable 26
Air Vision 27
Homogeneous Feedstocks from Heterogeneous Biomass 28
Advanced Renewable 2023 29
Ecosystem for Local Advanced Biofuels 30
Advanced Renewable Feedstocks 32
So That Energy Does Not Become a Weapon of War 33
The Abundance of Advanced Renewable Feedstocks 34
Sustainability Verses and Its Practice 35
Nothing is Wasted 36
Man and Machine 37
Off-Grid Electric Vehicle 39
Advanced Biofuels 5' Briefing 40

Greening the Desert....42
Advanced Renewable....43
Three Steps to Keep the Earth Habitable....44
Abundant Feedstocks for Advanced Biofuels....45
UMURE Deep Tech Challenge....46
The Heart of Clean Energy....47
Renewables Self-Consumers, From Up-Stream To Down-Stream....48
Towards Energy Efficient Personal Transportation....49
Universal Feedstocks for Advanced Biofuels and Renewable Electricity....50
Perspective: CO2 as a New Energy Source....51
Advanced Biofuels from Palm Oil Waste....52
The Appearance of Micro Refinery For Energy Transition....53
Greener Faster and Cheaper....54
World Cup on Nusa Island....55
The Appearance of Fast Pyrolysis Reactor (FPR)....56
Greening the Desert With Energy Trees....58
Appearance of Universal Commodity : Bio-Oil....59
DIY Biodiesel, What Do You Need?....60
Net-Zero Fuels and Power Generation....61
Mastering Natural Energy Storage....62
Energy Crops for RED II Compliance Independent Energy....63
POME Advanced Biofuels and Renewable Electricity....64
Closer To Advanced Biofuels....65
Opportunity in Exothermic Energy....66
Carbon Capture Biofactory....68
The Coupling Between Agriculture and the Renewable Energy Industry....69
Ultra Mobility for Urban and Remote Establishment (UMURE)....70
Long Head and Long Tail in Transportation Industry....71
First Step Toward Net-Zero Industry....72
Energy Densification....73
New Supply Chain System For Synthetic Gas....74
The Three Musketeers : Bioliquids, Biofuels and Advanced Biofuels....75
The Industry Tree For Biofuels and Green Chemicals....76
Energy Transition : From Diesel Genset to Microturbine....77
Green Energy From the Sea....78

Three Diesels of Choices 79
Introducing BioRePo : Bio-Refinery and Power Plant 80
Fast Track Net-Zero Emissions 81
3G Biofuels Tipping Point 82
The Color of MSW- Fuels 83
Appearance of Local Fuels 84
Biomass To Biofuels Pathways 85
3 Choices for Crude Options 86
Energy Self-Sufficient Ecosystem (ESSE) 87
Introducing New Green Energy Commodity : Fueldust 88
Waste Heat Scavenger 89
3 Steps For Net-Zero Emission 90
Advanced Biofuels and Renewable Electricity 91
Crude Bio-Hydrocarbon and Green Diesel 92
7 Choices of Raw Materials for Low Cost Biofuels 94
Third Generation Biofuels : Microalgae and Macroalgae 95
Alternative Fuels, Where Do They Come From? 96
Flying Taxi For Metropolitan and Islands 97
Agrowaste Sustainable Chemicals 98
The Color of Democratized Energy 99
Communities That Produce Their Own Biofuels 100
Waste Valorization Into Combined Energy 101
Biomass Fuels From Time To Time 102
Microturbine for Off-Grid Energy Transition 103
Souvenirs From B20 Summit 105
Energy Inspiration: Clean Milk Between Dirt and Blood 106
Green Vision: Toward A Greener EV and ICEV 107
Sense of Energy Crisis 108
Defossilization vs Dedieselization 109
Alternative Fuels: For Whom? 110
Alternative To Crude Oil 111
The Appearance of Alternative Biofuels 112
Alternative Energy : A Hope in the Dark 113
Solar and Carbon Harvesting for Energy 114
Bio-Gasoline 3.0 115

Dzulqarnain Energy Inspiration....117
Waste to Fuels Nomenclature....118
Renewable Black Gold....119
....119
New Energy Feedstocks....120
Black Is the New Green....120
Readily Available and Affordable Green Oil....121
Survival Fuels....122
SAF Blendstocks....123
The Sum of All Fuels....124
Distributed Waste to Energy and Chemical....125
Green ICE and EV....126
Introducing BioRePo : Bio-Refinery and Power Plant....127
Cheap Fuels and Electricity in the Age of Energy Transition....128
Value-Added Chain of Waste....129
Appearance of RED II Advanced Biofuels Feedstock....130
Circular Energy Economy....131
Affordable and Clean Energy Champions....133
Carbon Capture To Energy: Key to Sustainability....134
Harnessing Emissions For Cost Leadership Excellence....135
Fuels Independent With Bio-Oils....136
Bio-Oil Stabilization As A Universal Commodity....137
Independent Fuels....138
Mother of All Fuels....140
Biofactory for Food and Fuel....141
Bio-Gasoline, What Can It Be Made Of?....142
Clean Energy Front Line....143
SDGs and Net-Zero Economy....144
Low Cost Fuels From Our Trash Bin....145
Bio-Mining : Valuable Waste of Waste....145
Bio-Hydrocarbon Economy....146
Low Cost Process for Low Cost Fuels....147
Local Fuel for Energy Security....148
Sustainability Equation....149
First Generation G100 Bio-Gasoline....150

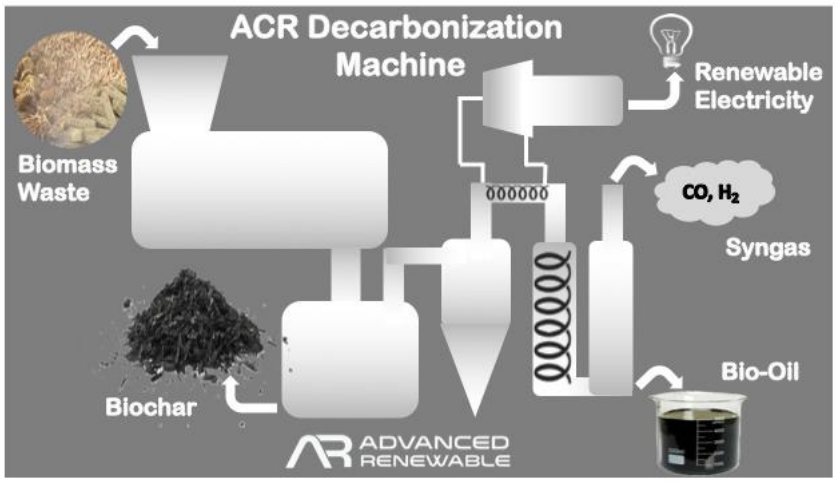
Clean Energy, Powered by Waste 151
Micro FCC For Independent and Democratized Energy 153
Sustainable Balance 153
Alternative Crude Oil : Oil For the Rest of Us 155
Plankton: A Neglected Source of Energy 156
The Moment For Affordable and Clean Energy 157
Self-Sufficiency in Clean Energy in the Agricultural Industry 158
CocoJet : Perfect Blendstocks for Sustainable Aviation Fuels 159
Biomass To Biofuels (B2B) 160
Introducing CHeaPFuel - Circular Economy in Energy 161
Synfuel, Synthetic But Better Than The Original 162
Save Environment, Create Value 163
MENA Green Opportunities 164
Fire Civilization 2.0 165
BioJet : Opportunities for a Greener Flight 166
Introducing CHPF, Renewed CHP After 140 Years 167
Bidollars Islands 168
Waste-Solar To Energy (WASTOE) - Municipals Projects 169
Surviving the Global Energy Crisis 170
3Bs Plan To Anticipate the Global Energy Crisis 171
Karimunjawa : Net-Zero Islands 172
Duomikro For Carbon Capture To Biofuels 173
New Perspective on Food and Fuel 175
Bio-Gasoline 2.0 176
Microces For Accelerated Energy Transition 177
The Sustainability of Waste 178
Production and Road Test for Green Diesel D100 179
Waste of Waste Energy 180
Energy Transition Challenge 181
Affordable Clean Energy, How Low Can You Go? 183
OPEC vs NOPEC, How The Rest Of Us Can Survive 184
Fuel Solution: One Stone for Two Birds 185
3 Ways To Affordable and Clean Fuels 186

Decarbonization Nation

In terms of CO2 emissions, the world in general will still deteriorate rapidly before slowly improving. We in Indonesia, for example, currently our CO2 emission is around 270 million tons per annum, will increase rapidly to around 330 million tons in 2030, and our Net-Zero emission target will only be reached by 2060.

So, if we just accept the existing scenario, in the next seven years we will still experience a worsening of the climate, an increase in the temperature of the earth's atmosphere, disaster after disaster related to global warming will still increase and so on. But is there anything we can do other than give up to accept the scenario?

God willing, there is still something we can do, we are presented on earth to make improvements that we can. So it is in the context of efforts to make improvements that we are capable of, our Advanced Renewable team continues to work.



One of their achevements is a decarbonization machine based on ACR (Auto Catalytic Reforming) technology that we have previously developed. This ACR can function as an effective decarbonization machine in two ways.

The first way is to produce renewable energy in the form of bio-oil or syngas which becomes feedstock for Advanced Biofuels, because this type of biofuel is carbon neutral - so its use will slow down the rate of CO2 addition in our atmosphere. Likewise the waste heat that is captured into Renewable Electricity - will slow down on the rate of addition of CO2 in the atmosphere from the electricity generation sector.

The second way is to use biochar - which can easily be produced using ACR - for purposes other than energy. The use of biochar for other than energy is even carbon negative, that is, it does not only slow down the rate of addition of CO2 in the atmosphere but instead reduces existing CO2.

An example of using biochar other than energy is for fertilizer and soil improvement if biochar is produced from agricultural waste, and if biochar is used from urban waste, it can be used for building materials and other materials needed to build urban infrastructure.

With a simple machine whose manufacturing cost per unit is no more expensive than the price of an echelon 1 official car, if there is only political will - Indonesia can become the nation that achieves Net Zero emission first. Detailed explanations can be requested from us for institutions and corporations interested in utilizing this technology.

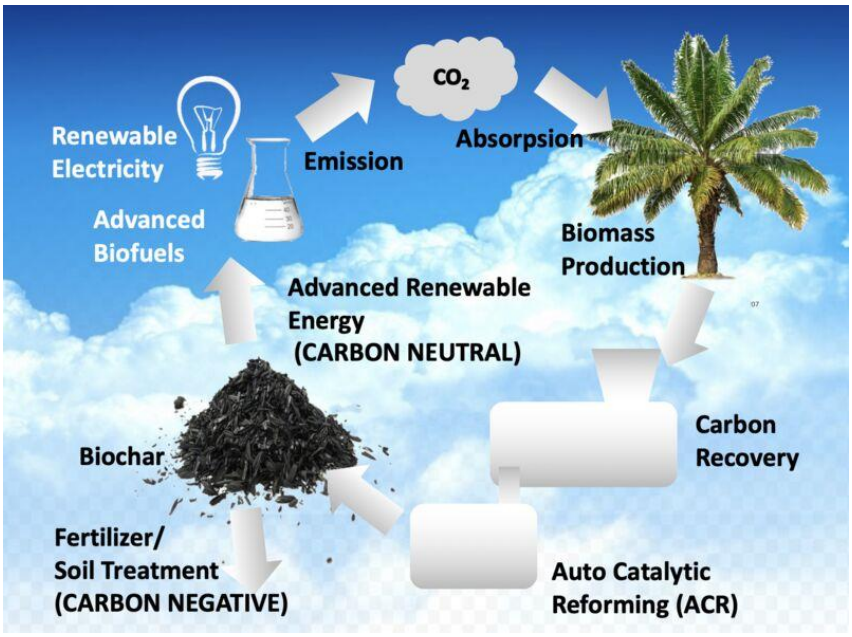
Biochar : Carbon Neutral and Carbon Negative Feedstocks

The agricultural industry broadly including plantations, forestry, livestock, and fisheries - contributes very significantly to the total GHG emissions on earth, its contribution reaches about 24%. But on the other hand, this industry is also the most likely to be able to quickly and cheaply provide feedstocks that are carbon neutral and even carbon negative. How to ?

We certainly understand that plants in their lives always absorb CO2 for their photosynthesis process. This is where biomass is produced, the largest element of biomass - in the range of 50% and even more is carbon. Some of them become carbohydrates and oils that we eat, but some of them also become lignocellulose which we generally don't eat. The majority of agricultural waste is from this ligocellulose category.

With just one reactor - what we call Auto Catalytic Reforming (ACR), the carbon that becomes agricultural waste - in the form of empty palm fruit bunches, corn cobs, husks, straw etc. - the majority can be recovered into very useful feedstocks, which can be biochar, bio-oil or syngas depending on the next use plan.

Of the three feedstocks, we will take the simplest one - biochar. This biochar has become carbon neutral feedstocks when used in the energy industry, to produce heat, Renewable Electricity and Advanced Biofuels. It is carbon neutral because it's presence does not add to CO2 in the air - because everything was came from absorbed CO2 by plants that produce their biomass, but also does not reduce the concentration of CO2 in the air.



Biochar also has the potential to become carbon negative feedstocks when it is immersed in the soil as fertilizer or treatment of the soil. A number of studies have shown that biochar can fertilize land in at least two ways, namely the first by presenting the nutrients carried by the biochar.

The second creates porosity in the soil so that air circulation improves and soil microbes can multiply freely. The majority of soil microbes are good microbes for soil fertility - even one of the characteristics of good soil is soil that contains a lot of this microbial activity.

Due to the use of biochar which is carbon negative, Verra - currently the largest carbon registry in the world - has introduced a biochar methodology since last year to encourage large biochar projects to be funded, among others, through the carbon credit scheme.

This is a truly extraordinary opportunity for this agricultural country, our farm, plantation, forestry, fishery and animal husbandry waste can not only produce clean energy that is carbon neutral, we can even use it to fertilize our 14 million hectares of critical and very critical land - which at the same time also as a carbon removal project, which invites its own investment, namely from the carbon trading market.

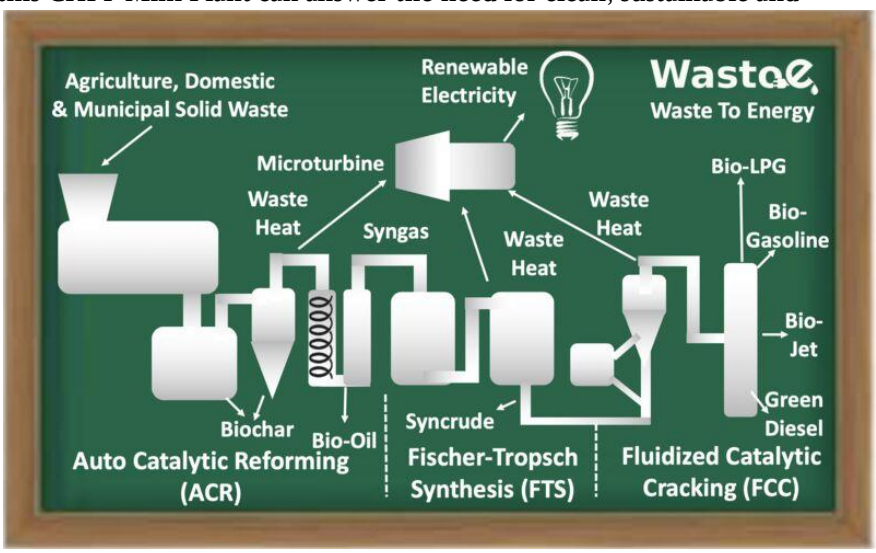
CHPF Mini Plant - Independent Energy System.

Comprehensive energy provision for this country of 17,500 islands has very different challenges from countries with only one land area. We need separate solutions for remote areas or islands, so they can enjoy the same progress as large islands.

One of the most important enablers in advancing the region is the availability of energy in the form of heat for processing crops, electricity for lighting and work machines, as well as fuel for transportation and the most flexible stored energy for various purposes.

So this solution, which we call CHPF (Combined Heat, Power and Fuels), God willing, can answer this challenge as a whole. Because this CHPF can be built on a mini or even micro scale, even islands or remote areas will be served well. Feedstocks for CHPF are whatever biomass is available on site, so it doesn't need to be imported from other areas.

Even for urban communities, this CHPF Mini Plant can answer the need for clean, sustainable and independent energy, which in the European Union's RED 2 is called Sustainable Self-Consumer.



The essence of the CHPF Mini Plant lies in the four technologies that we have developed. First is what we call Auto Catalytic Reforming (ACR) to convert any biomass into biochar, bio-oil and syngas.

The second is the Fischer-Tropsch Synthesis (FTS) technology to convert syngas into syncrude - a cleaner substitute for crude oil, free of NOx and SOx and sustainable. And the third is Fluidized Catalytic Cracking (FCC) and its

Fractional Distillation, to break down, select and sort syncrude into green diesel, jet-fuel, bio-gasoline and bio-LPG.

The fourth technology is the Organic Rankine Cycle (ORC) Microturbine to capture waste heat from ACR, FTS and FCC and convert it into electricity. So while there is cheap biomass, whatever energy the community needs can actually be met with this CHPF Mini Plant. And with this, God willing, prosperity can really be evenly distributed throughout the country.

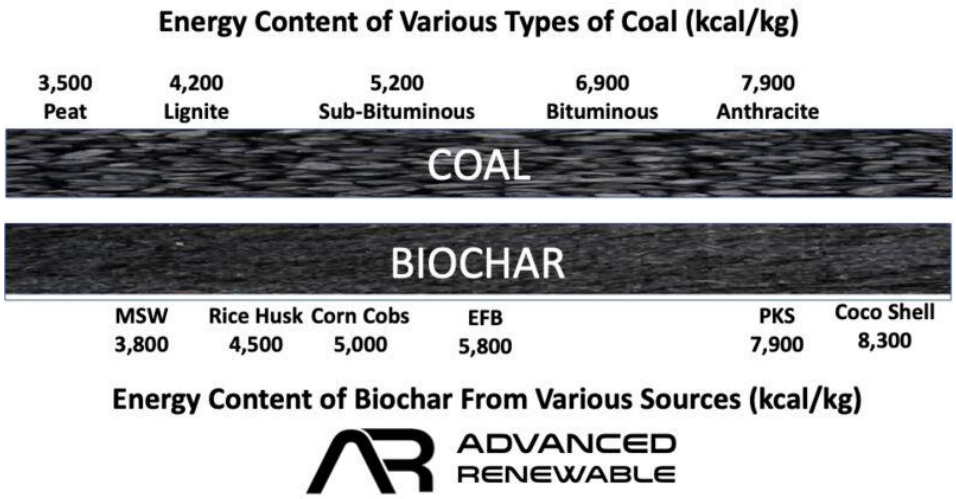
Greener Faster With Biochar

It might be a bit too long if we wait for our electric energy to become clean, with the Net-Zero Emission target proclaimed for 2060. Because with this target, even electric vehicles are mushrooming now - our air as a whole will still be polluted by emissions from steam power plants across the country.

Actually there is another way to get cleaner faster, which is to replace coal as much as possible with biochar from our abundant biomass. Regardless of the type of coal used for electric generation, there is always a suitable biochar substitute. The graphic below shows this.

Power plant which requires coal with a calorie content of 4,600 to 6,400 kcal/kg, for example, can be replaced by biochar from corn cobs and empty palm oil bunches - the latter in particular, the source is abundant and the energy content of it's biochar is already high.

Even if any plant needs coal with the highest calorie content such as anthracite in the range of 7,800 kcal/kg, there are certain biochars that contain more energy than this, such as oil palm shells, coconut shells, candlenut shells, cashew shells, tamanu shells etc.



Of course, to produce biochar with the highest calorie content, the process for making biochar must be improved. Traditionally, the calorie content tends to be low because the pyrolysis process to produce biochar is supposed to be free of oxygen. It is difficult to make traditional biochar without oxygen because if you use nitrogen as an inert gas in the process, it becomes expensive.

But all of these problems can be overcome with ACR (Auto Catalytic Reforming) technology from our Advanced Renewable division, without the use of nitrogen gas even, our fast pyrolysis products produced in the form of biochar, bio-oil and syngas are of high quality.

How about the price of this biochar? With the current price of coal which tends to increase - the price of biochar is equated with coal which has the equivalent calorie content of each, it will be attractive for farmers and planters in waste biomass production centers to process it into biochar. If we can have carbon neutral electric now, why wait for 2060?

The Story of 2 Hydrocarbons

Long before getting to know petroleum, humans have used biomass, including that used as biochar for energy. In the era of energy transition towards the Net-Zero emission target of 2050, it is very likely that people will return to hunting for biochar as their basic energy source.

All types of fuel used by the majority of vehicles in the world today, such as gasoline, diesel and jet-fuel, can all be produced from biochar, which is better than petroleum. Mainly from a net emission perspective, renewability, and in time the price will also be more competitive.

Even so in terms of continuity and equality of supply. If petroleum is only produced by certain regions or countries and its production will tend to decrease over time, the biochar can be produced in any region or country that wants to produce it. It can be produced continuously because waste and garbage - as the main raw materials for biochar - are inherent in human life activities. As long as we live and do activities, we will continue to produce waste or garbage.

ADVANCED RENEWABLE

Type	Biochar (Bio-Hydrocarbon)	Crude Oil (Hydrocarbon)
Hydrocarbon Content	55 - 80 %	94 – 99 %
Energy Content	20 – 35 MJ/kg 4780 – 8370 kcal/kg	42 – 47 MJ/kg 10,000 – 11,200 kcal/kg
Net Carbon Emission	~ 0	~ 2,350 eq CO2/kg
Price Range	120 – 170 US$/MT	600 – 850 US$/MT
Renewability	100 % Renewable	100 % Non - Renewable

The table below shows an overview of Bio-Hydrocarbon from biochar when compared to petroleum Hydrocarbons. In the same weight unit, the energy content of biochar is around 25% - 52% lower than petroleum, but the acquisition price is around 80% lower. So from this we can see that even now we should be able to produce Biochar-based Advanced Biofuels which cost less than fossil fuels.

If you add to this the consideration of achieving Net-Zero emission which is definitely faster with the use of biochar, plus massive economic equality - because biochar can be produced in even the most remote areas or islands, then I would be very surprised if this solution would not be immediately adopted by the country's energy authorities.

Moreover, the regional heads, who until now have not completely resolved the waste problem, will be ironic if they will only pass this waste problem on to be continued by their successors in 2024, even though they can act now to be able to pass on their waste-free regions. while bringing clean energy to the earth.

All the technology needed from A to Z, from initial waste handling to Advanced Biofuels - is now here, 90% of the machines can also be produced domestically. So all that's left is the vision, will and enough resources so we should be able to start right away. God willing.

Waste To Energy Tree

The Supreme Creator likens a good sentence - everything that is good - like a good tree, its roots are strong and its branches reach up to the sky, this tree bears fruit all the time with His permission (QS 14:24-25).

So that's how we describe good energy, its roots are very strong - it is sustainable and able to carry whatever energy load we need. This strong root is formed from a number of raw material options that we can process into energy sources, from agricultural and industrial waste to urban waste, all of which can be used as energy.

Its branches soar into the sky, that is, after we process the basic energy source into a universal feedstock in the form of biochar or bio-oil, it can be further processed into all forms of energy we need. It can be various types of fuels such as gasoline, diesel, jet-fuel, LPG and of course also electricity - either

directly from biochar/bio-oil or from waste heat in the biofuels production process.

All types of biofuels produced are included in the category of Advanced Biofuels in the European Union's RED 2. Apart from the fact that the ingredients are included in their list of feedstocks, all of the ingredients also completely meet all the criteria set by them, such as being part of the circular economy, not requiring new land, not destroying the environment, not using food and feed and so on.

Like planting trees in general, starting with planting small seeds and continuing to care for them, God willing, one day they will become shady trees that give coolness to those who take shelter under them.

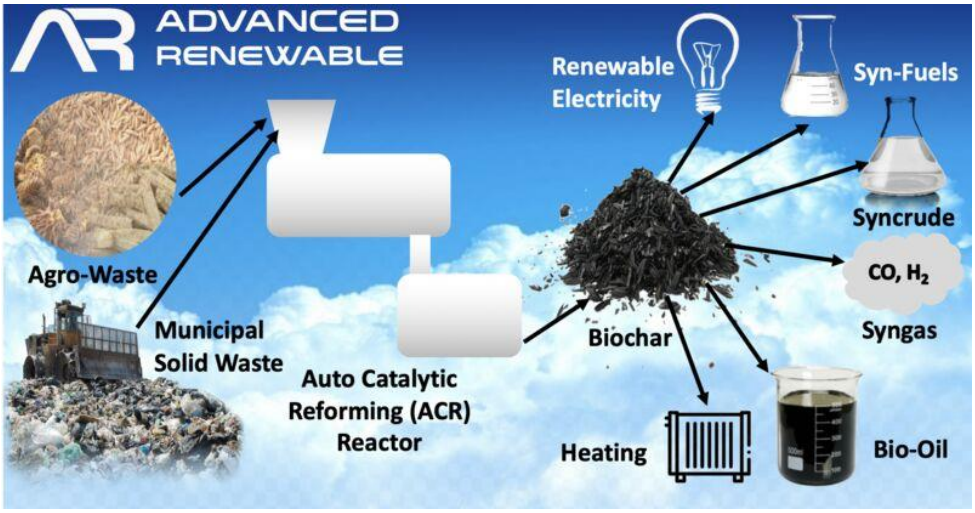
The initial seeds are in the form of a multipurpose reactor that we call Auto Catalytic Reforming (ACR), it can process any waste or trash into biochar, bio-oil and syngas. It is from these three that the following 'fruits' will be produced all the time in the form of various types of fuel that we need now and renewable electricity.

Corporations, institutions and communities that are interested in starting to participate in 'planting trees' can already contact us, so that together we can cool the planet earth which is otherwise getting hotter and hotter.

Simple Stored Energy for Advanced Biofuels

Advanced biofuels - The European Union's RED 2, can be realized in start with a very simple form of stored energy, namely bio-char. Making charcoal is a simple task that people have done since pre-historic times, but now we can perfect it so that the energy stored in the biochar is maximized and the process is very fast and clean.

It is a multi-purpose reactor that we call Auto Catalytic Reforming (ACR) whose function we have designed, among other things, is to be able to make biochar from anything very quickly. All kinds of agricultural, plantation, forestry waste and of course also urban waste - which was originally in the form of liability, can now be quickly converted into assets of high value, in the form of stored energy biochar.



If desired, the output of the same reactor can be directed to become bio-oil or syngas, but the simplest, easy to manage logistics and can be directly used for various purposes is this biochar. This can be done at the residential, commercial or industrial complex level, so there is no need to send any

waste out of the complex - your waste has now become an asset.

As stored energy, biochar stores far more energy content compared with original biomass. If the biomass in its natural state stores energy on average 15 - 18 MJ/kg (3,500 - 4,300 kcal/kg), after becoming biochar the stored energy increases to 20-35 MJ/kg (4,780 - 8,370 kcal/kg). Biochar is odorless, not damaged by time and water so it is easy to store and transport.

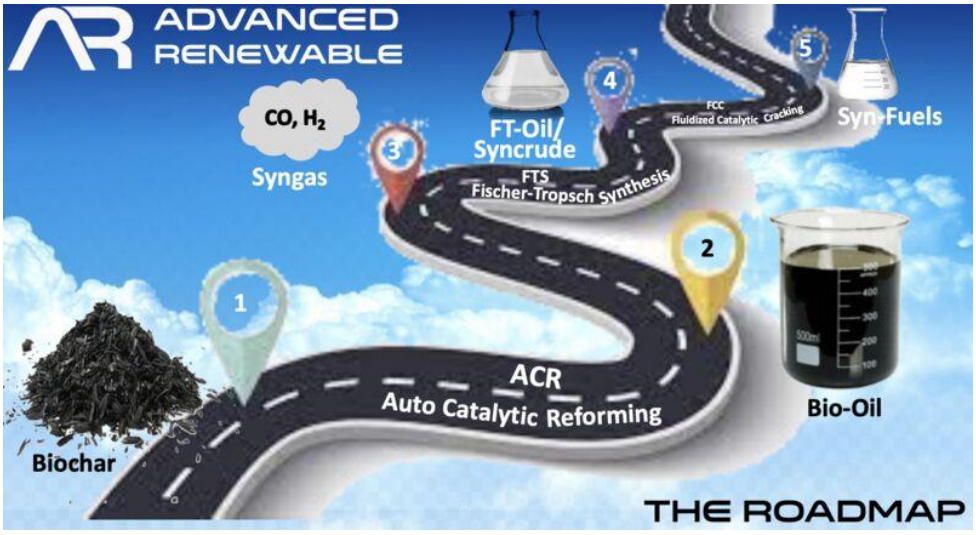
Biochar can be used directly for domestic needs such as cooking, room heating room and so on. In the fuel industry, biochar can be further processed into bio-oil, syngas, syncrude and finally drop-in biofuels such as green diesel, bio-gasoline, bio-jet and bio-LPG.

For the electricity generation industry, biocha can be used to accompany (co-firing) coal directly or even replace it altogether. Waste heat from all processes that burn or decompose biochar can also be a source of cheap, renewable electrical energy.

Outside of the energy industry (fuel and electricity), biochar can be an effective feedstock for the pharmaceutical, water purification, green chemical, and various other industries that are still dependent on fossil hydrocarbons. About 80% of the content of biochar is bio-hydrocarbon - so anything that has come from hydrocarbons can always be replaced with products derived from this biochar.

It's time for us to clean up this earth and take advantage of the abundant resources around us that we are still wasting until now, namely garbage and waste. Now we can store the garbage and waste into stored energy - biochar.

Roadmap to Advanced Biofuels



The term Advanced Biofuels was originally introduced in the European Union 5 years ago in Renewable Energy Directive 2 (RED 2), for fuels that are produced from a list of feedstocks that they have identified, or that meet the conditions they have determined. The majority is abundantly available to us in the form of agricultural, plantation, forestry and urban waste.

The challenge is how to convert this waste into fuel that is clean, carbon neutral and of course renewable - in a process that does not make Advanced Biofuels more expensive than fossil fuels. The illustration below is the result of our research for the last 5 years - since RED 2 was introduced to the

world.

The stages of processing waste into clean fuels using existing technology tend to be expensive. The reasons include energy costs to provide the high temperatures required for these processes, catalyst costs, cost of depreciation of expensive series of reactors etc.

So this is what our solution focuses on, how can the reactors be simplified. We unite the process from biomass to biochar, bio-oil and syngas in one reactor which we call Auto Catalytic Reforming (ACR). The investment costs for the machine become cheap, it doesn't require external energy because heat is generated from the waste itself, and even the catalyst needed also uses the biochar produced by this process itself.

Another benefit of this ACR technology is that the quality of bio-oil is very high compared to ordinary fast pyrolysis bio-oil, and can even be directly used to be mixed with fossil fuels. With the ACR technology that uses an auto catalyst from biochar, syngas production can also be carried out at much lower temperatures, namely in the range of 700 degrees Celsius, while syngas production through ordinary gasification requires temperatures above 1000 degrees Celsius.

The low cost syngas output from the ACR reactor can be further processed into syncrude via Fischer-Tropsch Synthesis (FTS) - which can completely replace crude oil. The difference is that syncrude is free of NOx, SOx, is carbon neutral and completely renewable.

Syncrude can be further processed into various types of synfuels through the fluidized catalytic cracking (FCC) reactor and its fractional distillation, to produce green diesel, sustainable aviation fuels (SAF), bio-gasoline and even bio-LPG.

This series of processes not only produces low-cost Advanced Biofuels, waste heat from ACR, FTS and FCC reactors can also be recovered and converted into Renewable Electricity using the ORC Microturbine that we have also developed.

Abbas Ibn Firnas
875 M, 10 Minutes Flight

Wright Brothers
1903 M, 12 Second Flight

FlyNow
2024 M, > 30 Minutes Flight

All the knowledge has been written down, the technology has been tested - what is needed next is all the resources to implement it in a structured, systematic and massive manner - so that our planet earth remains comfortable to live in.

12 Centuries Since the First Flight

Most aviation history states that the first flight was expanded when the Wright Brothers managed to fly 12 seconds with a plane that was heavier than air in 1903. In fact, 11 centuries before the Wright Brothers, in Andalusia there was Abbas Ibn Firnas who managed to fly 50 x longer than The Wright Brothers with their plane, Abbas Ibn Firnas managed to fly 10 minutes!

But the lesson is not a matter of who came first, the lesson is why we, who live almost 12 centuries after Abbas Ibn Firnas, have not yet tried to be able to fly to overcome the problems that are very imminent in this era.

There are at least 3 problems that can be solved by flying in this ultra modern era. The first is traffic congestion in big cities, which until now has no solution yet. The second is remote areas or islands that have not been able to prosper because of transportation constraints.

And the third is energy efficiency and its emission reduction from it, the personal transporter that I present in the photo - it is very energy efficient because apart from the energy saving of the engine itself, there is no additional energy load as happens in land vehicles which encounter traffic jams, in the air there is no road congestion.

So 12 Centuries after Abbas Ibn Firnas, it's only a matter of time before modern humans have to start being able to fly in personal transporter to overcome these three things. Together with the team from FlyNow, we aim to be able to fly complete with permits globally in 2024, God willing.

Advanced Feedstocks for Green Industry 4' Briefing

When the supply of petroleum is disrupted, it could be because its reserves are continuing to decrease, it could also be due to world geopolitics, so what is being threatened is not only the supply of fuel. All industries that have so far depended on feedstocks from petrochemical derivative products will also be disrupted.

On the other hand, what needs to change towards a greener, carbon neutral and sustainable industry is not just the energy or fuel industry. A number of industries such as chemicals, plastics or materials in general, pharmaceuticals, pesticides to the food flavoring and aroma industries which so far use petrochemical derivative products will all be disrupted.

So there is a lesson learned from the potential energy crisis which could be prolonged which was triggered by the war between the two neighboring countries Russia - Ukraine, so that countries and their people really think about being able to independently securing feedstocks from existing sources in each country or region, so that does not depend on imported feedstocks from other countries.

While we are still at the beginning of our search for new and renewable sources of feedstocks, we can direct our search to sources of feedstocks that are not competing with food, animal feed, agricultural land or forests. The new source of feedstocks in the European Union's RED II scheme is called Advanced Biofuels.

However, in our initiative we have perfected this term to become Advanced Renewable, because from the same material it is not only used to serve the fuel industry but can also be used for various other

industries that need to be green and maintain the sustainability of their supply chain.

This short 4-minute executive briefing can help business players in industrial sectors who have so far depended on oil products or their petrochemical derivatives, who currently need alternative feedstocks that are greener, more sustainable and more importantly also support local economy growth.

https://www.linkedin.com/feed/update/urn:li:activity:7015520436352413696?updateEntityUrn=urn%3Ali%3Afs_feedUpdate%3A%28V2,urn%3Ali%3Aactivity%3A7015520436352413696%29&lipi=urn%3Ali%3Apage%3Ad_flagship3_groups_content_search%3B2c+%2FkTmXTw+fL

As Clear As Water, As Burns As Oil

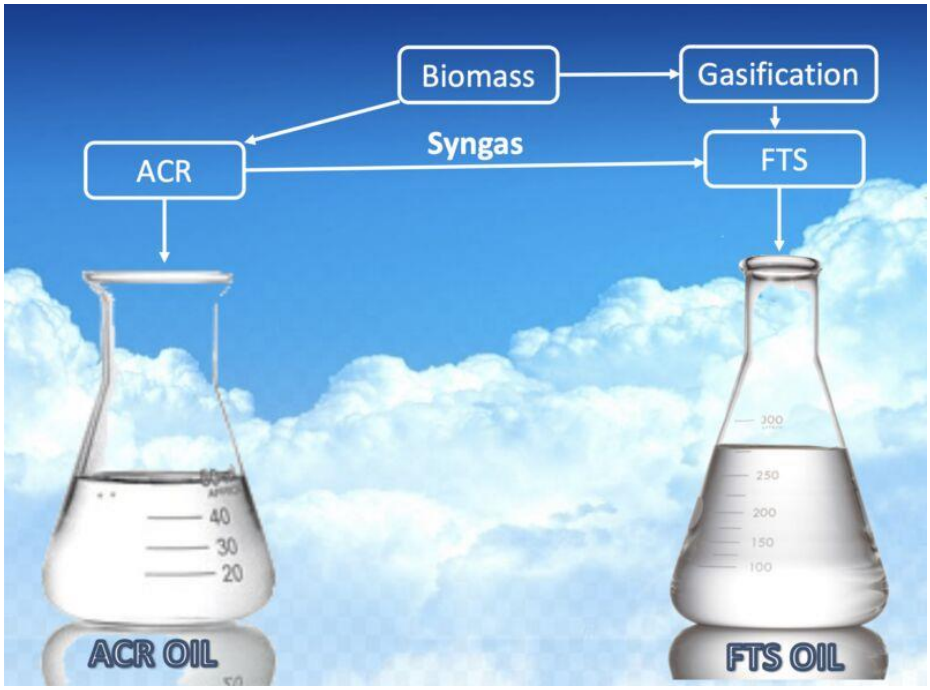
In the tireless journey of our research team to search for clean and renewable energy, there are interesting phenomena that we found, including two types of Advanced Biofuels which besides being clean - in the sense of being free of NOx, SOx and carbon neutral, they are also literally very clear physical appearance.

Both are included in the Advanced Biofuels category of the RED II standard, because the raw material can be any biomass on the 17 feedstocks list of Annex IX A RED 2. What is abundant around us are rice husks, straw, corn cobs, empty palm oil bunches and urban or household organic waste.

The first clear Advanced Biofuels we call ACX OIL - which is the result of the latest biomass energy conversion process where not only the heat source takes part of the biomass material itself, but even the catalyst we use also comes from the biomass itself. When the biomass becomes charcoal, it comes with micro elements from metal groups such as Ca, Fe, Al etc.

Apparently our Creator has truly provided for all our needs on this earth. If we process biomass into

sophisticated fuels, the need for the catalyst has already been provided by Him in the biomass itself. The metals that are available on a micro-scale in the biomass charcoal are already able to function as the catalysts we need, they don't need to be imported far from outside.



Because we get heat for the process and the catalyst from the biomass itself, the process to produce the first clear Advanced Biofuels is what we call Auto Catalytic Reforming (ACR). However, because there is not much ACR Oil, so far the yield is only a few percent of the dry weight of the processed biomass, we are continuing the process to produce clear Advanced Biofuels to the second type.

Apart from producing ACR Oil, ACR Reactor also produces charcoal and syngas. Then we process this syngas using Fischer-Tropsch Synthesis (FTS) to produce synthetic crude (syncrude) which after cracking and fractionation will produce various types of Advanced Biofuels which are also have clear appearance. This second group is what we generally call FTS Oil.

With a series of processes to produce ACR Oil and FTS Oil plus the waste in the form of charcoal, almost all - above 90% - of the energy stored in biomass, either waste or garbage can be used as a source of feedstocks collectively is called Advanced Biofuels. Still we don't care about processing garbage and waste? Are we still going to continue to fill this earth with mountains of garbage in the centers of our civilization, in our cities?

Survival Fuels

It has been more than a decade that our people have been accustomed to being so dependent on the supply of LPG for their domestic fuel, even though the majority of LPG is imported and even though it has to be heavily subsidized. What if LPG suddenly isn't around?

Natural disasters that often come to this country, can make an area isolated for several days, even for people who live on small islands - the wave season is enough to eliminate the LPG supply on the island.

Other emergency situations don't have to be from natural disasters or climate change, emergency situations can also arise from public policies. When production MSMEs need so much energy, while they can no longer access subsidized 3 kg LPG, the LPG supply becomes an emergency for them.

This means that LPG emergencies can occur for various reasons and can happen to anyone. So what can we do if LPG, which is comfortable for domestic use, disappears due to the various emergency situations that I gave an example of above?

Several years ago we designed an emergency stove which we called Survival Gasification Stove 1 (SGS 1), the design is simple and can be imitated by anyone who needs it. Although simple, this stove can really produces gas from the heating process of the firewood in it.

So the fire that appears to be burning on the stove is not from the wood which burns directly, but the gas that decomposes from the burning wood which becomes hot in the stove. That's why fire comes from the holes in the top of the stove, not from the wood directly.

The problem is finding firewood, especially in urban areas, of course, is not easy. However, in our cities there is an increasingly abundant fuel - namely municipal waste. So that it doesn't stink and is easy to store for long-term energy reserves - to anticipate emergencies, all that remains is to make biochar, so we will already have reserves for basic energy - in anticipation of emergencies for any reason.

If there are institutions, NGOs or social enterprises interested in managing this emergency energy, God willing, we are ready to fully support it with all the solutions that we have continued to develop to date.

From Waste to Fuels and Power

Two weeks ago the President of the Republic of Indonesia challenged all the governors in this country, who is already in charge of handling waste in their respective areas, and no one showed up. This shows how waste is still a huge liability - and no one has succeeded in turning it into an asset.

The reason is that waste is still handled centrally, each region needs a Final Disposal Site (FDS) which

continues to expand. The cost of land for this continues to swell, and the biggest one is of course the cost for transporting waste from all over the city to the FDS. It's not only a matter of cost, but also the social and environmental impacts are no less serious than this issue of cost.

On the other hand, waste actually includes one of the feedstock of 17 feedstocks which in the European Union have been identified as feedstock for Advanced Biofuels which came into effect in the RED 2 (Renewable Energy Directive 2) scheme since last year (2022). In this scheme, the use of municipal waste and household waste as feedstocks for Advanced Biofuels is included in those given special incentives in calculating their targeted emission reductions.

Even the waste heat from the process to produce Advanced Biofuels can still be recovered to produce Renewable Electricity - which is given further greater incentives in calculating emission reductions in the RED 2 scheme.

What is the mature technology for converting waste into Advanced Biofuels and Renewable Electricity? The following is a brief executive briefing, less than 5 minutes, which can provide insight for governors, regional heads, corporate and institutional leaders and various other parties who have an interest and concern for this waste.

It's time for someone who is able to immediately accept the President's challenge mentioned above, so that we can immediately change waste that is still a liability, to quickly become a high-value asset in the energy transition era.

Appearance of Green Universal Feedstocks Machine

If all this time municipal and household waste is still a big liability, local governments and communities have to pay a high price to be able to dispose of their waste, now is the time for all parties of waste stakeholders to rethink how they have handled their waste so far.

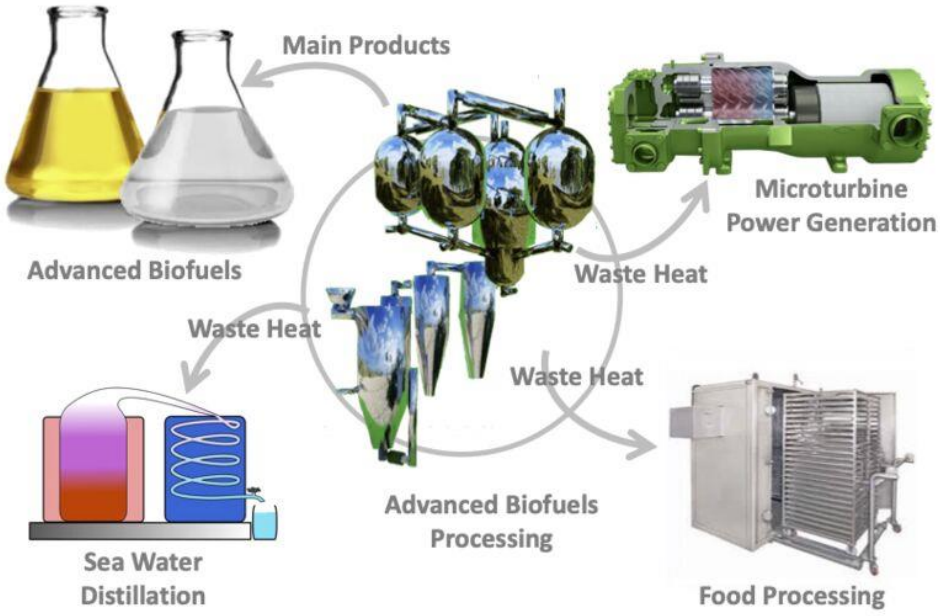
Each organic waste biomass generally contains more than 50% of the dry weight of hydrocarbons. If only we could take these hydrocarbons, then we would get universal feedstocks which are very widely used. This hydrocarbon is bio-hydrocarbon, which is renewable and carbon neutral.

So this is one of the machine that can extract bio-hydrocarbon from organic waste. The output of this machine is bio-oil according to the current international standard, namely ASTM D7544.

Besides being able to be used for direct fuel, with one step of the gasification process it can be converted into synthetic gas or syngas.
Syngas, which is a product derived from Bio-Oil, can become a green universal feedstock for all types of industries that need it. In addition to the Advanced Biofuels industry, it can also be used as feedstocks for green chemicals, green pharma, bioplastics, biomaterials, etc. Interested in trying it?

Solution for FEW Trilemma

Meeting the three basic needs of Food, Energy and Water (FEW) in a conventional way, as has happened so far, often creates a trilemma - that is, competing for resources for each need. When the majority of fresh water is used for food production, drinking water reserves suffer. When food is used as renewable energy, food reserves are sacrificed and so on.



This trilemma will be easier to solve and even integrate into one solution, when we can focus on solving energy problems that no longer rely on fossils and do not use food or feed. The energy that in the European Union are called Advanced Biofuels and Renewable Electricity.

The solution ecosystem is more or less like in the illustration below. The series of reactors ranging from fast pyrolysis to catalytic cracking/distillation which are used for the process of producing biofuels from waste, apart from producing the main product in the form of various types of Advanced Biofuels, also provide a by-product in the form of a large amount of waste heat.

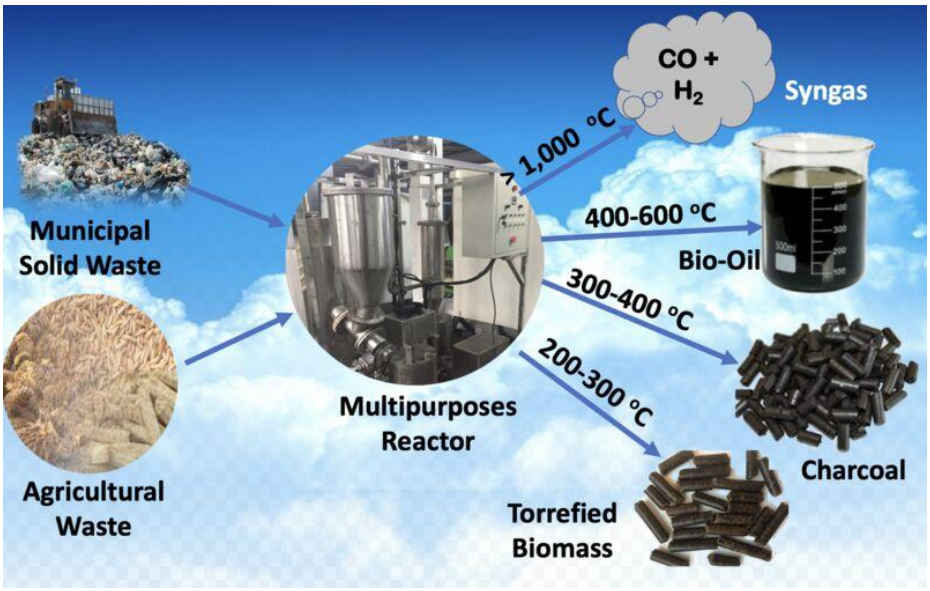
This waste heat can be used for distillation of seawater to produce fresh water, so our water needs will be easily met because seawater is 97.5% of the water on earth - there will always be enough water for all inhabitants of the earth - as long as we have enough heat energy for the distillation process, and it is this sufficient and free heat energy that is provided by the Advanced Biofuels reactors mentioned above.

Some other waste heat can also be used to solve food problems, 25% - 30% of agricultural products are generally wasted because they are damaged or rotten before consumption. This damage is generally due to the absence of proper processing of agricultural products which are inherently perishable in character.

The easiest but most effective processing of agricultural products is drying, both simple and sophisticated with freeze drying, for example. But both need energy, when energy is expensive - then the processing of food products also becomes expensive. On the other hand, cheap energy such as waste heat, as well as the electrical energy produced by this waste heat, can be used to process agricultural products inexpensively.

If only the 25% to 30% that is wasted is saved, then our food security will be much better. As a result, starting with one good thing - namely processing waste into Advanced Biofuels - other good things will follow, hal jazaa'u al-ihsaan illa al-ihsaan, there will be no FEW trilemma.

Once Throwing a Stone, Four Birds Hit



Initially, we only built a reactor which we directed to work at a temperature range of 400-600 degrees Celsius for fast pyrolysis of biomass into bio-oil. However, this machine is equipped with a flexible temperature controller, so that it can work at lower temperatures or at much higher temperatures.

Apparently this one reactor can serve a variety of products needed by the market, not necessarily bio-oil. When we set the maximum temperature to 200 degrees Celsius, the biomass inside is just completely dry, but there's no point in working at this temperature because drying in the sun can also dry biomass completely - it just takes time.

Then if we set the temperature in the range of 200-300 degrees Celsius, this temperature is torrefaction temperature, the product is called torrefied biomass - which can be used for the production of high quality biomass pellets from any biomass material.

If we raise it even higher in the range of 300-400 degrees Celsius, this is the temperature for making charcoal. The result is pure charcoal, which can be further processed into higher quality charcoal pellets or briquettes.

In the temperature range of 400-600 degrees Celsius, this was our initial design target. The targeted product is bio-oil, which is a universal feedstock for the various types of Advanced Biofuels that we want.

If we keep increasing the temperature until it reaches around 1,000 degrees Celsius, this is the gasification temperature. The main product at this temperature level is syngas or synthetic gas. Syngas

is a basic building block that can be used for various products that have so far depended on petroleum and its derivative products. So it can be used for biofuels, green chemicals, green pharmacy, bio-plastic, bimaterials and so on.

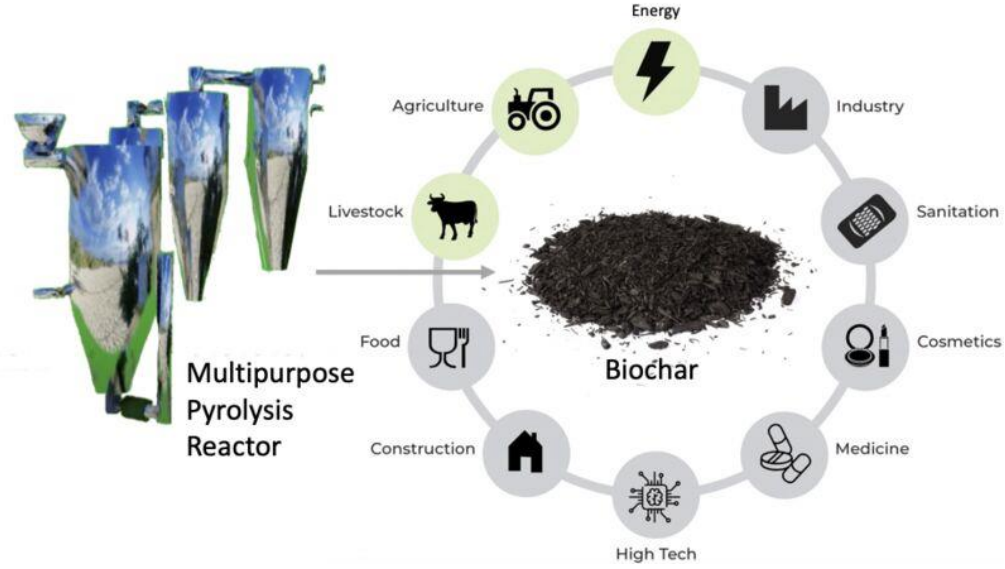
At whatever temperature is desired, this reactor does not require an external heat source, our design relies on the concept of autothermal - that is, using a small part of the biomass itself as a heat source, to process a large part of it into the desired product.

With a machine like this, if there are no governors or regional heads yet who are able to respond to the challenge of the President of the Republic of Indonesia two weeks ago to deal with waste thoroughly in their respective regions, it could be because there is simply no will to do their best to deal with this waste problem.

Biochar as Multipurpose Feedstocks

This energy conversion reactor from the fast pyrolysis category is truly a multipurpose reactor. At whatever temperature he works, it can produce feedstocks for various industrial needs. At temperatures of 500 - 600 degrees Celsius as originally designed, the result is bio-oil that can be used for anything from energy to the pharmaceutical industry. Likewise, if I increase the temperature to around 1000 degrees Celsius, the result is Synthetic Gas or Syngas, which is even more flexible in its use.

What if I lower the temperature down to around 300 - 400 degrees Celsius? the majority of the result is biochar. The difference with char-making machines in general, this pyrolysis reactor produces char very quickly - in just a matter of minutes from the time the biomass is entered into the reactor, it will come out as char.



So what is this biochar for? depending on the original biomass. If we process biomass such as rice husks, corn cobs, empty palm fruit bunches and even urban organic waste, the results are the most ideal for energy. We can make it into biochar pellets, with the energy content is around 20 MJ/kg or

about 45% of the energy content of petroleum fuels.

The benefit of making biochar pellets is that it makes agricultural and urban waste tradeable easilty, easy and efficient way to transport because the energy content per unit volume increases in the range of 8 to 16 times that of the initial waste.

Biochar from certain agricultural wastes such as coconut shells, for example, is mostly needed by the pharmaceutical industry because of its phenols content which they need for drug production. The same goes for bamboo, the pharmaceutical industry has long been making medicines to absorb poisons in the stomach using ingredients from bamboo charcoal.

Because the average energy density per unit weight of biochar is about 33% higher than the energy density per unit weight of the initial biomass, it is more economical to use as a substitute for biomass for power industries that are starting to move towards co-firing coal with biomass.

Another advantage of using biochar pellets is that the source is very flexible. If the biomass used for co-firing the power plant is only from certain types of biomass so that its supply is not guaranteed for its sustainability, by using biochar the source can be from any biomass - sustainability is more guaranteed.

God willing, our ecosystem is ready to talk to industries and institutions that are entering the energy transition process from fossil to renewable energy that is sustainable and carbon neutral.

Appearance of Universal Feedstocks for Advanced Renewable

Of the 17 types of feedstocks targeted by the European Union for their Advanced Biofuels, the majority are in this country. Only the position is spread out, including in places that are not pleasant to visit such as Temporary Waste Disposal Sites (TWDS)) and Final Waste Disposal Sites (FWDS), so the feedstock that has the potential for green economic growth has barely been processed.

So this is the solution we offer, waste and trash everywhere can be turned into biochar, bio-oil or synthetic gas (Syngas) with the same type of machine, namely a pyrolysis reactor, of which I have shared detailed videos in

previous uploads.

Of the three types of products, biochar like the one I hold is the easiest to handle. It is very stable, not damaged by water or weather even in the open, making it easy to transport and store.

After it becomes biochar - from any source, almost the same as one another, it doesn't smell anymore - because the volatile materials that cause unpleasant odor have been used up in the pyrolysis process.

So when the trash in your housing complex has turned into this biochar, there will be no smell of trash around you anymore. In fact, there is no need for TWDS and FWDS anymore, when all the organic waste that the scavengers are not interested in - has now turned into feedstoks with quite high economic value - the buyer will pick it up at your place.

Because the pyrolysis process takes place quickly - in a matter of minutes, all waste in one housing complex can be processed into biochar on the same day. So that there is no garbage/waste that has to stay overnight - which creates an unpleasant odor.

From this biochar various industries will be able to process it to become a substitute for their fossil feedstock. Not only for energy such as Advanced Biofuels, but also for green chemicals, green pharmaceuticals, bioplastics etc.

Even the waste heat from the pyrolysis process can still be recovered to become Renewable Electricity. If it is on a small scale, for your own complex or company - in the RED 2 scheme it is included in the Renewable Self-Consumers category which is encouraged in all EU member countries..

Air Vision

There are three areas that Allah subdued for all mankind, namely the sea, air and land - there is no area of the earth that does not belong to one of these three areas. This give to humans is found in a number of verses, but sequentially in QS 45:12-13, where in all three Allah uses the same word, namely sakhara.

So what has been subdued by Him for this human being, it is our responsibility to guard, manage and explore it in a balanced way. If we only focus on one of them, it will be imperfect the blessings that He has actually given us.

Look at the sample photos below, because we are too focused on solutions on the ground - in this ultra-modern era, humans are still unable to solve problems that should be trivial, namely the congestion of big cities and their unusually ugly air pollution. As a result, how many resources are wasted, the excessive burning of fossil energy - whose ensuing further consequences also disrupting

the balance in the air.

Because it is still too focused on land, even a solution that looks smart still doesn't solve the problem. The birth of the electric car was encouraged and even subsidized, but do electric cars solve traffic jams? definitely not, in fact it will still exacerbate the congestion. Does it reduce emissions? in total it is not significant because as long as the majority of our electricity still uses fossils, the use of electric cars only transfers air pollution from cities to power generation centers.

So what if we want to look up a little - look up into the air. Our air in several hundred meters above the ground - still very quiet. Why don't we make this a way for personal transportation, which so far has used private cars that have caused this extraordinary traffic jam?

The technology is not much different from an electric car, and the cost to build the unit is not that different from making an electric car. Security issue? Modern humans have even designed security for exploring space, designing security for vehicles that only fly a few hundred meters from the ground must be easier.

What is needed initially is only vision, we must open our eyes to the cue from the Creator who has subdued the sea, air and land for us. We must be able to manage all three in a balanced way to solve the problems we face.

Visions are different from dreams, visions are born from values, visions must be detailed into missions, strategic goals and tactics, while dreams do not need elaboration. So Air Vision is our vision to solve congestion and air pollution that keeps getting worse. The detailed description is available for interested parties to work together in the same vision.

Homogeneous Feedstocks from Heterogeneous Biomass

In addition to its highly dispersed production centers, biomass also varies greatly in shape, size, moisture content, calories etc. So far this distribution and diversity has become an obstacle, why biomass which has so much potential for biofuel feedstocks which in the RED II scheme are referred to as Advanced Biofuels has not been utilized optimally until now.

I have described the problem of handling from very dispersive sources in a previous upload, how about handling the diversity of biomass? This is where the fast pyrolysis reactor technology that we have

developed comes into play. The biomass can be anything, but the output from this reactor is a relatively uniform product, in fact there is a standard in the market, namely ASTM D7544.

Notice from the photo below, in their original form the husks and corn cobs are of course very different. However, when we processed it using the fast pyrolysis reactor, the results were physically exactly the same. The difference between the two can only be seen when analyzing the energy content, water content, etc.

Homogenization of this feedstock will facilitate easier handling in further processes when this bio-oil is to be converted into Advanced Biofuels such as diesel, jet-fuels, gasoline and even LPG. This homogenization will also facilitate easier planning of the downstream industry for Advance Biofuels, because it is no longer dependent on a particular type of biomass.

Likewise, price stability will tend to be stable because the diversification of sources of raw materials will make it difficult for cartels which tend to control only certain sources of raw materials. If certain raw materials tend to increase to an abnormality, simple solution, leave them and use other raw materials - after all, the bio-oil will tend to be relatively the same.

With the concept of homogeneous feedstocks even though the biomass is very heterogeneous this will also enable the birth of small scale energy producers (fuel and electricity) which in RED II are called Renewable Self-Consumers, God willing, there will always be feedstocks that are suitable for the fuel you need.

Advanced Renewable 2023

The years leading up to SDGs 2030 are getting closer, countries in the world will strive to meet their respective NDC (Nationally Determined Contribution) targets, various laws and regulations related to emission reduction will increasingly pressure business players to support their respective government who have committed in reducing emissions.

Apart from the government, business players will also be under pressure from their respective markets which must also reduce emissions in their entire supply chain network. Even further, the financial industry has made preparations not to provide support to industries or business players who do not

care about the need to reduce emissions and other sustainability issues.

The world's stringent efforts to reduce emissions don't really have to be seen as a problem, on the contrary - it can be a distinct opportunity for industries or businesses that really have a strong desire to make emission reductions part of their strategy in the energy transition era.

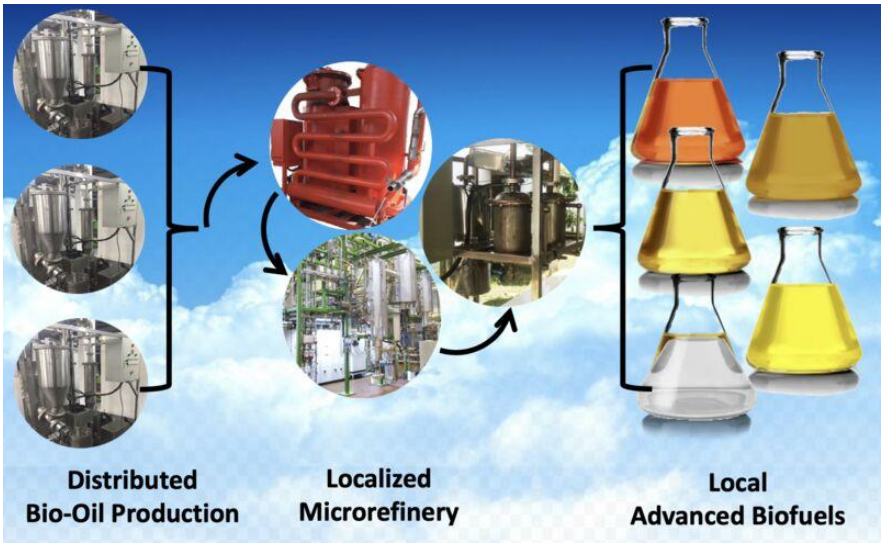
The European Union market, which is one step ahead compared to other markets, has even opened up opportunities for the birth of new commodities, both in the form of feedstocks and finished products called Advanced Biofuels, Renewable Electricity, Renewable Self-Consumers, etc.

A trend can be a threat to those who are not aware of the existence of the trend, and conversely it can be an opportunity for those who welcome it and are ready to work on it. Therefore, we have prepared all the programs needed to understand the ins and outs of this new trend in the field of renewable energy.

We call this program Advanced Renewable 2023 (AR 2023), which can be in the form of executive briefings, in-house training, workshops, coaching, mentoring, consulting, etc., all related to Advanced Renewable.

Because there are still limited resources available, this program is only for corporations, institutions or communities directly involved in renewable energy in general and Advanced Renewable in particular. For the individual public, the program will follow. Further information can be asked via private message of this media, or you can directly email to: ceo@advancedrenewable.org

Ecosystem for Local Advanced Biofuels



In European Union countries, through the Renewable Energy Directive II (RED II) which came into force this year, the so-called Renewable Self-Consumers are encouraged. In addition to accelerating the increase in the use of renewable energy, this step also encourages people's creativity in producing energy and using it themselves.

In countries that still subsidize energy for their people, such as Indonesia, a step like this, if carried out, will have multiple benefits. Apart from increasing the use of renewable energy and encouraging people's creativity, it will also reduce energy subsidies while at the same time distributing development throughout the country.

Remote small islands that have not been optimally developed due to the high cost of fuels shipping, can grow rapidly if they can produce their own energy. Not only electricity that can be generated from sunlight, but also fuel for transportation vessels and fishermen.

What will it take for these islands and remote areas to produce their own fuels? In essence, there are 4 of these technologies that are needed.

The first is fast pyrolysis technology to process any biomass into bio-oil. This bio-oil production can be done wherever there is biomass production. Biomass needs to be converted to bio-oil first so that it can be easily managed logistically, after it becomes bio-oil it becomes stored energy that can be used or processed next anytime and anywhere.

The second is gasification, to convert bio-oil into syngas. The third is Fischer Tropsch synthesis to convert syngas into syncrude. And the fourth is catalytic cracking and its fractional distillation to convert syncrude into diesel, gasoline etc., for the needs of the island or remote area itself. These three processes can be concentrated in one of the most strategic locations on the island or remote area, not necessarily in the center of the biomass production.

Of these four technologies, we have made 3 of them, namely fast parolysis, gasification and catalytic cracking/distillation. One more technology Fischer-Tropsch synthesis (FTs) which is still in the planning. But in our network there are already those who can produce these FTs reactors for micro sizes from a capacity of 10 to 100 BPD - enough for the production of 1,500 to 15,000 liters of fuel per day.

What does this mean? The RED II Standard Advance Biofuels category fuel can be micro-produced even on remote island or remote areas. Development will be evenly distributed quickly, and islands or remote areas where on average the air is still clean - can be maintained from an early age so that development does not need to join in polluting the air like their relatives who live on islands and big cities. So that living on small islands and remote areas is beautiful and remain clean!

Advanced Renewable Feedstocks

When world oil reserves shrink or trade is constrained by global geopolitical situations, what is disrupted is not only the supply of the energy industry that relies on petroleum, but also all industries that use feedstocks from products derived from this petroleum industry.

Vice versa, if we can overcome supply for the energy industry that is no longer dependent on petroleum, then in fact we can also overcome all industries that were originally dependent on petroleum-derived products or petrochemical products.

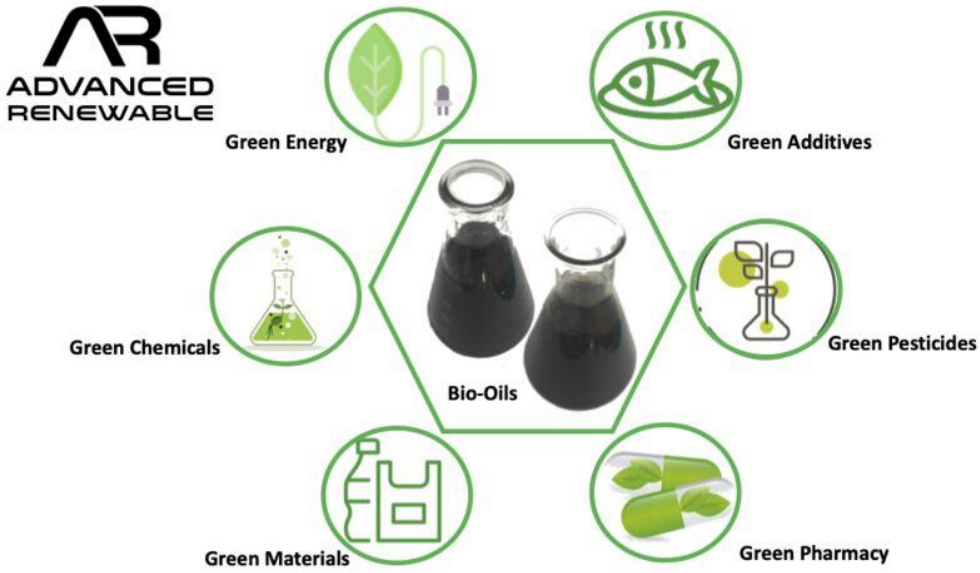
The first, of course, is what I have uploaded a lot on social media, namely Advanced Biofuels and Renewable Electricity which can be produced from the various biomass around us, which we have processed into homogeneous feedstocks, namely bio-oil, to facilitate its accumulation and processing in downstream fuel industry and power generation.

The second is the chemical industry in general, all of which previously depended on petroleum-derived products can now be replaced from bio-oil-derived products. An example is a solvent that is widely used for industrial process, which can be completely replaced by green chemicals from bio-oil derivatives.

The third is the material industry, such as a variety of plastics, textiles, composites, etc. Everything that originally relied on petroleum-derived products, can also be synthesized from syngas - the first derivative product of bio-oil. After becoming syngas it can become anything, because syngas is like the bricks we use to build our homes - we can build any building out of these bricks.

Fourth is the pharmaceutical industry, all the chemicals that have been used by this industry - now they can also be produced from bio-oil. There are two approaches, the first is bio-oil which is already rich in phenols - all that remains is to take the phenols for pharmaceutical ingredients. The second can go through the syngas synthesis pathway as for the chemistry mentioned above.

When Fifth is a pesticide industry, all chemicals used in this industry can also be replaced from bio-oil derivatives. The approach is similar to the pharmaceutical industry, where compounds in bio-oil can be used directly for pesticides or to develop special compounds from syngas.



The sixth is industrial additives which are widely used in our food industry, particularly for

preservatives, flavors and aromas. The traditional one has even been widely used, namely bio-oil or the low temperature version called liquid smoke - it is used to preserve fish and meat, as well as to give the taste and aroma of grilled fish or meat. The advanced version can again be synthesized from its bio-oil derivative products, for all kinds of flavors and aromas that we want.

The first one for green energy, God willing, our team can work on it from upstream to downstream, for five other green industries - those of you who are interested in developing them with us are welcome.

So That Energy Does Not Become a Weapon of War

T
he Russia-Ukraine war this year has shown the world how modern wars have used basic human needs as weapons, one of which is energy. Supporters on one side really need an energy supply, while the other side really needs a market - this is where they can put pressure and threaten each other.

In contrast to physical wars which only bring victims to conflict areas, energy wars have a much wider impact. Even countries that don't know anything about it are affected, at least in the uncertainty of energy prices and the sustainability of their supply.

A more serious impact is of course experienced by countries involved in the conflict, either directly or just as supporters. In winter which is happening in the Northern Hemisphere at this time, that winter can really take its toll - when the supply of energy to warm their bodies is disrupted.

The use of energy as a weapon of war can actually be prevented, namely if access to energy can be owned by everyone wherever they are, both in countries that are in conflict let alone those that are not in conflict. This is actually possible when society shifts from dependence on fossil energy whose sources are only owned by certain countries, towards renewable energy whose sources are abundant.

Countries whose people are energy independent - certainly cannot be pressured by other countries in their energy needs. So energy independence must be part of the national security priorities of each country.

One of the basic energy sources that can be used as feedstocks for energy independence is biomass, because this biomass grows anywhere - including even in very dry desert areas. The Al-Qur'an, which was revealed in a desert country, even hints at this biomass energy in a number of its verses (QS 36:90; 56:71-73 etc.).

Energy conversion from biomass is also very flexible, starting from the fast pyrolysis reactor as seen below, for example, with one gasification step, it produces gas that is self-sustaining. With the addition of two more steps, namely Fischer-Tropsch synthesis and catalytic cracking, it will produce various types of fuel that we need everyday, diesel, jet-fuel, gasoline and even LPG.

Even further, with one additional configuration, namely the ORC Microturbine, it will also generate electricity. All the technology for this are mature, it only need to be disseminated evenly throughout the world - so that no country will use energy as its weapon of war.

Our social organization - Advanced Renewable Organization, God willing, is ready to cooperate with world institutions working in the humanitarian field, to open the widest access to this affordable clean energy, this is also a concrete form of goal number 7 of the SDGs.

The Abundance of Advanced Renewable Feedstocks

There are two terms introduced by the European Union in the Renewable Energy Directive II (RED II) which should inspire energy stakeholders, especially renewable energy. The two terms are Advanced Biofuels and Renewable Electricity, which in our team we combine these two terms to become Advanced Renewable - because it can indeed be handled in one process at a time.

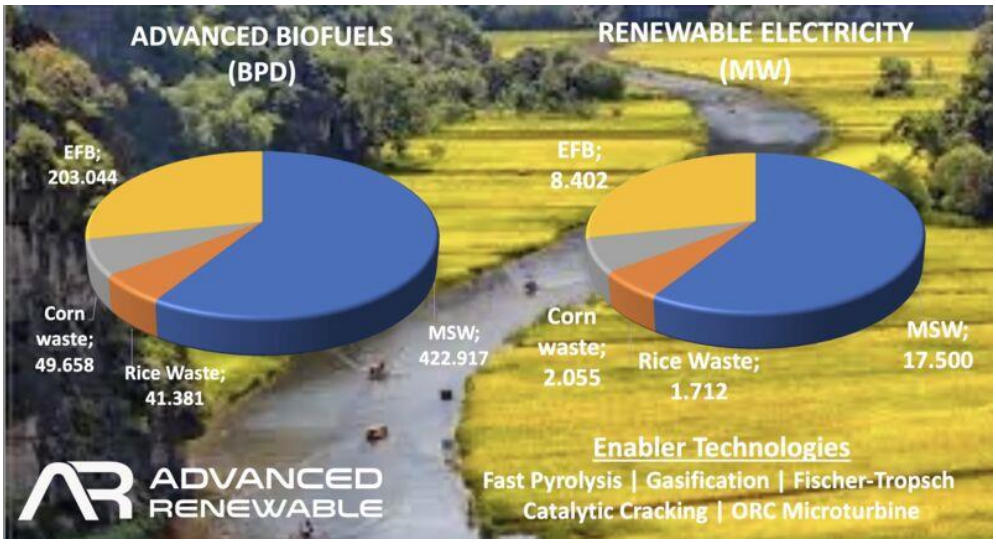
Why is this an inspiration? Even though we are not part of the European Union and there is no obligation to follow RED II, this opens up huge market opportunities for us, as well as makes it easier for us to think about our renewable energy development strategy. Far away in Europe there are already those who have mapped out what kind of raw materials are ideal for Advanced Biofuels, for example, then what standard biofuels products they want and so on.

Of the 17 types of raw materials targeted in RED II, for example, we can realize that around us there are abundant raw materials that are ideal for Advanced Biofuels. If I take just 4 of the 17 on the list, namely urban organic solid waste, empty palm oil fruit bunches, corn waste and rice waste - we can already produce Advanced Biofuels equivalent to 717,000 BPD of petroleum. This is more or less the same as our current oil production, or more than 70% of our oil production target in 2030!

Meanwhile, Renewable Electricity can be harvested from thermochemical process waste heat for the production of the Advanced Biofuels mentioned above. The potential electricity capacity of this waste heat alone is around 30 GW, if it is harvested with the concept of distributed power generation

through the ORC Microturbine that we have designed as well.

The question is how are we going to collect the feedstocks that are so widespread in the form of city waste, palm oil, corn and rice waste? The mindset has to be changed. It is no longer the mindset of the existing fossil energy players, but must adapt existing best practices in the management of related biomass resources.



How can logistic company collect rice, which once its production has spread, becomes a stock that is managed nationally? Similarly, we should also collect this energy feedstocks from the same farmer's land. The only difference is that what logistic company used to collects grain that has been processed into rice, now for energy feedstocks they will collect biomass which has been processed into bio-oil.

The same goes for municipal waste, following the pattern of collecting waste from the source to landfills - only what is transported is no longer waste but is already in the form of bio-oil. Apart from being more concise, now we will be transporting assets with high sale value, and no longer a liability with full of unpleasant smell.

Our team from Advanced Renewable is now ready to share with anyone who wants to help clean up our earth and work on this future green and clean opportunity. God willing.

Sustainability Verses and Its Practice

Ever since Allah told the angels that He would create humans as leaders / caliphs (QS 2:30), then this human task is very clear, that is, when sent down to earth, one of their role is to prosper it (QS 11:61). Even more than that humans are also given the power to conquer the sky (QS 45:13).

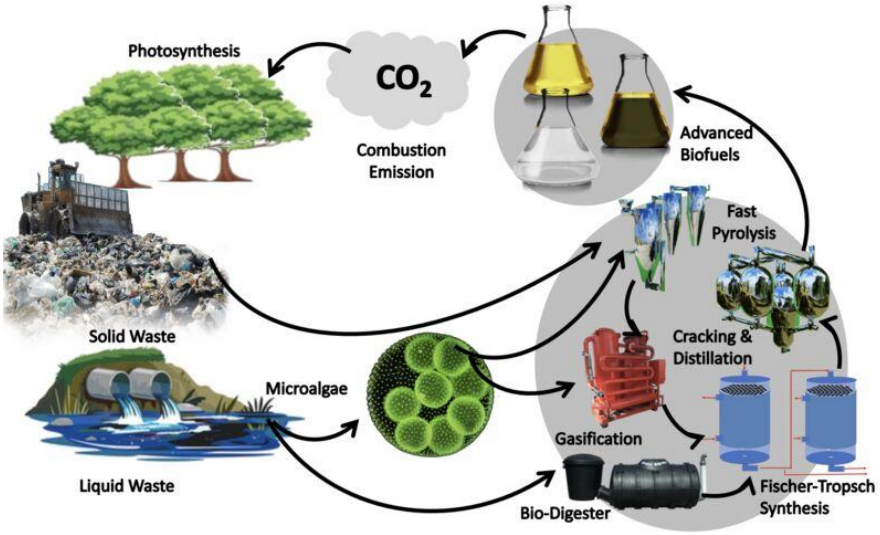
What if we do not carry out the task? There will be destruction on land and at sea (Qur'an 30:41), and disturbance of the balance in the sky. So He also ordered that this balance should not be disturbed, and further He commanded humans to uphold this balance with justice. (QS 55:8-9)

To be able to carry out this mandate, humans are given reason, so they must be intelligent human beings, they must be able to read His verses which are in every object and every event, an expert in knowledge who masters the essence of the matter - ulul albab (QS 3:190).

Even to become ulul albab, He also told how. Namely by continuing to remember Him and seriously thinking about His creation, until they can find a lot of wisdom or goodnesses, and until he doesn't waste every object and event that they thinks about. (QS 3:191).

Because through His verses He provides answers to every problem (QS 18:89), then we can also use these series of verses to solve the biggest human problems of this century. Namely global warming and climate change as the impact of environmental pollution, mismanagement on land, sea and in the sky/air. At the same time, it also provides an answer to the needs of modern humans who need a lot of energy for all of their life activities.

If only we could see the benefits of every waste we put out, both solid and liquid waste -then with our minds we also build proper science and technology to utilize those wastes, then the two big problems will be solved by themselves.



The earth including our seas will be kept clean, and the supply of CO2 to the air will be maintained in balance with the needs of trees and plants for photosynthesis. Meanwhile, energy is met from the waste of our daily activities, and from the produces of trees/plants today - while they still green (QS 36:80; 56:71-73) - not fossils from millions of years ago.

If only we follow His guidances, then He guarantees that we will not get astray and not suffer (QS 20:123), nor will we be afraid or sad (QS 2:38). Isn't this what we all dream of? Our earth and sea are clean, our air is fresh, we are safe from all kinds of harm, and our hearts are happy, free from fear and sorrow? God willing, we can.

Nothing is Wasted

Avocados are now a new healthy food trend in the world, becoming a healthy luxury food in developed countries. Currently it is the 4th largest tropical fruit in the world in terms of sales volume, over 5 million tons per year.

Each avocado has a very large seed, depending on the type - but this seed can be more than 30% of the avocado's own weight. Unfortunately, the majority of avocado consumption in the world almost always leaves this seed which is thrown into the trash. Scavengers didn't even pick it up when they saw this avocado seed in a landfill.

Even though the character of all of His creation is that nothing is useless, it's just that you need 'ulul-albab' to be able to see the benefit of every object that exists between heaven and earth (QS 3:190-191) and then take advantage of it, including this very large avocado seed.

Processing it into vegetable oil is possible, but the oil content is low - so it is not feasible if it is processed by pressing or extraction techniques of vegetable oil in general. Thank God, now there is a new technique for utilizing avocado seeds, as well as other seeds that have been wasted, such as mango seeds, rambutan seeds, jackfruit, zalacca, etc.

This new technique includes using a fast pyrolysis reactor like the photo I shared two days ago. Similar to the characteristics of biomass in general, the hydrocarbons contained in avocado seeds are in the range of 55%, so it is these hydrocarbons that we will take through the fast pyrolysis process.

Same with seeds in general which contain oil - regardless of the percentage, it always provides a higher energy content than non-oil-containing biomass - when processed by fast pyrolysis.

For avocado seeds, the energy content of the bio-oil is in the range of 20 MJ/kg, or around 45% of the standard energy content of RED II Advanced Biofuels. This means that it only takes less than 2.5 liters of bio-oil from these avocado seeds to produce 1 liter of Advanced Biofuels, either in the form of diesel, jet-fuel or gasoline. Not bad for the waste that has been wasted all over the world.

Man and Machine

An engineer's joy is when he can turn his design machine into reality, and this is the very basic engine in the Advanced Renewable world - literally down to the nuts and bolts I designed myself. What is the function of this machine?

Its principle is a fast pyrolysis machine, a machine for the most upstream conversion of biomass energy, converting any biomass into bio-oil. With a few modifications to the inside of the reactor, the direction of the air blowing and the working temperature - it can also be converted into a gasification machine, converting biomass into synthetic gas (syngas).

Both bio-oil and syngas are universal feedstocks that can be processed in more downstream industries to become Advanced Biofuels whatever the market needs, such as green diesel, sustainable aviation fuels (SAF), bio-gasoline, and bio-LPG. All types of fuel produced are drop-in biofuels, which means they can be used in existing engines without the slightest modification.

This machine is like a hoe for the farmers, with a simple hoe the farmer can plant anything, just like a wok for the mothers at home - with her simple wok she can cook anything. So with this simple machine it is hoped that anyone can be involved to take a role in the upstream of the Advanced Renewable industry.

It is called Advanced in the RED II standard, because the target that is processed can be any waste which of course does not need to fight over food or animal feed, there is no need to fight over agricultural land or forest conversion into plantations etc., it is enough to take whatever waste is there including urban solid waste to be converted into bio-oil or syngas.

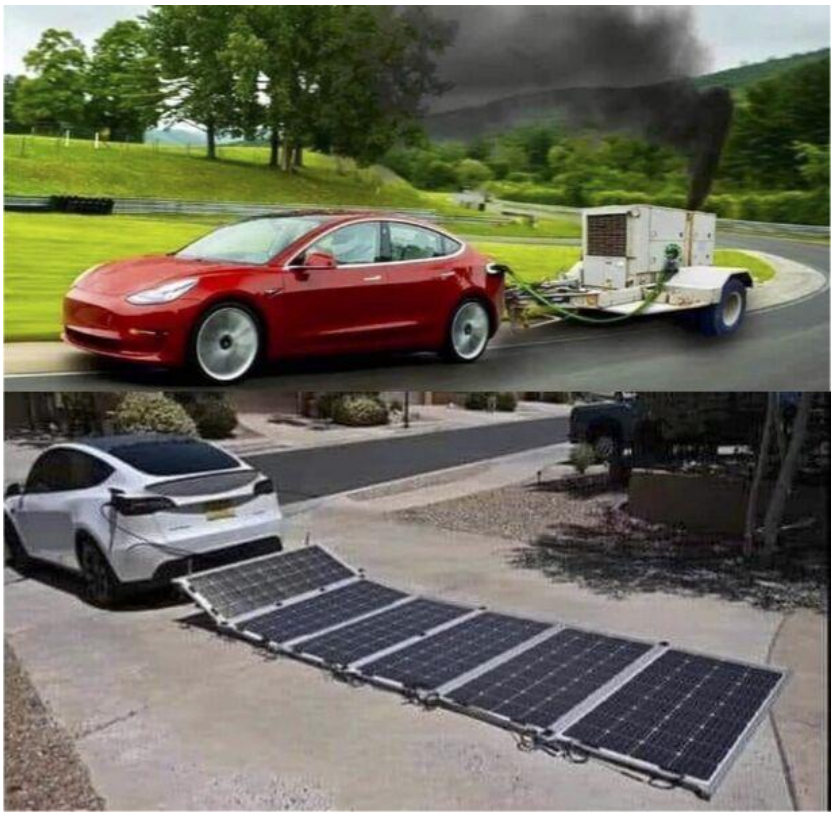
With a heat source from the processed biomass itself, this machine can reach 500-600 degrees Celsius for the fast pyrolysis process or even above 1,000 degrees Celsius for gasification, both without fuel or other external heat sources.

The waste heat from this process that I am currently designing for recovery will become a source of heat for ORC Microturbine to produce what is called Renewable Self-Consumers, in the form of Renewable Electricity which is encouraged for it's growth in the RED II scheme.

The next step is teaching it to people who want to get involved in the upstream of the Advanced Renewable industry, not necessarily for energy, but also to produce feedstock for the green chemical, pharmaceutical, bioplastic industries, etc. InshaAllah.

Off-Grid Electric Vehicle

Even in developed countries whose territory is all mainland, anecdotes of the irony of electric vehicles still often appear. Some have to recharge their electricity with diesel which pollutes the air, some bother to carry heavy solar panels etc.



So the procurement of electric cars in this archipelago country must have more challenges, especially the infrastructure for recharging the batteries of these electric vehicles. Our utility company recommends 5,500 VA power for those of you who want to charge your electric car at home, with a Wuling Air ev it will still take 3-4 hours of 'fast charge' with this power.

We check now the electrical power in our homes, the average must be far below what the utility company recommends. How about charging it up at the PEVCS (Public Electric Vehicle Charging Station)? the choice is indeed this, but where is the closest PEVCS to your home and office? So make sure this is there before buying an electric vehicle.

Moreover, if you want to take your electric car for Ramadhan homecoming, make sure there is a PEVCS in the village, or ask the family in the village to add power to 5,500 VA first. What about during a traffic jam? where can you recharge your car? Still a lot of other problems to solve.

But in every difficulty there is ease, there is also a great opportunity behind the need for electricity which will soar sharply along with the rise of electric cars in this country. And this time the opportunity could be for us, no longer the monopoly of certain utility company - especially to be able to provide sufficient electricity wherever needed by electric vehicles which will continue to increase.

The solution we offer is what I have uploaded several times before, namely the Micro Combined

Energy System (Microces), one of the products from Microces is what we call Off-Grid Electricity (OffGE) - independent electricity in sufficient capacity - which can be present anywhere. Even apart from OffGE, Microces also produces Bio-Oil, so whatever type of car you have, electric or petrol/diesel - can be served by the same system.

How big is the OffGE capacity of this Microces? depending on the raw material of garbage or waste that is around you. For every ton of waste in your housing complex, an average of 690 Kwh of electricity can be generated plus a bonus of 500 liters of Bio-Oil. This is enough to charge 38 Wuling Air ev in 24 hours. So the waste in your housing complex is processed, your electric car is met with electricity needs, and there is still bonus fuel that can be processed further for your gasoline or diesel cars.

Advanced Biofuels 5' Briefing

If you only have 5 minutes to find out what and how Advanced Biofuels that are being implemented in the European Union start this year, complete with technology, opportunities etc., then this 5 minute video can help.

I use this video to answer the various curiosity of energy industry players, especially those engaged in renewable energy, because sooner or later what is happening in Europe will also spread and have an impact throughout the world.

The impact can be positive or negative depending on how we react to it, see it as a threat or an opportunity. For those who want to perpetuate fossil energy or have even developed renewable biofuels but still use food or feed, the direction initiated by the European Union could be a threat.

On the other hand, for those who are eager to develop biofuels that are truly sustainable, without competing over food or feed, and do not need additional agricultural land, then the EU's new direction for renewable energy as outlined in the Renewable Energy Directive II or RED II can be a reference as well as opportunity.

https://www.linkedin.com/feed/update/urn:li:activity:7011847638014730241?updateEntityUrn=urn%3Ali%3Afs_feedUpdate%3A%28V2,urn%3Ali%3Aactivity%3A7011847638014730241%29&lipi=urn%3Ali%3Apage%3Ad_flagship3_groups_content_search%3BgFpP2Z%2FpSjeXlkY1q

Greening the Desert

Of about 510 million km2 of land area on earth, about one-fifth is desert, meaning that the area of deserts in the world today is around 102 million km2. This area continues to grow because some areas that were originally only arid on the face of the earth are also in the process of becoming deserts or what is called desertification. While previously only areas with rainfall of less than 250 mm/year became deserts, now areas with much higher rainfall are threatened to become deserts if there is no effort to stop the desertification process.

How can we stop this desertification process? even more than just stopping the process of desertification, greening areas that were originally deserts, God willing, we can do it if there is a will for this. Here are 3 steps to greening the original desert, which of course can also be used to reverse the course of the desertification process.

Firstly, the main problem in desert areas is that there is not enough fresh water to grow trees, so the mindset of planting trees must be with this fresh water which must be changed first. There are lots of plants called halophytes that can thrive in sea water well, tamanu (Calophyllum inophyllum), for example, includes plants that can live in sea water.

Second, starting from arid coastal areas to green deserts. Although fresh water is limited, sea water is always abundant, 97.5% of the water on earth is sea water. So as long as we have access to sea water, we can plant plants that are in the halophyte category. After success on the beach, all that remains is to gradually extend it to even places far from the beach. Pumping sea water to distant places for halophyte irrigation is also very possible.

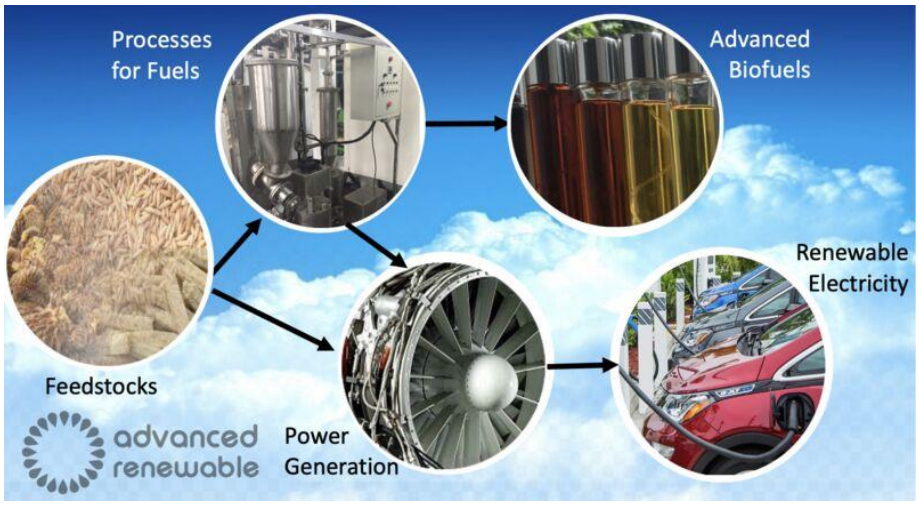
Third, use appropriate technology to plant trees in the desert. Deserts that don't contain clay soil at all really can't easily grow trees, because pure sand can't hold water and certainly can't store nutrients either. So that we can plant in the desert - then at the planting point it is necessary to add clay soil. An effective way to add to this with current technology could be using Liquid Nano Clay (LNC) spraying.

In the Net-Zero emission scheme, only planting trees in previously arid areas such as deserts can be counted as carbon removal. Therefore in these 3 decades the movement to green the desert will occur massively because it has the potential for high economic value from carbon trading, biomass production and other plant products.

Saudi Arabia together with countries in the Arabian Peninsula already have plans to plant 50 billion trees within this decade, one of our proposals to them also uses these three steps. We can share the same proposal to those of you who need it.

Advanced Renewable

More than 3/4 of the biofuels that we know today will disappear from the European market in the next 8 years or the end of 2030. The reason is that in the RED II scheme, the European Union is targeting 0% for biofuels whose raw materials are competing with food or feed. Even though 78% of the biofuels in the world today are competing for food and feed, the largest are palm oil 31%, soybean oil 27% and rapeseed oil 20%. So what kind of biofuels are they looking for?



They pushed for the growth of a new type of biofuels which began to be used this year, this new biofuels is called Advanced Biofuels. What is emphasized is that the material must not compete with food or feed, does not add to the need for new land, does not damage the environment, must be part of a circular economy and various other stringent requirements.

What was initiated in the European Union is actually also a big opportunity for all of us, because of the 17 types of feedstocks that they are targeting for Advanced Biofuels - all of them are around us. In fact, 3 of them are abundant in this country, namely palm waste - empty fruit bunches and their POME, corn waste - cobs and stems, and rice waste - husks and straw.

So here is a big opportunity that can become a new growth area for our energy industry, especially renewable energy. The development can target the export market, or we can use it ourselves to reduce our imports of fossil fuels.

Moreover, the technology that we use to develop Advanced Biofuels will also produce a byproduct in the form of Renewable Electricity - which in the RED II scheme is also strongly encouraged to grow to replace the role of fossil-based power generation.

It is impossible to exploit this economic opportunity as well as environmental improvement on a massive scale without massive socialization and education, therefore we together with several well-known universities in this country are currently preparing a special training and mentoring program for what we call Advanced Renewable - a combination of Advanced Biofuels and Renewable Electricity.

We also need to move towards Advanced Renewable, because if what grows in the world are biofuels that we know today - our most popular food and cheapest source of protein - could also disappear from the market. There will be no more fried tempeh and fried tofu, because palm oil for frying them can be unable to compete with the growing demand for fuel, as well as soybeans - we can no longer

import them because they are also used as fuel in the countries where they are produced, while local soybean production is very inadequate.

Three Steps to Keep the Earth Habitable

It is believed that the earth continues to get warmer and the climate continues to change due to greenhouse gas (GHG) emissions, the largest being CO2, then methane gas, Nitrous Oxide and so on. The next impact of disaster after disaster appears, in tropical countries the dry season is very dry, the rainy season is floods and landslides. In sub-tropical countries, summers experience extreme heat and winters too cold.

But the earth that is starting to become less comfortable to live in is still possible to be repaired and it must be repaired, because we do not have another place to live that is more decent than this earth. And every one of us can take part in saving this earth, for that we introduce three easy steps - for sure there is something we can do.

The first is Carbon Reduction (including of course other GHGs), saving energy use, reducing unnecessary trips, lowering the car's CC, slightly increasing the AC temperature settings, etc. all including this Carbon Reduction activity. The bigger one is as much as possible replacing fossil energy with carbon neutral ones like biomass which I have uploaded a lot in this media.

An even bigger example of Carbon Reduction plans in the transportation industry is using public vehicles instead of private vehicles. Even if you are have to use personal transportation, we introduce it in the UMURE project, there will be personal transportation replacement from energy-intensive and multiplied energy requirements due to increasingly severe traffic jams in major cities of the world, with energy-efficient vehicles that are not stuck in traffic jams.

The second step is Carbon Removal, the most natural and easiest way is to plant trees. If we plant an average of 7 large trees, God willing, this will be enough to offset our CO2 emissions for a lifetime. Companies and industries that emit a lot of emissions should plant more trees. Will there be enough land? It will not be enough if the first step is not taken. But if the first step is carried out optimally, God willing, there will be enough land to plant this tree.

The third step is Carbon Exchange, this is an effective form of reward and punishment mechanism. The form can be of emission taxes and incentives for their reduction, carbon trading, takaful or mutual risk sharing, etc. Not everyone agrees with this third step, but we see that this is also an effective way after the first and second steps have been carried out to their full potential.

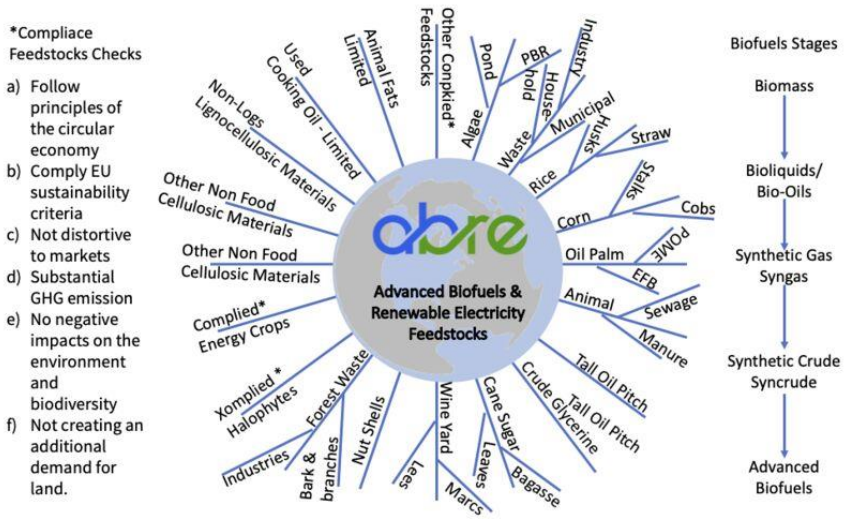
Because someone must continuously educate and guide the wider community, especially industry players to do these three things, we have organized all the expertise and resources related to this in an NGO forum which we call CARREX (Carbon Reduction, Removal and Exchange). Institutions, corporations and industries that already need it can contact us. And so expert, professional and practitioners in these 3 subjects, you can joint us already.

Abundant Feedstocks for Advanced Biofuels

Such a sophisticated fuel, whose feedstocks are abundant, is everywhere humans live. So it is ironic that modern humans are still so dependent on a handful of countries that produce more oil than they need themselves.

European Union countries have actually formulated advanced fuels or what they call Advanced Biofuels, but the application is also not fast enough. They are only targeting the use of 0.2% this year for transportation fuel, increasing to 1% in 2025 and 3.5% in 2030.

It should be faster, because the abundant raw materials are everywhere. For those of us who live in tropical countries where there is lots of water and sunshine all year round, this is indeed an advantage. Almost all of the materials targeted in the European Union's RED II are already with us, so we should be able to help our brothers and sisters around the world to meet their fuel needs - with Advanced Biofuels.



But even for our brothers and sisters who live in the desert, there should be no problem. There are certain plants that do very well in seawater, which are called halophyte plants. Tamanu (Calophyllum inophyllum) is an example of this halophyte plant, there are many other examples - almost always found in every country.

All the biomass that we can process to produce Advanced Biofuels (AB) will at the same time produce Renewable Electricity (RE) - two things mandated in RED II, because each stage in the AB process produces waste heat which can be recovered into RE, then we call the whole process ABRE.

The ABRE concept is indeed triggered by the need for fuel and electricity that meet the RED II specifications, but the opportunity for massive implementation, very likely will come first in countries where the feedstocks in the illustration below are abundant, one of which is of course us.

The technology for ABRE is mature, institutions and corporations that are interested in elaborating on this opportunity, for their own use or to become a leading trading commodity, can talk for the details with us.

UMURE Deep Tech Challenge

If only someone had been able to completely solve the problem of metropolitan transportation, our big cities would have been free from traffic jams. And so, if only someone had been able to solve logistics transportation matters for islands and remote areas, the development of this country would have been evenly distributed.

When there is a problem that is so big and clear, it will be an opportunity for those who can help solve it or at least reduce the existing problems. If this solution is technology-based, the startup that does it is called a Deep Tech Startup, which is a startup that works on big problems - which means it also has a very big market- with technology. When the technological solution is resolved, the market will be wide open for it.

For this reason, we gathered a number of experts and partners in their respective fields, at home and abroad to think about this big problem. These Think Tanks gather in a team we call Ultra Mobility for Urban and Remote Establishment (UMURE).

This team is ready with the types of vehicles that we will use in two areas at once, namely metropolitan and remote areas, the energy needs of which are 100% renewable and clean have been resolved wherever the eVTOL (electric Vertical Take-Off and Landing) vehicles will operate. There are early target users both in metropolitan and remote areas, and various other detailed technical issues that have been resolved.

But for execution in the field, we still need a number of experts and other partners, for perfect execution in the field with a target of launching in 2024. This is your opportunity who has a passion for technology and has a very strong internal drive to solve big problems that have not been solved

until now.

What we still need is a team in the executive ranks starting from the CEO, CFO, CTO. CMO and various other C-Level positions. It is also open for partners who wish to be involved in completing this project in terms of financing/investment, provision of local components - in order to achieve adequate local content, etc. Opportunities have also been opened for potential early adopters of this UMURE solution, both users in metropolitan and remote areas.

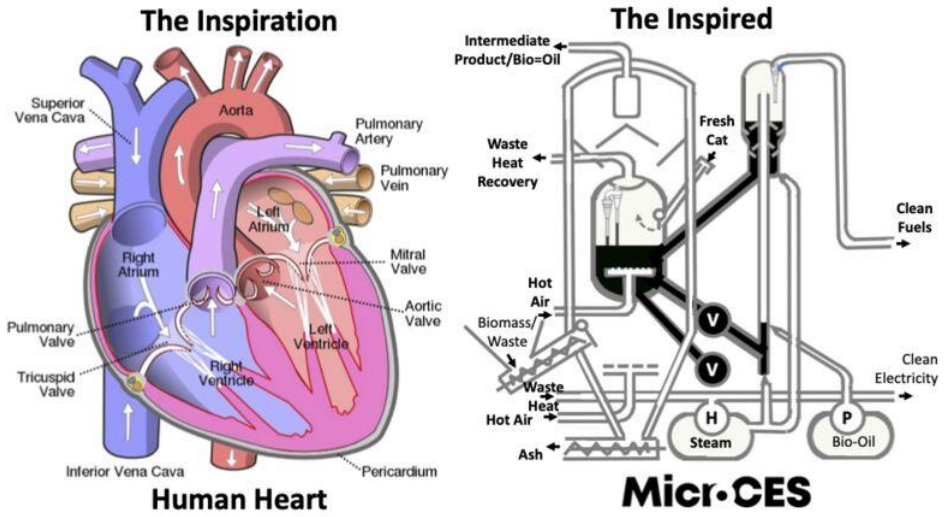
Those who are interested, just contact us via private message on this social media, our team will review your profile and suitability with what we need. Interested parties in the short list will be invited to brainstorm with us, to elaborate your opportunities and your role in this UMURE project.

The Heart of Clean Energy

I
n our body there is an organ that is very, very vital, if this organ stops then this life stops too. That is the heart, its function is to pump blood containing nutrients and oxygen to all parts of the body, as well as to clean it when it is dirty and mixed with CO2. With the energy that is circulated by the heart, humans can carry out activities continuously until the end of their lives.

So this way of working and the function of the heart is what inspired us to create an energy machine, so that it can sustain our life activities continuously - and can be presented wherever human life activities are located, without having to rely on energy supplies imported from places from other part of the world.

The result is a multi-function reactor that I present in the image below. At its heart are two reactors combined into one, namely fast pyrolysis and fluidized catalytic cracking reactors. With this combination they both share each other's waste heat, so they are both highly energy efficient in the process.



In fact, both of them still leave waste heat which if further utilized using Organic Ranking Cycle Microturbine, will produce electrical energy as a bonus from various fuels which are the main products.

Because of the way it works and its functions are all combined, we call this reactor as MicroCES -

Micro Combined Energy System. Namely a micro (small) reactor that can utilize any raw material (garbage or waste) to produce various forms of energy - both fuel and electricity.

Like the heart that brings life and growth, this MicroCES can be a vital instrument to bring economic activity and growth wherever it is. Urban and industrial communities who suffer from uncertainty about energy availability and prices, can back up their energy needs with this machine, as well as people on islands or remote places - they don't have to wait for expensive fuel shipments from urban centers.

But before this machine is mass produced for the general public, for the time being it is only produced on an order basis - for corporations and institutions that have a concern for sustainable energy, so they are willing to exercise with us to try this machine and continue to improve it. If your corporation or institution falls into this category, you can contact us to discuss the details.

Renewables Self-Consumers, From Up-Stream To Down-Stream

One that is being encouraged in the Renewable Energy Directive II (RED II) scheme is what is called Renewables Self-Consumers (RSC). These are people, corporations, institutions or communities that produce renewable energy and use it themselves.

What is common, of course, is the use of solar energy to meet household or industrial electricity needs, but for technology developers - this can be very attractive and very big opportunity.

One example is the heart of a CHPF (Combined Heat, Power and Fuels) engine in this photo from our workshop (left). It can be the upstream of any form of renewable energy that we need. Armed with the feedstocks that are all around us, trash and waste, it can generate heat of course, but also generate Renewable Electricity - with the addition of a microturbine, and even produce the feedstock for Advanced Biofuels in the form of bio-oil.

When this bio-oil is further processed it can become syngas, syncrude and the various types of fuel that we use today in the form of diesel, jet-fuel, gasoline and even bio-LPG. Bio-oil which is processed into syngas, can also be used as a feedstock to produce green and renewable hydrogen.

It is generally difficult for ordinary people to get involved as producers in the energy economy, because to be able to sell energy products to the market is not easy, so energy producers tend to be controlled by only a few parties. The RSC concept removes the entry barrier, as a group - ordinary people can produce their own energy.

Especially for corporations that need a lot of energy, of course the RSC concept is an opportunity in itself. This ultra-modern transportation concept, which we call Ultra Mobility for Urban and Remote Establishment (UMURE), for example (pictured right), this VTOL (Vertical Take-Off and Landing) vehicle engine has two choices of energy sources, namely electricity using batteries or hydrogen using fuel cell.

This new vehicle that we are introducing must be a vehicle that does not add CO2 to the air or is carbon neutral, so the electricity we use must be Renewable Electricity, and if you use hydrogen it must also be Green Hydrogen, based on renewable feedstocks, both must comply 100% with RED II provisions.

Because 100% Renewable Electricity and Green Hydrogen are not yet common in our market - neither in the world, it is a great opportunity for us if we also produce these two forms of energy ourselves in the RSC scheme mentioned above. From upstream to downstream, it is an opportunity for all of us, it is also open for those of you who have a passion to help clean up the earth and preserve the planet we live in together.

Towards Energy Efficient Personal Transportation

Ideally, mass transportation will meet the mobility needs of urban communities, but the reality is that our metropolitan streets are always packed with vehicles almost 24 hours a day. Of course, the majority is still the Internal Combustion Engine (ICE), which is very energy-intensive. The average ICE vehicle requires about 1000 Wh per passenger per mile traveled. But this energy consumption will double when vehicles are stuck in traffic jams for hours as happens every day in Jakarta.

So electric vehicles (EV) are expected to reduce this energy requirement. The average EV only needs 200 Wh per passenger per mile traveled. However, because EVs cannot escape traffic jams, the reality is that their energy needs are still doubling.

In addition, EV and ICE have a classic unresolved problem, which is that they always have more capacity than needed. Even for 1 person trips, the capacity of EV and ICE is still at least 4 people. As a result, the energy requirements of these figures must be multiplied by at least 4 and then multiplied again by the congestion factor.

So it's time indeed in this era of energy transition, the stakeholders in the world of transportation to seriously think about this personal transportation problem - apart from the mass one of course. What we've been putting a lot of thought into at the UMURE (Ultra Mobility for Urban and Remote Establishment) think tank is using eVTOL (electric Vertical Take-Off and Landing).

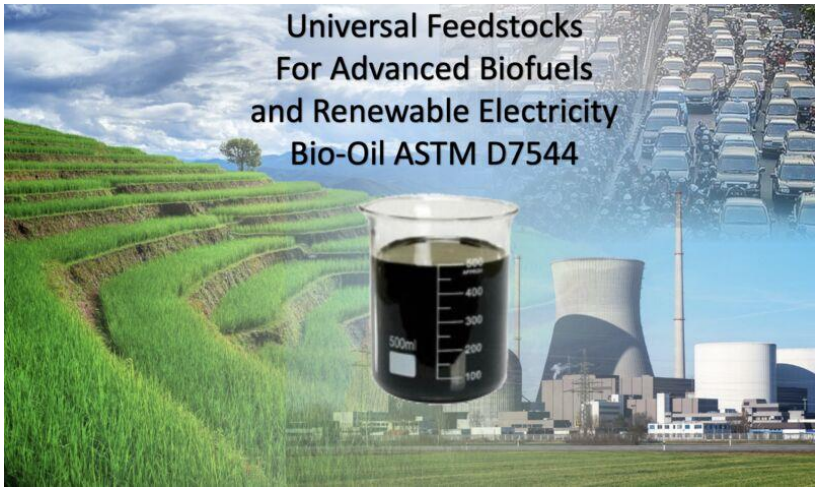
This eVTOL ultra-light flying vehicle can be very energy efficient, its current state of the art only requires around 130 Wh per passenger per mile traveled. Because eVTOL does not face traffic jams, and does not have to be driven manually onboard, even one person can be served with the capacity needed for just one person capacity eVTOL , so there is no multiplier factor for wasted capacity and congestion.

We really have to think in the direction of personal transportation which is very energy efficient, in fact a number of parties have developed it very maturely - one of them is our partner #FlyNow from Austria whose eVTOL images I have frequently featured on this social media.

Indeed, whatever type of your vehicle, it can have Net-Zero emissions long before 2050. For ICE vehicles, we can prepare Advanced Biofuels, for EVs we can prepare Renewable Electricity, the same goes for this eVTOL.

Both the Advanced Biofuels and the Renewable Electricity that we are developing refer to the Renewable Energy Directive II (RED II), so they will be ready to accompany your journey with 100% renewable energy, only if it can be made as efficient as possible these trips consume energy, isn't this what we should do? If it can be made frugal, why perpetuate waste?

Universal Feedstocks for Advanced Biofuels and Renewable Electricity



One of the feedstocks that will greatly assist the energy transition process that we prioritize is Bio-Oil, whatever energy needs we want to move from dependence on fossils to clean, carbon neutral and renewable energy, it can be started from this Bio-Oil. Why Bio-Oil?

First, the raw materials for Bio-Oil are abundant all around us, from the 17 types of feedstocks specifically mentioned in RED II Annex A - namely feedstocks that are eligible for Advanced Biofuels, all of them are available to us. Even most of it is available in abundance such as rice husk, straw, corn cobs, empty palm oil bunches, POME, biomass from urban solid waste etc.

Second, raw materials whose origins are very heterogeneous, with various types, physical forms, and

energy content - are easily homogenized into the form of Bio-Oil which even has a standard already, namely ASTM D7544. After the biomass is turned into Bio-Oil, the energy content becomes clear, namely a minimum of 15 MJ/kg, as well as a maximum water content of 30% and so on.

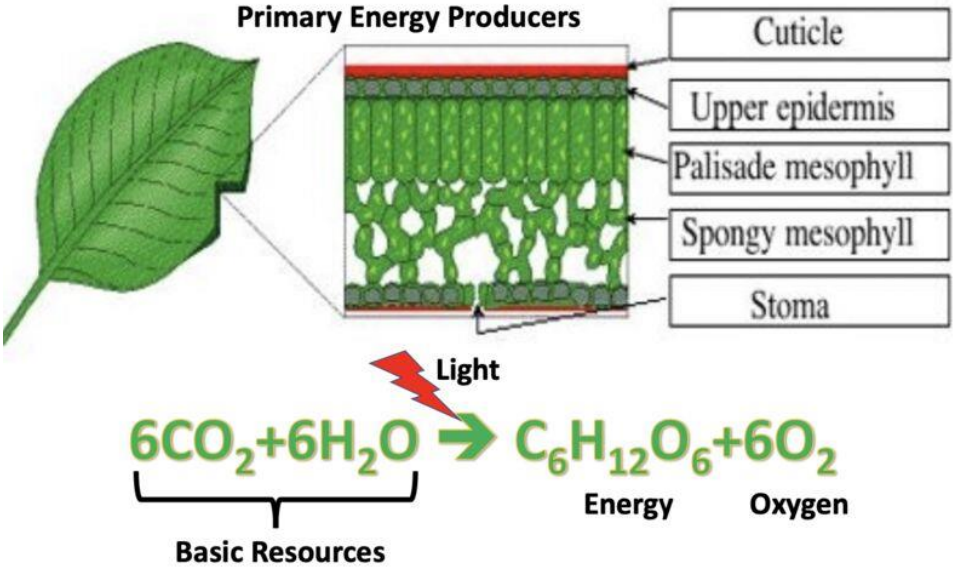
Third, Bio-Oil is easily further converted into various forms of energy that we need, with mature technology. If what we need is diesel, jet-fuel, gasoline and LPG, for example, then the route is Bio-Oil is processed into Syngas through LTG Gasification, then Syngas is converted into Syncrude through Fischer-Tropsch synthesis, after which it is cracked and fractional distillation becomes Advanced Biofuels that we want.

If what we need is electrical energy, then bio-oil can be burned directly with a special burner and the heat is used to drive a turbine, or gasified first and then burned to drive a turbine, or even just use the waste heat from a series of processes to convert Bio-Oil into Advanced Biofuels. enough to generate electricity using the Organic Rankin Cycle (ORC) Microturbine technology - which we have also developed.

Fourth, the process of converting biomass into Bio-Oil can be carried out at the farmer or farmer community level. In addition to increasing farmers' income, the waste from the fast pyrolysis process to produce Bio-Oil can be returned to agricultural lands as a source of organic mineral fertilizer. Only the hydrocarbons are used as energy, while the minerals remain in the farmer's land.

Fifth, Bio-Oil is easy to manage logistically, flexible in use - it can be used both on a large scale and on a small scale as was encouraged in RED II as feedstocks for Renewable Self-Coonsumers. Just as production can start on a small scale, utilization can also be done on a small scale - this will minimize the risk of adopting Bio-Oil technology as a solution to meeting our energy needs in the energy transition era.

Perspective: CO2 as a New Energy Source



The spike in fuel prices and energy subsidies around the world is very possible because we have the wrong perception about this basic energy source, as a result we are wrong to act in making this earth prosperous. Our earth is damaged even though it is our duty to repair it. Take a look at our biology lessons from elementary school which I recall to in the illustration below.

To produce energy, the main raw materials are CO2 and water. Through the help of sunlight both are converted into carbohydrates and oxygen, the oxygen we breathe for our respiration, carbohydrates

are basic energy. Pay attention to the formula C6H12O6, when eaten it immediately becomes energy for our bodies.

But because of the long and complex chain in the plant structure called cellulose, lignocellulose etc., not all of them can be eaten. In fact, most of the results of this photosynthesis are not for us to eat. What for? That's what it becomes energy in a broader terms.

Primitive people used it as energy by burning it directly to cook food or to warm their bodies in winter. Modern societies also do it the same way, but wait for the biomass to become fossilized in millions of years - then use it as energy - to cook their food, warm their room, run their car, etc.

In fact we are given direct instructions by Him, to be able to use the results of the photosynthesis process directly as energy - while it is still green or does not have to wait to become a fossil (Surah 36:80; 56: 71-73 etc.).

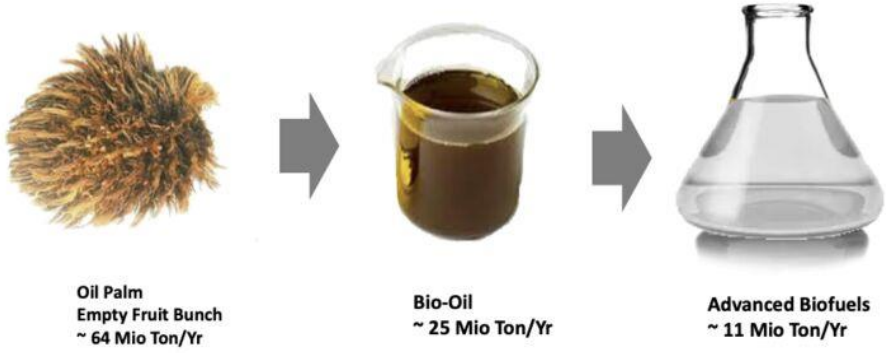
In the language of science and technology includes converting biomass into bio-oil through a fast pyrolysis process, then upgrading it to biofuels through catalytic cracking. The principle is only to change the basic formula of C6H12O6 above into chains of hydrocarbons (HC) with the length and shape we want.

So it's time for us to look back at the lessons we have learned since elementary school. Because CO2 is as important as water in the process of providing energy for all the inhabitants of the earth, so don't antagonize it, don't bury it in the earth with various advanced technologies, treat it like we treat water, manage it - use it to grow plants.

If, after all, the production of CO2 is too large because our massive life activities emit emissions, then capture the CO2 in a massive way but still in a natural way - converting it through photosynthesis to become energy again. He the Creator has also provided us with His creation that can absorb very massive CO2 for its exponential growth - that is the microalgae.

My Lord, nothing is in vain from any of Your creations, Glory be to You, protect us from the hellfire.

Advanced Biofuels from Palm Oil Waste



Clean energy opportunities in the world can still come from the palm oil industry. Although the oil itself is not desired in Europe and fuel from palm oil, including those that will decreased to 0 % in 2030 in the Red II scheme, the waste is in the list of feedstocks allowed for Advanced Biofuels (Annex IX A), namely POME and Empty Fruit Bunches.

So this is the great opportunity for the palm oil industry, the oil is for cooking oil - so that our people do not have difficulty in finding their cooking oil, or if for fuel enough for domestic biofuel market, while our waste is by becoming a future fuel called Advanced Biofuels - Which is needed by the world, especially the European Union.

From around 16 million hectares of our oil palm plantations, there is roughly the production of empty bunches of around 64 million tons per year. When processed into bio-oil, this is equivalent to approximately 25 million tons of bo-Oil per year with an average energy content of 20 GJ/ton. Bio-Oil has become a widely known fuel in the world for static engines such as power plans etc. There is even a standard for this, namely ASTM D7544.

But if we want to increase the added value further, from bio-oil can be upgraded through 3 stages namely Gasification, Fischer-Tropsch Synthesis and Catalytic Cracking to become Advanced Biofuels, can be in the form of green diesel, bio-gasoline, bio-jet/SAF and even bio-LPG. Each contains the same energy as the fuel fossil, which is in the range of 44 MJ/kg, except Bio-LPG which contains 46 MJ/kg energy.

If we do the Advanced Biofuels process, then Indonesia will soon become the largest Advanced Biofuels producer in the world with annual production of around 11 million tons per year. This is more or less equivalent to oil production 218,000 BPD or 21.8% of our petroleum production target in 2030.

The potential for Advanced Biofuels production from palm oil waste is too big for us to ignore, there must be immediately systematically and massive action for this. God willing, we are ready to be accompany this project with our science and all pf the needed technologies.

Even outside of this empty fruit bunch, there is still another potential for waste that is also very large for the production of Advanced Biofuels, from POME (Palm Oil Mill Effluent) - namely the liquid waste of palm oil industries. The technology is a little different, God willing, will also share it in another upload.

The Appearance of Micro Refinery For Energy Transition

The energy transition from fossil fuels to carbon neutral renewable energy requires a lot of changes and breakthroughs, both software and hardware, mental attitude to science and technology. So this micro refinery is one model of change.

Abundant energy resources are scattered around us, in the form of waste which is still a liability, forest waste that causes fires in the dry season, agricultural waste that is wasted while farmers have to buy fossil energy which is not always affordable. All of this waste should be processed into clean and affordable new renewable energy as the world community aspires to - in the form of SDG no 7 – Affordable and Clean Energy.

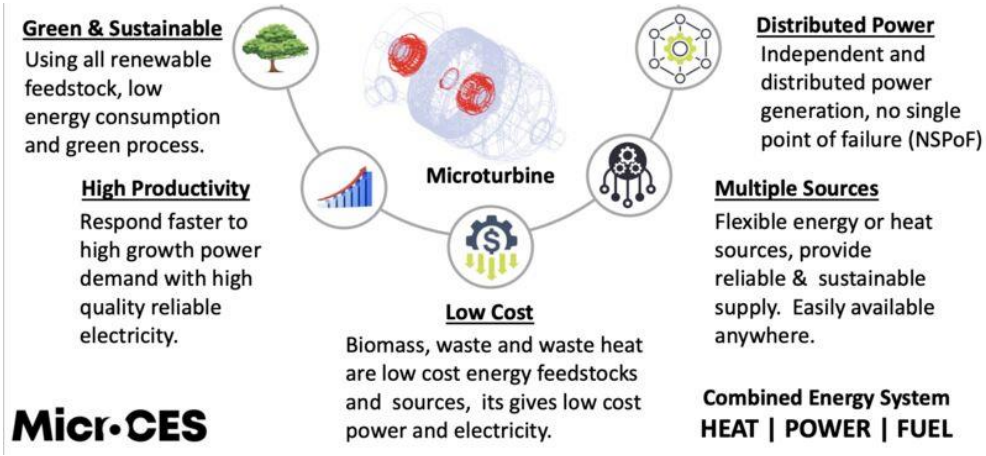
But even this awareness of the need for clean energy is not enough, it requires the support of adequate science and technology – so that the wider community can truly experience the presence of affordable

clean energy. For the procurement of this micro refinery can be done by community groups, institutions and corporations, they should be able to provide the energy they need independently.

For those who are starting out, this kind of micro-refinery may still be an expensive exercise – because it requires a lot of research and development cost to be share – even what we are building still needs to be improved from time to time. But someone needs to start it, in time when it is mass produced it will be very cheap like the machines or equipment that are around us today.

https://www.linkedin.com/feed/update/urn:li:activity:6956407532294725632?updateEntityUrn=urn%3Ali%3Afs_feedUpdate%3A%28V2,urn%3Ali%3Aactivity%3A6956407532294725632%29&lipi=urn%3Ali%3Apage%3Ad_flagship3_groups_content_search%3BgFpP2Z%2FpSjeXlkY1q

Greener Faster and Cheaper



The SDGs 2030 target is still 8 years from now, moreover the 2050 Net-Zero emission target is still 28 years away, but the movement to clean the earth from massive emission contamination should be made faster and cheaper. So all the potentials that can contribute to reducing these emissions should be facilitated.

After more than a year of discussing and experimenting cheap green fuels, the results of which I compiled in the book of Biohydrocarbon Economy, now it's the turn of green electricity which I will, God willing, discuss thoroughly in the next 12 months including its application in the field.

The two - fuels and power - in the concept that we are promoting cannot be separated, because if they are separated, the two will be expensive and the source will be difficult to sustain. In principle, clean and cheap electricity production can only be done if the basic energy sources are clean and cheap, and the process is the same.

So we chose the ORC (Organic Rankine Cycle) Microturbine concept, because it can directly utilize the waste heat generated by the green fuels production process, and convert the waste heat into power and electricity. Automatically the electricity will be green and sustainable because in fact it is only waste heat from green fuels from biomass and waste.

It will be easy to grow very quickly because the biomass and waste are spread everywhere, the waste heat will be too. It becomes cheap because the overall cost - especially the cost of the main energy sources can be shared with the fuel production.

Since any biomass can be processed into biofuels, as well as urban waste - solid or liquid, the biofuels production process does not depend on any particular source, nor does the waste heat source to generate electricity depend on the presence or absence of one type of fuel, there will always be a alternative source suitable for driving microturbines.

Power plants that spread to a number of waste heat sources will give birth to a distributed power generation ecosystem - the availability of electricity to all corners of the country will not depend on only one source - No Single Point of Failure (NSPoF), all communities and industries that need it can be provided in the region anywhere in this country.

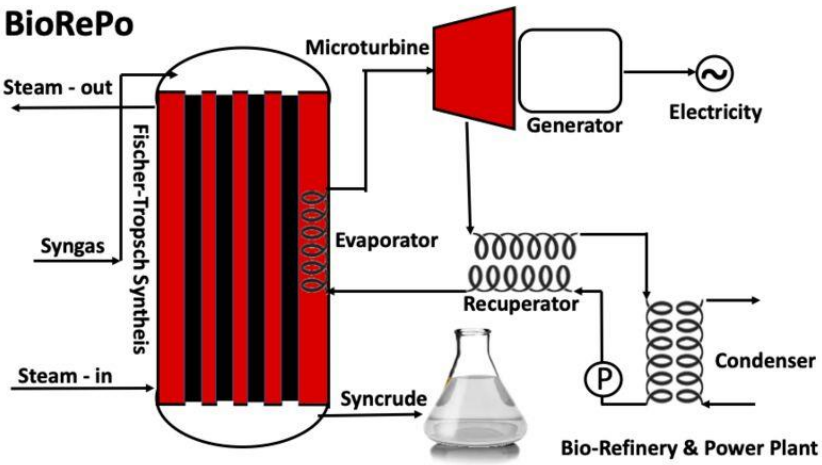
If the on-grid is still waiting for 2050 or even 2060 to achieve Net-Zero emission, the off-grid can be completely Net-Zero emission from the first day it operates. Even electric vehicles will only be truly green and emission-free - once the electricity is generated by these green energy sources and green processes.

World Cup on Nusa Island

The world's attention is now on Qatar, a small country with twice the size of the island of Madura - which hosts the most watched event in the world - namely the world football cup. How can this small country do it so beautifully? Because they are very rich - their per capita income is more than 20 times our per capita income.

How can they be so rich? because they produce energy - in this case oil - that is far above what they need. Here is the important lesson, that we will be able to prosper our tens of thousands of small islands, become prosperous islands - when we can build these islands into energy producers.

This is very possible in this energy transition era because all countries in the world are looking for new sources to produce clean energy, new and renewable energy. So it is very lucky for our islands which on average can grow maximum biomass because they get sunlight all year round.



If the land is already filled with forest, the forest waste is sufficient to produce energy. All of these islands have sea access which is 3 times that of the mainland. And in this sea, the 3rd generation of biomass can be growed, namely micro and macroalgae, biomass production that does not compete with food, agricultural, plantations and forests land.

In the era of energy transition, ayone who can produce any biomass massively and cheaply, and then be able to process it into energy - fuel and electricity, will be the next sultans or oil kings, only this one is not fossil oil but renewable fuels and power/electricity.

For the conversion of its own energy from biomass to biofuels and green electricity, the technology has matured since last century. All that is needed is fine-tuning for different materials in order to provide maximum results. In essence, the technology that is relatively inexpensive and ready to be applied from our studies is what I present in this picture.

Essentially a combination of exothermic Fischer-Tropsch synthesis (FTs) with Organic Rankine Cycle (ORC) Microrurbine. FTs produce the main product in the form of syncrude - a substitute for crude oil which is very clean and renewable, and still provides waste heat which is recovered into electricity through ORC Microturbine.

The feedstock of FTs itself is syngas (CO and H2) which can be produced from biomass directly or it can be from Bio-Oil which ends also comes from biomass. All of the raw materials to produce this syncrude and electricity can come entirely even from our smallest island. I don't know in what year, even that small island in Indonesia will be able to hold a colossal world cup event in its time, God willing.

The Appearance of Fast Pyrolysis Reactor (FPR)

This is the 6th type of reactor from reactors that I have designed, the category is Fast Pyrolysis Reactor (FPR) which is highly energy efficient. Only use a small 500 watt blower to control the oxygen supply.

Meanwhile, high temperatures in the range of 500-600 degrees Celsius are produced by sacrificing a small amount of biomass which is processed as a heat source, while the main product is bio-oil with ASTM D7544 standards. The waste heat generated from this system is then recovered again to expand the working media of the Organic Rankine Cycle (ORC) Microturbine to generate electricity.

What are the benefits of this FPR? In essence it is a very efficient energy conversion machine, converting any biomass including urban waste into the aforementioned bio-oil. Bio-oil itself can already be directly used as industrial fuel – such as for boiler fuel, a substitute for heating oil, and it can also be used for household fuel with special burner.

But the broader function of bio-oil is as an intermediate product, a highly flexible form of energy densification. If the average biomass only contains energy in the range of 3-5 GJ/m3, when converted to bio-oil, the energy content will be in the range of 18-30 GJ/m3. Bio-oil, which already has ASTM standards, can become a new energy commodity in the energy transition era.

Who can use this bio-oil? All industries that have been using direct fuels, both solid and liquid, can start using bio-oil for co-firing by only making a few additions or changes to the burner system. Industries that need their own power source can use this reactor to be combined with ORC Microturbine, the waste heat for electricity while still producing liquid fuels.

Bio-oil is also a basic material for the clean fuel industry in the energy transition era. Through gasification it will become syngas, through Fischer-Tropsch synthesis it will become syncrude, and after going through catalytic cracking and fractional distillation it will become whatever fuel we need, from gasoline, diesel, bio-jet to bio-LPG. Even syngas and syncrude which are derived from bio-oil can also be green feedstocks for the green chemicals industry.

In essence, all types of energy and feedstock that we need, whether in the form of fuel, electricity or chemicals, can be processed from the waste that is abundant around us, which was initially processed into bio-oil using this reactor. God willing.

Greening the Desert With Energy Trees

In the Net-Zero scheme, only planting trees on previously arid soil counts as true carbon removal. So countries that have large arid areas in the form of deserts such as the Middle East and North Africa (MENA) countries will become centers of green growth in the span of these three decades – until 2050, which is the year targeted as a Net-Zero year.

The challenge is how can we plant in these deserts where for thousands of years the conditions have been very arid and there is no water, while planting trees must need water? Actually, it's not that there is no water, the MENA countries in general still have a lot of water, namely the ocean – at the edges of their country. Only salt water has been perceived as not being used to grow plants.

It is this perception that must be changed, because the reality is – we in tropical countries are very accustomed to growing plants that grow in salt water. On our small islands many plants grow until their fruit falls into the sea. Among them is a plant called tamanu or its scientific name is Calophyllum inophyllum.

So Tamanu is what we offer to MENA countries who want to green their deserts. We have chosen this not only green but also because this tree is a very good vegetable oil producer. Per hectare can produce up to 5 tons of oil per year – even higher than palm oil. Its ability to live in sandy soil and salt water will make it suitable for desert greening. This plant is even proven to thrive also in the Sub-Tropical area.

The composition of the oil produced from tamanu is very suitable for the production of Drop-in biofuels in the form of Bio-Gasoline, Green Diesel, Bio-Mazut and Bio-LPG. And we provide all of these plant-related technologies, from nursery to processing into these biofuels products – we have at least three patents for these technologies.

In addition to the technology, we can also facilitate the market if the biofuels product is not used by your own market. Our market network in Europe in particular – which is just across the ocean from North Africa – is ready to accept whatever biofuels are produced by countries willing to plant these tamanu trees.

To achieve Net-Zero 2050, the world needs to plant a lot of trees on arid lands for carbon removal, the world also needs a lot of carbon neutral fuels to reduce emissions – the greatest potential is in these

biofuels. Open to those of you who want to be our partners in your respective countries for this greening the desert with energy trees project.

Appearance of Universal Commodity : Bio-Oil

In the midst of the Ukraine-Russia crisis that never ends, the Taiwan-China crisis could explode at any time. The energy crisis, which is already bad enough at the moment, could get worse if something happens to Taiwan and China. However, there is one way that can make every country in the world have the same opportunity in terms of energy supply, namely Bio-Oil.

This fuel can be produced by any country in the world - as long as they still have water, CO2 and sunlight. it only takes these three for the photosynthesis process to convert CO2 and water with the help of sunlight into biomass. Then only through one step process, namely fast pyrolysis, this biomass can be processed into Bio-Oil.

Bio-Oil is already in the form of fuel, only it is still low in calories. According to the American Society for Testing and Materials -ASTM D7544, the minimum standard for the calorie content of Bio-Oil is 15 MJ/kg. This minimum standard in Indonesia can be achieved by Bio-Oil from rice husks.

However, we also have a source of Bio-Oil whose calories are almost twice the minimum standard, namely Bio-Oil from empty palm oil bunches, which can close to 30 MJ/kg. If we want to cultivate microalgae, we can even produce Bio-oil at a calorie level of 30 MJ/kg or above.

The point is that we can produce the raw material for universal commodity, substitutes for oil from any biomass around us, with different quality levels. In the condition of Bio-Oil as is, it can already be used directly by the industry to replace or co-firing with industrial diesel fuel, for boiler etc. Or used in domestic households in cold countries as a substitute for heating oil.

But the real attraction of this Bio-Oil is when it is upgraded to transportation fuels. It can be a substitute for gasoline - Gasoline Like Fuel (GLF), a substitute for diesel - Diesel Like Fuel (DLF), and even become the main component for aircraft fuel mixtures called Sustainable Aviation Fuel (SAF).

We have curated all the technologies needed to bring this universal commodity - Bio-Oil to life. For humanitarian reasons, it can be taught to anyone and anywhere, so that there is no society in the world that does not have access to its own energy. This is part of the SDGs program, i.e. Goal no 7, namely Affordable and Clean Energy.

DIY Biodiesel, What Do You Need?

In the midst of the fuel crisis that threatens the world, not many know that making biodiesel is easy. Farmers in agricultural areas far from urban areas in a number of countries usually do it for their own needs. What is needed to make your own biodiesel?

First the materials, I group them into three types, namely the main ingredients, reactants and catalysts. The main ingredient can be any vegetable oil, including used cooking oil. For reactants generally use methanol or ethanol depending on what is available and cheap. For a catalyst, it depends on the type of reaction. For esterification using an acid catalyst such as sulfuric acid (H2SO4), for transesterification using base catalyst such as KOH, NaOH etc.

The second is to know the types of reactions, essentially there are two, namely esterification and/or trans-esterification. Esterification needs to be done first if the free fatty acid content in your ingredients is high (above 2%), direct trans-esterification if the free fatty acid content is below 2% already.

The third is the tools needed to process these reactions, the cool name is called a reactor. It doesn't have to be as sophisticated as the reactor in our lab as in the photo, you can also use any pan in your kitchen.

Standard biodiesel manufacturing processes - such as those on the market - do not involve high temperatures nor high pressures. Relatively harmless, except for the chemical substances involved, especially if it is necessary to esterify using strong acids such as sulfuric acid - so it is necessary to be careful and use safety precautions such as gloves, glasses, long sleeves etc.

The point is that it is very possible to make biodiesel by yourself with the equipment in your kitchen, at least this can be one of the survival skills that the public can easily learn - if the fuel crisis spread and worsens. More details for those who are interested in serious learning can try it in our lab.

Similar training programs to make Drop-in biofuels such as Bio-Gasoline and Green Diesel which are more sophisticated, God willing, we will also open it to the public once the minirefinery is ready.

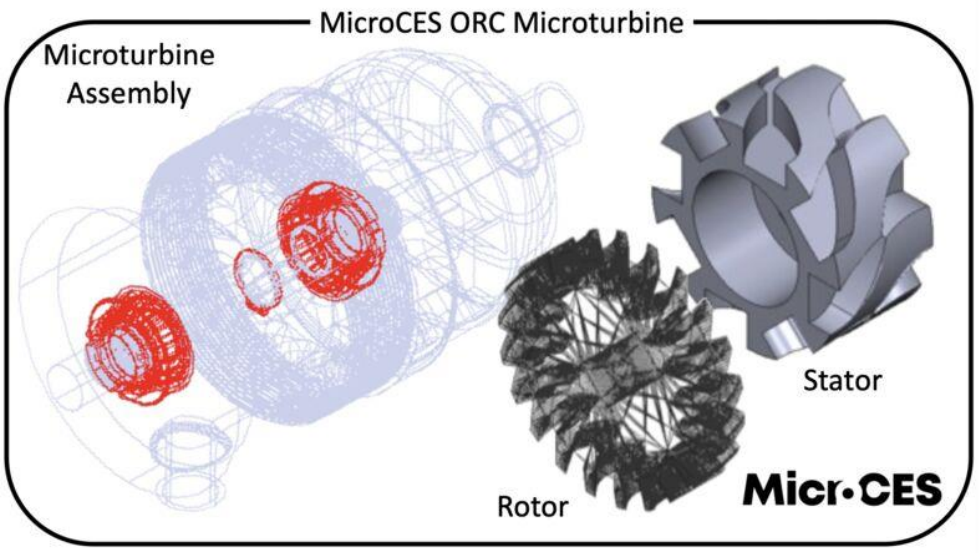
Net-Zero Fuels and Power Generation

One of the gifts from the G20 summit in Bali this week, Indonesia agreed to stop the expansion of the use of coal-fired power plants more quickly, with compensation for climate finance of US$ 20 billion from the US.

The question is how do we meet the growing demand for our electricity which will continue to soar, if the expansion of coal power plants is stopped? We know that until now coal is still the largest contributor to our national electricity capacity, reaching around 50%.

So this is where a big leap is needed in our clean and sustainable electricity supply. One that we propose is the use of biomass, especially second and third generation biomass, namely agricultural, plantation, forestry waste and micro/macro-algae.

The biomass is not only to meet the electricity needs, but also to meet the increasing demand for fuel in the midst of our declining oil reserves. For the fuel technology, I have written in full in the last 12 months, and it has been compiled in one book, Biohydrocarbon Economy - which I published yesterday.



For the production of electricity, it can be taken from waste heat from the series of drop-in byohydrocarbon fuels production processes. Starting from waste heat of Fast Pyrolysis, Gasification, Biogas Reforming, Fischer-Tropsch Synthesis to Fluidized Catalytic Cracking (FCC). This whole process uses the energy source of a small fraction of the biomass that we sacrifice for the whole process.

In order to effectively convert the abundant waste heat into electrical power, we use Organic Rankine Cycle (ORC) Microturbine. We can make this ORC Microturbine on a very small scale, a few kilowatts, but it can also be made to a size large enough to 5 megawatts. This size range is ideal for the character of the biomass waste heat, which on average has a very wide spread of sources, so the power

plant must also be distributed.

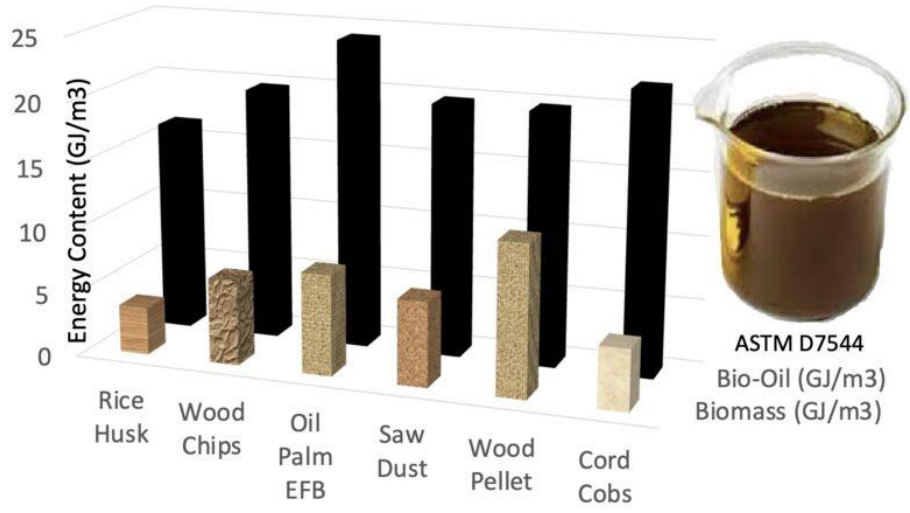
The distributed power plant can be integrated into the existing grid (on-grid) but is also ideal for off-grid power plants that will grow rapidly soon. Who needs this off-grid electricity? Electric Vehicle ecosystem that requires charging the battery anywhere the vehicle can run - ideal for off-grid solutions. Also the development of remote areas or islands, industries that want to have energy efficiency by utilizing their own waste heat, etc.

We have completed the planning process for this ORC Microturbine design, technical drawings for sizes 10 - 200 kilowatts are ready, mass production is also ready once the investment fund is secured. So institutions and corporations that are interested in integrating our solutions into their emission reduction programs can talk to us in detail.

Mastering Natural Energy Storage

Since Allah created this universe, Allah also created the source of its energy, "And We made a bright lamp (the sun)" (Surah 78:13). So from the earliest humans, to the most modern humans today - can use this sunlight for various purposes.

Allah also gave us an example of how to store the sun's energy "And we send down from the clouds rain that pours down in torrents" (Surah 78:14). The sunlight that hits the water (sea) will evaporate, becoming clouds that rain down on the mountains. This water from the rain is a very efficient energy store, our cheap and clean electricity comes from rainwater that falls on this mountain, which then flows down and managed into a Hydroelectric Power Plant.



Even more sophisticated is the sunlight which is stored by Him in the form of primary producers, namely plants. This is the most widely used form of energy storage, when eaten by animals and humans it becomes energy for life. When stored in nature for millions of years, it becomes a fossil energy reserve that we use until today.

And we are also given guidance by Him, so as not to wait for the plants and animals/humans that eat them to become fossils. We are given guidance to make energy from current plants - while they are

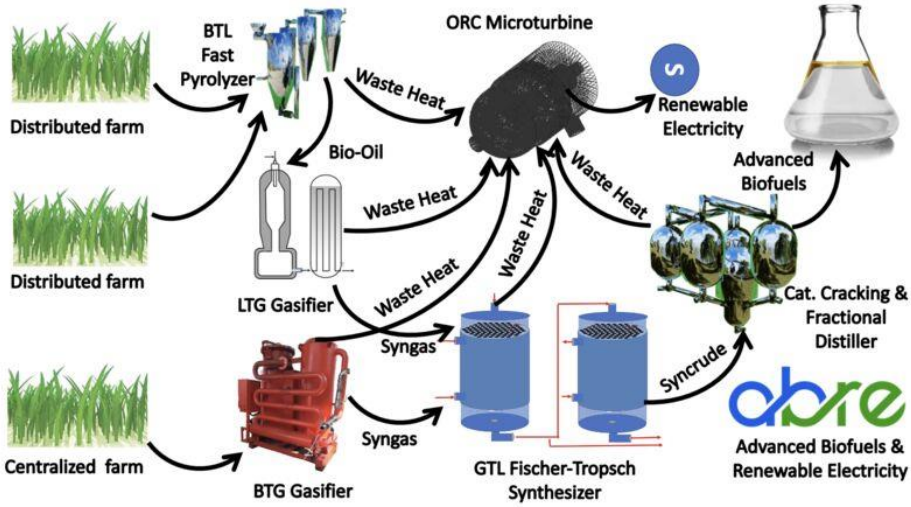
still green "He who made fire for you from a green tree..." (Surah 36:80).

That's what sustainable energy is all about, that is, if we can use plants that are growing now - not plants millions of years ago. But modern humans also have space and time challenges and the type of energy they need. Plants don't always grow where energy is needed. Also can grow at different times of energy requirements.

In the land of the 4 seasons, plants start to grow in spring and peak in summer, start to reduce activity in autumn and stop growing in winter - whereas in winter this is the most energy needed.

Therefore, biomass energy also needs to be stored in the most universal form, so that its use is flexible, not limited to space and time and not limited to physical types of biomass as like firewood. Bio-Oil is an inexpensive and highly flexible form of natural energy storage from biomass. Easily bio-oil can be converted into combined heat, power and fuels at once. So that wherever, whenever and whatever type of energy you need - you can still use the energy source of this 'green tree'.

Energy Crops for RED II Compliance Independent Energy



For those of you who live or have projects on small islands or remote areas, there is good news for you. Our technology is ready to provide all forms of energy you need, whether fuel or electricity. Even luckier than those on the big island, your fuel is Advanced Biofuels and the electricity is Renewable Electricity.

How to get it ? First, if there is, use all agricultural, forestry, plantation waste for biomass fuel. If these materials are not available or not enough, then there are two groups of plants that can be your source of energy. The first group is a type of halophyte - namely plants that can grow with sea water, in the previous upload. Or types of grasses that are easy to grow on arid land that is not used for agriculture.

I will take the example here, the elephant grass for an example. Dry elephant grass already contains good energy, around 16 MJ/kg. Only because the bulk density of dry elephant grass is low, less than 140 kg/m3, it must be processed on site. If the planting area is sufficient - more than 200 hectares, it is feasible to process it directly into syngas, then through the Fischer Tropsch synthesis it is converted into syncrude, and then it is cracked and through fractional distillation into whatever fuel you need.

If the land is spread out, dry elephant grass is expensive to transport to a faraway place for processing,

even worse if it is wet. Then elephant grass can be processed in-situ by fast pyrolysis into bio-oil which has a high density of around 1250 kg/m3, and also has a high energy content, which is close to 20 MJ/kg. This bio-oil feasible to be sent to its processing centers, to produce syngas up to the various types of Advanced Biofuels you need.

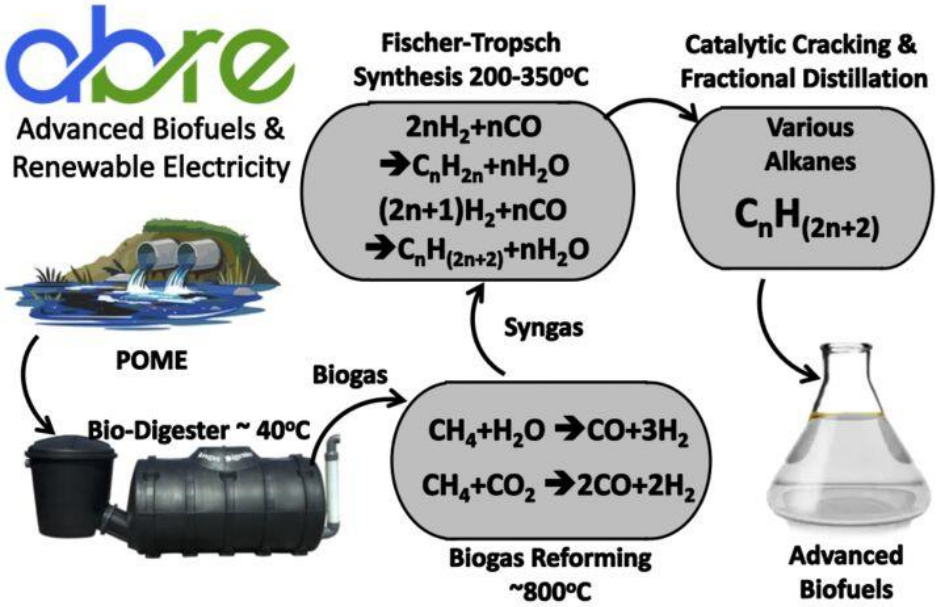
All biofuels produced through this process are drop-in, which means they can be used in all types of existing machines without any changes. It can be in the form of green diesel, biojet/SAF, bio-gasoline and also bio-LPG. The energy content is the same as that from fossils, which is in the range of 44 MJ/kg, except for bio-LPG which is 46 MJ/kg. The difference with fossil fuels, Advanced Biofuels is very clean, does not contain SOx nor NOx, is carbon neutral and of course renewable.

All thermochemical processes from biomass to Advanced Biofuels also generate a lot of waste heat. This waste heat by using another technology, namely the ORC Microturbine - which we have also developed it, can be processed into electricity which is also in the category of Renewable Electricity.

For every 200 hectares of elephant grass planted area, it can support the ORC Microturbine feedstock with a capacity of 1 MW Renewable Electricity, while producing 4.8 tons of Advanced Biofuels every day. This result is more or less sufficient to sustainably meet the fuel and electricity needs of a small island inhabited by around 1,000 families.

POME Advanced Biofuels and Renewable Electricity

Another palm oil waste that can be excellent for renewable energy, especially Advanced Biofuels and Renewable Electricity, is POME (Palm Oil Mill Effluent). This POME production is very large, because every ton of Fresh Fruit Bunches (FFB), in the process of turning it into palm oil will produce POME in the range of 2.5 to 3.5 m3.



Every m3 of POME if handled properly using an anaerobic digester will produce around 28 m3 of biogas. Biogas can be used directly for power generation or fuel in general. It can also be purified by removing the CO2 element and compressed into Compressed Natural Gas (CNG).

However, we do not recommend these two pathways. First, if used as a power plant or direct fuel, their use is limited in location, because the energy content of biogas is still low. Per m3 of biogas only contains 1.8 kWh or the equivalent of 1/7 liter of gasoline.

Meanwhile, turning it into CNG is expensive in processing costs because you have to get rid of the CO2 content, which ranges from 25% to 60% of the biogas content. The use of CNG is also limited because transportation engines in particular need special modifications to be able to use CNG fuel.

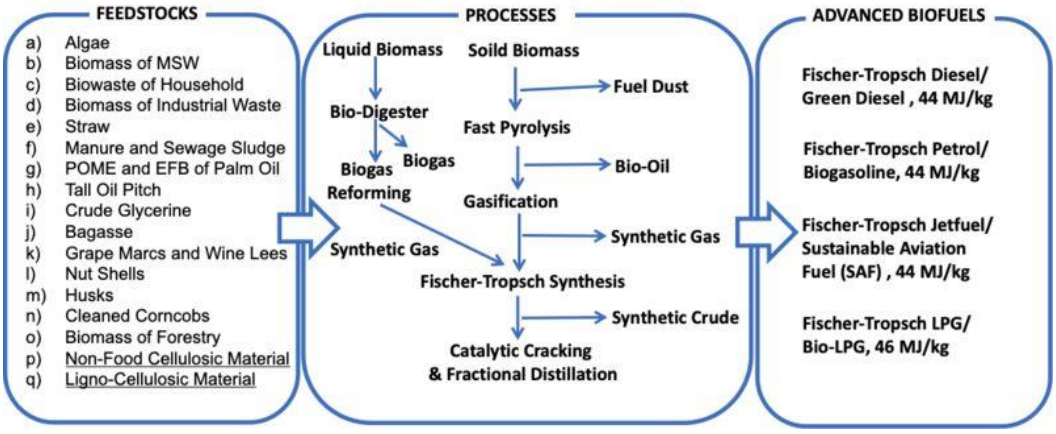
So with the new needs for the world's transportation industry, especially European Union which has implemented RED II (Renewable Energy Directive) this year, this POME is ideal to be used as feedstock for Advanced Bofuels as well as Renewable Electricity required in the RED II.

The process and technology for this are relatively mature in the world, namely technologies that are commonly used in the oil and gas industry in particular. The process and technology for Advanced Biofuels from POME can be seen in the illustration below, while the Renewable Electricity can be obtained from the waste heat of this process and the previous process (for empty fruit bunches) using ORC Microturbine technology which we have also developed.

If this POME is processed together with the empty fruit bunches in the previous upload, Indonesia will have a production capacity for Advanced Biofuels equivalent to 14.3 million tons per year or the equivalent of 280,000 BPD of petroleum equivalent. This is also equivalent to 28% of our oil production target in 2030, but this is very clean and renewable energy, its selling value can be higher than fossil fuels from petroleum.

Closer To Advanced Biofuels

Advanced Biofuels which is the target for biofuels development in the Renewable Energy Directive II (RED II), which came into force in the European Union this year. In this 2022, fuel for transportation must start using 0.2% of the Advanced Biofuels, and increase to 1% in 2025 and 3.5% in 2030.



What's so advanced about the new fuel? the raw materials are actually ordinary, in fact there are many around us, but this is where the sophistication lies. That is, if we can change materials that we call garbage or waste into modern fuels that are drop-in or can be used 100% directly in modern transportation machines - without any changes.

Even the biofuel in the form of biodiesel which we have been using massively now is not included in the Advanced Biofuels category. To enter this category, the raw materials must be part of the circular economy, comply with sustainability standards, not distortive to the market, substantially reduce GHG emissions, not have a negative impact on the environment, and do not need new land. Existing biofuels do not meet part or the whole of these six requirements, so they are not categorized as Advanced Biofuels.

The provisions in RED II regulate very strictly the use of feedstock which is categorized as Advanced Biofuel, while the form of the fuel itself is not specifically regulated, it is only indicated from the Annex, which specifically mentions certain types of biofuel. What is widely mentioned is the type of Fischer-Tropsch biofuels, even the desired energy content of this type of fuel also have been specified, whether a substitute for diesel, gasoline, jet-fuel or LPG.

With the conditions for the feedstocks and indications for the products, we can work on what technology can deliver this Advanced Biofuels. And this is what we have started to developed since RED II was initiated and socialized about 5 years ago. So that our technologies are now ready at the same time with the time of RED II comes into force.

Although RED II is applicable in the European Union, prior experience with EURO fuel standards, it is very likely that the Advanced Biofuels concept will also expand in other countries outside the European Union. We don't have to follow the standards they set, but if by following them we also benefit greatly both economically and environmentally, why don't we take advantage of them?

By participating in developing this Advanced Biofuels, we will be able to utilize all types of waste which until now has not been utilized much. Starting from agricultural, plantation, forestry waste to urban biomass waste - everything now can be processed into Advanced Biofuels.

And if we still feel that we have had enough of our fossil fuels plus the existing biofuels, and don't feel the need for these Advanced Biofuels yet- still we can export it to help our country's foreign exchange balance!

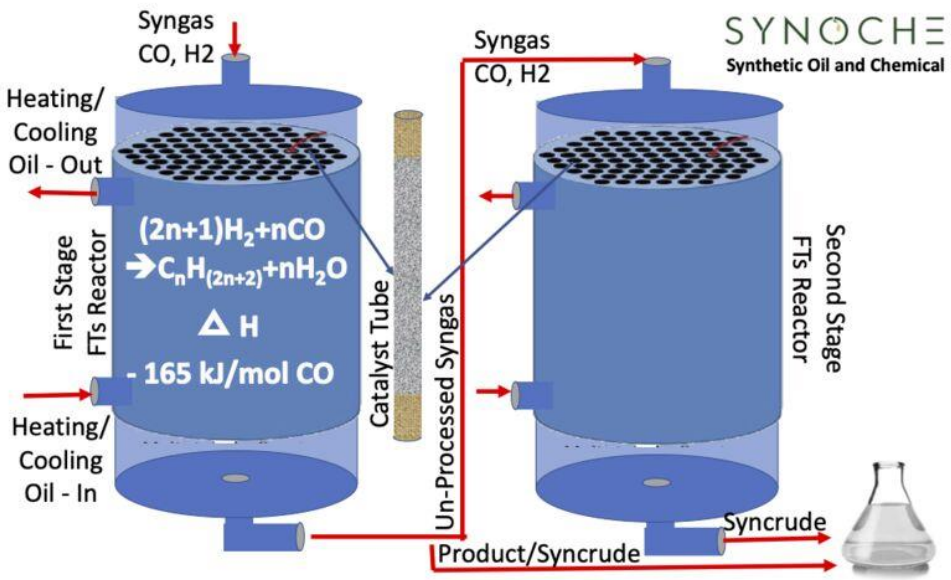
Opportunity in Exothermic Energy

The era of energy transition brings many opportunities for those who want to hunt for cheap clean energy sources whose basic ingredients are all around us. One of them is what we call exothermic energy, which is heat energy resulting from a chemical reactions. This free or waste heat of reaction can be a very clean new source of energy.

I take the example here is the reaction of CO and H2 with the help of a cobalt or iron catalyst. The results of the two reactions produce alkanes in the majority, and also alkenes depending on temperature and the catalyst used. Alkanes are the basic ingredients for the fuels we use today such as gasoline, diesel, jet-fuel and LPG. Alkenes also become the same fuel after going through the cracking process, to remove the double bond.

This reaction to produce fuel also produces high heat energy, the process of synthesizing alkanes from

CO and H2 releases heat of about 165 kJ per mole of CO reacted. This is clean energy, a by-product of the clean fuel production process. Even from the chemical reactions that occur - as in the picture below - the waste other than heat from this process is only clean water (H2O).



In the Qur'an there is an appropriate term for this, namely 'hal jazaa'ul ihsaan illal ihsaan', there is no reward for a good other than goodness. So when we try to produce good, clean, sustainable energy, then the series of backwards and forwards will be good as well.

Our nature will be sustainable, the earth will not have to overheat, farmers will get a new source of income, and the regions will have a new source of economic growth - namely the energy economy. For the latter I give an illustration of the nominal as follows:

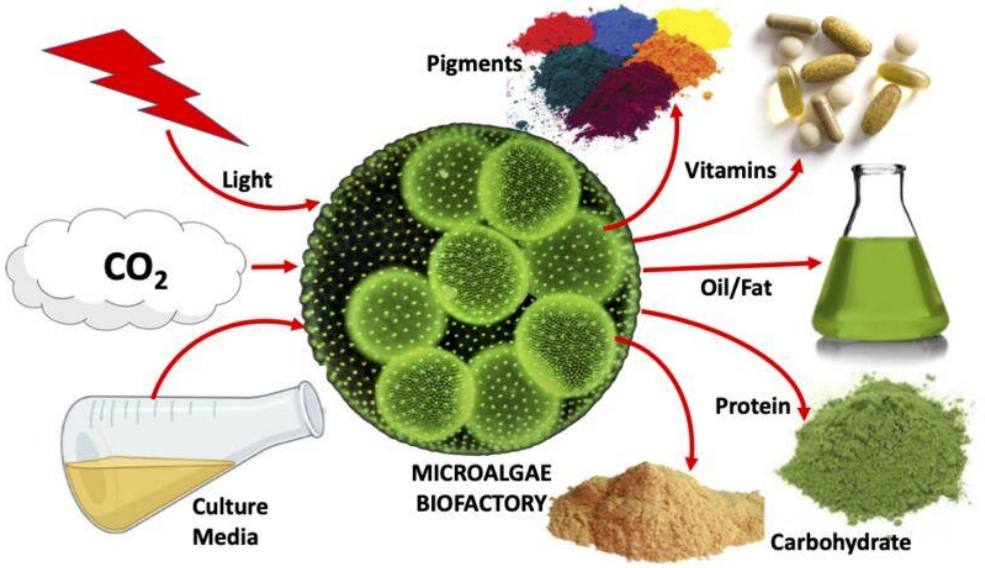
If we make a Fischer-Tropsch synthesis reactor with a capacity of only 10 m3 - so that all units fit into 20 feet container. II can process about 25 tons of agricultural waste biomass from local farmers every day. The yield is about 8 tons of syncrude which can be directed into whatever fuel is needed in the area, at high temperature reactions (300-350) degrees Celsius it will tend to become gasoline, and reactions at lower temperatures (200-240) degrees Celsius will tend to produce diesel.

In addition to producing 8 tons of syncrude, the reactor, which is contained in 1 container, produces waste heat from the process and the previous supporting processes (fast pyrolysis and gasification), which is sufficient to generate electricity with an ORC Microturbine at a capacity of 1 MW. This is sufficient for electricity of 1000 households who live in remote areas or islands - which currently do not have access to electricity.

Even islands or remote areas can suddenly become rich if the syncrude produced is more than their own need. The island becomes the new 'Qatar', the oil-producing island in the era of energy transition!

Carbon Capture Biofactory

Carbon dioxide (CO2) which is hated by the whole world, is scapegoated as the main source of air pollution, the cause of global warming and climate change is actually the raw material for life that we really need.



CO2 to plants is like Oxygen to humans, just as we cannot live without oxygen - plants cannot live without CO2. Whereas if plants cannot live, humans and animals cannot live either - because both need primary producers - namely plants, for food and all other needs.

So what should we do with this CO2? Treat it as it should, as the main raw material of life, use it to meet all the needs of our lives. Like raw materials, it needs a factory to process it into finished products - and a very sophisticated factory, which no human has yet been able to imitate - is a factory called plants.

If I take the simplest plant, single-celled plant called microalgae, we can already process the CO2 raw materials into all kinds of finished products that are ready for us to use. There are proteins, carbohydrates, oils/fats, vitamins, minerals, enzymes, pigments etc.

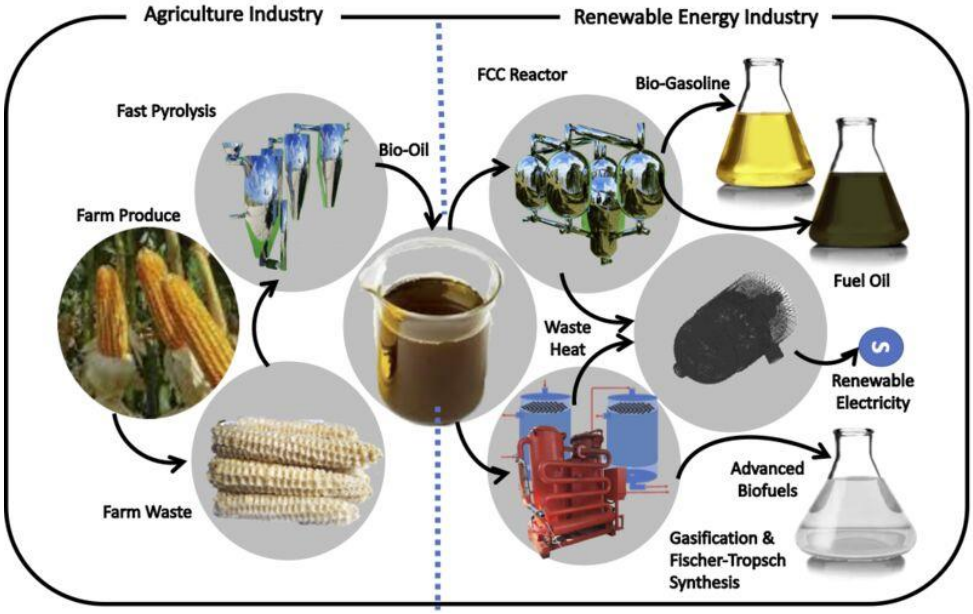
The factory of life, hereinafter referred to as the biofactory, can also be designed to produce products that suit our needs most. How to do it? There are three components of this factory's raw materials, namely CO2, light (sun) and culture media, the products from this biofactory can be controlled from the three raw materials that we use.

For example, if I have a cheap material in the form of agricultural waste and I want to turn it into high value energy, what can I do? The method that I have often shared is to process it into Bio-Oil, the result is Bio-oil with an energy content of 15 MJ/kg. Only then uograde again to become a fuel with a higher calorific value.

I can also process the waste first into glucose, then I use the glucose as a 'raw material' for microalgae biofactory media, and the result? The microalge oil content produced by this biofactory will increase more than 3 times, from the original 15% to more than 50% of the dry biomass. If I process this into Bio-Oil, the result is close to petroleum crude oil - i.e, Bio-Oil with a calorific value of 41 MJ/kg!

We can do the same way by controlling light/CO2/planting media to give the most optimal results we

want for carbohydrates, proteins, oils, vitamins, pigments etc. So, don't blame the CO2 for the damage on earth, and instead use it to improve life on earth.



The Coupling Between Agriculture and the Renewable Energy Industry

In motorized vehicles there is a component called a clutch, its function is to connect the driving machine to the wheel turning transmission. With this clutch the engine rotation can be harmonized with the wheel rotation.

Perhaps this 'coupling' is what is needed in the renewable energy industry with agriculture in a broad sense, including plantations, forestry, fisheries and animal husbandry. The renewable energy industry requires a lot of feedstock. But this feedstock must be relatively homogeneous, must be feasible to collect from all over the country or even the world, and the supply must be sustainable.

On the other hand, in agriculture, even though there is a large amount of waste available, its form and energy content are still very diverse, the average energy content is also small and it wastes space because of its low density. Its production is also seasonal, it cannot be relied upon directly as industrial raw material if it is only one type.

So this is where we need a kind of 'coupling' that is in the vehicle mentioned above, it needs a connecting component between the needs of the renewable energy industry, and the abundant raw materials in the agricultural world. What is most suitable to act as a connecting component is what we call bio-oil, which already has a standard in the world, namely ASTM D7544.

Bio-oil can be easily processed from all types of agricultural waste biomass. Whatever the origin of the biomass, the bio-oil is relatively homogeneous - so it can be standardized. In ASTM D7544 for example, the standard for the energy content of bio-oil can be set at a minimum of 15 MJ/kg, a maximum moisture content of 30% and so on.

With this standardized feedstock, the renewable energy industry will easily be able to process this bio-oil into the various forms of energy it needs, either for producing heat - by burning directly or gasifying and then burning the gas, it can be used for electricity generation, and it can even be used to produce high quality fuel required for modern transportation engines.

For the latter, this can be done through two approaches, the first is in a simple way by using Fluidized Catalytic Cracking (FCC), bo-oil can already be converted into bio-gasoline and fuel oil. The second, if you want more flexibility and higher quality products, use a three-stage process, namely gasification, Fischer-Tropsch Synthesis and FCC. The product is RED II standard Advanced Biofuels in various forms, i.e, green diesel, bio-jet (SAF), bio-gasoline and bio-LPG.

We have been able to accept apprenticeships for those who wish to learn how to produce this bio-oil. What we need next is a renewable energy industry that will process the bio-oil into various forms of renewable energy, especially Advance Biofuels. With this bio-oil, the renewable energy industry will get its sustainable feedstock, and the wheels of the agricultural economy will spin fast.

Ultra Mobility for Urban and Remote Establishment (UMURE)

The world of modern transportation still faces a number of paradoxes that are not easy to solve. At a time when Elon Musk's shuttle is already flying through the sky, a number of big cities in the world like Jakarta are still unable to cope with their traffic jams.

On the other side of the 17,600 islands that we have, only around 6000 are already inhabited, the problem of transportation is the main one. The potential of small islands has not been explored because of this transportation problem. The Karimunjawa Islands, for example, are actually only 130 km from Semarang and only 80 km from Jepara. But as the fastest sea mileage is 3.5 hours by speed boa,. I has not become an attraction for tourists yet.

However, these two problems that have not been solved until now, God willing, will be solved in the next two years, namely 2024! What are we going to solve it with? Not with politics, but with technology that is now mature already. It is an ultra-modern transportation project that we call Ultra Mobility for Urban and Remote Establishment (UMURE) which can be a solution for these two cases at once.

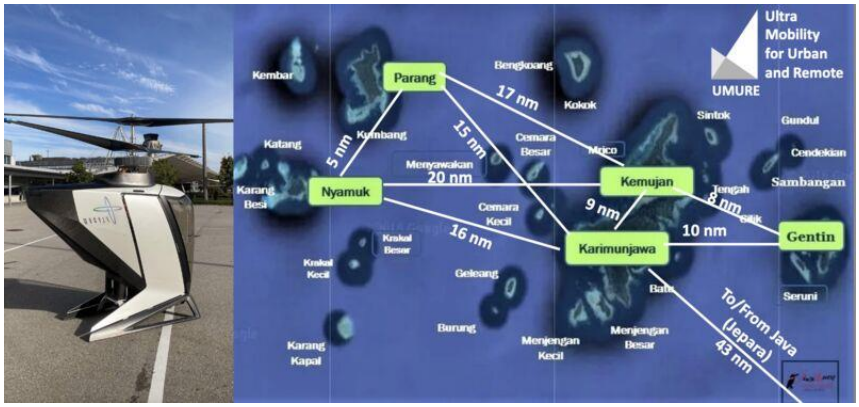
Sooner or later to overcome traffic jams and obstacles on land or sea, we do have to use air routes. But it must be affordable, easy to operate, safe, and must not add anyCO2 emissions into the air at all.

For this, the UMURE team is collaborating with providers who can provide the vehicle we need. FlyNow from Austria is ready to produce a new type of vehicle which is generally called Vertical Take-Off and Landing (VTOL), a kind of miniature helicopter that is very cheap and safe.

But this VTOL itself as a new type of transportation, must have been designed from the start to use the cleanest energy. So this is where the role of the UMURE team itself is, namely ensuring that the VTOL that we will use only uses renewable energy with the RED II standard. If it uses batteries, the electricity to charge them must be 100% renewable electricity. If it uses hydrogen fuel cells, the hydrogen must also be produced from renewable materials.

In big cities, batteries can be recharged from processing waste into Advance Biofuels, then with a standard generator set it will produce Renewable Electricity from waste, or from fast pyrolysis and waste gasification, the waste heat can be recovered to drive a microturbine, which also produces Renewable Electricity. If it uses hydrogen fuel cells, the hydrogen can be processed from the syngas

produced by the gasification of the waste above. If the operation is in a remote area, all that remains is to replace the urban waste with agricultural, plantation or forestry waste.



So UMURE not only presents ultra mobility that is not hindered by traffic jams, sea and other difficulties on land, but it also presents a transportation system with ultra clean emission from the start, achieving Net-Zero Emissions long before the world's goal of achieving it in 2050.

Long Head and Long Tail in Transportation Industry

There are two clear problems before our eyes, but no clear solutions so far, they are metropolitan congestion and uneven development. For the former, even though various modes of mass transportation are being developed, in reality new motor vehicles are still being sold at over 5 million units a year. As a result, traffic jams on the roads in all of our big cities are getting unmanageable.

The second is that our natural resources are spread across 17,500 islands, only 6,000 of which are inhabited. Even from those inhabited, especially in remote small islands, remote areas are still very difficult to empower because of the resources needed to process them, such as energy, funds, skills, etc. difficult to get to the site.

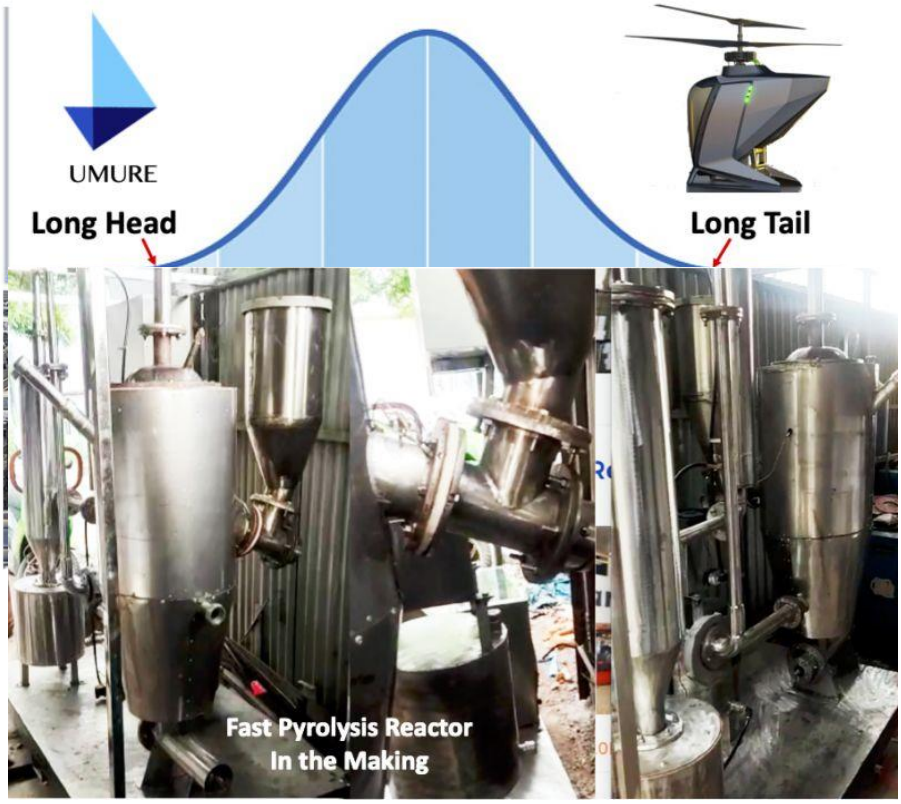
But with every difficulty there is ease, so it is these two difficulties that our think tank which is named UMURE (Ultra Mobility for Urban and Remote Establishment) wants to overcome. Two very different problems, but the solutions can be the same.

Even though the pandemic era has educated us to work online so that it should greatly reduce the need for mobility, in fact after the pandemic a surge in traffic jams has occurred again. This means that there are many activities that cannot be online. And among the people or objects that need to move, there must be a small portion - which if the total number can be very large - who can't wait to get stuck in traffic jams. This is what we call a Long Head, namely a small portion of the market that requires ultra mobility solutions - because time is precious, not to be wasted in traffic jams.

Likewise in remote areas, there is a lot of natural wealth that has not been processed and of course also has not found a market. It is difficult to find out, let alone process and market the results. So there is a need for cheap transportation that can reach every corner of the country - including those that are still un-charted territories, this segment which we call the Long Tail.

Both need vehicles that can't get stuck in traffic jams, no need to build roads, bridges, airports or ports. These vehicles are generally called VTOL (Vertical Take-Off and Landing) or those that use electric propulsion are called eVTOL.

The technology certainly continues to develop, but the state of the art is now very close to commercialization, our partners from #FlyNow who are developing it in Europe even have a target to enter the market in 2024 complete with all the certifications and permits.



Had Abbas Ibn Firnas not dared to fly in the 9th century, the Wright Brothers might not have dared to fly more than 1,000 later either. But they've all done it, why don't we fly now to overcome the congestion of the metropolis and the inaccessibility of our islands and remote areas? At the same time, cleaning the earth with a neutral carbon vehicle.

First Step Toward Net-Zero Industry

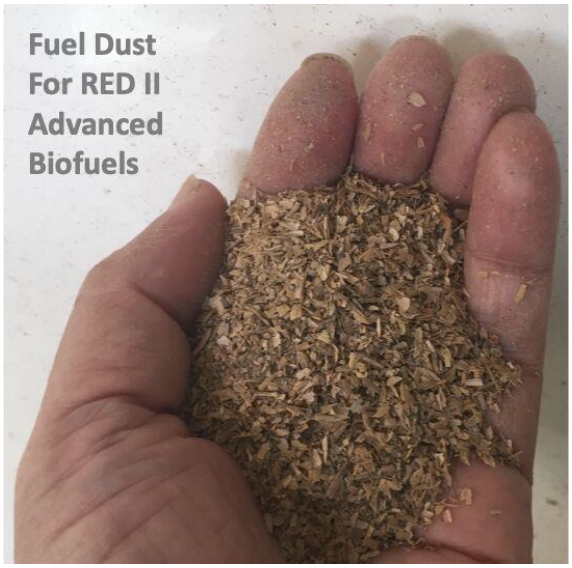
The global commitment towards Net-Zero emission 2050 will be a tremendous opportunity for farmers in any country in the world. If so far their main product is generally for food and their waste is not very valuable, agricultural wastes in the energy transition era will become the main source of raw materials for renewable energy.

The basic weakness of agricultural waste in its natural state is its low energy content, 1 m3 of rice husk for example only contains 3.75 Gj, or about 1/10 of the energy content of 1 m3 of crude oil, so until now husks are abundant in our agricultural areas but we don't get much of it into energy.

There is a technology for densifying biomass energy, such as making pellets, for example, but the material that can be pelleted is not all biomass as well, generally need lignin as an adhesive. Not suitable for biomass such as husks. You can make charcoal, but the energy density also doesn't change much, only increasing by about 30% from the condition of the husk.

So it is very important to produce an effective machine to increase the energy density of biomass - agricultural, plantation and forest waste. A simple technology that has existed since the last century for this is fast pyrolysis, the result is that the energy density for husks will increase from 3.75 GJ/m3 to around 18 GJ/m3. Even the bio-oil from empty palm oil fruit bunches can reach 29 GJ/m3.

So by processing agricultural biomass waste into bio-oil, it will make it an economical new commodity to trade even long distances. In the downstream industry, this bio-oil can then be processed into anything.



The most promising market is processed into syngas through gasification, continued into syncrude through Fischer-Tropsch Synthesis and finally into Synfuels in the form of bio-gasoline, green diesel, bio-jet and bio-LPG through catalytic cracking and fractional distillation. In addition to bio-fuels, bio-oil can be used as feedstock for the green-chemical industry, pharmaceutical industry, etc.

With the reactors that we have started to produce, God willing, we are ready to guide farmers to start producing bio-oil in a distributed manner, from biomass production centers. Only we still need partners in the downstream industry, who will turn them into bio-fuels, green chemicals, pharma feedstocks etc. Is it your industry that we are looking for?

Energy Densification

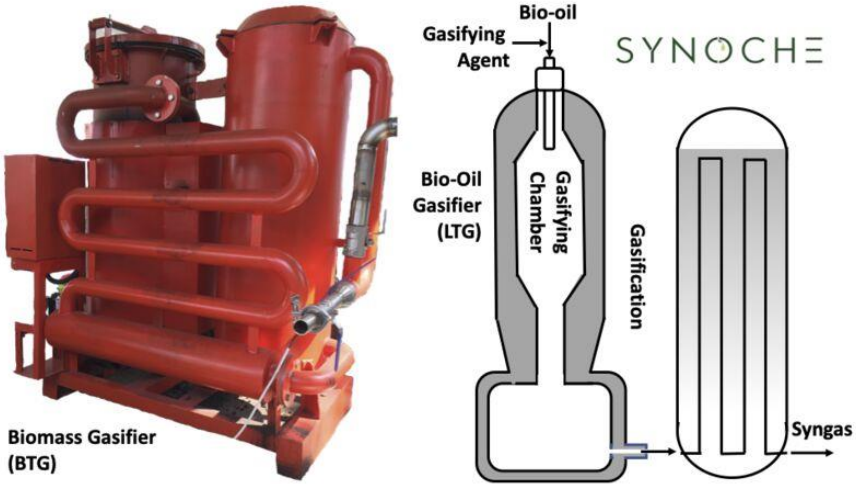
Who would have thought that from our rice fields a global fuel solution would soon be born which the developed countries of the world, especially Europe, are hunting for. That is RED II (Renewal Energy Directive II), which among other things states that rice husk and straw are included in the feedstock list in the category of Advanced Biofuels, which receive special treatment in achieving the European renewable energy target of 2030. In fact, it is start being used in stages this year at 0. 2% of transportation fuel, increasing to 1% in 2025 and 3.5% in 2030.

But before this opportunity becomes a reality, someone has to teach our farmers - how to handle clean energy in their fields, so that it becomes a commodity that is worth selling internationally. The first thing that really needs to be understood is the concept of energy densification. In its natural state, a 20 ft (32 m3) container of rice husks contains only about 69 GJ of energy, or the equivalent of about 1.64 m3 of crude oil. So if husks are sent, the material is cheap but the shipment cost is high - the end result is an expensive fuel.

So we have to condense the energy in the husk first, that's why we have to turn it into bio-oil so that it can become a commodity that is tradeable globally. In the condition as bio-oil, the same container contains 576 GJ or more than 8 times the energy density compared to the original husk.

Even if desired by the buyer, we can further compress it into biosyncrude (to differentiate it from syncrude which comes from fossils) until it reaches an energy density of 1.461 GJ per container or experiences more than 21 times the increase in energy content per unit volume, compared to when it was still in the form of husks.

With the same energy densification concept, we can process the waste and trash around us into super clean, renewable energy and become a new commodity in the energy transition world.



New Supply Chain System For Synthetic Gas

Synthetic gas (syngas) is a very flexible building block for the production of fuel and green chemical feedstock, which can completely replace all types of petroleum products and their petrochemical derivatives. Besides being carbon neutral, the source of raw materials is abundant and does not depend on certain types of raw materials.

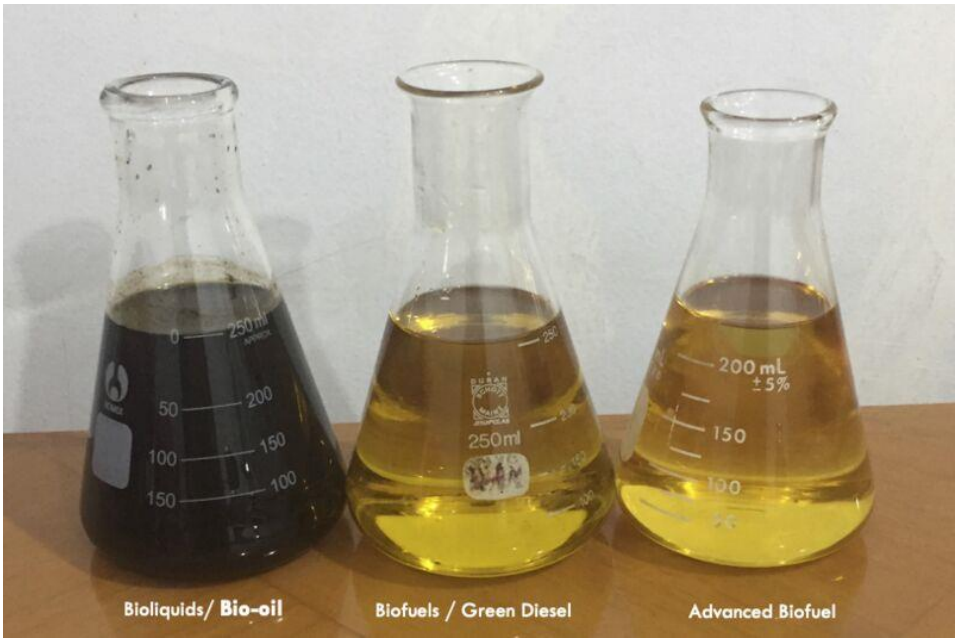
All types of second-generation biomass such as agricultural, plantation and forestry waste, urban waste as well as third-generation micro and macroalgae - all of which can be processed into syngas. For this you only need a syngas reactor like the one I made - in the photo below (the red one).

Because the main content of syngas is CO and H2, syngas is easily converted into syncrude to produce all kinds of fuels that we use today, ranging from bio-gasoline, green diesel, bio-jet, bio-LPG, bio-DME and can even be a source for green hydrogen. Syngas can also be used directly as a clean, carbon neutral and fully renewable fuel.

However, with all these advantages and potentials, the use of syngas is still not widespread. The main problem is on a logistical dilemma. Although it can be produced with a simple gasifier machine like mine, shipping its products to industrial users requires pressurized tanks which of course become expensive.

When produced at the user's site directly, the delivery of raw materials is problematic. Biomass is generally bulky, has a large volume and low energy content - so it is expensive to transport when processed in remote locations. Other biomass, such as municipal waste, has serious social and environmental problems if it has to be processed in distant places.

Thank God the syngas logistical problem can now be completely solved with only one reactor, namely the Fast Pyrolysis Reactor (FPR), which I uploaded yesterday. By using this FPR, any biomass can be converted into bio-oil first. Bio-oil has an energy content of between 3-6 times of biomass per unit volume, so it is much more efficient for logistics and does not require pressurized tanks.



Only at the user's place, when the syngas about to be used or processed into further products, syngas is produced just in-time and in-situ from the bio-oil. During stock transportation and storage, bio-oil is much cheaper and easier to handle than transporting and storing syngas.

In order to use the syngas produced just in-time and in-situ, what is needed is an LTG (Liquid To Gas) type gasification reactor as shown in the image below - the one on the right. It's simpler than the BTG (Biomass To Gas) reactor - the one on the left, so it's easy to just install the LTG at the user's location. Industries that already need this new supply chain system for this syngas throughout the world - can discuss with us for details.

The Three Musketeers : Bioliquids, Biofuels and Advanced Biofuels

These are three types of biomass-based renewable fuels, which we can now fully produce with existing technologies, which we will develop simultaneously for different target markets. The picture on the far left is bioliquids, namely the simplest type of fuel, a form of energy densification of biomass which is generally low in calories. The type of bioliquids that we develop is bio-oil or also called fast pyrolysis oil according to ASTM D7544 standards.

Bioliquids are aimed at industrial fuels, for electricity or heat generation, the character of bioliquids such as bio-oil is low in calories, still contains quite high water, up to 30% maximum, can be very cheap for electricity and heat generation. Similar to the original biomass, but has undergone energy densification up to 3 to 5 times, so it is cheap and easy to transport and store. Bioliquids of the bio-oil type can also be upgraded into high quality fuels such as Advanced Biofuels.

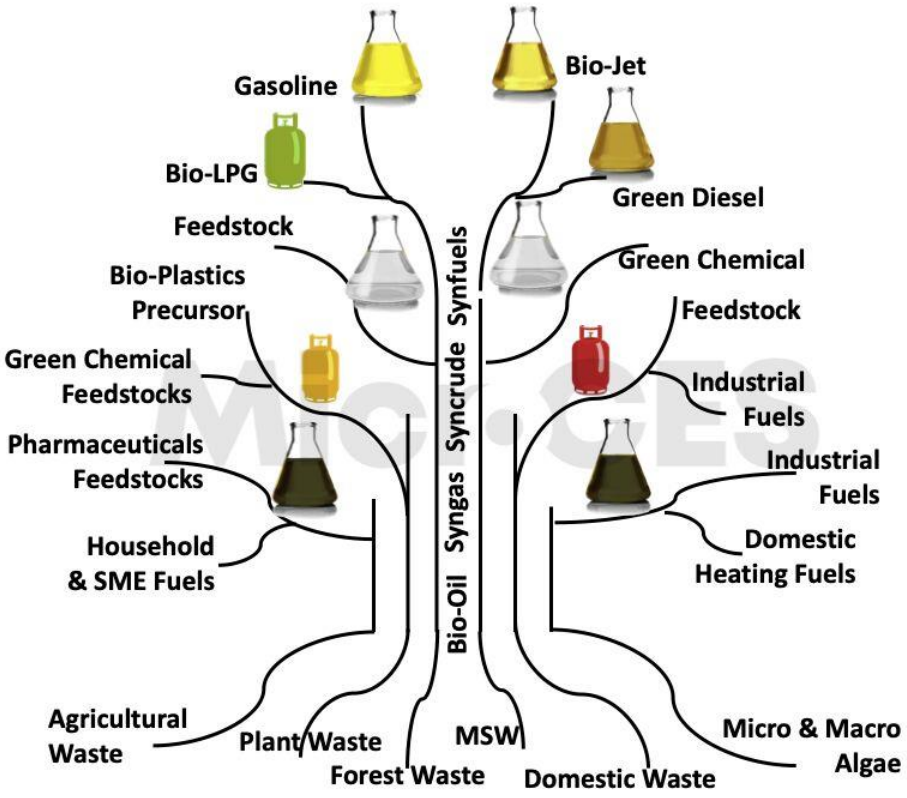
The one in the middle is biofuels, namely the type of biofuel that is currently most widely used, for example biodiesel. A higher version of biodiesel is green diesel or also called drop-in biofuels. Both biodiesel and green diesel which are produced from raw materials that compete with food or feed, do not want their growth. Even in the European Union, which has implemented RED II starting this year, biofuels of this type will continue to be reduced to 0% in 2030.

As alternative biofuels, which do not compete with food or feed, what we are pushing for are drop-in biofuels such as green diesel and biogasoline which are produced from non-food vegetable oils such as tamanu oil, where even the land for planting can use arid lands that have been long not used for food or feed production. This type of drop-in biofuels is cheaper to process than biodiesel because it does not require co-materials such as methanol or ethanol in the production process. In terms of calories, it is about 19% higher than biodiesel, which is equivalent to petroleum diesel.

The one on the far right is the type of fuel we are most focused on developing and producing. In the definition of RED II, this is what is called Advanced Biofuels, namely fuel produced with specific feedstocks listed in Annex IX A. The abundant feedstocks in us are agricultural, plantation, forestry waste and even urban waste.

While reducing dependence on imported fuels, we are also cleaning cities, forests, gardens and land. Our earth will be clean, and so the sky, no longer polluted by CO2 which is not offset by CO2 absorption from the growth of today's plants.

The Industry Tree For Biofuels and Green Chemicals



If until now the world is still dependent on fossil energy, it could be because it is our own choice that has not tried our best to replace it with clean energy. Likewise, dependence on petroleum-derived products such as plastics, chemicals, etc.

On the whole, the fossils, which originate also from plants and animals that lived tens of millions of years ago, can always be replaced by the plants we grow and live today after going through the appropriate process. Not even necessary from the main produce, from the waste is enough.

Below is the industry tree for biofuels and green chemicals or feedstocks, which we can produce entirely from biomass that does not compete with food and agricultural land or forests. Like trees, they originate from roots, all kinds of agricultural, plantation, forestry wastes, even household and urban wastes can be used as the 'roots' of this solution. To meet future needs that are growing very fast, we can also plant micro and macoalgae in the sea if the previous sources were not sufficient.

Since the biomass is generally dispersed and has a relatively low energy content compared to petroleum, the energy content must be compressed before becoming a flexible raw material for direct use, further processed or sold to the next processing industry.

The energy condenser we chose due to the cheap process and the product is easy to handle is to make it bio-oil first. From here, bio-oil can be used directly as fuel for households, SME and industry. Can also be used for industrial raw materials such as pharmaceuticals - because the main content is phenols.

Bio-oils can also be further processed into synthetic gas or syngas. It can also be directly used as industrial fuel or raw material for the chemical industry, or further processed into synthetic crude. Syncrude is exactly the same as crude oil, only it is much cleaner, carbon neutral and renewable. Syncrude is an ideal candidate to replace dependence on petroleum.

From syncrude, you can go directly to refinery and fractional distillation to become drop-in biofuels that can directly replace all types of fuels that we use today. It can be in the form of green diesel, bio-gasoline or the fuel that is currently being hunted by the aviation industry, namely bio-jet or Sustainable Aviation Fuels (SAF). Even from syncrude, Bio-LPG can also be produced, to replace our LPG which we still have to import it a lot.

There are four technologies that we can use to process biomass into all products in the above industry tree. Namely Fast Pyrolysis, Gasification, Fischer-Tropsch Synthesis and Fluidized catalytic Cracking or FCC

- Fossil Fuels
- Non Renewable
- Fuel must be bought expensively
- Noisy machine
- So many moving part, costly maintenance.
- CO2 Emission

- Biomass fuels or any heat source
- Renewable
- Fuel available around us some of it free
- Quit machine
- Single moving parts, low cost maintenance
- Carbon neutral

Energy Transition : From Diesel Genset to Microturbine

The transition energy era if taken seriously will present a lot of new opportunities, especially to bring new machines with lower or even zero emissions. If in the world of transportation there has been a transition from the Internal Combustion Engine (ICE) to Electric Vehicles (EV), how about in the world of electricity, especially the off-grid?

So far, the demand for off-grid power and electricity has ranged from a few kW to a large scale of several MW, the majority of which have been fulfilled by diesel generators. From farmers' needs for water pumps, corn shellers, rice millers etc., to electricity needs for small islands - most of it fulfilled by diesel generators.

Besides the expensive fuel cost because it has to be imported from far away places, the carbon foot-print is high and of course the emissions from combustion itself are also very high. In the era of transition energy, what we offer as a replacement is microturbine.

Microturbines will be able to answer all the needs that have been met by diesel generators, and have a number of advantages. Among other flexible fuels, whole biomass or other heat sources such as waste heat can be a source of energy for this microturbine.

Anything around us can be used as fuel, so it doesn't need to be imported from far away. The impact apart from being carbon neutral - the carbon foot print for logistics is also definitely low. The microturbine is actually a simple machine, only one component rotate, namely the axis for the turbine which is at the same time also the axis for the generator. Thus maintenance will be easier and cheaper.

The question is who has produced this microturbine? In the world there are a number of names that have produced them, but nowadays they are still expensive - the same as when electric cars were first introduced, expensive. If this machine is mass-produced for a large need, it might be much cheaper.

Indonesia is really needs a machine like this to be able to simultaneously develop its 17,500 islands. So it is appropriate that we are the ones who initiated and pioneered the transition from diesel generators to microturbines. God willing.

Green Energy From the Sea

Offshore oil workers are used to living at sea to explore and produce oil from the sea, so for new and renewable energy, the biggest opportunity will come also from the sea. Among them is microalgae. Why does it have to be from the sea?

Indonesia as an example, the area of this country is 7.8 million km2, but 75% of it is ocean. Similarly, the earth's surface, 71% ocean and only 29% land. This means that marine exploration is an opportunity that is at least 3 times greater than the opportunity on land. Besides the average land has been filled with agricultural land, forests, housing and various other needs.

So now is the time for us - especially those who live in this maritime country - to find new energy solutions by utilizing our oceans. For farming in the sea, for example, the most feasible is microalgae cultivation. In addition to many species that are their natural habitats in the sea already, various technologies have now been developed to enable low-cost, safe and high-yield cultivation techniques at sea.

Likewise, the process of harvesting and processing the produce. At this last point our R&D has pioneered the processing of any microalagae to produce high quality bio-oil, with a calorific value in the range of 30 MJ/kg - meaning this is 2 times the average calorific value of bio-oil from typical biomass.

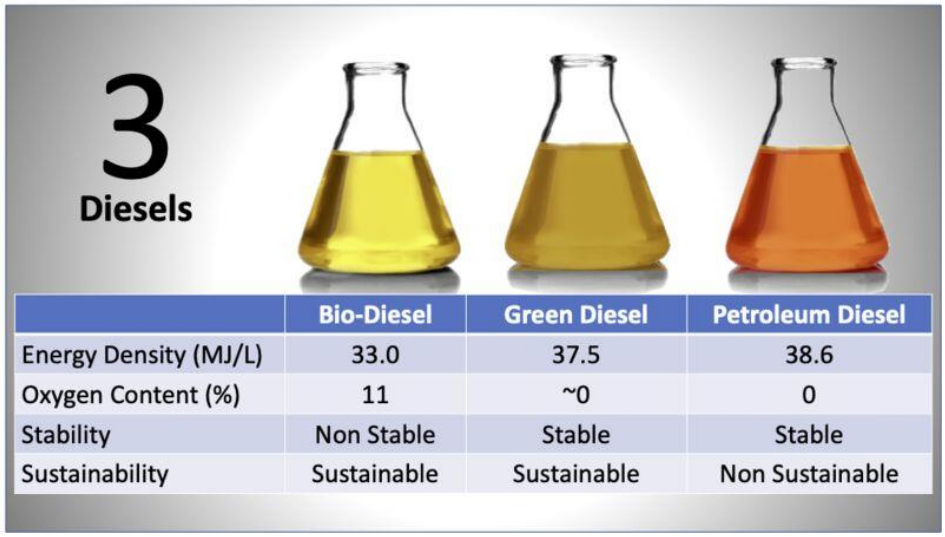
This finding will also have an impact on the cultivation process, we no longer need to choose which ones can grow and which don't - let nature grow the best microalgae - and whatever the best our oceans produce - that's what we cultivate and process.

The cultivation process is cheap because you don't have to bother with problems of contamination, nutrition and special ecosystems, etc. Everything is already in our oceans, including for water circulation - no need to use a pump for water circulation like in pond microalgae cultivation or in photobioreactors, seawater waves become free energy to stir our microalage continuously 24 hours a day. In the sea (supposedly) we triumph!

Three Diesels of Choices

The users of diesel engines both for personal and industrial use these days are screaming, it is true that this type of fuel is very expensive if it is not subsidized. Is there any choice but to complain? The answer is yes! it just takes extra effort for you to get green and cheaper fuel.

The first choice is to make your own Bio-Diesel, how? Come to our lab with used cooking oil or any oil, plus methanol and KOH, you can make your own Bio-Diesel with these three ingredients. After learning, later you can make your own at home with or without reactor equipment like the ones you use in our lab.



	Bio-Diesel	Green Diesel	Petroleum Diesel
Energy Density (MJ/L)	33.0	37.5	38.6
Oxygen Content (%)	11	~0	0
Stability	Non Stable	Stable	Stable
Sustainability	Sustainable	Sustainable	Non Sustainable

In this way, you can still get Bio-Diesel for under Rp. 10,000 per liter, if you buy the used cooking oil not more expensive than Rp. 6,000/liter. But it should be noted that standard biodiesel - the same as those on the market, has a

weaknesses in its energy content which is about 14.5% lower than fossil diesel, its oxygen content of up to 11% also makes it unstable when stored for a long time.

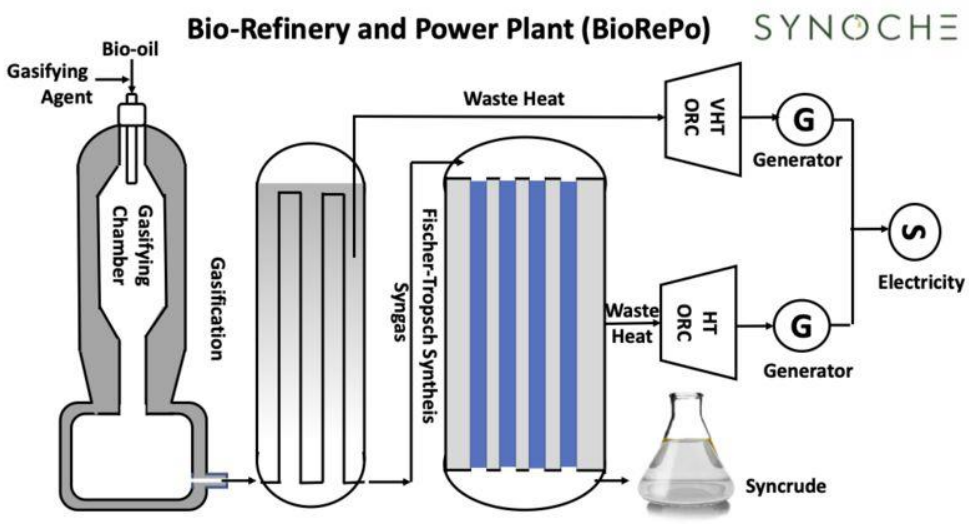
Especially for the industry - you can also make your own Green Diesel or also called Drop-in Diesel, which was introduced by the International Energy Agency (IEA) since 2014, it is a renewable fuel, it can be made from vegetable oil and even can also be from biomass. In addition to its energy content that is close to petroleum diesel, its oxygen content is close to zero and it is stable for long term storage - thus making Green Diesel an ideal substitute for petroleum diesel.

Industries that want to make it can discuss with us, but basically you only need a catalytic cracking reactor if the material you use is vegetable oil including used cooking oil. If you want to make it from biomass you will need one more reactor, the fast pyrolysis reactor. It will take some investment at first, but you will become independent with your own fuel, and it can be very cheap if the material is waste from your own industry, or local biomass.

If the Bio-Diesel that you can make yourself does not meet the specifications of the fuel you need, making Green Diesel difficult to invest in reactors, then your last option is to buy diesel on the market - whatever the price is, you just have to calculate whether this fuel cost remains acceptable for your production cost structure in the long run.

Introducing BioRePo : Bio-Refinery and Power Plant

The era of energy transition provides many opportunities for those who continue to innovate, on the contrary, it poses a threat to those who seek to perpetuate their comfort in enjoying industries that pollute the environment. In the energy sector, both fuel and electricity, which have been the scapegoats for CO2 emissions, it is actually very possible to pioneer this clean and



environmentally friendly industry.

So far, it seems very, very difficult to move from fossil fuels for fuel and electricity to clean and carbon neutral fuel and electricity, so difficult that the world has set a target of 2050 as its Net-Zero emission target, even countries like us in Indonesia are bargaining it up to 2060.

Whereas on the other hand, we have abundant sources of clean fuel, in the form of agricultural, plantation, forestry and urban waste. Even if this is not enough, we have the opportunity to plant biomass that grows very fast, micro and macroalgae in the ocean which is almost 3 times our land area.

It is from this abundant biomass that we can produce clean fuel and electricity simultaneously in one process, and this is where one of the disruptions in the energy transition era comes, namely if we can combine the two into a single process with the same basic energy source - biomass.

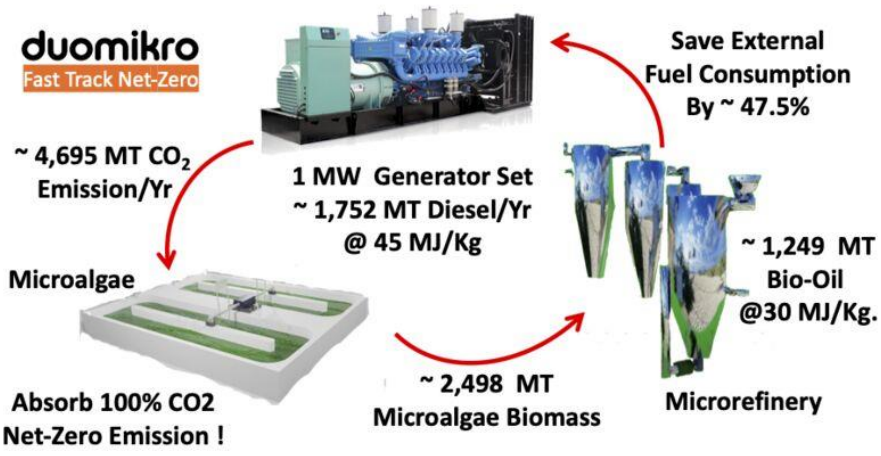
So far, it is very difficult for the power generation industry to obtain clean and sustainable fuel, as well as the fuel industry. if only they sit down and worked it out together, then both of them would be able to save their feedstock costs very significantly. What had been borne alone, became shared.

The concept that we introduce is what we call BioRePo from Bio-Refinery and Power Plant. With this BioRePo, we can drive a very broad community economy, from the farmer class, cooperatives to corporations - all of whom can process any biomass around them to become Bio-Oil. This Bio-Oil is the feedstock for BioRePo.

In BioRePo Bio-Oil is first processed into syngas, then followed by Fischer-Tropsch synthesis (FTs) to become syncrude. Syncrude is a versatile material that can be used to produce all forms of fuel that we use today, whether it be gasoline, diesel, jet-fuel to LPG, and even feedstock for green chemicals.

Both the gasification process and FTs, generate a lot of waste heat. Waste heat gasification can reach temperatures of 1000 degrees Celsius, while FTs in the range of 200-350 degrees Celsius. Both can be converted into electricity through the ORC system that we developed. We can see now that both fuel and electricity should be clean and low cost.

Institutions and corporations, domestic and overseas, can now talk to us if they are interested in implementing the BioRePo concept.



Fast Track Net-Zero Emissions

The impact of global warming and climate change is increasingly being felt by people all over the world, some are experiencing an unprecedented heat wave, some are suddenly hit by flash floods, tidal flooding and rising sea water, forest fires everywhere and various other natural disasters.

It's just that the world is too slow in responding to global warming and climate change, the Net-Zero Emissions agreed upon by world leaders will only due in 2050, a number of countries have even bargained it to be 2060 and even 2070. Are we willing to let next big disasters come to us before the Net-Zero Emissions be achieved?

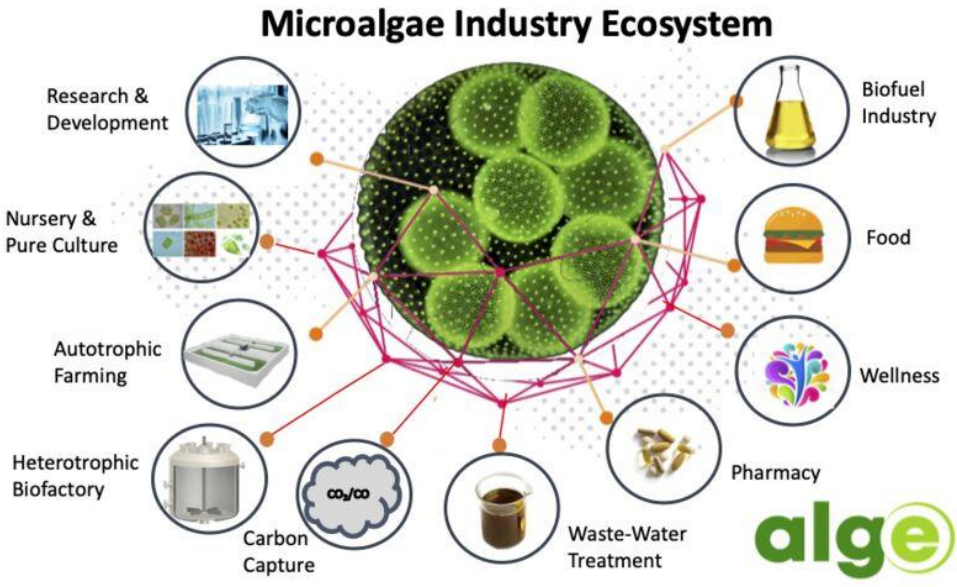
There must be a big effort that is really out of the box in overcoming the root cause of emissions, it can no longer rely on commitments between countries and merely laws and regulations which are then made in each country for its implementation. Conventional methods will be too slow and industry will only do it by force - not to the fullest effort to improve nature.

So what we have conceptualized is the Net-Zero Emissions movement which is driven by economic motives - because this is the motive that is always pursued by industry players. Industries that consume increasingly expensive fossil energy, will voluntarily make improvements to Net-Zero Emissions if they get incentives in the form of economic benefits that can be enjoyed directly and quickly.

This direct and fast economic incentive will really can be enjoyed by industry players, among others with the technology that we introduce as Duomikro. That is capturing industrial CO2 emissions with microalgae and then directly processing the biomass it produces in-situ using a microrefinery to become Bio-Oil.

In the modeling that we made as in the illustration below for example, an industry that uses a 1 MW diesel generator will be able to absorb all of its CO2 emissions by planting microalge in a pond or tank at a volume of about 8,500 m3. In fact, not only absorbing 100% of its emissions, the industry will also get a bonus in the form of high quality Bio-Oil - which can be directly used for fuel for its own industry or upgraded to transportation biofuels.

For diesel power plants, the value of Bio-oil produced from the CO2 capture process will be in the range of 47.5% of the diesel fuel used. This 47.5% fuel saving will become an economic incentive for the industry concerned to quickly pursue its Net Zero Emissions. In the era of fossil fuels that are increasingly scarce and expensive in the future, who is not interested in saving their fuel costs by up to 47.5%? Those who are interested can contact us for Duomikro applications in your industry.



3G Biofuels Tipping Point

The third generation (3G) biofuels that are most sought after in the world are biofuels from microalgae, because it does not compete with agricultural land and food, their growth is very fast and can be produced anywhere, there is no country or region that cannot grow this microalgae.

Although it has been sought after for the last decades, until now its mass production is still facing a number of obstacles. Among them are high production costs, low population density of microalgae in culture media, high risk of contamination and so on. These obstacles are still a barrier to the presence of these third generation biofuels at affordable prices.

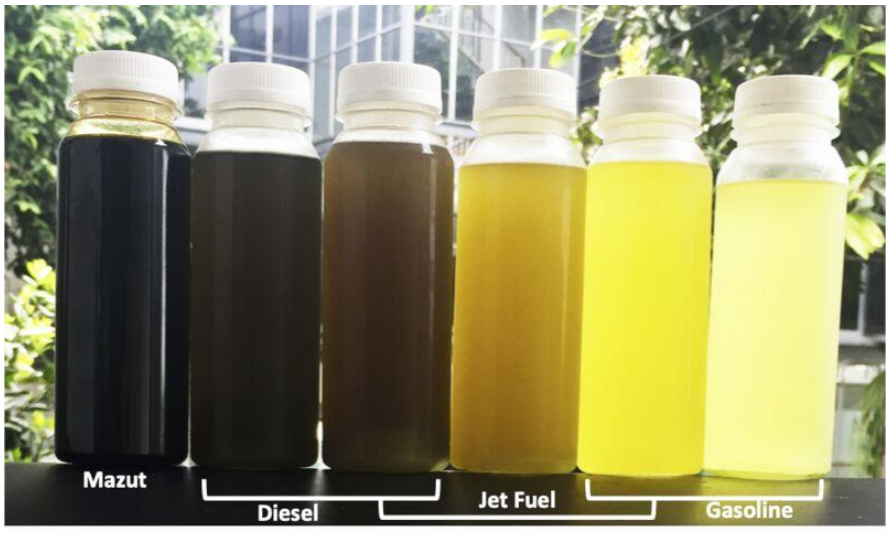
But all these obstacles at the laboratory level can actually be overcome already, the population density of microalgae for example can be overcome by Heterotrophic - Ultra High Cells Density (HUHCD) microalge culture. Because the cultivation of HUHCD microalgae is carried out using a bioreactor, the problem of contamination risk can also be reduced to a minimum level.

So there is only one more problem that needs to be addressed, namely the investment cost of the bioreactor which is still very high at this time. A number of parties are working on this domestically, hopefully it can be successful in the near future. What is the strategic value of a bioreactor that is cheap but meets the standards of bioreactor?

It will be the so-called 'tipping point' in the procurement of this 3G biofuels. That is the moment of critical mass, such as when water boils at a temperature of 100 degrees Celsius - water that was originally unable to fill its container, suddenly spreads throughout the room it can reach when it turns into steam. So that's how 3G biofuels based on microalgae are, it will be able to very quickly flood the market once the problem of economical mass production is resolved, while to overcome this now a number of parties are on the edge of their respective findings.

From what I have been directly involved in the development, I can predict, God willing, that the tipping point of 3D biofuels could occur in a matter of months - that is, when a number of experiments currently underway in the field - no longer in the lab - could be successful. If this tipping point occurs, then the opportunity will belong to all parties who are interested in getting involved in producing this 3G biofuels.

Not only for biofuel, a number of other opportunities will also open up to deliver a comprehensive microalgae industry ecosystem as I present in the graphic below.



The Color of MSW- Fuels

If this energy crisis hits us, it must be our own fault. Why is that? Everything that grows between the heavens and the earth, both plants and animals - is built, among other things, from the element of hydrocarbons. If we can take the hydrocarbons - that's the fuels we need actually, but we still prefer importing it very expensively up to now - that is hydrocarbons from fossils called petroleum.

On the other hand, we still view the pile of municipal waste in our city as a liability, it must be handled with a very large budget and from time to time the local government is busy looking for new land for the FDS (Final Disposal Site) of waste, because the existing piling ones are already too high and life threatening.

In fact, from that waste - of which more than half are hydrocarbons - we can get whatever fuel we need. We call these new fuels as MSW-Fuels, from Municipal Solid Waste Fuels. At first glance the colors look like a variety of fresh drinks, until in the lab we have to make a warning Do not drink!

The color gradation is the result of our fuzzy logic reactor fractionation, we can sort it into whatever fuel we want. For gasoline, for example, the one on the far right is the hydrocarbon C5-C10, in the middle is the Jet-Fuel hydrocarbon, which is the C8-14 chain. The one on the left is Diesel, which is a C14-20 hydrocarbon chain. And on the far left is Mazut or industrial fuel, the dregs from our fractional distillation process with a chain length of C22 and above.

As a result, fuel is abundant all around us, only because of our ignorance that makes us have to import so much of our fuel needs and subsidize it very heavily - to keep it affordable for the people. In fact, if we want to, we can produce any kind of fuel whose production costs are actually very cheap - because it's trash!

Institutions, investors or entrepreneurs who are interested in this deep-tech project in the field of sustainable fuels can contact us to get the teaser.

Appearance of Local Fuels

The current fuel crisis in the world cannot be separated from the world's dependence on certain oil-producing countries. Actually, we can produce it from any biomass that grows around us, both those that produce vegetable oil or those that only produce lignocellulose. We can even using Municipal Solid Waste (MST).

The result is like in the photo below, this is a collection of fuels that we managed to make using the materials mentioned above. It really depends on the raw materials, but in general we can make any kind of fuel we need, from gasoline, jet-fuel, diesel and industrial fuel.

We will certainly continuously improve these research and developments, but because of the urgent

world need today for the presence of what we call local fuels - then all the results of this research are now ready to be scaled up to a commercial level.

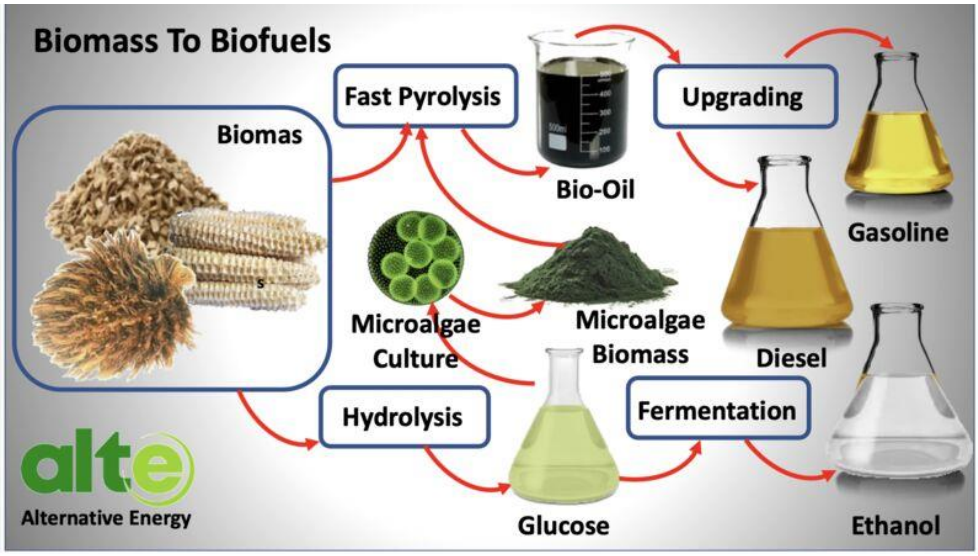
There is no other way to be free from the scarcity and volatility of world oil prices, other than making these local fuels - fuel that is produced using local raw materials and is also used for the same area.

This solution is ideal for plantations and mining in remote areas, remote island communities, fishing communities who often cannot go to sea due to fuel constraints, world communities whose countries are threatened with a fuel crisis and anyone who already needs this clean, renewable energy. We provide detailed teasers for those who are interested in participating in this opportunity.

Biomass To Biofuels Pathways

Our Creator has given His inspirations, that the pleasure for those who travel comes from the fire that is lit from the tree that He grows (Qur'an 56:71-73). What pleasure is meant? What relate fire, trees and travel in this era? That is what we know today as transportation fuels.

We will not be able to enjoy the journey of today if there is no fuel. Even when the fuel is not from the trees that are planted today, then the enjoyment is not sustainable. Because in the last century we have almost used up fuel from trees millions of years ago, it is time now for us to return to natural fuels - those from the trees we plant today.



This is what we now call biofuels, thank God with all the science and state of the art technology currently available - we have many options to be able to convert trees or what we call biomass into biofuels that are suitable for today's vehicles, either in the form of gasoline, diesel and even jet fuel.

There are three technology options currently available from the ALTE - our Alternative Energy team for biofuels derived from this biomass - as illustrated below.

The most common and relatively simple technology is the hydrolysis process to convert lignocellulosic biomass into glucose, then ferment the glucose to produce ethanol. Ethanol is already a widely known fuel, although its energy content is only around 24MJ/l, compare for example with gasoline which is in the range of 34 MJ/l. Ethanol 10% in gasoline (E10) is commonly used worldwide for gasoline-engined

vehicles without any modification. Can be up to 85% ethanol (E85) when using a special machine.

The second way, biomass is processed through fast pyrolysis to produce Bio-Oil, then from Bio-Oil it is upgraded by catalytic cracking or hydrodeoxygenation (HDO) into fuels similar to gasoline - Gasoline Like Fuel (GLF) or similar to diesel - Diesel Like Fuel (DLF).), both of which can be used directly without engine changes, for gasoline engines and diesel engines, respectively.

The third method is the most sophisticated and the results are the maximum. That is, biomass is hydrolyzed into glucose, then the glucose is fed to a biofactory in the form of heterotrophic microalgae culture, the result will be biomass that already contains high energy. Fast pyrolysis process of this microalgae biomass will produce Bio-oil (41 MJ/kg) which is very close to petroleum crude oil (42-47 MJ/kg).

From this third route, dependence on oil could be completely abandoned eventually. Moreover, now a way has been found for the cultivation of heterotrophic - ultra high cell density (H-UHCD) microalgae which can produce up to 55 liters of drop-in biofuels per week per 1 m3 of microalgae culture!

3 Choices for Crude Options

Next week, the world community may have to live in a new normal in terms of their fuel needs. Early November is the due date of oil production from OPEC + which is reduced by 2 million BPD. So we must be prepared to accept the possibility of a new turbulence in world oil prices.

But actually we also don't have to depend too much on the availability and affordability of the world's oil. In this fertile equatorial country, there are many opportunities to adequately replace petroleum, even with better substitutes, because this substitute is clearly cleaner and always renewable.

The results of a series of our latest research and studies, place at least three options for renewable crude that we are very likely to produce adequately with current technology. The options are as follows:

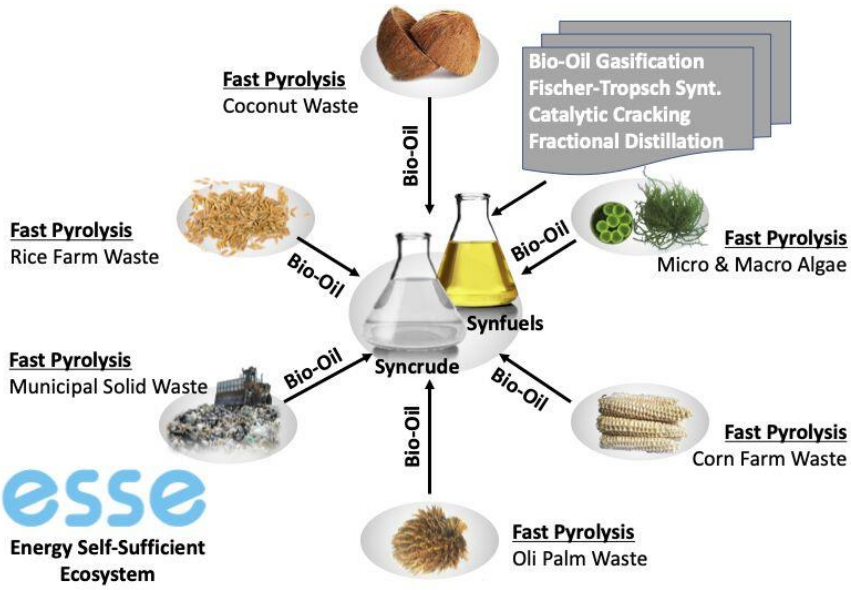
Our first choice fell on Synthetic Crude or also called Syncrude. This is the product of the Fischer-Tropsch synthesis process from Synthetic Gas (Syngas) raw material. We chose it as the first choice because the Syngas material is abundant around us, it can be in the form of agricultural, plantation and forestry waste biomass, as well as solid waste and even urban liquid waste. Another advantage of Syncrude is that it is very flexible in producing fully drop-in biofuels to replace gasoline, diesel, jet fuel and LPG, all of which until now still rely on petroleum crude oil.

The second choice falls on Crude Bio-Oil or CBO, the raw material is similar to Syncrude, but our current technology is not able to process liquid waste into efficient Bio-Oil yet. Another disadvantage of Bio-Oil is that the fuel produced is not exactly the same as gasoline or diesel, the products are called Gasoline Like Fuel (GLF) and Diesel Like Fuel (DLF). But CBO also has the advantage of a simpler and cheaper process, the result can be a very cheap fuel.

Our third choice fell on Crude Vegetable Oil (CVO), specifically on non-edible one, like tamanu oil (Callophyllum inophyllum). The drawback compared to the two options above is that in terms of cost, CVO will tend to be much more expensive than Syncrude, not even compared to CBO. But there are also advantages, namely if we plant trees in arid areas, there will be a very valuable environmental impact, carbon removal, groundwater improvement etc.

As a result, whichever one we choose, God willing, it will be sufficient to replace our dependence on oil which we still have to import in increasing quantities. In its application in the field, it is very possible that we will need all three, and can start from anywhere that is doable first.

Energy Self-Sufficient Ecosystem (ESSE)



For a tropical country on the equator like Indonesia, the road to self-sufficiency in clean energy is actually wide open. Any biomass is grown all year round in this country, it doesn't even have to be planted specifically. For second generation biofuels, we can rely on agricultural and plantation waste. For the 3rd generation, it is necessary to plant algae (micro and macro) in the sea which is almost 3 times our land area.

It's just that the handling of biofuels from biomass can't just be centralized like in the fossil era, because on average the biomass is bulky - the volume is large but the energy content is low, so efforts must be taken to compact the energy content in-situ where the sources of biomass originate.

One of the effective and inexpensive ways to condense the energy content of biomass is to convert it into bio-oil. For example, one 20 feet container when filled with rice husks only carries about 8 tons of husks with a total energy content of about 120 GJ. The same container can lift 26 tons of bio-oil with an energy content of 390 GJ or 3.25 times compared with when it was still a husk.

So that all biomass can be processed effectively to become drop-in synthetic fuels (synfuels), which are very clean and renewable fuels to replace fossil fuels, what we offer openly is to integrate them into Energy Self-Sufficiency Ecosystem (ESSE) clusters. If this ESSE can be present in every 100 km radius

between producers and users, then the fuels produced will also be local fuels - that is, fuel is produced and used in the same area.

Imagine if our fuels are drop-in synfuels which are also local fuels, apart from being carbon neutral from the material side, it also has a very low carbon footprint from a logistical point of view. Moreover, farmers who are in a radius of 100 km from the existence of ESSE will have a new source of income, namely selling bio-oil from their agricultural waste.

The region concerned will be capable of self-sufficiency in energy, and has a new source of economic growth. Regions become their own energy producers and are no longer just consumers of energy importers.

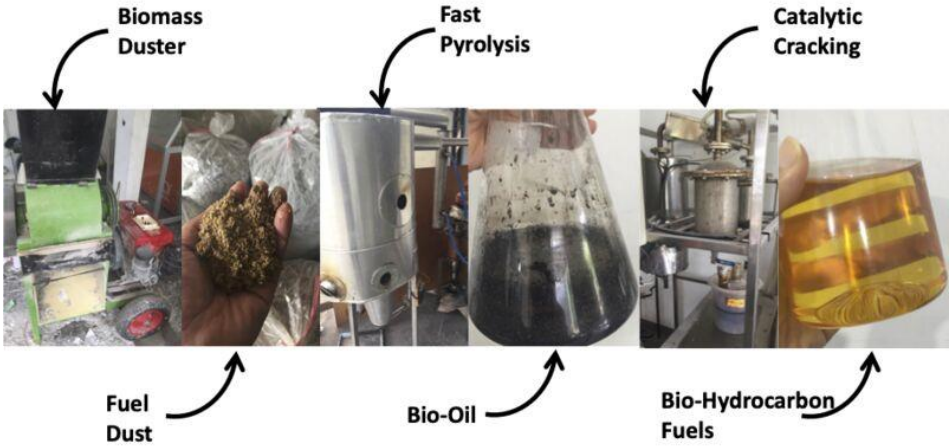
We have curated all studies and technology developments to present this ESSE, we just have to choose which regions are interested in being the pilot. What is needed is a regional head who has a vision for energy independence, a vision for SDGs 2030 and Net-Zero 2050. Is your region ready to be the first in self-sufficient for clean and renewable energy?

Introducing New Green Energy Commodity : Fueldust

In the world of new and renewable energy (EBT), the world already knows what is called sawdust, woodworking waste that can be used as pellets to fuel power plants or biomass stoves. The problem is that anyone who has used sawdust must have experienced the same problem, the supply is erratic and certainly has an impact on prices.

So we introduce a new substitute commodity which we call fueldust. The difference with sawdust, fueldust can be from any material, ranging from agricultural, plantation and forestry waste, including of course sawdust and urban waste.

What's interesting is that the production of this fueldust can be done by anyone who has access to the materials mentioned above. It's also easy to produce fueldust, you only need one machine that I presented in the photo on the left - that's a biomass duster or biomass pollinator.



So how to use this fueldust for energy? although it can be used directly as ordinary biomass, what we recommend for high value added energy products - is to process it through a fast pyrolysis machine to become bio-oil. Fueldust is ready to be directly dropped into the fast pyrolysis machine that we

designed.

Bio-oil can already be used directly for boiler or burner fuel which is specially designed for this purpose. However, the next value-added process is more recommended. This can be done, among others, through the gasification route into syngas, then liquidated into syncrude and cracked into synfuels, if you can do this, of course this is the best and has maximum added value.

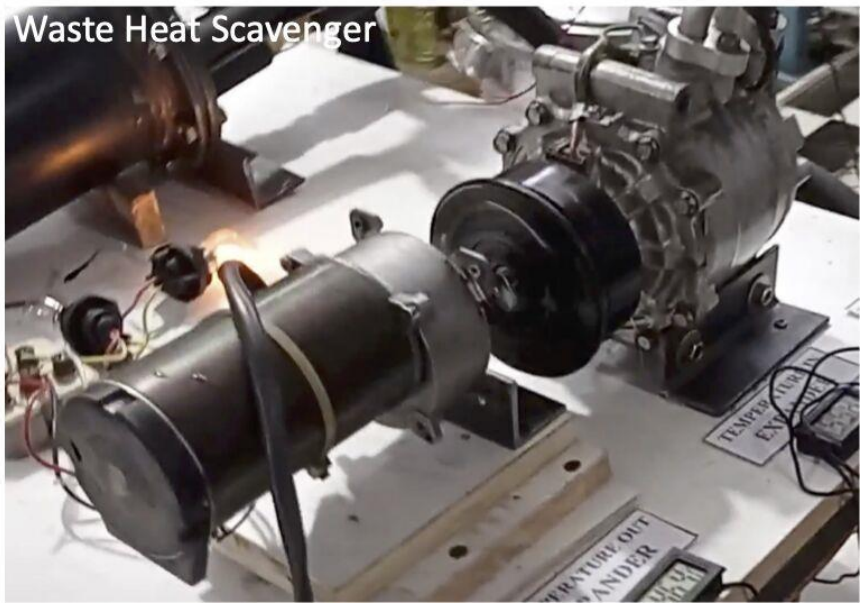
But if not, you can also use a one-step method, from bio-oil directly upgrading through catalytic cracking to become bio-hydrocarbon fuels, replacing gasoline, diesel, sustainable aviation fuels (SAF) and so on.

The existence of this new energy commodity - fueldust, can be a great potential for both rural and urban communities, those in the rural process agricultural, plantation and forestry waste, while those in the city process urban solid waste.

So that this commodity can immediately contribute to the search for affordable clean energy, we are ready to train all related technologies for those who are interested in joining our agent of change team, to be present in the community - processing existing waste and turning it into the most needed energy.

Waste Heat Scavenger

Waste that is very much wasted in household, commercial and industrial is waste heat. Unfortunately, this enormous energy potential has not been widely utilized. On the other hand, it is very difficult for us to find new and renewable energy to reduce emissions while building energy security.



So this photo is our simple experiment to convert waste heat into electricity. We classify this waste heat into 4 groups. First, Low Temperature (LT: 60 - 100), Medium Temperature (MT: 100-250), High Temperature (HT: 250-500) and Very High Temperature (VHT > 500) are all in degrees Celsius.

The one in this photo is the LT type, which is the most waste heat around us, including waste heat from air conditioning system, from kitchens and from industrial processes in general. However, the principle of the same machine, namely the Organic Rankine Cycle (ORC) Microturbine that we developed can handle all types of waste heat. It's just that for HT and VHT, organic working fluids - ie

fluids used for the ORC system must be specially made.

What is the strategic value of electricity from this waste heat? In the era of energy transition, scavenging waste heat in industry in particular, can have a huge impact on reducing emissions. Because any amount of electricity produced will reduce electricity consumption from utility companies - the majority of which are massive fossils.

Second, changing the mindset that electricity can be generated from waste heat will have a massive impact on national energy efficiency. Let me take the case now, power generation companies around the world are looking for biomass for co-firing with coal - to reduce emissions. Since biomass is generally only burned solely to generate heat and then to generate electricity - the energy conversion efficiency is on average low, in the range of 30% of the biomass's potential.

Now if we turn back, the same biomass is directed to produce bio-oil for syngas, then upgraded again to syncrude and the ultimate to synfuels - all of these processes produce waste heat in the HT and VHT categories. Electricity from waste heat from HT and VHT is not reduced or even more, even though it is only from waste, while the main product is synfuels - clean fuels that are sustainable, and of course also have high selling value.

So it's time for the world's power generation companies - as well as fuel producers - to think about their new business model. If they still only produce electricity or only fuel, they will only be able to reach Net-Zero in 2050 or even later. If they produce both with the same raw materials, Net-Zero will be achieved much faster.

What if power generation companies and fuel producers do not change - because the business model is too big to change? That is our chance, who do it first, will become captain of the industry in this energy transition era.

3 Steps For Net-Zero Emission

The task of cleaning the earth from CO2 emission is not only the government's job, because the disaster it can cause can affect anyone who lives together on this earth. So, both individuals and corporations, must be able to contribute maximally to the joint effort to achieve Net-Zero emission, the sooner the better.

Here are 3 steps that we can all contribute positively to the comfort and security of the big house that we will leave for our children and grandchildren on this earth, until the end of time.

The first is Do Your Best in reducing emissions, there is so much that can be done for this. Use public transportation instead of private, if you have to use a private vehicle use a smaller cc, turn off the lights, air conditioning, etc. if it is unnecessary. As much as possible avoid the use of fossil energy. At the corporate or institutional level, they must begin to be concerned with the use of fossil energy as much as possible. The development of all types of and new renewable energy that we upload in this media is part of this Do Your Best!

The second is Remove the Rest, emissions that still come out no matter how hard we try to suppress them, must be off-set with efforts to absorb these emissions at least as big as the emissions that come

out. The easiest and most effective way is to plant trees. The average Indonesian population for an example, emits 2.2 tons of emissions per year per capita, planting 5-7 large trees can offset our lifetime personal emissions. For corporations that need greater effort, they can do so with plants that absorb CO2 much faster, such as micro and macro algae.

The third is Share The Risk, various problems and disasters can arise at any time that interfere with the achievement of the Net-Zero target. So a number of parties are trying to have this risk-sharing mechanism to smoothen global efforts in achieving the Net-Zero emission target. One of them is with the appropriate concept of insurance/takaful. This risk sharing mechanism will also be a way out for individuals or corporations who for one reason or another cannot directly carry out steps 1 and 2 mentioned above.

By paying an amount of contributions or premiums, God willing, in the near future individuals and corporations will be able to be actively involved in supporting the achievement of the Ne-Zero target in each country. The funds collected through the risk sharing mechanism is used to finance green projects such as tree planting, new renewable energy development and various other green developments that are in line with the Net-Zero emission target.

God willing, we can all contribute to this global endeavor, if not for ourselves - we need to secure this earth for our children and grandchildren who will still live on this earth for a long time, we must be able to make this common place to live comfortable and safe for them.

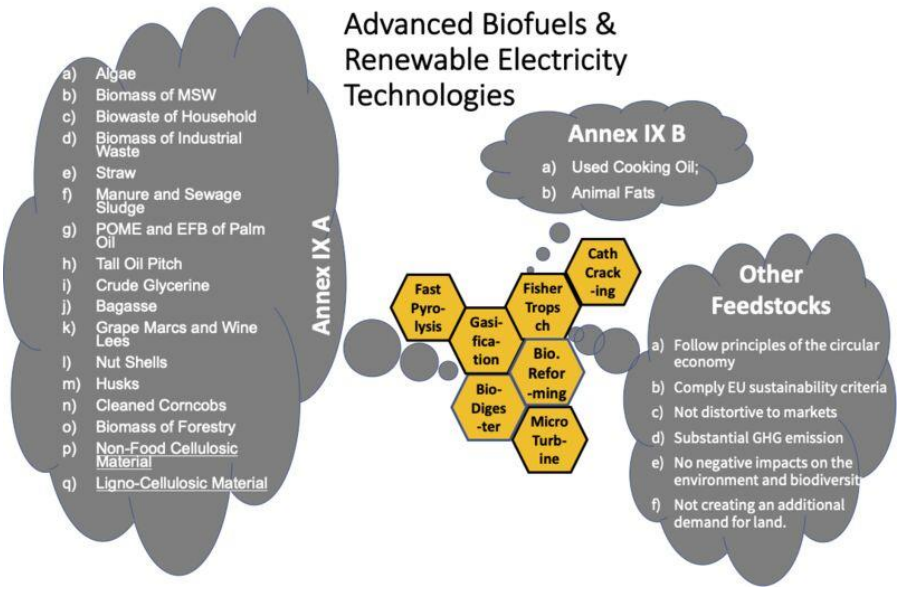
Advanced Biofuels and Renewable Electricity

These two things are the focus of the Renewal Energy Directive II (RED II), which has now become effective in the European Union. Both are encouraged to develop, and even given incentives in calculating their 2030 renewable energy targets.

What is meant by Advanced Biofuels is actually a simple definition, namely biofuels produced from feedstock that has been listed in the directive (Annex IX A), can also use used cooking oil and animal fats in a limited way (Annex IX B). Apart from those that have been listed, your feedstock can still be considered as meeting the Advanced Biofuels criteria if it fulfill the six requirements - which are in the illustration below.

From the listed feedstocks, we can see that the majority exist and are even abundant around us, so it is very possible for us to become the main producer of these Advanced Biofuels. What is then needed is an appropriate and effective technologies to process the abundant feedstocks, into Advanced biofuels that are drop-in or can be used 100% directly in modern transportation engine without making any changes.

Based on the research and technology development that we have pioneered since RED II was initiated and socialized about 5 years ago, our conclusions are narrowed down to 7 technologies that are very possible to produce the above Advanced Biofuels at this time.



The first of these technologies is fast pyrolysis to convert biomass feedstock into bio-oil to simplify logistics and subsequent processes. The second is gasification to convert bio-oil into syngas, the third is Fischer-Tropsch synthesis to convert syngas into syncrude, and the fourth is catalytic cracking to break down syncrude into the desired fuel type, which can be diesel, gasoline, jet-fuel and even also bio-LPG.

The fifth technology is a bio-digester which is needed if the feedstock is a liquid or solid with a high water content, the result is biogas. The sixth technology is biogas reforming to convert biogas into syngas, so that it can be further processed in the third and fourth technologies.

What's really interesting about the combination of technologies that we use, they all give off high waste heat - except for the fifth technology. We recover this waste heat with the seventh technology, namely the microturbine to become Renewable Electricity. So even better than the RED II scenario, we can produce Advanced Biofuels and at the same time Renewable Electricity with the same material, which is any material on the RED II list - can processed into both at once.

All of these processes are very energy efficient because we combine autothermal, partial oxidation and exothermic reaction approaches - so there is no need for external energy to produce Renewable Energy.

Crude Bio-Hydrocarbon and Green Diesel

Last weekend I uploaded the first test of our micro-refinery in the form of a short video that I made myself from the test site. For those who are curious about the products produced from the micro-refinery, this photo is the result.

In essence, there are two processes in our micro-refinery. The first is the catalytic cracking process, which is the release of oxygenated compounds through the formation of CO, CO2 or H20. A number of reactions that occur simultaneously in the cracking reactor are Hydrodeoxygenation, Decarboxylation, Decarbonylation, Hydrocracking and Hydrogenation.

After going through a series of high-temperature processes (400-500 degrees Celsius), the raw material in the form of vegetable oil or biomass oil (Bio-oil) will turn into what we call Crude Bio-Hydrocarbon, just like Crude Oil in petroleum but this one renewable. Crude Bio-Hydrocarbon that is formed depends on the raw materials used.

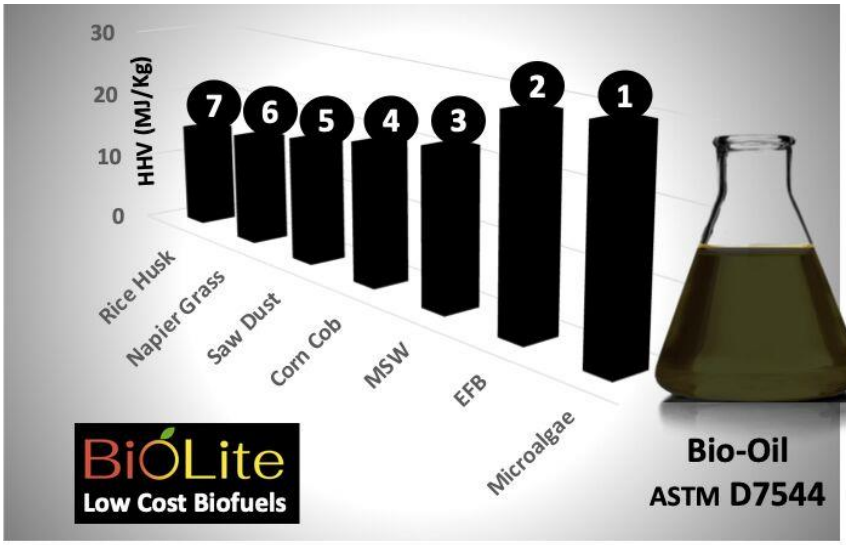
When the raw material is vegetable oil, almost the entire result are straight-chain bio-hydrocarbons or alkanes - in various sizes. When the raw material is Bio-Oil, the result are various forms of bio-hydrocarbons - consisting of striated chains (alkanes), branched chains (iso-alkanes), circular chains (cyclo-alkanes) and hexagons (aromatic). Physical form as in the photo (the black one).

The second process is fractional distillation, which separates Crude Bio-Hydrocarbon into the desired fuel groups. This separation is carried out on the basis of the condensation temperature, in the range of 220 degrees Celsius for example - the green diesel group that condenses first, then below 200 degrees Celsius is the Bio-Jet group, in the range of 40 degrees Celsius the Bio-Gasoline, and which does not condense at room temperature will become Bio-LPG.

From this process, we are absolutely sure now, that the fuel that currently depended on most of the imports, is now actually we can make it ourselves - from materials that are abundant around us. There is no need for giant refineries, these small refineries or micro-refinery can be built in just a few months. If demand is high, then we can build micro-refineries networks that complement each other in a distributed production network - whatever our fuel needs we can meet together.

Raw materials must be around you, ideally if you use vegetable oil that is non-edible, if you don't have it you can use any biomass including urban waste. Even if there is no urban waste, all you have to do is plant microalgae that can be harvested within days! So don't give up with the energy crisis !

7 Choices of Raw Materials for Low Cost Biofuels



In the midst of high fuel prices, heavy subsidies and global geopolitical uncertainty, the search for alternative fuels is a very urgent matter. But what is the most immediately ready fuel for the millions of vehicles now already on the street?

So our research is focused on Bio-Oil, which is biomass oil that does not compete with food, agricultural land and forests. This Bio-Oil fuel has long been known in the world and even has a standard, namely ASTM D7544. However, to become transportation fuels, it needs to be upgraded to become Gasoline Like Fuel (GLF), Diesel Like Fuel (DLF) etc. This is what we call BioLite, which is a low cost fuel produced from biomass.

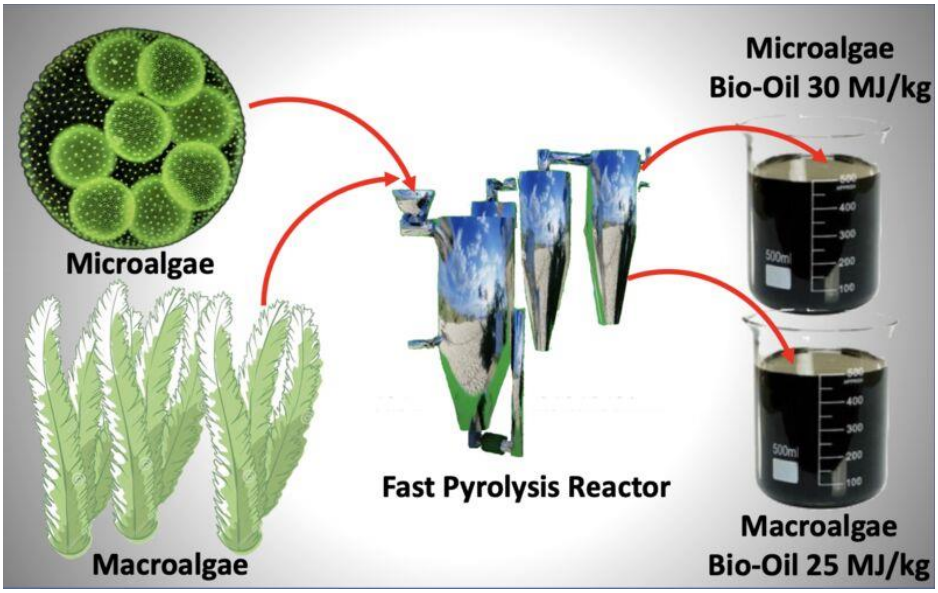
Of the many choices of biomass in Indonesia, our choice fell on the 7 materials that we chose based on their energy content when converted into Bio-Oil, cost of raw materials and their scaleability. The options are:

The 7th is rice husk, it fits the ASTM D7544 standard and the source is quite abundant. No. 6 is Napier Grass, a type of elephant grass that can grow like weeds to fill idle lands. No. 5 is sawdust because its presence in Indonesia is also quite large along with the growth of the forest product industry.

No. 4 is corn cobs, in addition to its high energy content - its abundance is due to the growth of corn production for animal feed. No. 3 is municipal solid waste, high energy content and abundant volume in all major cities in Indonesia.

The second or runner-up is empty palm oil fruit bunches. There are around 16 million hectares of oil palm land in Indonesia today and the majority of the waste in the form of empty bunches has not yet become a value added product. With the energy content that tends to be high in the Bio-Oil processed by these empty fruit bunches - in the range of 29 MJ/kg, this should be one of the focuses of the search

for raw materials for this low cost fuel.



The first winner is microalgae, why? Investment costs for microalgae cultivation infrastructure tend to be high, but these costs can be absorbed by the emission control budget (carbon removal) from industries that emit high emissions. After all, they do have to spend money to control these emissions, ine stone for two birds - while tackling emissions, producing biofuels.

Another factor we chose microalgae is also because of its almost unlimited scalability. Can be planted in the sea which is 3 times of our land area. With the highest energy content among other biomasses - up to 30MJ/kg, microalgae deserves to be the champion.

In reality on the field, we can use all 7 raw materials to jointly replace our dependence on fossil fuels, now and in the future - when oil no longer exists in this country.

Third Generation Biofuels : Microalgae and Macroalgae

In my previous upload, I have shared 2nd generation biofuels from empty palm oil bunches and corn cobs, which have a potential of 400,000 BPD in Indonesia or equivalent to 27% of the national fuel demand which reaches 1.5 million BPD. The next question is then what can fill the gap that still needs another 1.1 million BPD?

In addition to filling it with planting oil-producing trees that do not compete with food and agricultural land/forests such as Tamanu in our arid lands, the potential of which is almost limitless are microalgae and macroalgae. Both can be grown on our coast which is the second longest in the world after Canada.

Both are types of plants that do not compete for food or agricultural land, both of which are the best candidates for third-generation biofuels. Each has its own advantages, microalgae plants grow very rapidly with a harvest age of 1-2 weeks, the Bio-Oil is also very high in energy content in the range of 30 MJ/kg.

On the other hand, macroalgae are very easy to grow and do not require high investment in

infrastructure for cultivation or harvesting, the drawbacks are the harvest age which takes 6-8 weeks and the energy content is lower than microalgae - in the range of 25 MJ/kg.

Both can complement each other to fill our fuel needs in the future. With the fast pyrolysis technology that we have developed, the production of Bio-Oil from microalgae and macroalgae becomes easy and inexpensive. Because the Bio-Oil produced from both of them is far above the Bio-Oil ASTM D7544 standard which only requires a minimum energy content of 15 MJ/kg, the Bio-Oil from microalgae and macroalgae already has a high value to be sold in the condition of Bio-Oil as is, or Crude Bio-Oil (CBO).

However, for people who are able to develop up to this Bio-Oil, the next upgrading process into Biofuels for gasoline and diesel is also just one step away, namely using a catalytic cracking reactor whose micro-scale example that we have made also have been shared in my previous upload.

The point is that future fuels or third-generation fuels can already be present in front of our doors now, it's just a matter of who wants to work on them first. If I were Elon Musk this concept might not need to be shared openly like this - because I would have all the resources needed to make this happen. Thank God I'm not him, so I still need other resources to make it happen. Are you the one I'm looking for?

Alternative Fuels, Where Do They Come From?

If energy literacy is taught from an early age and followed up until it is applied, then we will never experience an energy crisis. How come? All the fossil fuels that we rely on until now are basically hydrocarbons, while these hydrocarbons are scattered around us - but we consider them useless garbage.

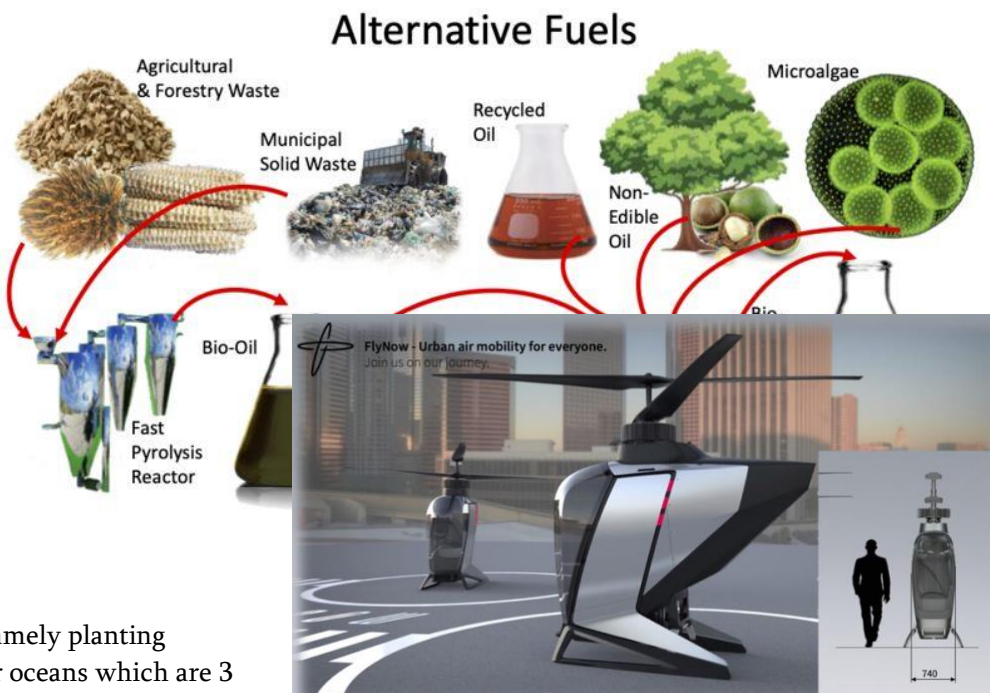
Biomass that we don't eat because it's not tasty and hard - that's what is generally called lignocellulose that becomes trash everywhere, in agricultural areas, in forests that are a source of fires in dry seasons, and urban waste - which sucks up so much budget. All of this waste and garbage contains an average of 50% more is hydrocarbons, if we can take these hydrocarbons then that is green fuel.

It's not really that difficult, you just need to provide the tools and practice the skills. Of all the waste can be converted into ready-to-use energy called Bio-Oil. Besides being able to be used directly for industry, it can be upgraded to various fuels that we use today such as diesel, gasoline and even sustainable aviation fuel (SAF).

Another source that is also easier to process is used oil or recycled oil. With one process through catalytic cracking, it can be converted into various fuels that we need, whether diesel, gasoline or SAF.

Nice problem to have when waste including used oil are all processed into fuel - because it means our cities have become very clean. So to meet the next fuel need is to plant trees in our 14 million hectares of arid land. Tamanu tree for example, it produces a lot of oil - up to 71% of the dry weight of its kernel. The oil can easily be processed into various bio-hydrocarbon fuels, also through one process, namely catalytic cracking.

If our arid land is also exhausted - then this will be the next nice problem to have - because it means that there is no longer aridity in this country. There are still opportunities to produce the next green fuel that is endless, namely planting microalgae in our oceans which are 3 times our land area. The biomass produced by these microalgae is easier to process into liquid fuel because it does not contain lignin.



In short, God willing, this country will never run out of fuel, as long as the people are encouraged to understand the ins and outs of this energy and are supported by the government in the development of science and technology, skills, infrastructure and everything that supports the achievement of self-sufficiency in cheap fuel.

Surely this is cheaper than continuously subsidizing fossil fuels which half have to be imported. If only a small part of the Rp 500 trillion subsidy was used for this, God willing, we will soon be energy independent!

Flying Taxi For Metropolitan and Islands

Like a farmer who goes to the market to sell his produce, in the market he sees a beautiful toy for his child - so he buys the toy to entertain his children at home. That's what we do here.

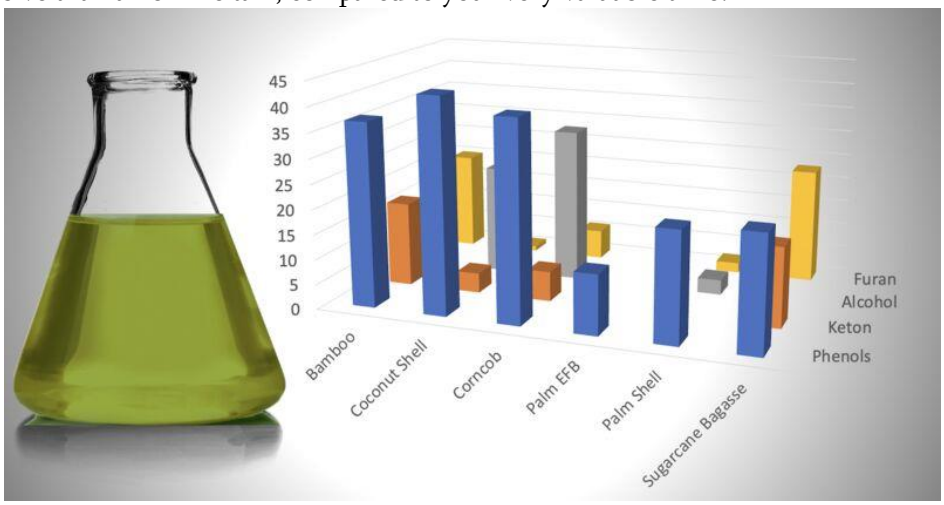
We are trying to market this country's produces, in the form of biomass that has been processed into Sustainable Aviation Fuels (SAF) blendstocks to European markets that really need it, especially the 3 DACH countries - three countries that are allied in language - Germany (D), Austria (A), and Switzerland (CH), and in their aviation industry we found this beautiful 'toy'.

The technical name is eVTOL (Electric Vertical Takeoff and Landing) vehicle, which can be a solution to congestion in our metropolitan cities, as well as an effective inter-island transportation. There are

indeed many developers of similar vehicles, but I have never met one like this.

Designed by former BMW engineers, the standards for components and workmanship are of the highest quality - but it is affordable. One unit is not more expensive than the minister's official car. If it is used as a flying taxi, the cost per kilometer is only about 3.5 times the cost of a standard online taxi.

So who are the potential users? Busy people who need to be physically present in the midst of a metropolitan traffic jam that is not getting better. What does it mean to pay for a flying taxi which is 3.5 times more expensive than an online taxi, compared to your very valuable time?



Another very potential application for this archipelago is for inter-island transportation. Thousand islands tourist attraction, for example, the distance from Jakarta is only 9-30 km, ideal for this flying taxi.
Thousand islands can be part of a more integrated metropolitan life because of it.

With this vehicle, islands that are still deserted can become as busy as metropolitans. The Selayar Islands - in one district there are 120 islands, the Karimunjawa islands - in one sub-district there are 27 islands and other islands can become very attractive environmental tourism objects after this effective transportation available. For inter-island costs, eVTOL is no more expensive than a sea trip using a speedboat.

So what is our role in this product when it is ready? Wherever it lands and takes off there must be a compatible electric charging station, with our Microces - Micro Combined Energy System, electricity and fuel can be present anywhere easily - even in the smallest island in the middle of nowhere. Institutions and corporations that are interested in this 'toy' can contact us already, God willing, the units will be available for the country's big agenda of 2024!

Agrowaste Sustainable Chemicals

Apart from being an abundant source of renewable biofuels, agricultural, plantation and forestry wastes are also very rich in interesting compounds that can be an alternative for industries that need them.

From our study of the most abundant biomass in Indonesia, we found that almost all of them contain very significant phenols after the biomass is processed through fast pyrolysis into bio-0il. Only in rice husks we barely find it.

So what are these phenols for? it functions as an antioxidant, antimicrobial, anti-inflammatory etc. Therefore, these compounds have good market opportunities in the pharmaceutical, wellness and food industries.

In addition to phenols which are generally in the light fraction of bio-oil, in the intermediate fraction there is a combination of phenol and aldehyde, both of which can be used as raw materials for petrochemical substitutes for polyurethane etc. After taking the light and medium fractions that have a high value, the bio-oil will leave a heavy fraction which is generally long chain hydrocarbons - so it is suitable as a feedstock for diesel substitute fuel - which can be cheaper than petroleum diesel because it is a waste product.

This bio-oil, which is processed from agricultural, plantation and forest waste, is now ready to present a sustainable chemical industry - which is safer and healthier for the community and better able to preserve our nature.

The Color of Democratized Energy

Just as democracy in politics where we have to get used to sticking together even with people whose political color is different from ours, so is democracy in energy. So that we can process various types of raw materials in small quantities into uniform energy, either in the form of fuel or electricity - then our energy machine must be able to accept all forms of materials, and still produce the same energy - which essentially is renewable hydrocarbons.

The photo below is the energy source for the machine I uploaded earlier, namely the CHPF - Combined Heat, Power and Fuels engine which we call MicroCES. In essence, any bio-hydrocarbon that is around us can be processed with this machine to become heat energy, fuel or electricity.

Just so that the process can run very efficiently, all materials must first be powdered with the longest side in the range of 2-3 mm. With this size the biomass powder can be decomposed into bio-oil in just seconds in the MicroCES reactor.

Just as in a democracy where everyone has an equal voice, in an energy democracy it is the same. Anyone who wants can take on the most suitable role in the supply chain to procure various types of energy that we need ourselves.

See what biomass sources around you, then that's what you can process into minimally powdered biomass. Those who want to invest in building a reactor will be able to process it into bio-oil, biofuels, electricity or heat for various industrial and commercial processes.

In an energy democracy, it is the people who are the perpetrators, the people who produce energy from upstream to downstream and the people who use it. If in a democratic party, people even get their votes in remote areas and islands because somebody have an interest on their vote, in an energy democracy, it is the people who have the interest in meeting their own energy needs.

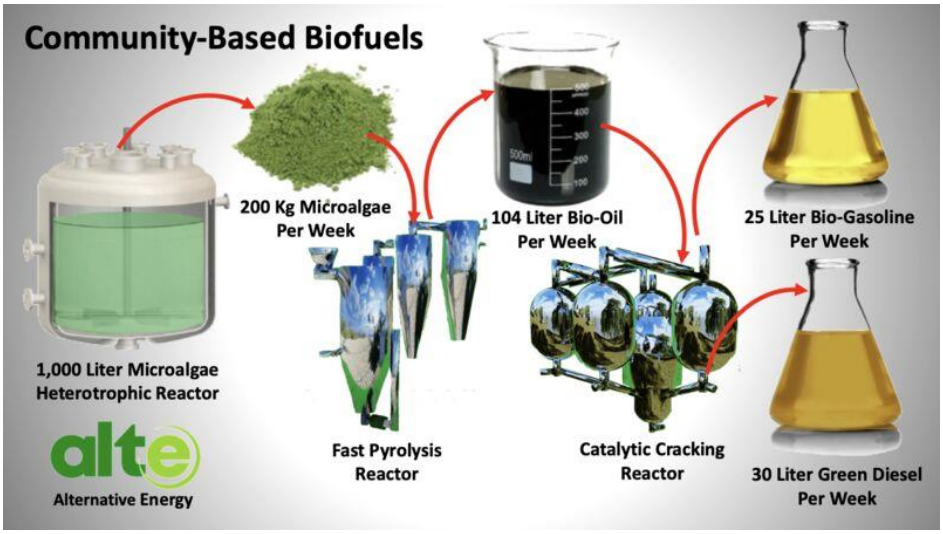
Communities That Produce Their Own Biofuels

The pandemic and the Ukraine-Russia war have indeed become very bitter lessons for the world community, especially regarding their impact on energy security. Most of the world's people are now worried about the increasingly heavy energy prices, even some others are no longer able to buy the energy they need.

Actually, there is an opportunity for the community to build their own energy security on a micro scale, community scale, housing complex, village, company or industrial scale, etc. At first glance, it looks like science-fiction, but all science and its state of the art technology have now made it possible. In fact, all the figures that I present in this illustration are based on existing research and are very doable at this time.

The route of an energy self-sufficient society that is universally applicable - can be done anywhere in

the world - we chose the microalgae route, because there will always be suitable species and the resources needed to be able to grow them in your area.



There are three ways of cultivating microalgae, the first using an open pond - this requires a large area, prone to contamination and the results are less effective. Second, with a photobioreactor (PBR), this method is expensive and has limited productivity because at a certain level of density - light becomes difficult to evenly distribute in the reactor.

So what we recommend is the cultivation of microalgae without light, using a technique called heterotrophic - that is, all the growth needs of microalgae are met from the culture media which includes organic carbon, or carbon emissions when used for carbon capture from industrial emissions.

To be able to grow in the dark, cultured microalgae can be selected from common species such as Chlorella, Scenedesmus, Neochloris and Tetraselmis. Meanwhile, heterotrophic reactors can be made from cheap materials such as modified water tanks, flexibags, etc.

How much microalgae people need to cultivate in order to be energy sufficient? Not much when used the heterotrophic technique I mentioned above. Depending on your activities, 1 m3 of microalgae may be enough for you, as this will already be able to produce 30 liters of diesel and 25 liters of gasoline per week.

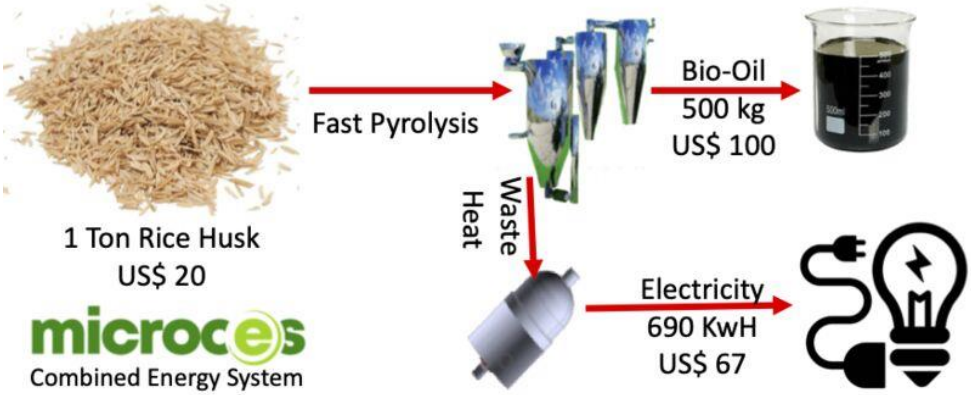
Although it looks simple, my advice is not to do it yourself alone because it is quite complicated and requires a decent investment, my advice is to do it together with your community - so that there is a division of labor, or by your company to be energy independent. God willing, we are ready to assist the community or industry who want to try it.

Waste Valorization Into Combined Energy

The next source of economic growth is already in front of our eyes, the raw materials are abundant and the market is also huge. The raw material I mean is waste, and the market is the new and renewable energy market.

In our cities, on average, waste has not been handled properly, it is still a very heavy budget burden for local governments, to provide landfill area, trucks transporting garbage back and forth from all over the city and labour costs which also continue to swell.

In agricultural, plantation and forestry areas, too, people buy expensive fossil fuels while the clean fuels that are in front of their eyes are ignored. Often just burned, it often causes fires in the dry season.



How interesting is it actually to process this waste into energy? If it only becomes one type of energy - into electricity or into fuel - even though it is quite attractive, often the problem of investing in the machines becomes an obstacle.

So what we have prepared is a technology that can maximize the valorization of waste into a combination of energy, in the form of liquid fuel as well as generating electricity. With the same pre-treatment equipments, waste can produce two product categories at once.

How big is the energy economic potential of this waste? I take the example of the case of agricultural waste, namely rice husk. If you have to buy it from a rice mill, the rice husk costs only Rp 300,000/ton or US$ 20/ton. From 1 ton of rice husk, through the fast pyrolysis process that we designed, around 500 kg of Bi0-Oil is produced, assuming a price of Rp 3,000/kg, the proceed is Rp 1,500,000 or US$ 100.

Because some of the husks are burned at a very high temperature - around 500 degrees Celsius, the heat generated is not only sufficient for the fast pyrolysis process which requires high temperatures, but also leaves a very high waste heat. Once this waste heat is processed using an ORC Microturbine - it will still produce around 690 KwH of electricity, at the current rate it is around US$ 67.

We can see now from the waste that was originally worth US$ 20, being processed into a combination of energy to US$ 167, this could be a very attractive circular economy opportunity for our agriculture, plantation and forestry industries. It is also good for the country and its people because it will suppress imports of petroleum, suppress the use of fossil energy and spread economic growth evenly.

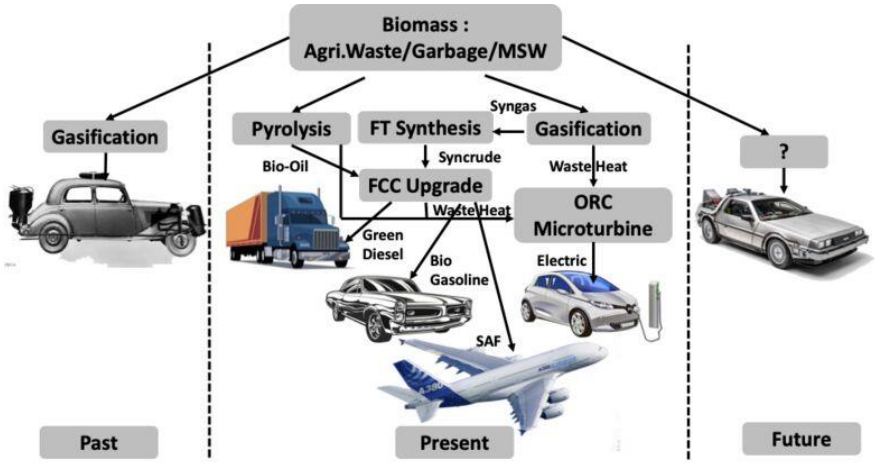
As usual, interested industries and institutions can contact us for details.

Biomass Fuels From Time To Time

In the era of World War II, many vehicles carried large tubes behind them, that was gasification tubes. With biomass fuel, these tubes produces gas (syngas) which can be directly used to run vehicles that were originally fueled by gasoline.

In the 80s there were two famous writers, namely Zemeckis and Bob Gale, whose work was filmed as Back to the Future. In the imagination of these two people, the future car is also fueled by biomass

waste.



We are currently living in a super modern era compared to the WWII era, and we are also living in the 'future' envisaged by Zemeckis and Bob Gale above, ironically we are still so dependent on fossil energy. Even if today we can buy an electric car, it still has more then 80% source of the electricity come from fossil.

The complacency of using fossil energy is very difficult to change, even though the world is already very much aware of CO2 emissions, global warming, climate change, etc., what is the cause? it is no longer a matter of technology or economy, but rather of perpetuating the convenience of a few countries or people in the world - who control petroleum, and enjoy its dominance over other countries or people.

Technologically, it is very possible for us to produce clean fuel made from biomass, whether in the form of Gasoline Like Fuel, Diesel Like Fuel or a superior clean fuel called Synthetic Fuel (Synfuel) - all of which can be produced from biomass. Even clean electricity can be produced cheaply by utilizing waste heat from the process of making fuel from the biomass above.

Moreover, all the elements needed to make a sustainable aircraft fuel - the SAF - can now be produced from biomass as well. The process is exactly the same as making fuels for land vehicles - only the formulation is different.

Because everything can be made from cheap biomass, and the process is also cheap because the energy for the process can be used from the biomass itself or even from the waste heat generated, there is no economic reason for us to continue to depend on fossil fuels. More than Zemeckis and Bob Gale mentioned above, we can not only imagine the future but we already live in the future itself - so we don't just imagine, we have to make it happen.

Microturbine for Off-Grid Energy Transition

Last year we started serious experimenting to make microturbines, but at that time it was not completely finished because we had not found a suitable business model, including what cheap energy sources could be used to drive this microturbine.

Over time, we also built a fast pyrolysis reactor to produce bio-oil from any biomass waste. It turns out that from biomass waste heated at high temperatures (500-700 C) there is a cheap source of energy - a by-product of the bio-oil production.

Imagine now if we could produce clean and cheap electricity from waste heat - from our bio-oil production. The benefits can be very broad. All electricity that has been paid dearly by farmers because it has to be produced from diesel engines to process rice, peel corn, thresh soybeans etc., can be produced by the farmers themselves by utilizing their agricultural waste.

Moreover, large plantation industries such as oil palm etc., there is a lot of waste that can be processed to produce bio-oil and it's by-product in the form of clean electricity and of course very cheap.

For urban communities as well, household waste in housing complexes can be processed to produce two products at once, bio-oil which will soon replace LPG, and off-grid electricity generated by this microturbine.

What do we need off-grid electricity for?, among other things, to recharge the batteries of electric cars, which are increasingly widespread, while the charging stations cannot grow as fast as the growth of the vehicle itself. Meanwhile, our average household doesn't have enough electricity to recharge an electric car.

Tens of thousands of our islands, which are still uninhabited, are interesting to explore because we can provide fuel and electricity anywhere and in any size.

We have started with detailed designs and have even tried on a very small scale with components that we manufacture entirely in-house as in this video. However, we still need partners to complete this work, especially precision machining technical partners and of course also investors who have green vision.

https://www.linkedin.com/feed/update/urn:li:activity:6997016121052717057?updateEntityUrn=urn%3Ali%3Afs_feedUpdate%3A%28V2,urn%3Ali%3Aactivity%3A6997016121052717057%29&lipi=urn%3Ali%3Apage%3Ad_flagship3_groups_content_search%3BgFpP2Z%2FpSjeXlkY1q

Souvenirs From B20 Summit

If in the world of government, world leaders will meet at the G20 summit next week, business leaders have already met in the B20 Summit forum. This is an arena for business actors who are concerned about carbon reduction and carbon removal, whose goal is to achieve Net-Zero emission at the agreed time.

From the perspective of business actors in the field of sustainability, I attended and met with players who were of the same vision as the B20 participants. More than just being present in Bali, God willing, we can also immediately take concrete action for carbon reduction and removal on a global scale.

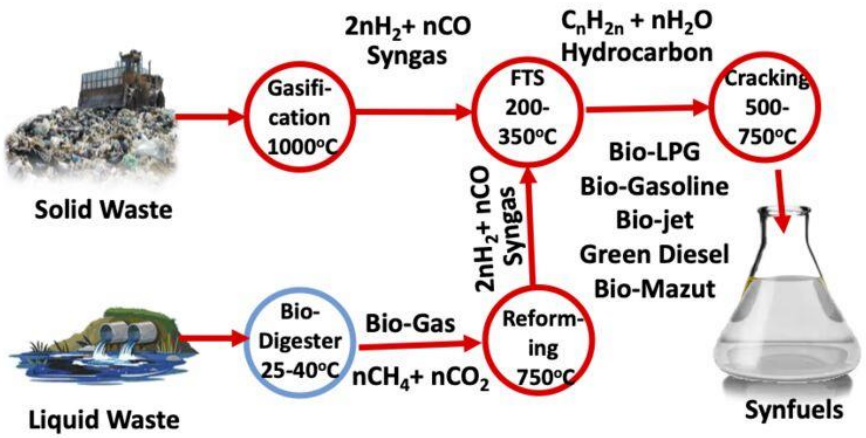
With our partners, for example, Gianfranco Caccamo is the director of Icaro Ecology Spa, from the country of Vespa - Italy, whose machines I have known since I was a baby - the Vespa and Fiat. With Franco, we will produce together the Microturbine machine which I published this morning.

In addition to cooperation in this machine production, we have agreed on two other points - namely that in the short term we can export renewable energy materials as much as we can afford, this can be an opportunity for fellow coconut farmers in particular and biomass in general.

In the longer term, we will also plant tamanu trees in MENA Plus, namely the Middle East, Mediterranean, North Africa and Africa in general. In this collaboration, the point is that we, from Indonesia, provide technology and raw materials, while Icaro, who has access to a broad sustainability market in Europe, will play a role in marketing these sustainability products globally.

From the three frameworks of cooperation, let colleagues whose fields are appropriate can participate in filling this collaboration - so that globally we can play an important role and join hands to clean and prosper the earth.

Energy Inspiration: Clean Milk Between Dirt and Blood



The inspiration this time from His word: "And indeed, in the cattle there is a lesson for you. We give you to drink from what is in its stomach (in the form of) pure milk between dirt and blood, which is easy to swallow for those who drink it." (Surah 16:66)

Even today's super-modern technology is not yet able to make pure milk between feces and blood (in the stomach of cattle), but the lessons can be applied to other fields where it is possible. From solid waste (dung) and liquid waste (including blood), we can process it into very clean energy (fuels).

These super clean fuels, whose generic name is Synfuels - Synthetic Fuels, can literally be made from solid or liquid waste. It is very clean because it is synthesized from hydrogen and CO - or what is called Syngas (Synthetic Gas). The syngas itself can be processed from solid waste through a gasification reactor.

Or if the source is liquid waste, the process is through a Bio-Digester to produce Bio-Gas and then reforming it into Syngas. From here the next process is the same as Syngas which comes from solid waste. Through the Fischer-Tropsch synthesis Syngas is converted into pure Hydrocarbons and water.

All of the technology has actually been around for the past century, but what we are improving is in terms of process efficiency - especially the energy requirements for the process. Everything requires high temperatures - except for the Bio-Digester, this high temperature has been an economic constraint to produce clean fuel from this solid and liquid waste.

However, with our series of inventions related to low-cost high heat sources - i.e. sacrificing a small part of existing raw materials to process most of the raw materials, we can turn both solid and liquid waste into clean energy - with the energy source of the waste itself - which is very inexpensive.

The whole process must be combined with each other, so that the waste heat of one reactor can be utilized by another reactor that requires lower heat, it will only needs to sacrifice a small part of the raw material/waste for the reactor that requires the highest heat. The rest of the other reactors utilize the waste heat from the first reactor, and by adding it to the waste heat of the reactor itself.

Waste heat that is no longer used to produce Biofuels can be used to produce very clean electricity as well with another technology that we call ORC Microturbine. Because of the combination of the production of various types of fuels and electricity, we call the whole system as Microces - Micro Combined Energy System.

With this Microses we can get very clean fuels which is also drop-in, can be used directly by existing vehicles and machines without requiring any modification or conversion at all!

Green Vision: Toward A Greener EV and ICEV

In the current scenario, the world will only clean up emissions in 2050, for us in Indonesia 2060 instead. So any vehicle on the highway will still continue to pollute the environment massively, including electric vehicles. Our electric vehicles will only have Net-Zero emissions in 2060 because the majority of our power plants are still fossil-based.

Internal Combustion Engine (ICE), Gasoline and diesel vehicles certainly pollute the air more massively. The irony is that the sales of these environmentally polluting vehicles are still being boosted. This year alone in Indonesia, it is estimated that half a million new vehicles will hit the roads. These vehicles will still exist until at least the next 1/4 century, even though the existing fuel is not only dirty - it is also very expensive. What fuel will these cars use in the next 1/4 century?

So what is needed is a green vision for any stakeholder in this country, including us - environmental polluters every day in our activities. We must realize that what we are doing is wrong and we must start thinking about how to fix it. And one thing that can be done to improve the conditions mentioned above is presented in the illustration below.

If only every existing coal power plant would absorb its emissions with microalagae (for diesel fueled already in my previous upload), then not only the electricity that we can directly make it Net-Zero Emissions, even the power plant will become a 3rd generation biofuels producer. So the cost is one, namely cleaning emissions, the benefits are two - zero emissions and biofuels production.

In our simulation, for every 1 MW coal power plant, the emissions can be completely absorbed with a microalgae pond with a volume of about 20,000 m3. This pond will be able to absorb all 10,577 MT of CO2 per year released by the power plant. The bonus is 5,626 MT of microalagae biomass, which when processed into Bio-Oil will reach 2,813 MT. If we upgrade this Bio-Ol further to fuel our vehicles, either gasoline or diesel, the total produced is 1,875 MT biofuels per year - which is equivalent to about 38 BPD (Barrel Per Day) of petroleum.

Now in Indonesia we have around 35 GW power plants with coal as fuel. If all of them adopt the same solution, then we will make 100% of our coal electricity clean, far ahead of the world's Net-Zero Emission target in 2050. The bonus is that we will have a production of 1.3 million BPD of 3rd generation biofuels, which is much higher than Indonesia's oil production target in 2030 which is set

at 1 million BPD.

So to make this earth livable, what is needed is a vision - Green Vision! And a vision is not a dream, a vision must always be spelled out in detail. So the detailed teaser for this can be requested from us for those who are serious about making it happen.

Sense of Energy Crisis

These days you can witness an extraordinary car show in Jakarta, part of the automotive industry activities that will sell 950,000 new cars this year. Plus the number of new motorcycles of about 5.4 million units, then in Indonesia this year there will be around 150 million motor vehicles. Of course the majority - above 99% are still ICEVs - internal combustion engine vehicles, which run on gasoline or diesel.

The irony is that in the midst of the massive growth in the number of motor vehicles - above the population growth! fuel subsidies have also swelled and certain types of fuel, especially those subsidized by the government, are even now increasingly difficult to obtain. Meanwhile, non-subsidized fuel will continue to fluctuate in price in the future.

About 6 million new motor vehicles that rolled on the highway this year, it is very likely that they will remain on the highway for the next three decades, even though we may no longer have oil in the next decade. Then what fuel will these vehicles use after the end of the oil era or the era we call AfterOil?

Therefore, it is important to build a sense of energy crisis in the community, especially automotive industry stakeholders, all parties must be concerned about the AfterOil era. When you design a vehicle that is reliable and will remain roadworthy for decades to come, make sure you also think about what fuel it will use throughout the life of these vehicles.

On the other hand, this is also a big opportunity for new energy stakeholders, there is a much bigger opportunity than electric cars in sight, namely how to provide new clean and affordable fuels (SDG no 7) for the 150 million motor vehicles that this year on our roads, and will continue to increase in the years to come.

What will it take to work on this great opportunity? Starting from the sense of energy crisis! because if we still think that our fuel supply is okay, big problems can come suddenly - when we are not ready yet. What is the use of so many cars and motorcycles when the fuel is not there or is no longer affordable?

Replacing it with an electric vehicle? This is good but not enough. Besides the electricity that we use is also not clean yet, the fuels problem of 150 million motor vehicles above remain. A great opportunity

for those who can solve this big problem, if you are interested and confident that you can contribute to solve this problem, you can join our team which has been preparing fuel technologies for the AfterOil era since five years ago.

Defossilization vs Dedieselization

This archipelagic country with a number of islands approaching 17,500 islands has a difficult challenge to be able to bring electricity to each island. Currently, there are only around 5,200 Diesel Power Plants (DPP) in Indonesia, whilst electricity from DPP is still the most feasible for our small and medium-sized islands.

What does it mean? If we only have 5,200 DPPs, it means that there are around 12,300 small islands that have not get electricity from utility companies yet - the exact number may be even higher because some DPPs are also on big islands.

On the other hand DPP is also a complicated problem in this country, it is the most likely to reach remote islands and areas but it is also the most expensive. The cost of electricity produced is still in the range of Rp 3,000/kWh (about US$ 20 cent/kWh) or about twice more expensive than the average electricity bill actually paid by the public - meaning it must be subsidized up to 50%!

So it is not surprising if the utility company makes a program called dedieselization, no less than 250 MW of DPPs which are planned to be dedieselized in the next few years. What's the replacement? One of them is the Solar Power Plant (SPP).

It's just that SPP is also not an ideal solution for this country, firstly because the majority of its components must be imported, secondly, the effectiveness of solar panels in this cloudy country tends to be low - so the electricity costs tend to be high, my calculations are still in the range of US$ 15 cent/kWh, and thirdly where are these expensive generators going when they are replaced by SPPs? On the one hand it requires expensive new investments for SPPs- whoever invests, while existing expensive assets can no longer be used.

So I made another open offer, don't do the dedieselization, but do the defossilization. Don't replace the diesel engine, just replace the fuel, from initially dirty and expensive fossil fuels - because they had to be imported from far away big islands, replaced it with biofuels produced by local people with raw materials from the DPP service area itself.

With this solution electricity is not only cheap, my calculation is only around US$ 10 cents /kWh, it will even revive the local economy. People who were originally only consumers of electricity, now they can participate in producing locally grown biomass to produce biofuels equivalent to diesel.

There is no longer a need for subsidies for cheap electricity for this energy-independent community.

Institutions or corporations that are interested in program can contact us for details.

Alternative Fuels: For Whom?

Under normal conditions, when fuel is still easily available, still affordable, the government is still able to subsidize it - then we probably don't need to bother thinking about alternative fuels. But unfortunately those times could end sooner than we thought. In a matter of days, the government could announce another increase in the price of our fuel - because of the heavy subsidy.

Our research and development since five years ago has focused on the era we are currently facing - namely the era we call afteroil, an era where petroleum is no longer available or if there is it is increasingly unattainable, or affordable but no longer wanted because of the damaging effects it causes in the environment.

One of our R&D products can be seen in this photo, a microrefinery for producing various types of alternative fuels. Why do you need a micro? because the alternative material sources are very numerous, spread out and the average value is low when it has not been processed, then on-site or in-situ processing is the most feasible one.

So who already needs a microrefinery like this? Residents on this small island in this 17,500 islands country, whose fuel supply is often disrupted, subsidized fuel is often lost from the island, fuel on the black market is multiply in the price.

Also need this microrefinery plantation and mining companies, raw materials are abundant around them but fuel is a heavy burden of operating costs. This also required by diesel power plants which are fuel-hungry, a day it takes about 4.8 tons of fuel per megawatt of electricity it produces.

This also needs of the fisherman community who can only go to sea when there is fuel, the farming community around which is abundant with agricultural waste - a clean fuel source, but they have to buy dirty and expensive fossil fuels.

Already in need of this microrefinery the automotive community that concern about the cleanliness of their fuel. So far, the automotive community has tended to be hedonistic, showing off their luxury cars, big motorbikes, etc. How about creating an automotive community that can be followed by anyone, regardless of the car or motorcycle - but the fuel is Net-Zero Emission, the fuel that is produced in the community itself.

And the long list of those who need alternative fuels will continue to grow, from companies, communities or congregations and anyone who wants to have affordable and clean fuel options, this is the goal of SDG no 7 - Affordable and Clean Energy. So what we are doing is also helping the government and the world in their respective efforts to achieve the SDGs.

Alternative To Crude Oil

Petroleum Crude Oil (CO), which has fueled the world's economy for the past century, is now facing challenges. Apart from being blamed for causing global warming and climate change, reserves around the world continue to deplete. Due to its unequal existence on earth, some countries have excess resources while others do not, as a result, oil has also become a 'weapon' in various global conflicts.

Actually, substitutes for petroleum CO are already all around us, it's not a matter of science and technology that actually hasn't been used, nor is it a question of price, but rather a matter of political economy. As long as the countries in the world or starting from the private sector intend to seriously reduce or even replace their fossil oil needs with sustainable and carbon neutral ones, even now it can be done.

What's the replacement? Just as petroleum comes from fossils, namely plankton and plants that have been decomposed for tens of millions of years, their replacements also come from the same sources - just don't have to wait tens of millions of years to form. Current plants or what we call biomass are processed by liquefaction - for example by fast pyrolysis - into Bio-oil, that is the most possible substitute for petroleum CO today.

However, Bio-Oil as it is or what we call Crude Bio-Oil (CBO) does still have weaknesses, namely its relatively low energy content, it is also unstable - so it is not easy to instantly become a global trade commodity.

	Crude Bio-Oil	Stabilized Bio-Oil	Crude Oil
Energy Density (MJ/Kg)	15-30	22-42	42-47
Water Content (% m/m)	~ 30	~ 0	0
Stability	Not Stable	Relative Stable	Stable
Sustainability	Sustainable	Sustainable	Not Sustainable
Estimated Price ($/Barrel)	45-70	80-130	90-110

The solution is that the CBO can be stabilized, among others by esterification, removing the water content, increasing the pH, increasing the energy content - then it will become a stable Bio-Oil

(Stabilized Bio-Oil or SBO) which contains high energy - it can even match the energy content of crude oil.

How about the price? Even now, the SBO can compete with oil prices on the world market, in the future because the price of oil will tend to rise due to the scarcity of reserves, while the SBO is sustainable, the price will be even more competitive compared to petroleum CO. The supply of biomass is relatively unlimited, because if the resources on land are not enough - we can plant microlagae in the offshores or high seas - which is about 2.5 times the land area of the earth.

If only there were no interests of a handful of parties who want to perpetuate their power in the world's energy supply, the world will be green faster, God willing, climate change can be reversed into climate improvement, and disaster after disaster can be prevented.

The Appearance of Alternative Biofuels

Completing the previous upload about the alternative fuel concept that we carried, here we share the appearance of the fuel with the background of the reactor we use to produce the fuel which we will call AlteFuel - from Alternative Biofuels.

What is the difference with Biodiesel? although both are made from vegetable oil (can also be from biomass oil or Bio-Oil), AlteFuel is very different from Biodiesel. While Biodiesel which is also known as FAME (Fatty Acids Methyl Ester) is made through an esterification and/or trans-esterification process, AlteFuel is processed through catalytic cracking technology.

Biodiesel is processed using methanol or alcohol as a companion, so the oxygen content is quite high, which is around 11%, so the energy content is also rather low, in the range of 33 MJ/L. Because the demand for methanol or alcohol is quite high - in the range of 23%-32%, the price of methanol/alcohol also affects the cost of biodiesel production.

On the other hand, AlteFuel does not use methanol or alcohol in its production process. The oxygen

content is also released through the cracking process, the result is a fuel that is almost freeof oxygen and is very similar to fuel from petroleum - only AlteFuel is renewable.

AlteFuel is not FAME but Bio-hydrocarbon (Bio-HC), so it has stability like other hydrocarbons. Similarly, in terms of energy content, it is very close to fossil fuels, namely in the range of 38 MJ/L. AlteFuel is also based on the Drop-in Biofuels concept introduced by the International Energy Agency (IEA) 8 years ago (2014).

So how can AfterFuel be cheap? First, in terms of the production process, which does not involve methanol/alcohol, it certainly has cut production costs. Second, AlteFuel can also be made from Bio-Oil - i.e. oil produced from biomass which is very cheap in price, so the final product can be very cheap.

Moreover, AlteFuel is not only a substitute for petroleum diesel, but can also be used for gasoline, aviation fuel and even LPG. What this reactor does is just sort out the length of the hydrocarbon chain it processes into starting with the shortest LPG (C3-C4), then gasoline (C5-C10), Aviation Fuels (C12-C14) and diesel (C16-C18), the rest will become Bio-Mazut, namely industrial or ship fuel.

When will AlteFuel be available to the public?, waiting for someone to build a reactor bigger than the one in the photo. Opportunities for those of you who want to be involved in this Alternative Biofuels or AlteFuel project. It can also be made specifically for industries that already need it, such as plantations, mining, projects in remote areas, etc. Instead of worrying about the issue of rising fuel prices, it's time for us to have our own alternative fuel, AlteFuel!

Alternative Energy : A Hope in the Dark

Complementing the previous post about alternative energy - namely to replace oil and LPG which must be imported from outside so that it has an impact on the current very heavy subsidy burden, in this upload I share the results of our study for medium and long-term solutions.

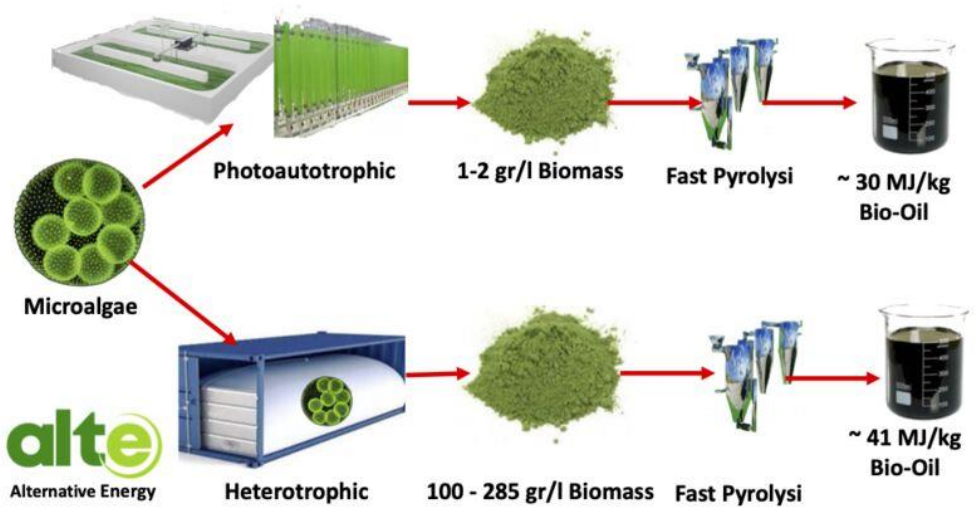
The short term solution that I have publicly proposed is to use the full potential of the abundant biomass. Starting from agricultural waste, forest waste, urban waste and what was very massive in my upload yesterday was the waste from rejuvenating our 15 million hectares of palm oil.

While the medium and long term solution is microalgae, all science and technology are relatively mature - it's just a matter of building skills and best practices in this potential. Because in its current condition, microalgae cultivation for energy is not yet optimal, so it is less attractive.

Whether using an inexpensive open pond, or an expensive photobioreactor (PBR) - photoautotrophic microalgae cultivation still produces low dry microalgae yields, the yield is only in the range of 1-2 grams per liter of media. When we process this dry microalge with our fast pyrolysis, the result is Bio-Oil with an energy density in the range of 30 MJ/kg. Indeed, this is already 2 times greater than the average biomass, but it is still about 30% lower in energy content than the petroleum it is trying to replace.

A new hope emerged from the study of our Alternative Energy (ALTE) team, which found that we could cultivate microalgae in the dark. Common microlagae species such as Chlorella, Scenedesmus,

Neochloris and Tetraselmis can actually grow in the dark. Glucose or other carbon sources that are added to the culture media can have dual functions, namely as a source of energy (replacing sunlight) as well as a material for forming hydrocarbons/biomass.



What is the significance of this finding? This means that we can cultivate microalgae like cultivating bacteria, it can grow at very high densities even in a narrow and dark medium! In a cheap flexybag in a container like in the illustration below for example.

Heterotrophic microalgae cultivation - all needs are met from the culture medium - can produce microlagae with a density of hundreds of times compared to photoautotrophic, from our study it can reach 100-285 grams of dry microalgae per liter of media!

Furthermore, if this heterotrophic product is processed by our fast pyrolysis, the resulting Bio-Oil already contains high energy in the range of 41 MJ/liter, or 98% close to the energy content of the petroleum it is trying to replace. This is light of a hope for a complete energy alternative for the near and far future.

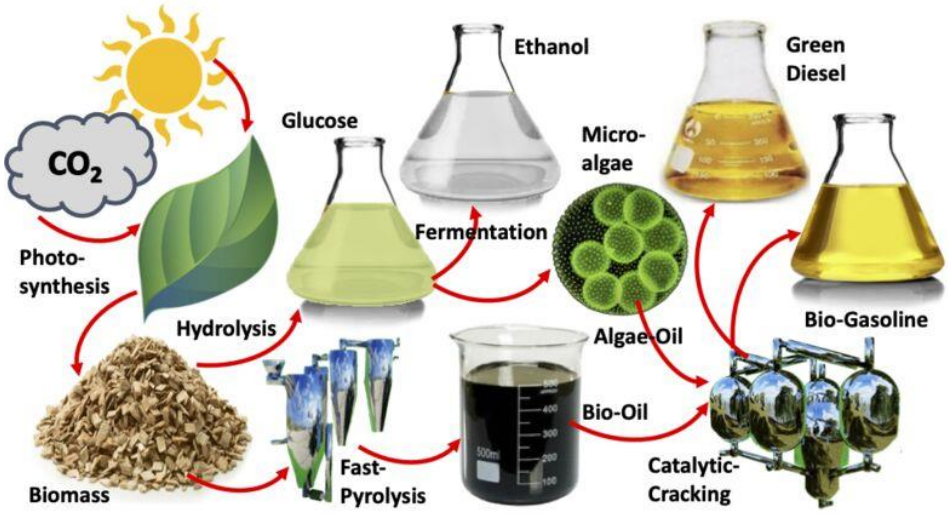
Solar and Carbon Harvesting for Energy

These days the people of this country have to live with the another new normal, namely no more cheap fuel – after the government raised the price of fuel by more than 30% for Pertalite – the fuel that is most widely used by the public. Hopefully, the fuel subsidy budget that has been reallocated into direct cash subsidies is truly more targeted, thus easing the burden on the people who really need it.

One of the allocations should also be for the R&D of the fuel itself, because if only this had been done a long time ago – God willing, we will be able to become energy independence these days. already, we no longer have to import so much dirty fuel in the form of petroleum whose prices continue to fluctuate in the world market.

The basic ingredients for clean fuels are abundant all around us, the sun shines all year round, the

production of CO2 emissions tends to be excessive, and fresh water and sea water fill 3/4 of this country area. It is from these three sources that the process of primary production through what is called photosynthesis occurs. What is the result?



The result is a concentration of hydrocarbons – aka the fuel that we still waste, in its original form of biomass, the majority of which is lignocellulosic. Just because the current form is still in the form of urban waste, agricultural waste, plantations and forest waste which is the cause of forest fires in the dry season – we have not seen it as a potential yet to replace the energy we have been using.

So if only 1-2% of the energy subsidy is allocated for this fuel R&D, what is the difficulty of converting the biomass into fuel to replace gasoline, diesel, jet-fuel and even LPG?

Even without a single penny budget from the government we do this kind of R&D, the results are what we always share with you through uploads in this media. To process biomass into gasoline and diesel, for example, at least we are ready with two paths.

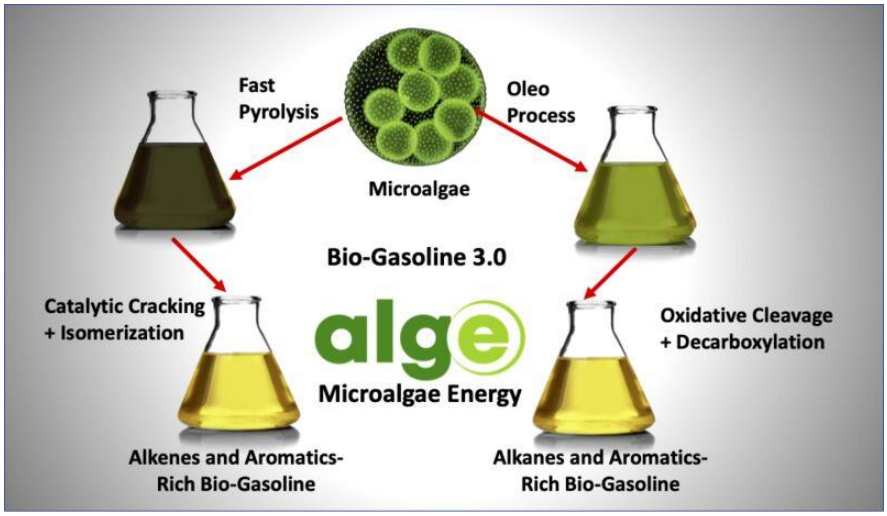
The first path we process biomass in a fast pyrolysis reactor to produce Bio-Oil, which then when we upgrade through one more reactor, namely catalytic cracking, it becomes gasoline, diesel, jet-fuel and LPG. The second path will have even better results and can bring new jobs to the wider community.

That is, biomass is hydrolyzed into glucose – this can be done by MSMEs, the glucose produced is then used to grow Heterotrophic Ultra High Density (HUHCD) microalgae – which can be taught to the wider community in villages and cities. The result will be high energy content microalgae biomass, and this is where the fuel industry can comes in to turn it into an affordable clean fuel – SDG no 7 Affordable and Clean Energy.

Bio-Gasoline 3.0

To complement the previous two consecutive uploads related to Bio-Gasoline 1.0 and 2.0, this upload is related to Bio-Gasoline 3.0, which is a type of biofuel that uses microalgae as its raw material. Microalgae was chosen because it can be planted anywhere, in fresh or salt water, does not require large land and grows by mitosis or divides very quickly so that it can be harvested in 7-14 days.

This type of microalgae is very wide, there is always one that is suitable for every condition on the earth's surface. Certain species, such as Chlorella vulgaris, can even live productively in both fresh and seawater, so this species is ideal to be a superior microalgae for all regions in this archipelagic country.



This single-celled plant is relatively easy to modify its metabolism by controlling the nutrition of the culture medium for its growth. As a result it can produce very high oil content - more than 50% of its dry weight, the rest is carbohydrates and protein.

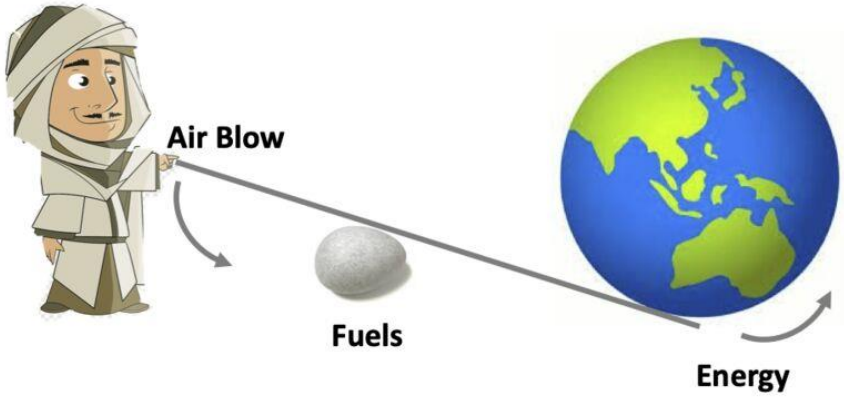
The oil content of the microalgae C. vulgaris is about 30% long-chain saturated fatty acids (SFA), about 10% is long-chain monounsaturated fatty acids (MUFA) and the remaining 60% is long-chain polyunsaturated fatty acids (PUFA). SFA goes through a single catalytic cracking process to become diesel, while MUFA and PUFA go through a two-stage processes, namely oxidative cleavage followed by catalytic cracking for decarboxylation will produce majority gasoline and the rest are short chain alkanes for LPG.

The biomass residue after the algae oil has been extracted can still be further processed through fast pyrolysis to produce Bio-Oil. Like Bio-Oil in general, the largest content is oxygenates - compounds that contain oxygen. Bio-Oil which is upgraded through catalytic cracking will produce the majority of light olefins or short chain alkenes, then through isomerization will become medium chain alkenes in the gasoline range.

So there are two types of Bio-Gasoline 3.0 based on microalgae, namely those that through the oleo process will produce gasoline that is rich in alkanes and aromatics - just like gasoline from petroleum. Meanwhile, the fast pyrolysis biomass pathway will produce gasoline which is rich in alkenes and aromatics. So the second one is also called Gasoline Like Fuel (GLF) - because it is not exactly the same as the gasoline we know today.

With the vast potential of microalgae to become the main raw material for third generation biofuels and especially Bio-Gasoline 3.0, R&D in this field should be a priority for all fuel stakeholders in this country - because the largest fuel consumption is in gasoline, while the biggest opportunity for raw materials in the future is in these microalgae.

Dzulqarnain Energy Inspiration



There are a number of beautiful stories in the Qur'an that can continue to teach mankind until the end of time, one of which is the story of Dzulqarnain. Our Creator Himself asked His Apostle to read this story to his people, the story is summarized in QS 18:83-98.

Dzulqarnain is a king who has all forms of power, he went west until the land of the sun sets and establishes justice, he went east to the land where the sun rises to overcome poverty.

And what inspires our energy technology is when he went to a place, he encounters a backward and weak society, their life is threatened by evil creatures who come from behind two mountains. So seeing the arrival of Dzulqarnain, the people asked to be made for them a dividing wall that stretched between the two mountains so that people could be safe from the cruelty of these evil creatures.

Responding to the people's request, Dzulqarnain said: "Give me pieces of iron!" Until when the (piece) of iron was (installed) evenly with the two (tops) of the mountain, he said, "Blow (the fire)!" When the (iron) had become (red like) fire, he said, "Give me copper (which is boiling) so that I may pour it on it." (Qur'an 18:96).

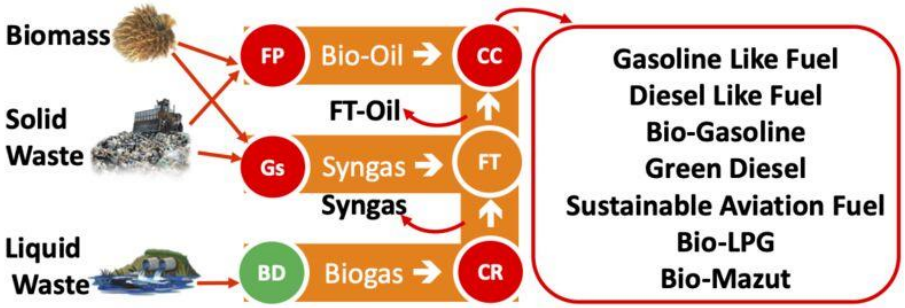
We know that iron burns like fire at temperatures in the 1,500 degrees Celsius range, and copper melts at temperatures in the 1,100 degrees Celsius range. How did Dzulqarnain's army produce such high temperatures in those days? It turns out that the secret is simple - "Blow it". Thus the technique of 'blowing' the fire to produce very high temperatures from any available fuel - is what we use for all energy reactors that require high heat.

Only with a light breeze of wind to blow the fire that burns a little biomass, fast pyrolysis reactors can reach temperatures of 500 degrees Celsius, catalytic cracking reactors can reach temperatures of 700 degrees Celsius, and even gasification reactors can reach 1000 degrees Celsius, and so on.

With the same principle we can make any engine that requires high heat with very cheap energy - namely biomass that is burned and 'blown'! We can produce fresh water from sea water that we heat cheaply, and even if necessary we can also produce green super-clean hydrogen energy in the same way.

More than that, just like the implied message of Dzulqarnain's story, we need all these powers - including the power of high energy - so that we can make 'walls' that can protect people from attacks by evil creatures that come from 'behind two mountains' or two seas?

Waste to Fuels



Nomenclature

The first knowledge that Allah taught directly to Adam while he was still in Heaven was nomenclature, which is about the names of all things. Because by knowing these names he can identify everything and also use them according to their respective uses.

Likewise, when we want to use cheap materials, namely garbage or waste, to becomes something more valuable, in this case it is fuel. We need to know the name of each process and the product it produces, so we will be able to choose the process and product that best meets our needs.

Under the existing conditions, waste can also be used as direct fuel - especially biomass and solid waste in general, by burning it - it has functioned as fuel, but its use is limited.

Then we can process the waste into various fuel products that are wider and flexible in their use. There are at least three routes that we can take to convert waste into high-grade fuels. The choice depends on the type of waste to be processed, the desired product and also the investment/production costs that we are willing to spend.

The simplest is the fast pyrolysis (FP) process, the result is Bio-Oil which can be used directly to fuel boilers and furnaces specially made for this Bio-Oil. It can also be further upgraded with catalytic cracking (CC) to make fuel that function like gasoline, like diesel, etc.

If we are willing to invest more, then we can go through the gasification (Gs) route, the first result of which is Synthetic Gas (Syngas), this can also be used directly for gas-fueled engines. Or further upgraded through Fischer-Tropsch synthesis to produce Fischer-Tropsch Oil (FT-Oil), this FT-Oil is like Crude Oil from fossil but much cleaner because it does not contain SOx and NOx, and it is also renewable. So when FT-Oil is further upgraded through CC, the result is drop-in biofuels, which have the same characteristics as petroleum fuels but are cleaner and sustainable.

If our waste material is liquid waste, then the route is through the Bio-Digester to become biogas, this can also be used for direct combustion or compressed into CNG and can be used as a replacement fuel for modified diesel engines. Or it can also be upgraded through catalytic reforming (CR) into Syngas. Once becoming Syngas, the next process is similar to the second option, which is like Syngas from the gasification of biomass or solid waste.

Renewable Black Gold

In the mid-19th century, about 300,000 people were hunting for gold in California after accidentally a man named James Marshal found gold in an area called Coloma - California. Of course the majority of the gold hunters went home exhausted without any gold because gold was not easy to get.

One of the hundreds of thousands who returned home with a lull, sat pensive behind his house - he accidentally saw a black 'liquid' flowing from his backyard. It was later discovered that this 'black liquid' was what we came to know as petroleum. Because this oil is also so valuable, since then it is also often dubbed black gold.

But looking for black gold in the form of petroleum is now no longer easy, not all countries have the source, even some countries that still have it like us - have to go to great lengths to drill in the depths of the sea to get this black gold. The control of black gold by a handful of countries can even now become a 'weapon' for a country to dare to attack its neighbors.

Some of the inhabitants of the western part of the earth have become limp and helpless because as winter approaches, their energy supply is either not available or not affordable, there is still huge production in other countries - but not affordable by some countries.

So what we need to do is look at our own 'backyards', lest what we are looking for is actually abundant there. Here is the new 'black gold', which can now be processed from anything that contains hydrocarbons. It can be from organic or non-organic waste, it can be from our agricultural waste biomass, it can also be from anything that grows around us, weeds, grass, wild plants etc.

What is visible in the photo is 'black gold' which I processed from rice husks. It is Bio-Oil, and in the world it is already well known and there is even a standard already, namely ASTM D7544. Bio-Oil from rice husks is right at the minimum threshold in the ASTM D7544. If I process corn cobs, empty palm fruit bunches and other oil-producing plant wastes - then the energy content will be far above the minimum ASTM D7544 standard.

Similar to 'black gold' from the petroleum era, this renewable 'black gold' can also be processed into any fuel, replacing gasoline, diesel, jet fuels and even LPG, the difference is that this one is renewable, so God willing, there will always be for those who want to deliberately seek it.

New Energy Feedstocks

In previous uploads I have shared various reactors for gasification, pyrolysis, catalytic cracking etc., then what are the raw materials that can be processed by these reactors? So this is the raw material that can become a new commodity that involves a very wide community.

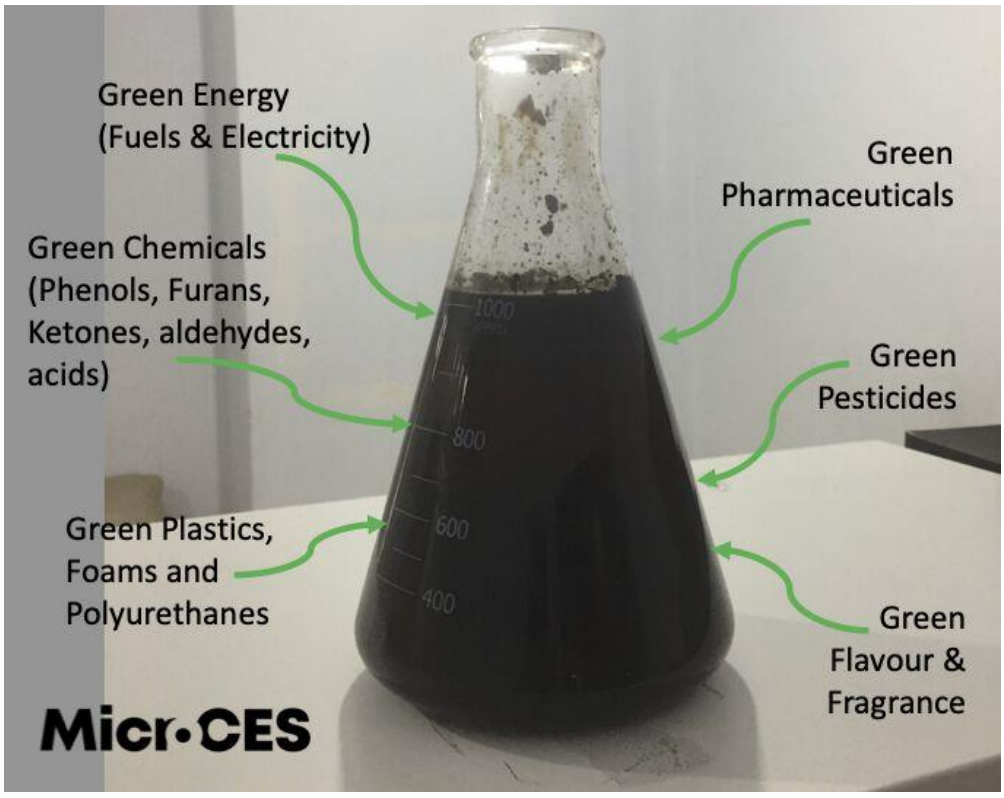
We call this new raw material as waste powder, which is any organic or non-organic waste that has been dried and powdered into a size of 3 mm on the longest side. Materials that cannot be processed only three, namely metal, glass and earth - included in the category of earth are stone, cement and soil. Apart from these three, everything that is not excluded can be processed, including garbage from plastic bags, aluminum-plastic packaging, and of course all forms of organic waste.

From this waste powder raw material, using a fast pyrolysis reactor, the waste is converted into Crude Bio-Oil (CBO) if it is from pure organic waste, or into Crude Waste-Oil (CWO) if it is from urban or mixed waste. The waste heat from fast pyrolysis at a temperature of 500-700 degrees Celsius is then processed with ORC Microturbine into electricity.

Another approach is to use the same raw material, namely the waste powder for the gasification reactor, the result is syngas - which can be further upgraded to synthetic fuels - a very clean and flexible fuel, can be made into gasoline, diesel, aviation fuel and even LPG.

This is a very low cost process because to produce high heat we do not use any external heat source, it is enough just to sacrifice a small portion of the waste powder itself for the heat source. As for the engine for pretreatment process - such as this garbage pollinator - it can use two energy sources, namely diesel fuel which is processed from the waste itself, or electricity from waste heat which is processed into electricity using ORC Microturbine.

The new energy from this new feedstock is the work of our research team at New Energy Asia and its strategic partners, you too can join in this clean earth movement.



Black Is the New Green

This Bio-Oil is really black in color, but it can be all sorts of

new greenery. Not only because the value creation it creates will encourage people to plant trees and crops anywhere and anytime, the wide use of Bio-Oil allows it to replace all types of products that have been produced from fossil fuels in the form of petroleum and its derivative products.

Bio-Oil can be a new feedstock for all kinds of green fuels and electricity because its utilization is carbon neutral, its combustion emissions are offset by the plants as they grow. Bio-oil, which is rich in various types of chemical compounds in it, can also be used as raw material for green chemicals which have very wide applications.

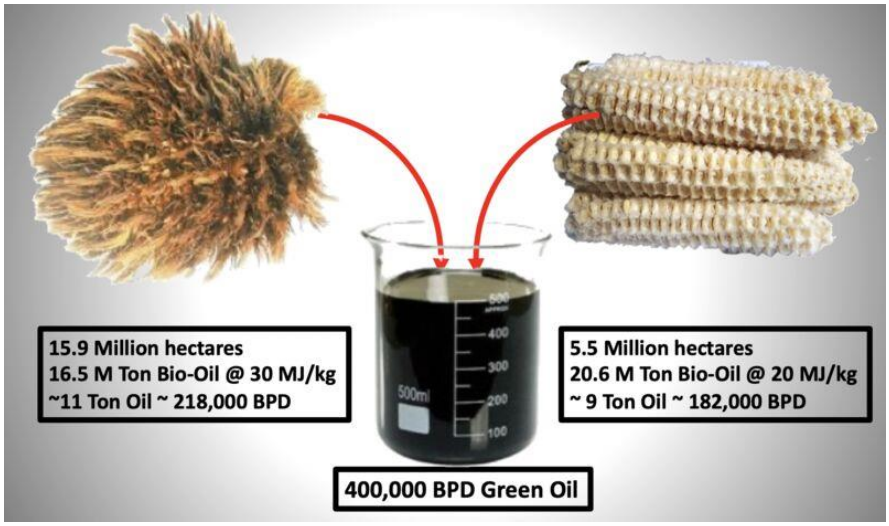
All types of plastic, foam to polyurethane which have been produced from petroleum derivatives, can all be replaced from Bio-Oil raw materials which are processed from today's plants. Likewise, chemicals for pharmaceuticals and wellness, the largest component in Bio-Oil is various types of phenols which are effective for antioxidants and antimicrobials, among others.

For the agricultural and plantation industries, Bio-Oil is also good news for them. If all this time pesticides were purchased with high prices from other industries, it is precisely at this Bio-Oil that they can get the Green version of pesticides and all kinds of plants and crops care and protection that they need badly. Not only will it bring sustainable agriculture industries, Bio-Oil will also bring new growth opportunity for the industry.

Even Bio-Oil from certain biomass sources such as coconut shells, clove leaf waste, citronella distillation waste, agarwood waste, vetiver and various other aromatic plants - can be a very efficient source of raw materials for the flavor and fragrance industry. So far, the production of flavor and fragrance from essential oils is obtained through an energy-intensive distillation process and the yields are not optimal - because it leaves waste that still contains a lot of essential oils that are not fully extracted by ordinary distillation. Through the Bio-Oils process, the extraction of essential oils is very energy efficient and give maximum yields.

But not all Bio-Oils can be directly directed to the various derivative products that I described above, apart from being sorted and selected, Bio-Oils also needs various up-grading to be able to answer the challenges in each industry. For the production of Bio-Oils and its upgrading, we need a multipurpose reactor which we call MicroCES from the Micro Combined Energy System. Industries and institutions interested in elaborating this opportunity can discuss in more detail with us.

Readily Available and Affordable Green Oil

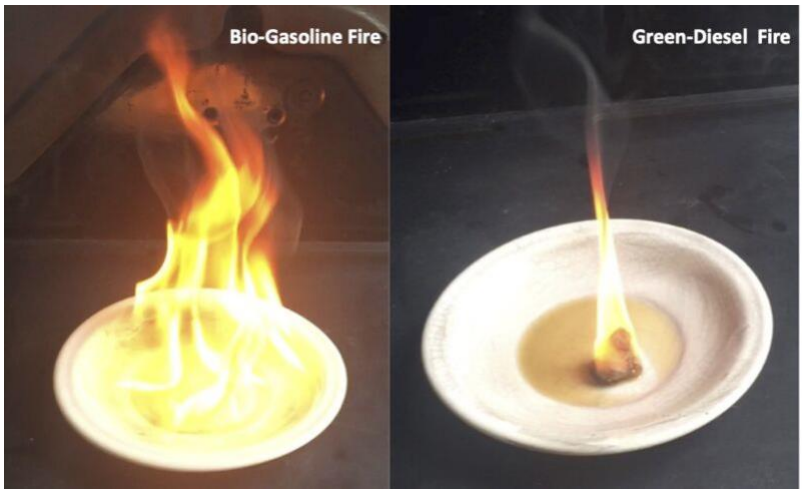


In the midst of high world oil prices and heavy energy subsidies, in front of our eyes there is great potential that is still not optimally utilized. Among the great

potential are empty fruit bunches from oil palm plantations and corn cobs. Together the two have the potential to produce green oil equivalent to 400,000 Barrel Per Day (BPD) or about 27% of our petroleum needs which are currently in the range of 1,500,000 BPD.

Where can we get such great green oil from? Indonesia has 15.9 million hectares of oil palm land which produces around 55 million tons of empty fruit bunches per year. With fast pyrolysis, it will be converted into around 16.5 million tons of Bio-oil with calories in the range of 30 MJ/kg. If further processed by catalytic cracking, it will produce around 11 million tons of oil equivalent to petroleum with 45 MJ/kg calories, or the equivalent of 218,000 BPD.

The same calculation applies to corn cobs. We have 5.5 million hectares of corn fields. The cob produced is about 41.25 million tons. When processed into Bio-Oil the yield is 20,625 million tons, but corncob Bio-Oil has lower calories than empty palm oil bunches, in the range of 20 MJ/kg. So if the Bio-oil is upgraded with catalytic cracking, the result is around 9 million tons of oil equivalent to crude oil with 45 MJ/kg calories. or the equivalent of 182,000 BPD.



From these two sources we have a potential of 400,000 BPD equivalent to petroleum but this one is green oil, carbon neutral - its combustion emissions are absorbed by plants when they are growing. We have also developed the processing technology in the form of a microrefinery - essentially a two-stage process, namely fast pyrolysis and catalytic cracking. Those of you who are in the production centers of empty palm fruit bunches or corn cobs, can synergize with us to work on the potential of these two green oils.

Survival Fuels

Imagine if you live in one of the 17,500 remote islands in Indonesia, your fuel will have to wait for shipments from the big islands. When the wave season arrives, a fuel crisis can hit your island for up to several weeks. Through my series of posts, God willing, you will be able to make your own fuel, both gasoline and diesel.

From the same vegetable oil or biomass oil (Bio-Oil) you can produce gasoline or diesel at the same time. The question then is in remote areas where there are definitely no laboratories, let alone sophisticated equipment such as Gas Chromatography (GC), then how do you know if your fuel is gasoline or diesel?

Before you decide to put it into the engine you want to run, this simple fuel test will be able to use you to distinguish which fuel is gasoline and which is diesel.

Gasoline with a short carbon chain (C5-C10), easily strikes and burns. As long as there are three components, namely fuel, air and sparks - it can immediately catch fire. If you put it in one container like in the photo, the entire surface will burn instantly - so be extra careful with this gasoline.

On the other hand, diesel fuel has longer of chains (C12-C18), it doesn't strike, even if it burns, it needs a conductor like a wick. When placed in a container - which burns only the wick that is connected to the part of the fuel, the other surfaces do not burn.

The same tips also apply to our brothers and sisters whose areas are boycotted from the outside world, who are trapped in war zones, disaster areas, etc. One day people will be able to make their own fuel from the materials around them. The photo below is the gasoline and diesel that we make from municipal solid waste.

SAF Blendstocks

The world's aviation fuel producers always have their own formula to blend their respective superior fuels, but like whatever formula they use, Sustainable Aviation Fuels (SAF) cannot be separated from these four types of blendstocks, namely n-alkanes, iso- alkanes, cyclo-alkanes and aromatics. All four have abundant resources in Indonesia.

For n-alkanes, i.e. straight and saturated carbon chains, mainly C11 is required, it can be produced from decarboxylated lauric acid molecules. Lauric acid itself is around 49% of coconut oil content, and 48% of palm-kernel oil content. Only this n-alkane is relatively expensive, and the combination of the two is mostly found in Indonesia.

The other three types of molecules are relatively inexpensive because they can be processed from biomass which is converted into bio-oil and then the appropriate components are taken. For example, for iso-alkanes, it is taken from the ester component and then isomerized, or from decarbonylated furans.

Cyclo-alkanes can be extracted from the cracking of aromatic and phenolic compounds. Meanwhile,

aromatics can be obtained from hydrogenation of phenolic compounds or oligomerization of light olefins. So not only n-alkanes, the other three ingredients are also abundant in Indonesia because they can be processed from agricultural, plantation, forestry and urban waste.

I would like therefor to invite the related parties, let's work together on this commodity which is being hunted by the world aviation industry. The blenders can be any of the world's aviation fuel players certified for this job, but the blendstocks provider should be for us to provide.

The Sum of All Fuels

One of the reasons why fossil fuels are still highly reliable is that they are available in very large quantities and are relatively homogeneous. There is no single substitute fuel that can replace its massiveness in meeting the world's fuel needs, which have relied on these fossils for more than a century.

Not yet available does not mean there is none, if we can sum up all the potential for clean and renewable substitute fuels, then we will soon be able to replace dependence on fossils. How can we sum up so many sources that are so different from one another? One way is to homogenize it by making it a commodity.

Corn cobs, empty fruit bunches, rice husks, municipal solid waste and even third generation micro and macroalgae biomass can be commoditized into relatively homogeneous biomass dust, when these dusts are processed with the same machine - for example using our fast pyrolysis reactor, the result is bio - Oil which is more homogeneous, its energy content will be in the range of 15-30 MJ/kg, and water content in the range of 20-30%.

The second source, which is generally liquid waste or biomass with a high water content, can also be homogenized into biogas through a bio-digester. Then both solid and liquid can be homogenized again when made into syngas. The different is the only way to get to this syngas. Solid waste through fast pyrolysis and gasification, liquid waste through a biodigester and biogas reforming.

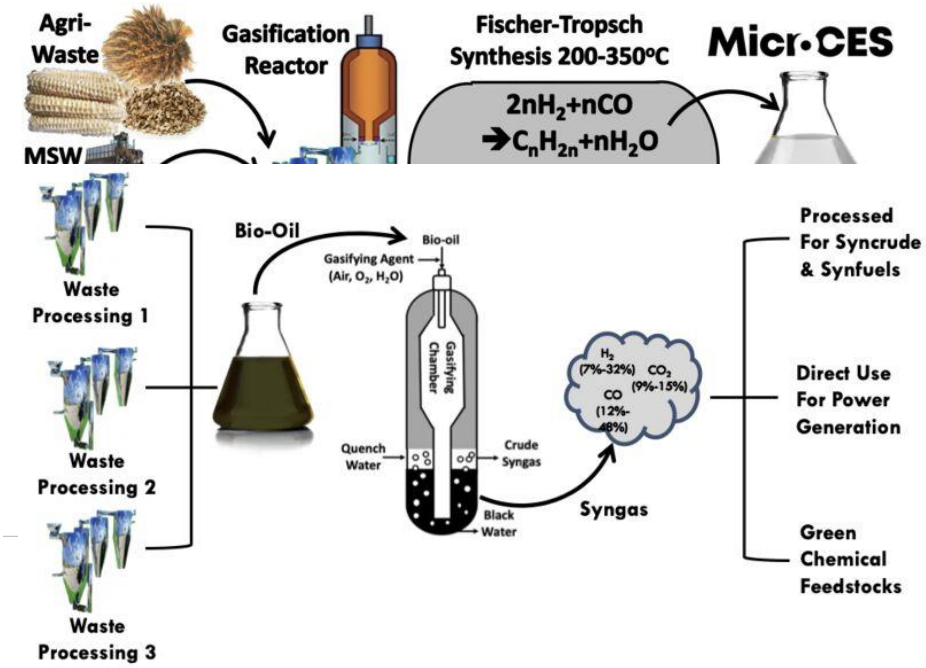
After the two become syngas, they can be combined in one process through the Fischer-Tropsch synthesis to become synthetic crude or syncrude. This syncrude has become a universal commodity that can directly replace fossil crude oil, the difference is that the syncrude is clean from SOx and NOx, is carbon neutral and of course also renewable.

It is by this way of commoditization that fossil fuelsca n be completely replaced by synthetic fuels, not by one substitute but by the sum of the many substitutes that have been combined into the syncrude.

A number of benefits will be enjoyed by the world through this solution, first, clean and renewable fuel substitutes can be presented soon. Second, peoples can all be directly involved in the energy economy. From the series of processes, for example, even at the farmer level, they can produce bio-oil from their harvested waste. Further processing into syngas and syncrude is then handed over to a larger industry because it is rather complicated and requires higher investment.

This fuel pie in the world is very large, we don't need to compete with anyone - the market is enough

for anyone who can produce it, so by commoditizing it, all parties will get the pie as long as they want to get involved.



Distributed Waste to Energy and Chemical

That waste can be converted into electricity has become a common knowledge, but why is there still a lot of unprocessed waste? Why is power generation still so dependent on fossils? The answer is that there is a mismatch between what is needed by power plants and the presence of widespread waste.

When waste must be transported to a location to be processed into electricity, there are many obstacles. Among them are the very large costs of transporting waste, social costs that must be paid and environmental pollution that arises before waste becomes electricity. As a result, we only have a few waste power plants.

On the other hand, power generation companies still have to fight hard to reduce their emissions by looking for co-firing raw materials that are sustainable, affordable and supply continuously according to need. Waste can be a solution, but it is not economical because of the problems mentioned above if it has to be transported to the power plant site in the condition as it is.

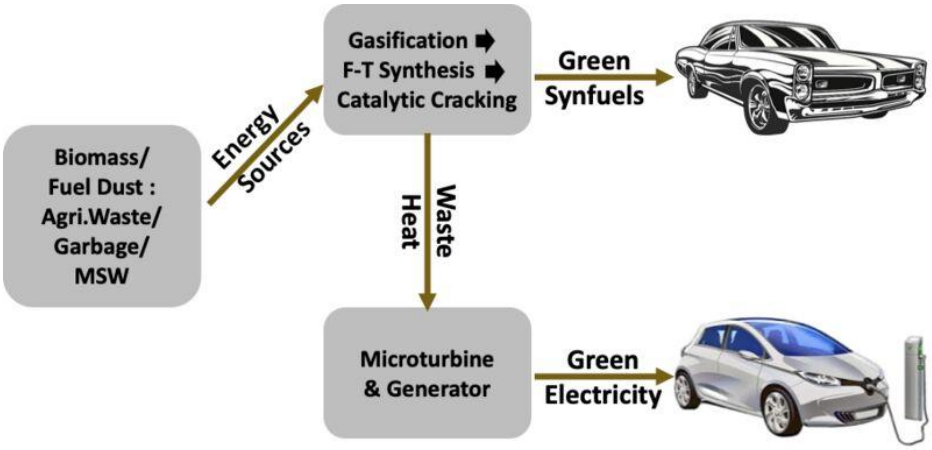
So this is the solution that we offer, namely waste in any form is processed first to become bio-oil at the location where the waste was originally located. This bio-oil is a standard fuel that even has an ASTM standard, namely ASTM D7544. In general, any waste can be processed into ASTM D7544. After becoming bio-oil, the waste no longer smells and the energy is condensed, sending it anywhere is no longer a problem.

The use of bio-oil is also very simple, the electricity generator just needs to do gasification first, then it has become clean, renewable energy and the source is sustainable. Even the results of this gasification process can also be further upgraded into syncrude and synfuels - replacing all types of liquid fuel that we use today. It can also be a green, clean and renewable raw material for the chemical industry.

In essence, there are many ways to effectively handle urban waste so that our cities do not need to continuously expand their landfills. Even our electricity will soon become green without having to wait for 2060. The technology is very mature because these are the technologies of the last century, they just need to be improved in their effectiveness.

In Jabodetabek, we have even prepared a studio, namely the Waste To Energy Studio (WastoE Studio) to facilitate people who want to learn about technology, corporations and institutions that want to start exploring opportunities, etc., so that we can all be involved in the movement to clean up the planet. God willing.

Green ICE and EV



Whatever type of vehicle we currently have, we cannot claim that our vehicle is green, if our vehicle is an Electric Vehicle (EV) type, it will depend on its electricity. Our EV will only be green in 2050 (or 2060 in Indonesia) when our electricity reaches Net-Zero Emission.

The Internal Combustion Engine (ICE) vehicle is the same way, as long as we use fossil fuels, our ICE vehicles are definitely not green. It can be considered green later after the use of fossil fuels is offset by equivalent carbon removal, and this will also only happen in 2050 or 2060 for us.

But actually there is a mature technology to make our vehicles have Net Zero Emission right now, both ICE and EV - both can be green together at the same time.

Our ICE vehicles will be green or achieve Net Zero Emission if our ICE vehicles are fueled with D100 (100% Green Diesel) for diesel vehicles or G100 (100% Bio-Gasoline) for gasoline vehicles. Both are known as drop-in biofuels that can be directly used 100% without a mixture in the cars that currently exist, both diesel and gasoline.

One route to produce drop-in biofuels whose results will be equivalent to petroleum fuels is through gasification of biomass into syngas, then the syngas is liquidated into syncrude through Fischer-Tropsch synthesis, and upgraded through catalytic cracking and fractional distillation to be the fuel we need.

The fuel produced through this process is also called Synthetic Fuels (Synfuels), a fuel that is better than petroleum fuels because it is clean, free of NOx and SOx, carbon neutral and completely renewable.

The above process also leaves a lot of waste heat, this waste heat that we can capture with ORC Microturbine and convert it into electricity. The electricity must also be clean because the processed materials are clean, carbon neutral and renewable.

Once you reach the paddle, two - three islands are passed, ICE vehicles can still run, the infrastructure for ICE vehicle factories, component factories, gas stations etc. will still be able to function, while electric cars are also welcome for those who can afford them - all of them will become green vehicle, God willing.

Introducing BioRePo : Bio-Refinery and Power Plant

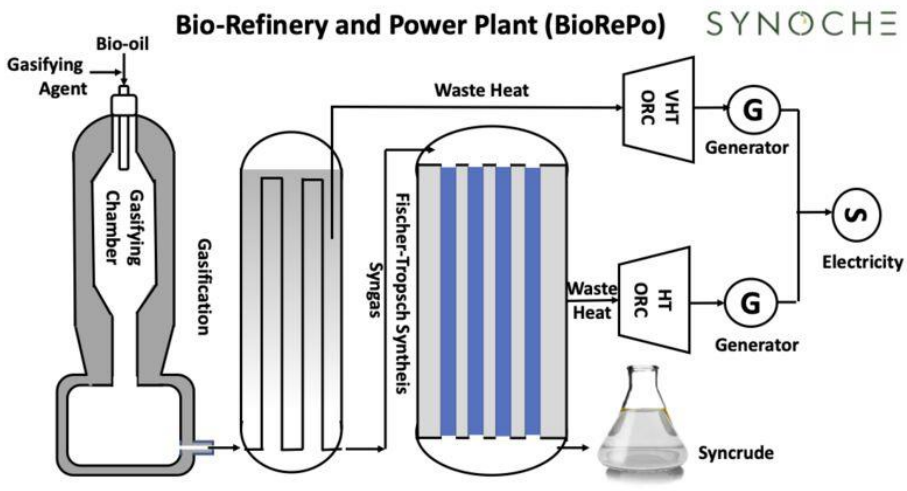
The era of energy transition provides many opportunities for those who continue to innovate, on the contrary, it poses a threat to those who seek to perpetuate their comfort in enjoying industries that pollute the environment. In the energy sector, both fuel and electricity, which have been the scapegoats for CO2 emissions, it is actually very possible to pioneer this clean and environmentally friendly industry.

So far, it seems very, very difficult to move from fossil fuels for fuel and electricity to clean and carbon neutral fuel and electricity, so difficult that the world has set a target of 2050 as its Net-Zero emission target, even countries like us in Indonesia are bargaining it up to 2060.

Whereas on the other hand, we have abundant sources of clean fuel, in the form of agricultural, plantation, forestry and urban waste. Even if this is not enough, we have the opportunity to plant biomass that grows very fast, micro and macroalgae in the ocean which is almost 3 times our land area.

It is from this abundant biomass that we can produce clean fuel and electricity simultaneously in one process, and this is where one of the disruptions in the energy transition era comes, namely if we can combine the two into a single process with the same basic energy source - biomass.

So far, it is very difficult for the power generation industry to obtain clean and sustainable fuel, as well as the fuel industry. if only they sit down and worked it out together, then both of them would be able to save their feedstock costs very significantly. What had been borne alone, became shared.



The concept that we introduce is what we call BioRePo from Bio-Refinery and Power Plant. With this BioRePo, we can drive a very broad community economy, from the farmer class, cooperatives to corporations - all of whom can process any biomass around them to become Bio-Oil. This Bio-Oil is the feedstock for BioRePo.

In BioRePo Bio-Oil is first processed into syngas, then followed by Fischer-Tropsch synthesis (FTs) to

become syncrude. Syncrude is a versatile material that can be used to produce all forms of fuel that we use today, whether it be gasoline, diesel, jet-fuel to LPG, and even feedstock for green chemicals.

Both the gasification process and FTs, generate a lot of waste heat. Waste heat gasification can reach temperatures of 1000 degrees Celsius, while FTs in the range of 200-350 degrees Celsius. Both can be converted into electricity through the ORC system that we developed. We can see now that both fuel and electricity should be clean and low cost.

Institutions and corporations, domestic and overseas, can now talk to us if they are interested in implementing the BioRePo concept.

Cheap Fuels and Electricity in the Age of Energy Transition

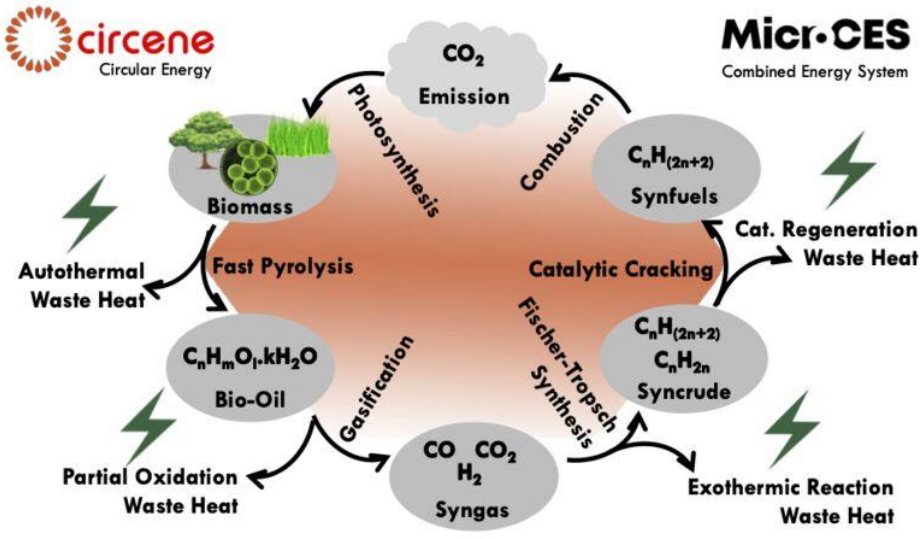
As of last week, the earth's population has reached 8 billion and continues to grow, while life support resources are relatively not increasing, even resources such as oil and other mines are nearing exhaustion. Thus, the concept of a circular economy emerged, so that the chain of benefits from these life supports can be extended and used repeatedly as much as possible.

For those that are not consumable, such as plastic, metal, rare metal, etc. easier to reuse in the circular economy concept, and this has been done in many industries. But what about consumables such as fuel and energy in general? How to make it circular? How to extend the chain of benefits?

This is one of the Circular Energy Economy (Circene) models - which we can already do with the technologies we have.

I take the case of biomass - any type. In its utilization in a linear economy, biomass is burned to produce heat and the heat is to produce electricity. In the circular economy concept, before being burned down - the same biomass used to generate electricity along the process chain, ends up being a high quality fuels and only here is burned away.

From biomass to modern fuels such as gasoline, diesel, jet fuel and LPG - there are 4 stages of the process, in which the waste heat can be taken to generate electricity. In the BTL (Biomass To Liquid) fast pyrolysis stage at the farm level which produces bio-oil, the waste heat can be used for



microturbine to replace farmer's diesel generator set.

At the industrial level, bio-oil is processed into syngas through the LTG (Liquid To Gas) Gasification process, also producing waste heat - which can be processed to produce industrial electricity. Both BTL and LTG consume a small amount of material to process most of it, through autothermal and partial oxidation processes, respectively.

For the next process GTL (Gas To Liquid) Fischer-Tropsch synthesis (FTs) less energy is required, because FTs are exothermic - the process itself generates high heat. So it only needs energy at the beginning when the reactor is started until the threshold or activation temperature is reached, after that heat will be produced by the syngas synthesis reaction to become syncrude, and the waste heat back into electricity again.

The last phase is refining syncrude into various desired synfuels through fluidized catalytic cracking (FCC) as well as fractional distillation (FD). Again, heat is only needed at the beginning of the process, the rest of the high heat (500 - 700 degrees Celsius) is generated from burning coke attached to the catalyst for catalyst regeneration - so that it can continue to be used.

So, fuel and electricity must be cheap in the era of energy transition, because one material is used for the production of both.

Value-Added Chain of Waste

In the midst of the world's commitment to reduce CO2 emissions and reduce dependence on fossil energy, around us there is still so much waste and garbage that has not been looked at as a potential solution. Even waste are still seen as a liability rather than an asset. So through this post, hopefully we can all take a role in reducing emissions as well as providing solutions for affordable clean energy needs (SDG no 7).

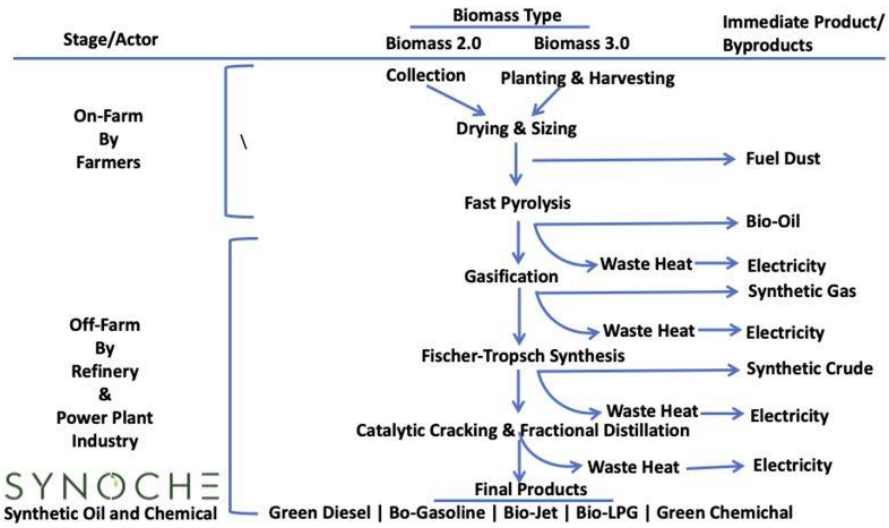
I only focus on 2nd generation biomass - i.e. agricultural, plantation, forestry waste, urban organic waste, and 3rd generation biomass from micro and macroalgae, which can be grown to capture industrial emissions or planted in the ocean to absorb CO2 emissions that still continue to pollute our air.

From the illustration below, we can see that the conversion of waste into clean energy can start from any level. At the farm level, agricultural waste that is chopped into fuel dust can already be used as industrial fuel. If farmers take one step further by processing fuel dust using fast pyrolysis, the result will be two forms of energy at once, namely bio-oil and electricity from. it's waste heat.

Bio-oil can be used directly or become the raw material for the next industry, only for this next stage it will require a refining and power generation industry - because it requires investment for it's a more complicated machineries. Through gasification, bio-oil will be converted into synthetic gas (syngas) as well as electricity from it's waste heat. Syngas is already a clean and easy-to-use form of energy, but it can also be processed further.

Through the Fischer-Tropsch synthesis, syngas can be re-liquidated into synthetic crude (syncrude)

and at the same time the waste heat can be recovered to become electricity again. Syncrude is the best candidate to replace the current crude oil, besides being renewable and carbon neutral, syncrude is also very clean because it does not contain NOx and SOx.



The syncrude market is now wide open because it is being sought by bio-fuels producers around the world. From this syncrude, all the fossil fuels that we are using it now can be replaced by their clean and renewable versions. Generally called synfuels, in the form of be drop-in green diesel, bio-gasoline, bio-jet or also called Sustanable Aviation Fuel (SAF), and even bio-LPG.

Our network of farmers and planters, with Fast Pyrolysis Reactor that we can produce ourselves, are now ready to process the biomass into bio-oil, whatever the fuel and power generation industry needs, then it becomes your role and opportunity in your industries to continue the relay of this value-added chain, so that our earth could be clean sooner, and so that its inhabitants wherever they are - no longer worry with their energy supply.

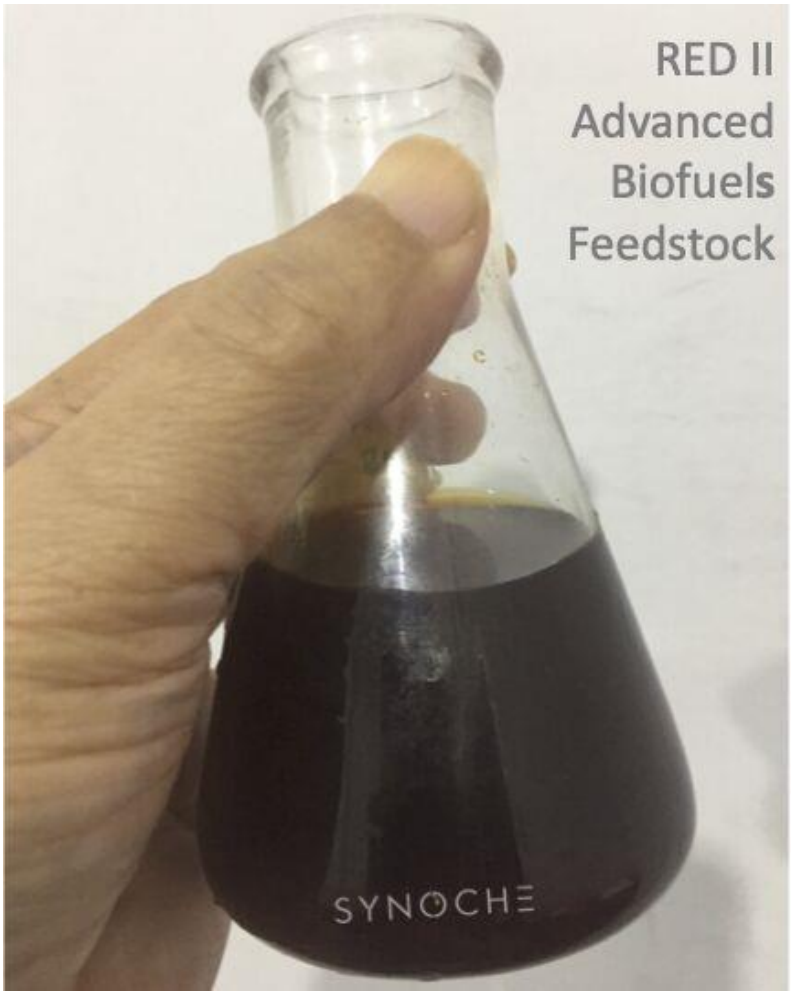
Appearance of RED II Advanced Biofuels Feedstock

Four years ago, the European Union agreed on a new directive for achieving their renewable energy target by 2030. This new directive is called Renewable Energy Directive II, abbreviated as RED II, which is a refinement of the previous directive. In addition to the global target, RED II also targets the achievement of a special type of renewable energy, which is called Advanced Biofuels.

Advanced Biofuels are regulated very strictly, as can be seen from the definition which states that what is meant by Advanced Biofuels are biofuels that are produced using feedstocks that have been specified in the list (Annex IX). Those not on the list can be added if 6 conditions are met, namely a) applying the circular economy principle, b) meeting sustainability criteria, c) avoiding market distortions, d) reducing GHG emissions substantially, e) not having a negative impact on the environment, and f) does not require new land.

However, in the midst of the strict requirements for feedstocks that are included in the Advanced Biofuels list, around us there is an abundance of raw materials that meet the requirements and are also included in the list. Among them are rice husks, straw, corncobs and urban waste. What's interesting is that even though they don't like the oil, palm oil plantation waste in the form of palm oil mill effluent (POME) and empty palm fruit bunches (EFB) is included in the Advanced Biofuels list.

This is where the big opportunity lies, we have abundant raw materials to be processed into Advanced Biofuels which the European Union has made it mandatory starting this year. The target is that this year they will use a minimum of 0.2% of the transportation fuels they use, increasing to 1% in 2025 and 3.5% by 2030. Because this European standard is usually followed by other countries as we know it before with EURO, the concept of Advanced Biofuels will also soon expand to countries outside the European Union.



In the photo below I show an example of feedstock that is included in the list above after we process it into bio-oil. With common refinery technologies, including gasification, Fischer-Tropsch Synthesis, Catalytic Cracking and Fractional Distillation - this bio-oil can become a superior, highly sustainable feedstock for all types of Advanced Biofuels that Europe wants. It can be processed into green diesel, bio-gasoline, Sustainable Aviation Fuels (SAF) and even bio-LPG.

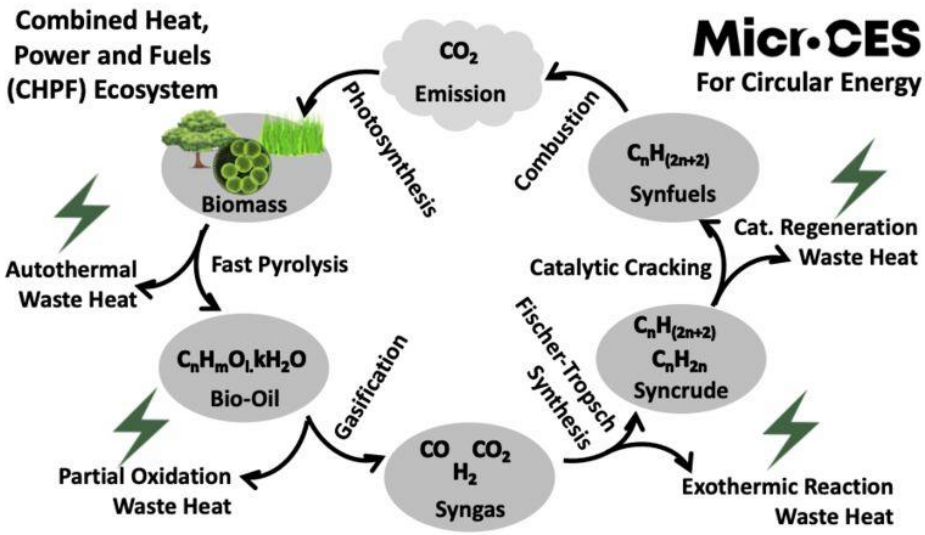
Our network of SYNOCHE (Synthetic Oils and Chemicals) is ready to produce these feedstocks at any scale and anywhere. Even if necessary, we are also ready to upgrade not only bio-oil but also processed products in the form of biosyncrude, as well as Advanced Biofuels which are ready to be used immediately.

Europe has directions and targets, we have the feedstock they really need, complete with all the technology to process it. Isn't this a big opportunity for all of us?

Circular Energy Economy

One of our obstacles in providing affordable clean energy is the search for new and renewable energy that is not integrated. For electricity we are looking for cheap biomass - which is certainly not easy to get and its supply is not guaranteed, while for fuel we are looking for vegetable oil - which is still competing with food and is already expensive.

In fact, if the procurement of electricity and green fuel is combined, both will get cheap raw materials - because the costs are shared, our nature will also be more sustainable because the existing resources are used in a circular manner.



I take the example of biomass that is used to generate electricity, every 1 kg of biomass with an average energy content of 15 MJ, should have the potential up to 4.17 kWh of electricity, but because the average conversion efficiency of biomass to electricity is under 30%, then what becomes electricity is only about 1 kWh only. As a result, electricity from biomass will tend to be expensive, whilst also not attractive to the biomass producers.

With this circular approach that we propose, because it only takes about 30% of the available energy potential of each kg of biomass, then enough electricity is generated from waste heat from processing biomass into liquid fuel. So the focus is on using biomass to produce liquid fuels with a higher selling value, but waste heat from the entire biomass conversion process to drop-in synthetic biofuels is used to generate electricity.

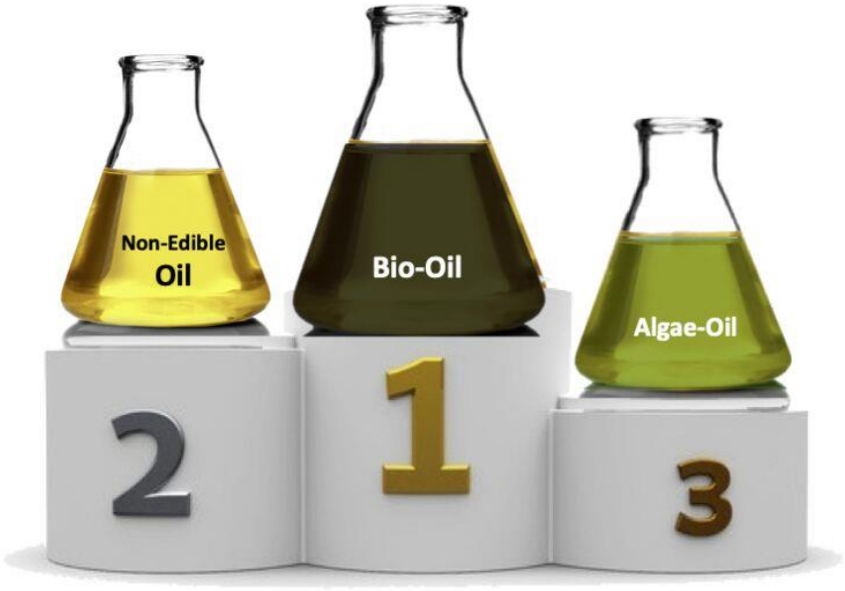
There are at least four stages of conversion - all of which have abundant waste heat - just convert this waste heat into electricity, if the small size can use ORC Microturbine technology, while the large size can use ordinary steam turbine.

The first four stages of the process are fast pyrolysis to convert biomass into bio-oil, waste heat can be obtained from the autothermal process - ie when only a small part of the biomass is sacrificed to reach high temperatures, while most of it is converted into bio-oil. This first process can be carried out at the farm level or at the temporary waste disposal site.

The second is waste heat from the gasification process, which comes from partial oxidation when bio-oil is converted into syngas. The third is waste heat from the Fischer-Tropsch synthesis process, the reaction itself is exothermic - that is, it produces heat. And the fourth is waste heat from the catalytic cracking process, which is when the coke attached to the catalyst is burned in the catalyst regeneration process - so that it can be used over and over again.

With this circular energy concept, God willing, we will be able to obtain affordable clean energy (SDG no 7) and even Net-Zero emission which is much faster than the world target of 2030 and 2050. We have integrated the technology in MicroCES - Micro Combined Energy System, and we ready to share.

Affordable and Clean Energy Champions



The heaviness of the burden of energy subsidies is getting louder and louder in our ears these days through the voices of the people who have the most authority to deliver it in this country - namely the President and the Minister of Finance. It is said that according to them, the energy subsidy for this year will reach more than Rp. 500 trillion.

Even the President has also indicated that no one will be able to bear the burden of subsidies that have soared to such a large extent. What does it mean after that? People have to start thinking seriously - what if there are no more subsidies!

We actually have been anticipating this since five years ago, that someday not too far ahead - the oil will run out or if it doesn't run out it becomes unaffordable, that's what we call the AfterOil era. All of our research and development in the last five years has been prepared in anticipation of the arrival of this AfterOil era.

In our calculations, the community doesn't really need to be too worried as long as they are prepared, by the energy literacy, adequate R&D, and develop the various skills needed in the field. Even our R&D results have narrowed down to 3 winners, who together will be able to replace 100% petroleum as our fuels, whether in the form of gasoline, diesel, aviation fuel, industrial fuel oil and even LPG.

The first winner we chose is Bio-oil, which is oil that can be produced from all kinds of biomass. The considerations are that the raw materials are abundant, the two main technologies needed are mature, namely fast pyrolysis and catalytic cracking, and the product can be very cheap - ideal for pursuing SDG no 7, namely Affordable and Clean Energy.

The second winner we chose non-edible vegetable oils. The consideration is that the planting potential is very wide - there are 14 million ha of critical and very critical land in Indonesia. If only the land which is generally idle is planted with tamanu or nyamplung, pongamia, kemiri sunan, jatropha, etc. - then we will have abundant vegetable oils production and no need to compete with food, agricultural land and land for forests.

The third place winner is Algae Oil. This Algae Oil has become a hot object of R&D throughout the world, but in general it is still experiencing problems in cultivation, oil content, planting and

processing. Thank God everything is resolved with a technology that we call Duomikro.

Growing microalgae and macroalgae is easy now because you don't have to be picky about species, you don't have to worry about contamination, you don't have to choose those that contain high oil - because all microalgae biomass, whether in the form of oil, carbohydrates or protein, all can be processed at once into special Bio-Oil or Alage Oil. - whose energy content is equivalent to 2 times the energy content of the average Bio-Oil in general.

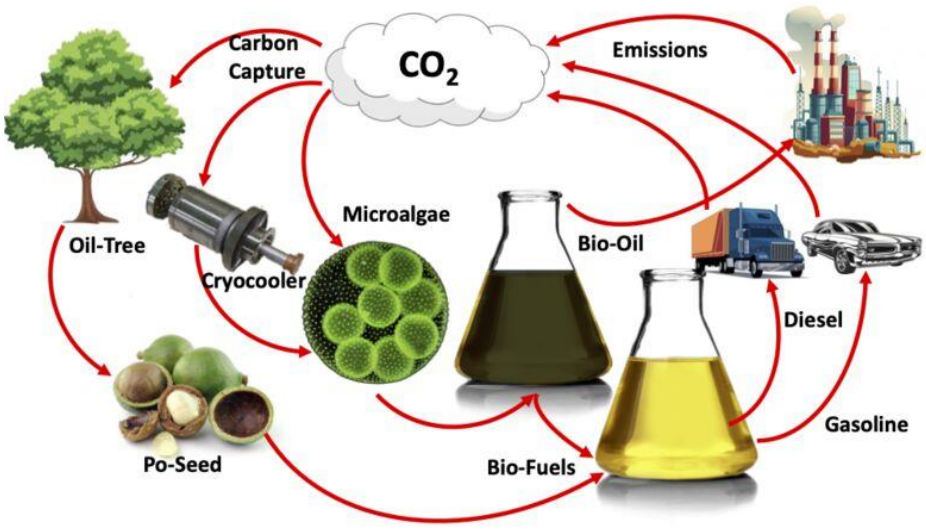
There is hope for people like us to get affordable clean energy without even subsidies.

Carbon Capture To Energy: Key to Sustainability

Climate change, global warming and the energy crisis have one solution in common, that is if we can capture the problem (CO2 emissions) and turn it into a solution (energy). For this, there are three options, all of which we have curated the science and technology needed and are ready to be implemented.

The first is planting trees, this is the most natural solution and has the broadest social and environmental impact. Certain trees such as Tamanu (Calophyllum inophyllum) besides being effective in absorbing CO2 in the range of 300-700 kg/tree/year, also produce seeds that have high oil content which can be directly processed into drop-in Biofuels. The yield is approximately 50 liters/tree/year. Because this tree can live in salty water and is resistant to extreme weather, it can be planted anywhere in the world as long as there is access to fresh water or sea water.

If it is not possible to plant large trees due to the absence of land, for example, it is possible to plant microalgae that do not require large areas of land. Microalgae can be grown in containers and stacked - so land requirements are minimal. Even microalgae can be planted directly in the sea if there is sea access. Its CO2 absorption is about 1.88 kg per 1 kg of biomass produced. Because microalgae can be harvested in 1-2 weeks time, the total annual CO2 uptake can be very high.



Every 1 kg of biomass or every 1.88 kg of CO2 that is processed through this microalage can produce about 0.5 kg of Bio-Oil with ~30 MJ/kg calories, or if upgraded to Drop-in Biofuels it becomes 0.33 kg of Biofuels with ~ 45MJ/kg calories.

If planting trees and microalgae is not possible in your location, then CO2 capture can be done with technology, one of them is with cryocooler. The principle is cooling the emissions to reach cryo temperatures (-150 degrees Celsius), at which only CO2 freezes - while Oxygen and Nitrogen are released into the air as components of clean air.

However, CO2 that has been frozen into dry ice should not be released into the air, although in other places, it is also not recommended to immerse it in the depth of the earth because apart from the possibility of other impacts in the future, this energy raw material should not be wasted.

So, after CO2 is captured by the cryocooler, the most useful thing is to use it to grow microalgae again even in other places. The advantage of this cryocooler is that it can capture CO2 from static emission centers such as factories, power plans, etc. also can be used for mobile emission sources such as motor vehicles, ships, airplanes etc. It's just that this cryocooler solution needs a supporting ecosystem, namely for centers for distributing CO2 that is collected and processes it into energy through the cultivation of microalgae.

Whichever your institution or industry are interested in applying these carbon capture technologies,our resource center is ready to assist.

Harnessing Emissions For Cost Leadership Excellence

Industries with a high level of energy consumption are currently being hit by rising fuel prices which tend to continue to rise, and in the future it will not be easier - because the reserve continues to decline in the midst of increasing demand. On the other hand, the industry must also start budgeting a large amount of money to reduce emission levels continuously to the point of Net-Zero in the next few years.

But now at the same time, technological advances have also made it very possible to combine the two problems mentioned above to become solutions to each other. The harnessing emissions will be a solution to energy needs, and vice versa - meeting energy needs can be a captive off-taker for products that are processed from

emissions.

This is what we offer in a deep-tech based solution we call Duomikro. That is capturing 100% of CO2 emissions by utilizing microalgae, then processing the biomass yield into fuel with the ASTM D7544 standard which is generally called Bio-Oil or Pyrolysis Liquid Biofuels.

Is this solution expensive? Not at all! Take for example an industrial scenario that uses a diesel-fueled 1 MW generator set - in my post yesterday. To pay for the fuel alone per year will cost about US $ 2.1 million. If the industry is willing to invest US$ 1 million only for the Duomikro solution, this investment will already be paid off by the savings in Bio-Oil fuel produced by the 2nd year. More than US$ 3.5 million saving by fifth year - when some part of Duomikro may need replacement.

So the proper handling of emissions does not have to be a cost center, but can instead be a cost leadership excellence. Apart from being a profit driver for the industry itself, it will also make it a captain of industry in emission management.

The further impact - if the electricity is generated from a plant that absorbs 100% of its emissions - then the electricity will be clean electricity that complies 100% with the Net-Zero Emissions target. If the electricity is used for electric vehicles for example - then this is what makes your new electric vehicle a truly clean electric vehicle - because it no longer consumes dirty electricity.

The reward for kindness is also kindness, so if your industry is willing to do this good - do good to process your own emissions, your company will also be doing well - become a successful company and be blessed for helping to improve the earth and not destroy it. God willing.

Fuels Independent With Bio-Oils

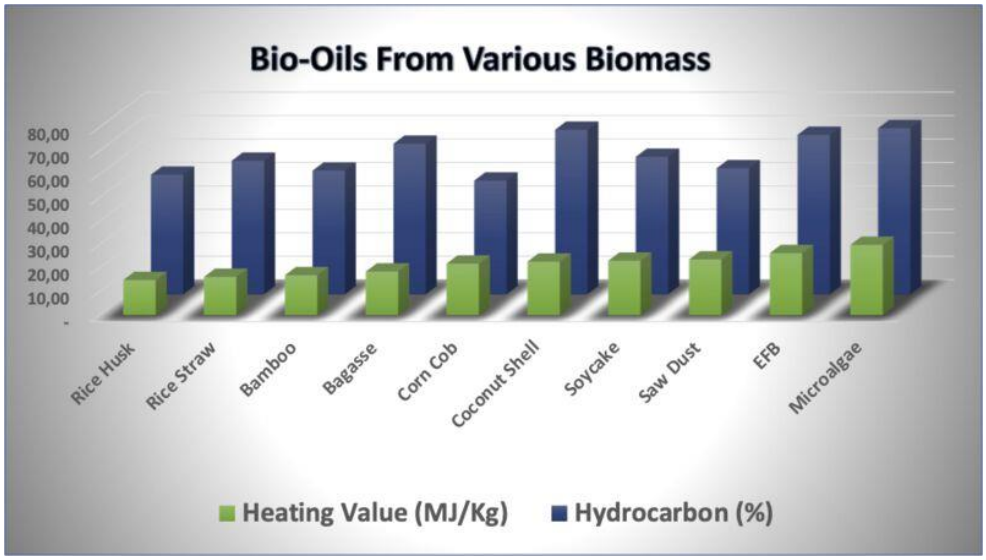
If only the world had not been lulled by crude oil for too long, perhaps we would have been energy independence long ago. However, because of our deep sleep in the cradle of crude oil, even when the crisis is in sight, we haven't woke up and realize that there is an energy crisis pounding on our doors.

All we know is that the price of fuel suddenly rose sharply, the government complained that the subsidies were too heavy, subsidized fuel that was relatively affordable was no longer easy to obtain. Truck drivers are willing to spend the night at gas stations to wait for the opportunity to get diesel at the next refill, and other indicators of the crisis that are already loud and clear.

The question is if we are waking up now from our long sleep anyway, what is our new alternative fuel? One of them that is ready in front of our eyes - all that's left to do is process it, is biomass. This biomass is abundant in this country, and after we liquify it into Bio-Oil the energy content is quite high.

Of the ten types of biomass around us that we studied, the lowest one is rice husks, even this one already able to meet international standards for Bio-Oil or also called Pyrolysis Liquid Biofuels ASTM D7544, which requires a minimum heat content of 15 MJ/kg. Other abundant biomass such as empty oil palm fruit bunches actually have almost double the heat content of this standard.

The highest heat content is in microalgae Bio-oil, which is up to 30 MJ/kg Bio-Oil. We categorize this microalgae as abundant biomass because even if we just start planting today, before the end of the month we can harvest it already.



Bio-Oil can be used directly as an industrial fuel, as a substitute for industrial diesel which is increasingly expensive now, or as a substitute for LPG with a customized stove or burner. In a land of four seasons, Bio-Oil can also replace heating oil to heat a room in winter. So the market is already very large for Bio-Oil as is.

In addition to the energy content, the Bio-Oil is also characterized by the hydrocarbon content (hydrogen and carbon) in it. The higher the hydrocarbon content in Bio-Oil, the easier it is and the higher the yield when it is upgraded to Bio-fuels.

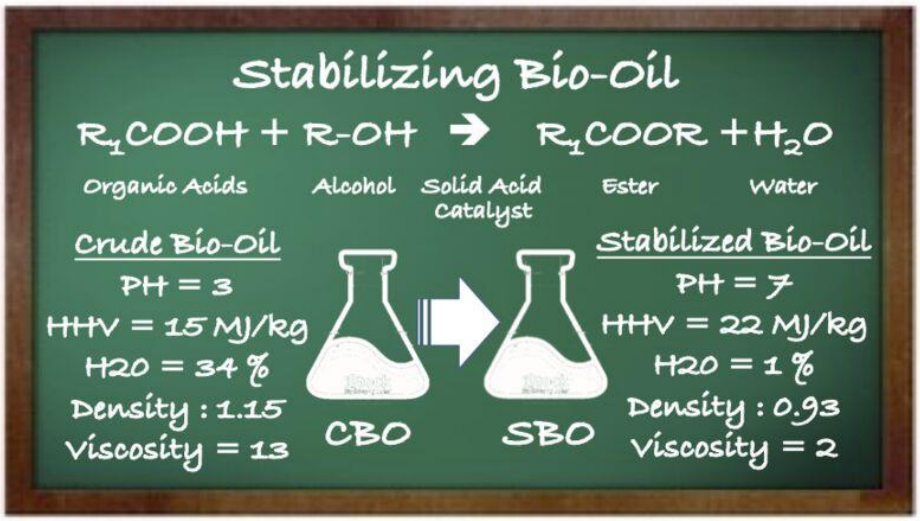
Of the 10 Bio-Oils that we studied, the lowest hydrocarbon content was corn cobs and the highest are microalgae and coconut shell Bio-Oils, but all of them are in the 50-70% range, so it is very feasible to upgrade to transportation fuels to replace gasoline and diesel. which is currently in crisis.

From here, God willing, we can be free from the shackles of crude oil, towards fuels independent with biomass oil Bio-Oil - which we can always grow around us, wherever we are!

Bio-Oil Stabilization As A Universal Commodity

In my upload yesterday I presented how potential Bio-Oil can be a solution to the energy crisis as well as an effective and fast way to reduce emissions. However, in as-is condition, Bio-Oil still has a number of weaknesses such as low stability, high water content, low pH which makes it very corrosive, and relatively low calories.

So as part of energy literacy, I feel I have to explain how to overcome these various weaknesses so that Bio-Oil really becomes a popular energy solution in the future, can be produced by anyone and anywhere. It does require some basic chemistry knowledge, but this is only a high school course, so it shouldn't be too complicated.



Bio-Oil already contains a number of organic acids - that's what makes it have a low pH, but it also contains a number of alcohols in various forms, some in the form of oxygenates, cresol, guaiacol, acetol etc.

What happens when we react these organic acids with alcohol? this reaction does not happen by itself - because an acid catalyst is needed, we use metal acid to make it easy to separate and not pollute the environment. That's a process called esterification, the result is an ester and water. After we separate the water, what remains is Bio-Oil which no longer contains organic acids but esters.

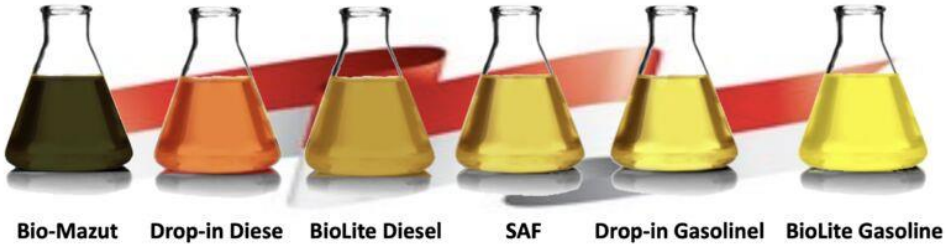
Because the nature of Bio-Oil has changed, it becomes a collection of compounds that are much more stable, PH neutral so that they are no longer corrosive and the calories have increased dramatically. This stabilized Bio-Oil we call it Stabilized Bio-Oil (SBO) which is safe even for international trade, or stored for a relatively long time before being upgraded again to Bio-Fuels if needed.

An example on the green-board is Bio-Oil from rice husk which is stabilized by this technique, in addition to its energy content which increases by 50%, the water drop remains below 1% and the pH is close to 7 or normal pH. Welcome to a new commodity that, God willing, is physically stable and the price is also stable!

Independent Fuels

Today we in Indonesia celebrate 77 years of independence, much to be grateful for for the progress of this country during 77 years of independence and 7 successive presidents. Only as ordinary people we can also make a wish, it would be wonderful if we are also more independent every day in fulfilling all our needs, especially after food is energy.

On this 77th anniversary of independence, this country is marked by the heavy burden of fuel subsidies which reach around 22% of our APBN, Rp. 500 trillion, out of the 2022 State Budget which is around Rp. 2,300 trillion. The irony is that what we subsidize is fossil fuels, about half of which are imported.



In fact, this country has so much potential for clean fuels, which if we seriously develop them will boost economic growth to even the most remote and arid regions. The fuel that I call Independent Fuels can replace everything we import and can even be cheap without subsidies.

If fuel is affordable without subsidies, you can imagine what can be done with Rp 500 trillion which is otherwise used for the subsidy. Can be used for massive human development, the budget for science and technology, research and development is boosted, etc. so that we can quickly catch up with other developed countries.

There are 6 fuels that are currently ready to be mass-produced if there is sufficient funding, as I have shown in the photo below. On the far left is Bio-Mazut, the dregs from the last distillation of biofuels. This can be used as industrial fuel to replace industrial diesel or marine fuel.

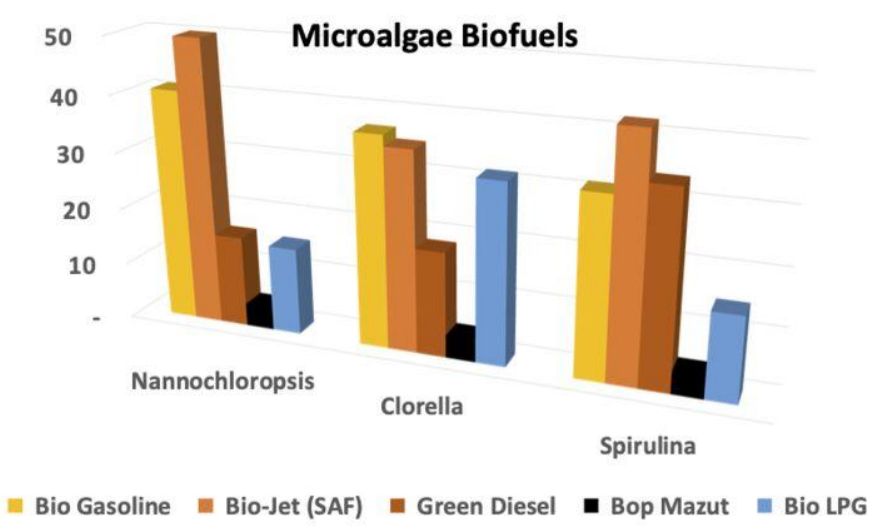
The second is Drop-in Diesel, which is diesel produced from vegetable oil but can completely replace diesel from fossil fuels - not biodiesel. The third is Biolite Diesel - which is low cost diesel that is processed from biomass - agricultural waste, forest waste and also urban waste.

Fourth is renewable fuel for aircraft or what is now commonly called Sustainable Aviation Fuel (SAF), made from a combination of vegetable oils, especially coconut and palm kernel for the n-alkanes element, then mixed with biomass oil (Bio-Oil) to fill the components of aromatics, and iso/cyclo-alkanes.

Fifth is Drop-in Gasoline, which is exactly the same gasoline as fossil gasoline, only it is made from vegetable oil. While the sixth is low cost gasoline that is processed from municipal solid or agricultural waste, its composition is similar to the composition of SAF, only the shorter carbon chain is selected in the gasoline class.

It doesn't matter if the idea of independence in fuel matters are bottom-up, from common people like us for the country, because those from the top-down still yet to come. God Willing !

Mother of All Fuels



In the plant world there is what is called the mother of plants, namely single-celled plants called Microalgae. Just as a mother who passes her character on to her children, so anything that can be produced by a large plant - can always be searched for Microalgae that can produce the basic elements. With this principle, because we can produce any fuel from biomass - which was in my previous upload, then we can also produce it from Microalgae.

If we use the two technologies that we currently have, namely oleochemical and thermochemical technologies to process the biomass of Microalgae from three genera namely Nannochloropsis, Clorella and Spirulina, the result will be all kinds of fuels that we need as shown in the graph below.

I started with the biggest one for Bio-Jet or SAF (Sustainable Aviation Fuel). Why this SAF is biggest yield? After the biomass of Microalgae is extracted the oil and processed by oleochemical - the result is saturated and unsaturated long chain triglycerides - which is generally called algae oil.

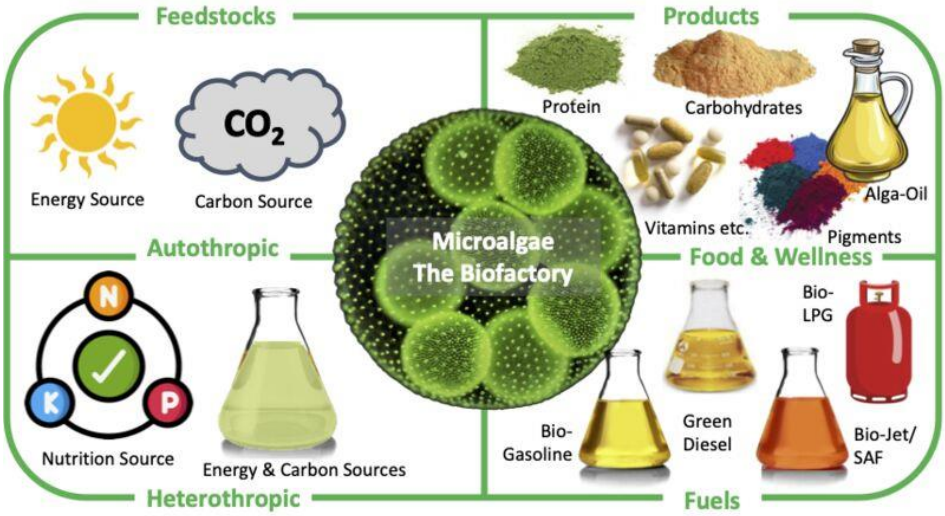
Waste from extracting algae oil in the form of carbohydrates and proteins after being processed by thermochemical - with fast pyrolysis, the result is Bio-Oil. After further upgraded with catalytic cracking, the result is various forms of Bio-hydrocarbon, some are straight chain - normal alkanes, some are branched - iso alkanes, some are circular - cyclic alkanes and some are aromatic. It is these various forms of hydrocarbons that are used to formulate SAF, so they tend to produce the greatest yields.

While the algae oil or triglycerides after being further processed by catalytic cracking, the results are alkanes and the largest are alkenes, the majority of which are long-chain hydrocarbons with more than one double bond - Poly-Unsaturated Fatty Acids (PUFA). Cracked PUFA will produce relatively short chain hydrocarbons, in the gasoline and LPG classes (propane and butane).

Diesel is produced only from saturated long chain alkanes, generally from palmitate or C16. Meanwhile, mazut, or industrial fuel/large ships, is taken from the waste of the thermochemical process. However, this waste is not much because the majority has already decomposed into previous products.

Seeing the enormous potential to use Microalgae as our 'new oil mine' in the future, it is an opportunity for all of us to make it happen. Everything I share here can be done well already on a laboratory scale. The next challenge is to scale-up it. And this of course requires all forms of greater resources, beyond what we can do on our own. So we share with you, who knows you can do it better than we can do ourselves.

Biofactory for Food and Fuel



The world has actually agreed on a common goal, the so-called Sustainable Development Goals (SDGs) 2030, including SDG no 2 Zero Hunger and SDG no 7 Affordable and Clean Energy.

Unfortunately, after half the time since it was launched in 2015, the world is now aware of how vulnerable food and energy security is. Two unexpected things - the Covid-19 pandemic and the Ukraine-Russia war - have disrupted the world's efforts to build food security and affordable clean energy.

But the path to achieving this noble goal is still very likely to be realized in 2030 or even earlier. How do we achieve it? That is by making full use of His bounty that spreads across the earth's surface, in the form of sunlight, water and CO2. With these three components the process called photosynthesis occurs, this is the primary production where the precursor of food and energy is produced.

If only all the results of the photosynthesis process could be fully utilized directly or indirectly and nothing was wasted, then the world would achieve its true food and energy security, when food and energy could be produced and accessed by the entire population of this earth.

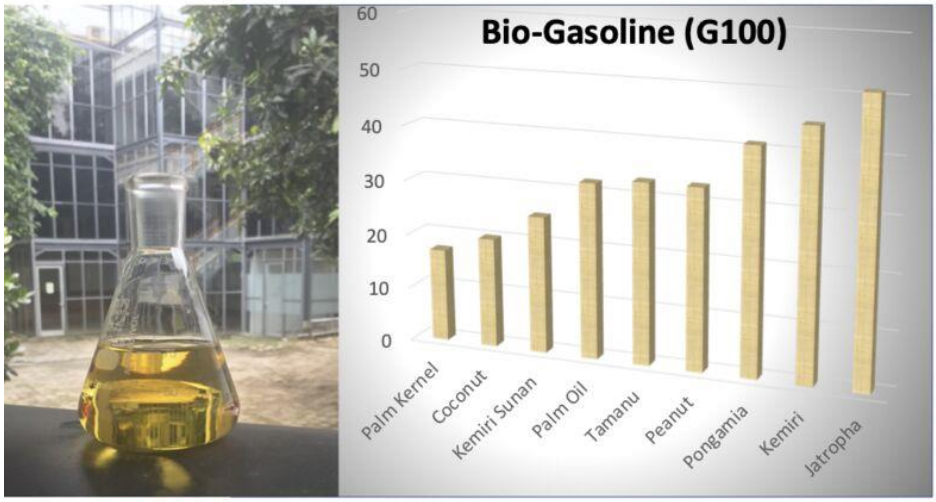
The implementation of the concept of utilizing all the results of the photosynthesis products from the three components mentioned above is what we introduce as Biofactory, namely utilizing single-celled plants - microalgae to be able to optimize the results of a very effective photosynthesis process.

Direct utilization of sunlight, water and CO2 can be used to grow microalgae autotrophically, and from here all of our food and energy products can be produced. Foods are not only macro elements such as carbohydrates, proteins and fats/oils, but also micro elements such as vitamins, minerals, antioxidants etc. For fuel, all types of fuel that we need today, ranging from gasoline, diesel, aviation fuel and even LPG can also be produced from microalgae.

Utilization of the results of the photosynthesis process indirectly, among others, is by processing all plant products that are not currently utilized, generally in the form of agricultural, plantation and forest waste - which is called biomass. The majority of this biomass is in the form of lignocellulose, which if we decompose it via hydrolysis process it will become glucose.

We can reuse the glucose to grow microalgae heterotrophically, using an intensive microalgae culture method called Ultra High Cells Density (UHCD), and from here the production of food and energy is multiplied from materials that have been wasted until now.

Bio-Gasoline, What Can It Be Made Of?



Two weeks after the increase in fuel prices, people have not really been able to move on to live with the new fuel prices. In particular, the price of gasoline, which has risen by more than 30%, is still not easy for the public to digest. As a result, wave after wave of demonstrations demanding a reduction in fuel prices continues.

On the other hand, for now, the government seems to have no choice, other than the complicated dilemma - maintaining prices will result in the collapse of the subsidy budget, raising prices - very bitter for the people. But actually there is a third option which if taken long ago, we should not be in this dilemma. The third option is innovation!

Gasoline, which is the most widely used fuel by the people, for example, can easily be made from renewable materials that are spread throughout the country. The first generation of bio-gasoline will indeed still use vegetable oil - which may compete with food needs, but this is also not too much of a problem and can even be a blessing for the farming community/planters.

Ask millions of oil palm farmers, islanders who have lots of coconut trees, candlenut trees, people who have already planted jatropha, etc. If only the oils produced from their plants were also processed into bio-gasoline, this would surely be very encouraging for them.

Fuel will be available in their locations, their farm produce will be sold easily, and there will be a new source of economic growth for the local community, namely the fuel economy. The community is not only a consumer of fuel, but the community can also be the producer of it.

From our series of experiments, there are at least 9 vegetable oils in this country that are feasible to be processed into bio-gasoline using the reactor we built. The easiest one with a single cracking/decarboxylation process is vegetable oil containing medium carbon chains such as caprilic (C8) and capric (C10) - directly single process into gasoline, both available in coconut oil and oil palm kernel.

The next that exists in almost all vegetable oils are a long-chain unsaturated combination of oleic (18:1), linoleic (18:2) and linolenic (18:3). This requires a two-steps process, namely the oxidative cleavage of the double chain, followed by cracking/decarboxylation. Thus, the real source of clean and empowering gasoline is always around us, even some of the 9 vegetable oil producers mentioned above are probably already around you!

Clean Energy Front Line

The origin of this very clean energy can come from the reactors that we build. In essence, It processes any biomass at very high temperatures in the range of 1000 degrees Celsius to become synthetic gas (Syngas), the majority of which contain hydrogen (H2) and carbon monoxide (CO).

Even though it takes a very high temperature, it does not consume external energy very nuch, because it uses the knowledge of Dzulqarnain - blow it! (Qur'an 18:96). A small part of the biomass that is ignited is then blown in the red reactor - then the temperature of 1000 degrees Celsius will be reached. What for this such high temperature? to decompose biomass into the basic elements mentioned above, namely H, C and O.

So how to change Syngas (H2 and CO) into clean fuel? There is a century-old technology called Fischer-Tropsch Synthesis to assemble these elements into hydrocarbons with water as a byproduct. Because this particular hydrocarbon is built from its basic elements, there are no pollutants such as SOx and NOx which are generally present in hydrocarbons derived from petroleum. The result is a very clean fuel that cannot be matched by fossil fuels.

Interestingly, this fuel can be fed from agricultural , plantation, forestry solid waste and even urban solid waste. For liquid waste, the gasification reactor can be replaced with a bio-digester and autothermal reforming, the rest of the Fischer-Tropsch reactor and catalytic cracking for up-grade fuel remain the same.

This super clean fuel solution, in my opinion, is the most suitable for this agrarian country consisting of 17,500 islands. The raw materials are always available from cities to remote islands, and can be made on a small scale. The whole series of reactors in the photo can be put in one container and sent to any site where we need it.

In fact, this series of reactors, apart from producing fuel, can also produce electricity at the same time - through the utilization of high heat waste from the gasification process and its catalytic cracking.

Currently, it is only an experimental stage, but if you are interested in funding the commercial version - you are welcome.

SDGs and Net-Zero Economy


Municipal Solid Waste


Forest Waste


Empty Fruit Bunch


Liquid Waste


Corn Cobs


Risk Husk

What can you directly see from the objects in the photo below? Most likely you will see municipal solid and liquid waste - which is still a big problem in our cities, agricultural and plantation waste that is still a burden on farmers, forest waste that triggers forest fires in the dry season.

That's all because in the fossil economy era, we are so focused on petroleum commodities and their derivative products. Apart from fuel, all of our daily needs from waking up to going back to sleep are made from chemical products derived from petroleum.

These three decades however will be different, our view of these objects will change. The driving force is the commitment of countries in the world to fulfill their respective NDC (National Determined Contribution), related to the achievement of SDGs 2030. Commitment to reduce fossil products and replace them with cleaner and renewable ones.

In the longer term, some countries have also committed to achieving Net Zero Emissions by 2050, others bargain to 2060 and some even to 2070. However, everyone agrees that CO2 emissions must be reduced, if it can't be reduced, must be compensated with equivalent carbon removal.

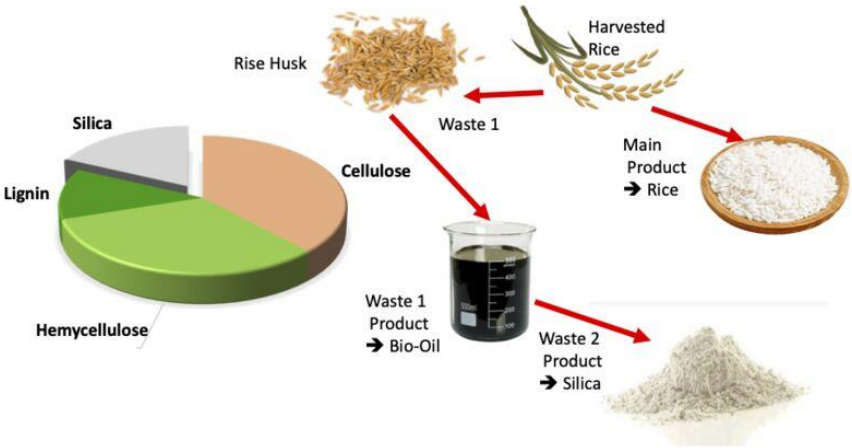
Efforts to meet the NDC and achieve Net-Zero will encourage new economic growth. People will hunt for anything that can be processed into cheap and renewable clean energy. Then the choice will go to trash and waste as in the photo below.

Why would these be the option? because it is a very cheap raw material, we continue to produce it sustainably as a by-product of all our daily activities. For the perpetrators, this is a very big opportunity, from raw materials with very low value, free or even minus (the ones who take them get paid), to high value products such as biofuels, green chemicals, etc.

Who is this opportunity for? Of course, for anyone who wants to change their mindset when they see objects like the one in this photo. That is for those of you who can see that this is no longer garbage or waste, but this is the fuel for economy of the future - the near one is (SDGs) 2030, and a bit longer one is Net-Zero 2050. Regarding how to process objects like these into biofuels, green chemicals etc. this is what we share in a series on this media.

Low Cost Fuels From Our Trash Bin

So clear and transparent the appearance of these gasoline and diesel fuels, even though in their original place people don't even want to approach it. These fuels are products of Fast Pyrolysis processing of municipal waste and then upgraded with Catalytic Cracking, all of which use heat energy from the waste itself. A small part of the waste is sacrificed for thermal energy, and the most of it is converted into fuel that is of high value and does not have to be expensive.



If only all municipal stakeholders willing to do good for their people, now is the time to process their waste into fuels that are very affordable even without the subsidy. While we are aware that fossil fuels are not always around us, even if they exist they will not always be affordable. Those who need a detailed explanation of the products and technology behind this low cost fuels, can contact us.

Bio-Mining : Valuable Waste of Waste

Perhaps this is what must be taken in order to be able to advance and prosper the farmers of this country, namely to take full advantage of every part of the produce that grows that is planted by farmers. If we grow rice, for example, so far we only take the rice as the main product. The rest is considered useless waste, even if it is sold, the price is very low and even more often it becomes just waste.

The main waste from rice milling is husk, the main content of this husk is cellulose (36%), hemicellulose (32%), lignin (12%) and silica (18%). The first three we can process into energy, with fast pyrolysis at a temperature of 500 degrees Celsius it will become Bio-Oil that meets the ASTM D7544 standard - can be a new source of renewable energy to replace petroleum.

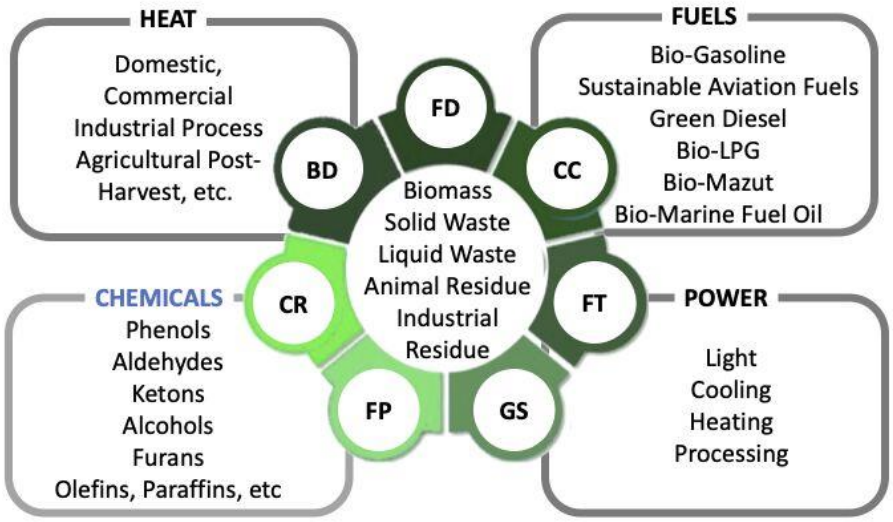
From this fast pyrolysis process there is still another waste,

namely ash - the majority - more than 95% is silica. Silica from rice husk waste can be a source of bio-mining, which is a type of sustainable mining because rice can continue to be planted and continue to produce this silica waste.

This can replace current silica mining which has been obtained from silica sand mining - which in addition to destroying nature is also unsustainable, will eventually run out.

Modern society is very much in need of silica as a raw material for silicon for various products, including paints, glues, computer chips, and even component to substitutes human organs. Indeed, none of His creation is in vain.

Bio-Hydrocarbon Economy



BD – Bio Digester | CR – Catalytic Reforming | FP – Fast Pyrolysis | GS – Gasification
FT – Fischer-Tropsch Synthesis | CC – Catalytic Cracking | FD – Fractional Distillation

About half century ago this country enjoyed the wealth of petrodollars, when oil prices were high and the country was still in a surplus of oil. But those times have long passed, even since about 20 years ago we have become net-importers for oil - until now, as a result when world oil prices soared - the people screamed because of it.

The substitute for the petrodollar wealth is actually already in front of our eyes, namely what we call the bio-hydrocarbon economy - as a substitute for a hydrocarbon economy or a fossil-based economy. However, we fail to realize the opportunity in front of us because we are still lulled by dreams that fossil energy sources will continue to be here, and we still intend to increase production until the end of this decade.

As a result, research related to the bio-hydrocarbon economy has received very little attention, which means there is also minimal funding. We are still given the stigma that biofuels, green chemicals, etc. is still far from being economical, still expensive, competing with food or agricultural land, etc.

The opposite actually happens, note from the illustration of the bio-hydrocarbon economy below. None of the raw materials we can use are expensive, we can use all the waste as the main raw material for this bio-hydrocarbon economy.

The process-even so, I choose all processes that are cheap with low-cost process energy, the principle is to deliver high heat by sacrificing a small portion of cheap raw materials to process most of these raw materials.

Likewise, the products of this bio-hydrocarbon economy, all of our needs which have been met so far

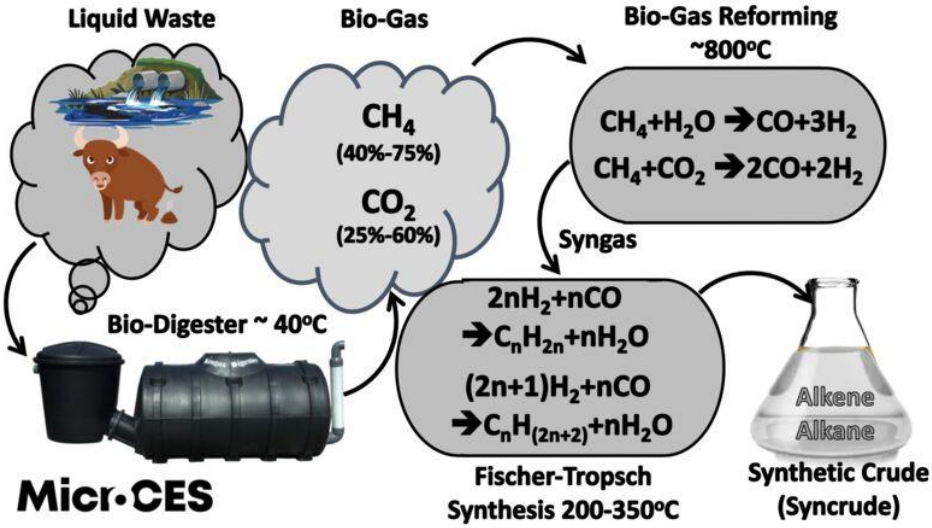
from fossils and their derivative products, can always be replaced by their bio-hydrocarbon versions through a series of processes below. Fossils come from biomass tens of millions of years ago, why not replace them from those that grow today, which we have called garbage or waste?

Low Cost Process for Low Cost Fuels

That waste and sewage can be processed into cheap energy, this has become common knowledge. The question is why so far not much of our waste and sewage that has been turned into energy? why are we still so dependent on fossil energy? In addition to the problems of interest that I uploaded earlier, also because the process costs used so far tend to be expensive.

So to make waste and sewage as a cheap source of energy, we must be able to overcome the cost of the process. I took a direct example of the cheapest sewage - even given it for free - few would like it, this is liquid waste from municipal, industrial and household wastewater, as well as livestock waste - animal waste.

Liquid waste or waste with a high water content is the easiest way to make biogas, but its utilization is still limited. If it is further processed into CNG (Compressed Natural Gas), for example, the process costs are expensive - because it must first purified, among others, from its CO2 content which can reach 60%, then compress it under high pressure in the range of 200 atm, there are also modifications to the vehicle that will use it etc., all of which are expensive. How to make it cheap?



In the MicroCES (Micro Combined Energy System) process that we designed, CO2 does not need to be removed - instead we use it with the CH4 together as materials to produce syngas. But this biogas reforming into syngas requires very high temperatures in the range of 800 degrees Celsius, so herein lies one of our patents - namely high heat production with very low cost process. With this solution, syngas can be produced from biogas cheaply.

Syngas is the building block for producing virtually anything. It can be used for the production of

hydrogen, methanol, ethanol, DME, all forms of green chemical and what we choose to produce very clean fuels, namely drop-in biofuels called synthetic fuels (synfuel).

Again, the process requires high heat, which is in the range of 200-350 degrees Celsius. We can get this high temperature for the Fischer-Tropsch synthesis (FTs) process from waste heat in the biogas reforming process. Even from the two processes, there is still the next waste heat that we can recover once again into electricity through ORC Microturbine technology which is also part of this MicroCES.

From this FTs reactor, we will be able to produce a very clean and renewable substitute for crude oil called synthetic crude (syncrude). From syncrude, you just need to upgrade it through FCC (Fluidized Catalytic Cracking) and fractional distillation to sort out its products into green diesel, biogasoline, sustainable aviation fuels (SAF), bio-mazut and even bio-LPG.

All fuel products are clean and renewable, as the raw materials are cheap/free and all processes are also low cost, then all fuels that are produced, God willing, will also be low cost.

Local Fuel for Energy Security

For those of you who are going to fill up with fuel at the gas station these days, be ready for a surprise on the spike in your non-subsidized fuel price - you should still be grateful because the fuel is still available to buy. The burden for industry players and those in remote area projects, apart from being expensive, it may not be always there.

In the future, it cannot be expected to be easier, apart from the decreasing world oil reserves, crises such as Russia - Ukraine, China - Taiwan and the like could occur at any time. Those of us who don't know anything about this crisis are also affected, rising prices and even fuel shortages that have also been triggered by crises like this.

So what's the solution? It could be that the solution is right in front of our eyes - we just ignore it all this time. I call this solution Local Fuel, which is fuel that is produced from local raw materials and is also used in the same area. I take the example here is municipal solid waste (MSW), this MSW is still piling up in our cities, even though with just two steps it can be converted into fuel to replace imported oil which continues to fluctuate.

In principle any waste can be converted except for three things - namely metal, glass and earth (soil, stone and cement). If we heat the MSW at a very high heating rate - in the range of 600 C/s, and then cool it very quickly, the result is oil - which we call MSW-Oil (Municipal Solid Waste Oil).

This MSW-Oil can be directly used by industry to replace industrial fuel. However, if you want to use it for transportation - a substitute for gasoline and diesel, then MSW-Oil needs to be upgraded. It is cleaned from potential harmful gases in the combustion products - such as NOx and SOx, and fractionated

into standard fuels for vehicles such as gasoline and diesel.

MSW-Oil when it is upgraded will become MSW-Fuels whose composition depends on the type of waste being processed, most of which will be a substitute for diesel fuel (50-70%), a substitute for gasoline (10-20%) and a substitute for mazut (10-30%). All the three can be fuels solution for urban communities.

What about those in the countryside and in remote areas? They have even better materials - agricultural, plantation and forest waste. The calories of Bio-Oil it produces will be lower than MSW-Oil but it will obviously be cleaner and more sustainable.

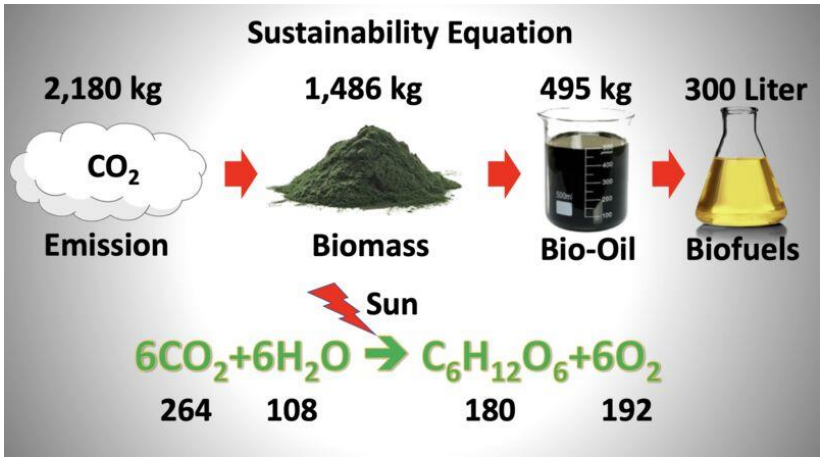
What if there is no waste or raw material that can be processed? For example those of you who live in arid desert areas? As long as you can still have access to water - if you don't have fresh water, you can also use sea water - then you still can grow microalgae and macroalgae - which when processed into Bio-Oil will has calories that are twice as large as the average calories of higher plants biomass in general. There is no place on earth that cannot produce its own local fuel, as long as you want to!

Sustainability Equation

After creating the universe and its balance system, Our Lord asked us humans not to disturb the balance, and even mandated us to uphold the balance with justice (Qur'an 55:7-9). How can we maintain this trust?

There is already a verse in nature that is very beautiful, we just need to take a lesson from it and then we take care of its sustainability - so I call this verse the sustainability equation, which is widely known as the process of photosynthesis. Through this process of photosynthesis, the balance of nature can be maintained. Moreover, through this process we can also see how sustainable energy can be maintained in its availability.

For concrete purposes, I take the example of the Indonesian case. On average, we in Indonesia emit CO2 emissions of 2.18 tons per year per capita. Since there are 280 million people, our average annual emission is 610 million tons of CO2 per year. On the other hand, we need an average of 300 liters of fuel per capita per year, or a total equivalent of 1.45 million barrels of oil per day (BPD).



So far, both are big problems, the CO2 emissions are huge, causing disaster after disaster, while the

need for oil is a very heavy subsidy burden because more than half of it has to be imported. In fact, if we follow the sustainability equation above, CO2 should be the main raw material to produce our fuel or energy. The emission problem is resolved, and all fuel needs are also met domestically.

But how to execute it? The instructions in the verses mentioned above are also clear, this balance must be enforced with justice. This means that the government must make strict laws or regulations to be obeyed by the people. What is the content of the law or regulation?

In simple terms, each person or entity must be responsible for the emissions it emits, then infrastructure is also provided for its implementation. This infrastructure does not have to be difficult and expensive or requires a large budget, because all examples already exist in nature. If each of us planted 5 large oil-producing trees - like tamanu for example, then these trees would have enough to absorb our CO2 emissions throughout the year and at the same time provide enough fuel for ourselves.

If planting trees is not enough land, it can be replaced by microalgae farming in a tank of 5 m3 water per capita, it is equivalent to 5 large trees in absorbing CO2 and producing green fuel. The obligation of business entities is also the same, 3 trees for every 1 tonne of CO2 emissions per year or 2.5 m3 of microalgae farming.

We have provided all the technologies related to this, from tree seedlings or microalgae cultivation, up to microrefinery to process the produce into green fuel that is ready to use. For the people of JJBB (Jakarta, West Java and Banten) they can even start taking tree seeds that are ready to be planted from our nursery in Bogor area.

First Generation G100 Bio-Gasoline

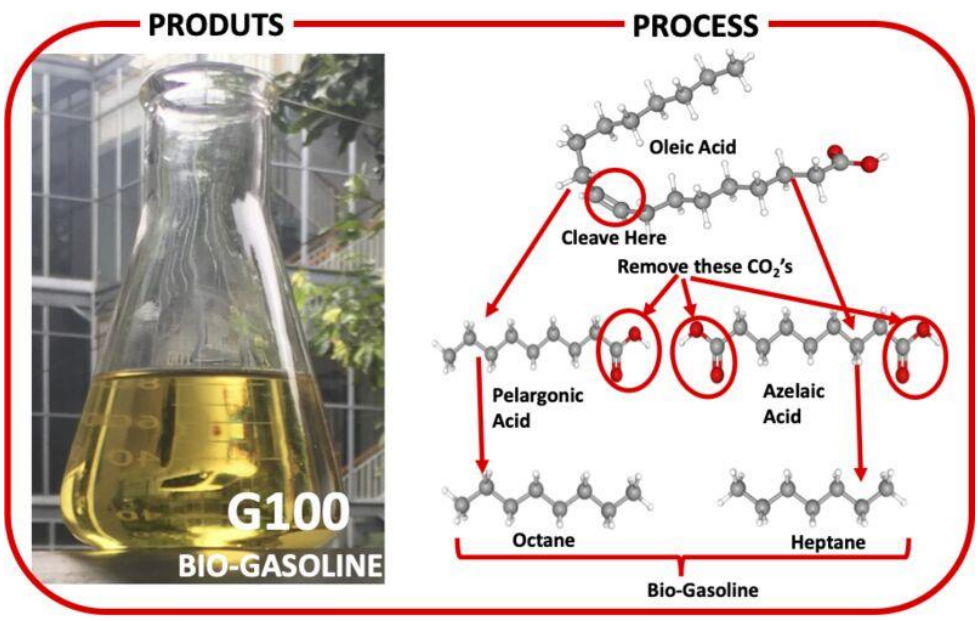
The fuel crisis that we are facing today is not a temporary problem, it needs an immediate solution - but it must also prevent similar crises from recurring. Currently there are more than 150 million motorized vehicles in Indonesia, around 130 million of which are motorcycles, so it's no wonder that our largest fuel consumption is gasoline.

The cars and motorcycles that currently crowd our roads, plus 6 million new cars and motorcycles every year – will remain on the roads for the next 30 years. What fuel do they use when there will be no longer any oil a decade from now?

So, on behalf of the ALTE (Alternative Energy) community, we want to make our contribution to this country. In what form? Solutions based on science, technology and innovation. We will open the products of our R&D to the wider community who are serious about getting involved in applying our solutions.

We started with gasoline first because of the largest consumption mentioned above, when last weekend the price went up by more than 30%, of course the impact was very broad. It should be realized that the consumption of subsidized gasoline alone this year is around 23 million kiloliters, there is no single alternative fuel that will be ready to replace it in the near future – the solution must be a combination of a number of solutions, so that gradually over time it will be able to replace all of them – if possible before our oil is running out.

So the solution that we have developed is divided into three generations of biofuels. The first generation still uses vegetable oils – edible and non-edible, the second generation uses lignocellulosic biomass, and the third generation uses microalgae. This upload is for the first generation based on vegetable oil.



Since gasoline requires short and medium chain hydrocarbons, while vegetable oils have very few of them – only coconut oil (15%), palm kernel (8%) and candlenut (5%), the rest must be sourced from long-chain un-saturated fatty acids -to be easily intervened. Our choice fell on oleic acid which is the C18:1 chain, whose the double bond is right in the middle – so when fully cleaved it would be perfect for gasoline.

Oleic acid is abundant in almost all vegetable oils, including palm oil (40%), jatropha (41%), peanuts (53%), tamanu (24%), pongamia (39%), candlenut (26%)) etc. The process for this oleic acid into gasoline which we have developed is summarized in the graphic below, beside it is a photo of the result of this process – the first generation Bio-Gasoline G100 (Gasoline 100%).

The core of the G100 production process is only two, namely the oxidative cleavage of oleic acid, then the result is decarboxylated in our Fuzzy reactor to release the CO2.

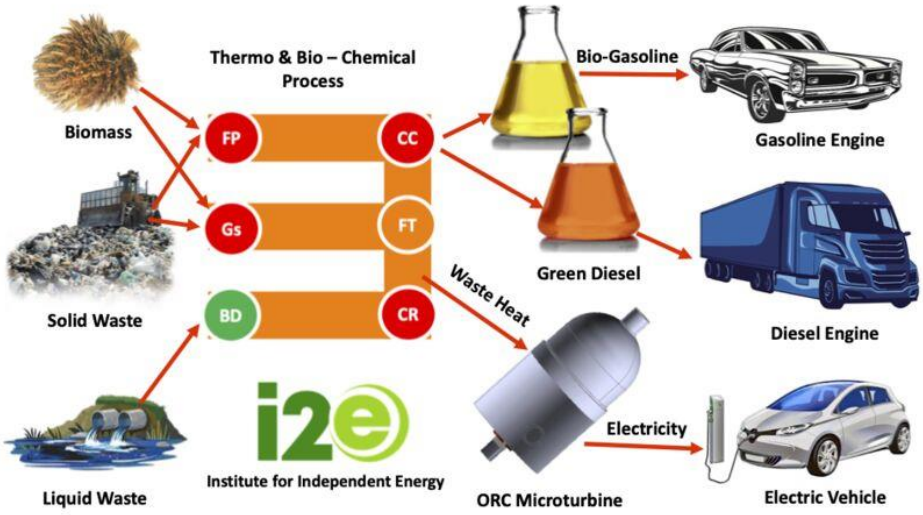
This R&D are open to corporations and institutions who want to join us in commercialization of the product. For the 2nd and 3rd generation Bio-Gasoline to follow in the next upload, God willing.

Clean Energy, Powered by Waste

On a macro level, this country is still bargaining for the achievement of Net-Zero emission which is targeted for the world to reach 2050, we are bargaining for 2060. This illustrates how difficult it is to achieve clean energy. With the current energy mix, any of our vehicles - including electric cars - are guaranteed not to have clean emissions, because the electricity itself has only reached the Net-Zero emission in 2060 mentioned above.

But on a micro basis, per community group, lifestyle group, company, institution, population living on

small islands - all of them will actually be able to become pioneers in the use of clean energy, both electricity and fuels for their transportation.



It is a technology that I have introduced in a number of previous uploads, which can convert biomass and waste - solid or liquid - into clean, carbon-neutral fuels. Basically, there are 5 thermo-chemical technologies and 1 bio-chemical technology. The thermo-chemical ones consist of Fast Pyrolysis (FP), Catalytic Cracking (CC), Gasification (Gs), Fischer-Tropsch (FT) synthesis and Catalytic Reforming (CR). While the bio-chemical is the Bio-Digester (BD) technology.

With the combination of these six technologies, we can produce whatever fuel we need for our vehicles, whether it be gasoline, diesel, jet-fuel, marine fuel and even LPG for households. All of them do not require a large input of external energy - even to produce the very high heat required by the thermo-chemical processes we use. Everything we do is autothermal - generating its own heat, both chemically exothermic (FT and CR), and engineered process autothermal (FP, CC and Gs).

Moreover, because a series of thermo-chemical processes involve high to very high temperatures - 200 to 1000 degrees Celsius, this process also produces very high waste heat. This waste heat can then be recovered to produce electricity.

The waste heat recovery technology that we have chosen is Organic Rankine Cycle (ORC) Microturbine, but this one, although we have designed and made it ourselves - we prefer to hand it over to other parties who are specialists in this field - if there is one, if not there then we must also be able to we make it ourselves.

So in total there are combinations of 7 technologies from 3 areas of expertise consisting of thermo-chemical, bio-chemical and ORC Microturbine, with which we will be able to deliver clean vehicles - regardless of our type of vehicle, whether gasoline, diesel or electric. Besides being clean, we will also be able to make it our own in large groups from us for ourselves. God willing, we will facilitate this process of public education towards clean energy independence in the form of an NGO called the Institute for Independent Energy (I2E). So that we don't have to wait for 2060 to reach Net-Zero emission!

Micro FCC For Independent and Democratized Energy

The world is currently threatened with an energy crisis, in addition to oil reserves that continue to shrink and are only available in limited quantities in certain countries – also exacerbated by the global geopolitical crisis that is not conducive to energy trade. As a result, there are already countries that have become victims, their people cannot get fuel and LPG, and other countries also have no guarantee of energy sufficiency – especially facing the winter months to come.

So solutions that can help the world community in meeting their energy needs must continue to be developed and disseminated openly. So that access to energy – especially clean energy – belongs to everyone. One of them is the Micro Refinery which uses this Fluidized Catalytic Cracking (FCC) technology. FCC technology itself is a mature technology that has existed in the world for the last 70 years.

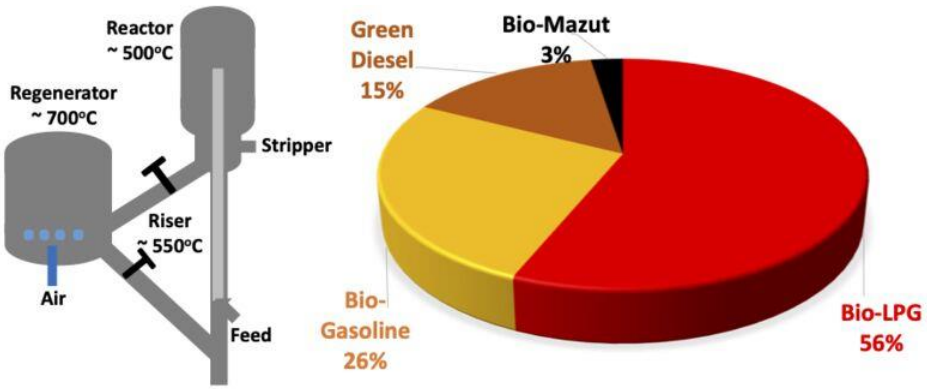
What we have been doing is only scaling it down to become a Micro Refinery – whose average size is less than 1/1000 of the FCC average in the world today. Why should it be scaled-down? Because the raw materials we are looking for are vegetable oil, used oil, agricultural waste and urban waste, all of which have well-spread character, low value in its natural conditions - so not economical to be transported to centralized processing.

With this MR-FCC, it is hoped that all people in the world can have access to affordable clean energy. This is the goal of the world with what is called Affordable and Clean Energy (SDGs no 7). Agricultural waste and urban waste must be present in the area or city where you live, even if they don't exist yet – we are willing to assist you to grow plants that grow even in very arid areas, which grow well even with the splash of sea water.

We also don't patent the technology, the technology becomes public knowledge – we are willing to teach it to anyone who needs it. For this earth to be a planet where we can live together peacefully – because we are no longer fighting over energy!

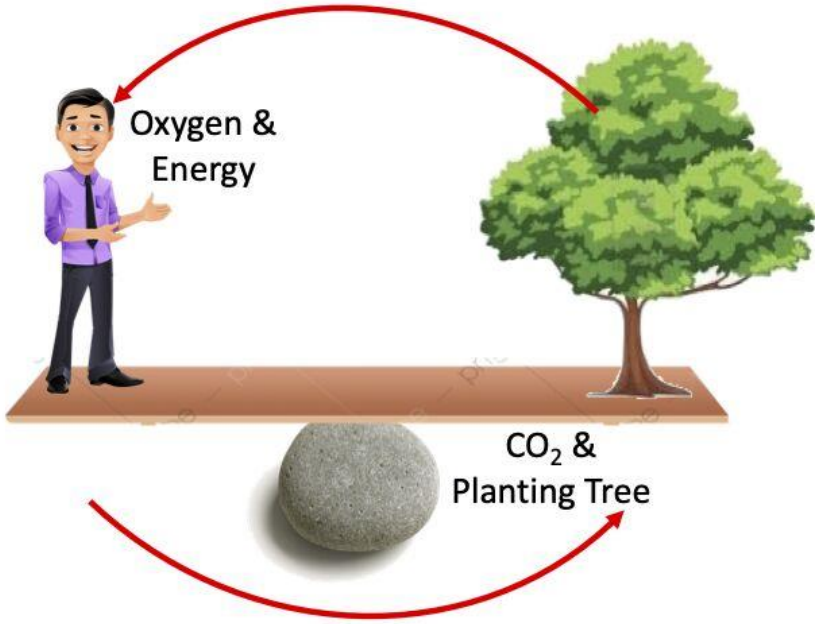
Sustainable Balance

The universe is said to have been around 14 billion years old, calculated from The Big Bang, and its size is 93 billion light years. But the continuity of this very old and very large nature can be



FCC Micro Refinery & It's Products

disturbed or damaged by very small creatures with very short lifespans - that is humans.



So our Creator said "Do not disturb the balance, and establish the balance with justice..." (Surah 55:8-9). How can humans shake the balance of nature? That's what we can easily understand now, according to NASA-even the position of the earth's poles has shifted, the earth's rotation becomes imballanced - like a spinning top before it stops spinning. What caused it? what we often blame is uncontrolled CO2 emissions.

If only we could always control CO2 emissions, then we will always need it for the growth of all our plants - namely primary producers that produce energy for us, both what we eat and which become fuel for all our activities.

This balance used to be maintained when the number of trees on earth was still far greater than the number of humans and all their activities, now it becomes a problem because of the large number of humans with such high activities - the number of trees is no longer sufficient to absorb our CO2 emissions. So what's the solution?

Still, the most natural should still be planting trees. Our calculation is that if every single person of us plant 5 tamanu trees or other big trees, that will be enough to offset the CO2 we emit for our lifetime. What if people all over the world plant trees? Is there land for this? Yes, it is there and very enough for all of us!

In Indonesia for example, we have 14 million critical and very critical lands that are idle. It can be used to plant trees for our 280 million inhabitants with 5 trees each. Saudi Arabia and its neighboring countries in the Arabian Peninsula, have planned to plant 50 billion trees in the next ten years - God willing, it will be enough to offset CO2 emissions for the entire population of the planet earth.

It's just that industries that still emit emissions must have their own solutions, they still have to absorb the CO2 released from their industrial activities. If planting trees requires a large area of land that they do not own, then they can use microalgae to absorb their emissions. Both large trees and microalgae are effective at absorbing CO2 and both become renewable fuel sources.

Because the technology we have developed can produce fuels from any biomass, be it large trees or microagae - so as long as someone grows anything - we will always be able to help them to process it into a sustainable fuels - without having to reduce the yield or other benefits of the plant. We can share the teaser for those who are interested in this technology.

Alternative Crude Oil : Oil For the Rest of Us

	BIO-OIL ASTM D7544	BIO-Oil ALT CRUDE	PETROLEUM CRUDE OIL
Gross Heat, MJ/Kg, Min	15	22 - 42	42 - 47
Water Content, % Mass, Max	30	0.5 - 5	< 1
Viscosity,, mm^2/s, Max	125	1 - 4	3 - 11
Density, kg/dm^3	1.1 -1.3	0.85 - 0.95	0.8 - 0.9
Sulphur Content , % mass, Max	0.05	Not Detected	1- 4

Due to the existence of oil that is not evenly distributed according to the distribution of the world's population, some countries in the world are very rich in oil wealth, and others are very dependent on oil to be imported.

Likewise, industrial players, because they require huge investments to be able to drill for oil from the bowels of the earth on land, especially in the deep sea, the world's oil industry is only controlled by a handful of players.

But in the era of sustainability and Net-Zero, this situation will soon change. Oil is no longer controlled by certain countries. All countries in the world that have access to sunlight and access to water - both fresh or seawater, can all grow biomass, which is the basis for all types of oil. Biomass that undergoes tens of millions of years of decomposition is what becomes petroleum.

In this era of course we no longer need millions of years to produce oil equivalent to petroleum, with a process called fast pyrolysis for example, we can convert any biomass into oil called Bio-Oil in just seconds.

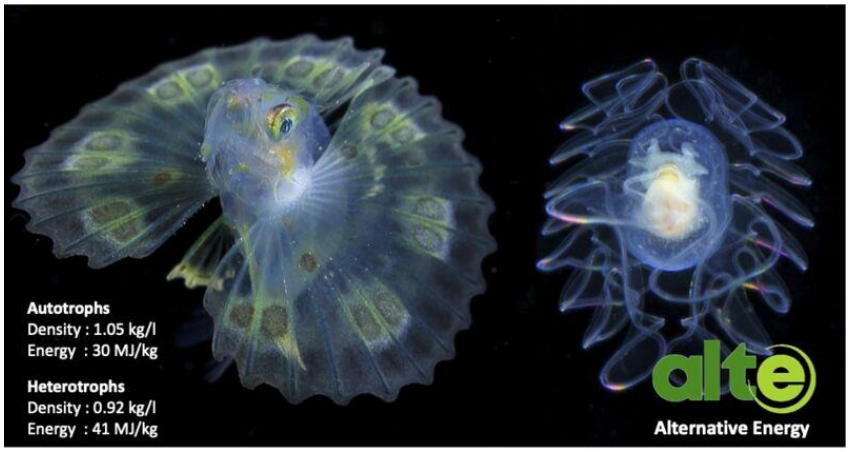
This Bio-Oil has become the standard fuel in the world, the ASTM standard already exists, namely D7544. It's just that in the as is condition Bio-Oil is less attractive, in addition to its low energy content, it is corrosive, has high water content, is unstable, etc. making it difficult to become a world trade commodity.

But technology continues to evolve, R&D continues to be done, discoveries continue to be made, one of which is a long process in our lab that finally produces what we call Alternative Crude Oil - or AltCrude for short. What's so great about this AltCrude?

It's more like petroleum than Bio-Oil, but because it's originally come from stabilized and upgraded Bio-Oil - it carries all the characters of Bio-Oil. Besides being renewable and sustainable, it doesn't contain sulphur!

More than that, because the biomass which is the raw material for Bio-Oil can be grown anywhere, in any country in the world - as long as there is still sun and water - either fresh water or sea water - then there is no longer any country that has to depend on the another country for their fuel, as long as they want to produce their own oil, then all can be energy independent, God willing.

Plankton: A Neglected Source of Energy



Overcast energy crisis looms over the world from the eastern to the western horizon. In the East, like us in Indonesia, the government is experiencing a dilemma, maintaining the price of subsidized fuel will swell the budget uncontrollably, while increasing prices or reducing subsidies - some elements of society have threatened to bring about the biggest demonstrations that have never happened before. In the West, they are even worse as Ukraina-Soviet war continue.

If only we worked faster and smarter, this dilemma could be avoided. We have abundant sources of energy raw materials, most of which are still neglected. In the city there is garbage piled up everywhere, in the village there is agricultural waste that is become burden, and in the forest there is forest waste which if not taken, can become a source of forest fires.

Especially in the sea that is still 100% neglected resources that we haven't processed it at all, what is called plankton, both phytoplankton (plants) and zooplankton (animals). These plankton are very small plants or animals - micro or macro - that do not have the strength to fight the tides of the ocean, so many are washed up on the shore when the tide is high.

So far, the stranded plankton has always been ignored by us, whereas if we collect, dried and processed by fast pyrolysis, it contains high energy, about twice the Bio-Oil energy of rice husk, which is about 30 MJ/kg. So just harvest plankton from our beaches which are the second longest in the world after Canada, we will have an endless source of energy.

Well, if it runs out, we can pick it up in offshore to harvest plankton in their habitat. High energy from these plankton we can get without even planting it, these plankton grow by looking for their own food for growth energy - or so-called autotrophs - the true primary producers.

It's even greater if we want to intentionally cultivate it, that is to grow planktons by giving them good food. As they are small creatures, we can modify their metabolism with the food and environment that we present to them, cultivated planktons are heterotrophs - grow with external inputs on nutrients etc.

These heterotrophs plankton will be able to completely replace our crude oil before our oil runs out. The bio-oil produced from the fast pyrolysis of heterotrophs plankton is very close to petroleum crude oil, both in terms of density (0.92 kg/l) and energy content (41 MJ/kg). This crisis does not have to happen, if we anticipate it quickly!

The Moment For Affordable and Clean Energy

Crude Oil vs. Bio-Oil

Property	Petroleum Crude Oil	Bio-Oil EFB - CBO	Bio-Oil EFB - SBO
Gross Heat of Combustion, MJ/kg	42-47	25-29	35-41
Water Content, % mass	0	30	<1
Pyrolysis Solids Content, % mass	0	1.06	1.0
Kinematic Viscosity at 40°C, mm^2/s	7.1	2.7	1.4
Density at 20°C, kg/dm^3	0.8-0.9	1.1	0.95
Sulfur Content, % mass	1.00 – 4.00	0.02	0.03
Ash Content, % mass	0.03-0.07	0.21	0.24
Estimated Price (US$/Ton)	650-800	400	600

Since 2015, the world has actually agreed to achieve a common goals in the so-called Sustainable Development Goals (SDGs) of 2030. One of them is the availability of affordable and clean energy for the entire population of the earth, SDG no 7.

Now that we have passed half the journey of time, there is no visible sign that the world is heading there. Let alone affordable, current energy tends to be more expensive and even some of the world's population can no longer afford it. While clean energy is still mostly at the level of research and discourse, its contribution is still too small in the real world.

It takes at least two preconditions for us to be able to deliver that affordable and clean energy. The first is a forced condition, humans will tend to be very creative and can jump far when in a forced condition. The second is that it is really necessary to find affordable clean energy, so that people automatically want to use it.

These two preconditions can be fulfilled now, the first condition is because of the very heavy burden of subsidies - it seems that our fuel prices will indeed be forced to increase in the near future. This will make the fuel burden very heavy for the community, this compelling condition should make us creative in finding alternatives.

The second precondition is the presence of abundant, inexpensive raw materials and adequate technology to process them into substitute fuels. The abundant raw materials is indeed available now, in the form of agricultural or plantation waste such as rice husks, corn cobs and empty fruit bunches of oil palm.

With the microrefinery technology based on fast pyrolysis and catalytic cracking that we have developed, all of this abundant biomass can become a cheap fuel. As a comparison, you can see in the table below, I took the empty fruit bunches that we processed first - because these are abundant all the time.

With the current world crude oil price range of US$ 90 - US$ 100/barrel or around US$ 650 - US$ 800/ton, Bio-oil which is processed from empty palm oil bunches waste has started to be competitive. Standard Bio-Oil (Crude Bio-Oil or CBO) or Stabilized Bio-Oil (Stabilized Bio-Oil or SBO) can both be substitutes for petroleum crude oil for the raw materials for fuels such as gasoline, diesel, jet-fuel and even LPG.

So this is the best moment for us to start getting serious about achieving the world's goals for the

availability of affordable and clean energy mentioned above, we don't even have to wait until 2030 to have an affordable and clean fuels!

Self-Sufficiency in Clean Energy in the Agricultural Industry

If there is an industry that can be self-sufficient in clean energy, the agricultural industry should be the model. Why is that? Because this is where farmers have all the resources they needs, biomass, sunlight, wind, water, etc. In fact, with only one of these existing resources - namely biomass, the farmer can already be energy independent. How to do it?

The first thing that is needed is a biomass-to-energy conversion machine, the most efficient of which is fast pyrolysis. For fast pyrolysis to run, only air is needed, the rest of the high heat source will come from a small amount of biomass - which is agricultural/plantation/forestry waste.

The process, which I call autothermal fast pyrolysis, will produce high temperatures of up to 500 degrees Celsius. This process in addition to producing Bio-Oil, also produces very cheap energy in the form of waste heat. Bio-Oil after being upgraded with catalytic cracking which again only needs a gust of air flow, will produce substitute for gasoline, a substitute for diesel and even a substitute for LPG.

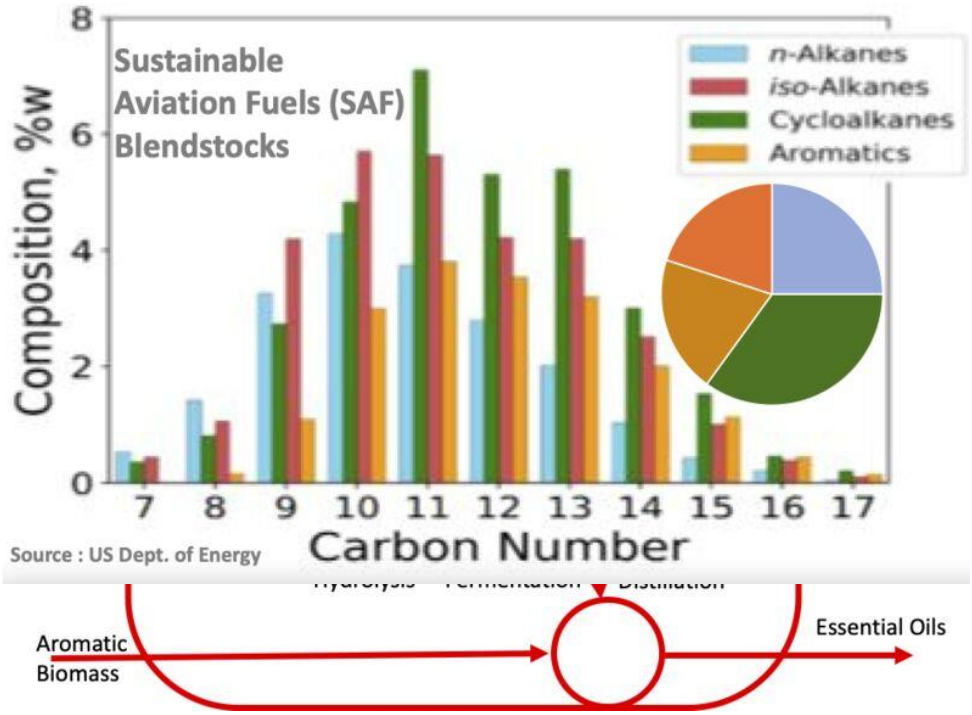
The waste heat becomes very useful for various processes in the agricultural world which do require heat. It can be used to dry all of the farmer's agricultural products, it can even be used for advanced agricultural industries. For example, to convert biomass into ethanol requires hydrolysis at a temperature of around 200 degrees Celsius, and distillation which is very energy intensive - but because it uses waste heat the energy costs are very cheap or even free.

Likewise, the production process of essential oils from aromatic plants requires a lot of heat because in the average essential oil content is only 1-3% of the refined material. With the concept of waste heat energy from autothermal fast pyrolysis II, not only is the cost of producing essential oil very cheap, but 97% more of the biomass that has been waste so far can be converted into biomass to produce high quality Bio-Oil and then easily upgraded to various biofuels mentioned above. .

The key is the utilization of biomass in the autothermal system - both in fast pyrolysis and catalytic cracking. Both only need air blow as energy from the outside - even this one can also be met by electricity generated by the waste heat itself after the system is operational, the rest of the abundant high waste heat can be used to treat anything.

We can assist the agricultural, plantation and forestry industries who want to try to learn to be energy independent in your industry.

CocoJet : Perfect Blendstocks for Sustainable Aviation Fuels



If there is a country that has the first opportunity to provide all the raw materials needed for Sustainable Aviation Fuels (SAF), Indonesia is one of them. However, if this opportunity is not immediately taken, this opportunity can be taken first by the countries of the Middle East and North Africa (MENA). Why is that ?

The most complete plant that provides the molecules needed to make SAF is coconut. This coconut grows wild easily throughout the country, but the existence of this abundant resource is almost neglected.

On the other hand, I saw the great enthusiasm of the MENA countries to plant this coconut. Even to grow coconuts, fresh water does not have to be available. In its natural habitat, coconuts grow to the edge of the sea because it is saltwater resistant. In Oman there is even a coconut plantation already that covers more than 500 hectares!

While coconuts are great to eat - using coconut for fuel doesn't compete with food - the ingredients can complement each other. Because it can be planted in areas that were not originally used for food crops. Like on the very long beaches in Indonesia all the way to MENA mentioned above.

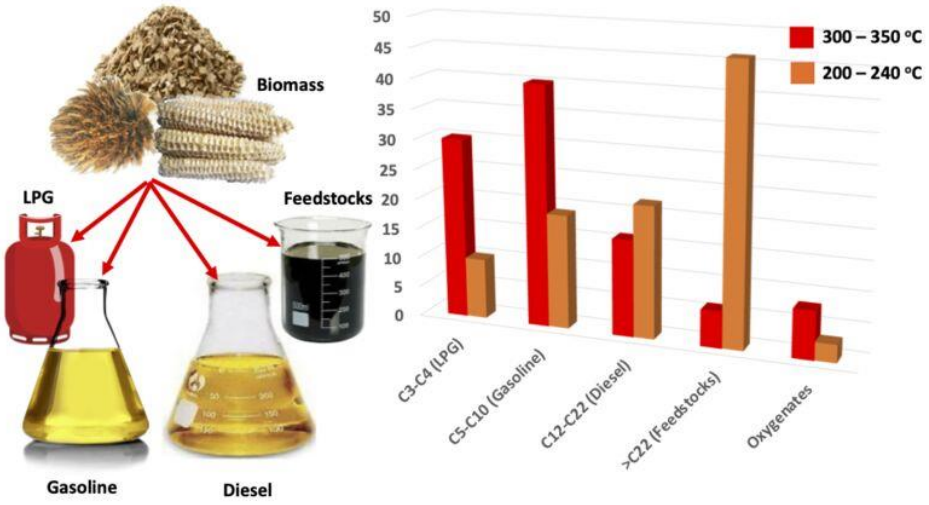
Medium chain fatty acids, namely caprilic (C8) and capric (C10) can be taken first for healthy energy food sources called Medium Chain Triglyceride (MCT), while long chain fatty acids can be used for a very complete SAF blend. According to the SAF specifications issued by the United States Department of Energy below, all the molecules needed to make SAF can be extracted from coconut oil and bio-oil processed from coconut waste.

Alkane requirements from C7-C17 can be taken from the process of oxidative cleavage, esterification, decarboxylation and oligomerization of coconut oil from the most suitable carbon chains. For example, C7 and C8 are processed from oleic acid which is oxidatively cleaved and then decarboxylated. The most needed C11 can be obtained from the decarboxylation of lauric acid which contains up to about 50% in coconut oil, etc.

About 75% of the SAF blend can even be obtained from bio-oil processed from coconut waste. Iso-

alkanes are processed from furans carbonylation and ester oligomerization, cyclo-alkanes from light olefins and alkene oligomerization, while aromatics are obtained from phenols which are all present in the bio-oil of the coconut waste.

If the beach which stretches across 17,500 islands, around 11,500 of which are uninhabited yet, are planted with coconut and become the basis for SAF's industry, what will happen? These islands will be protected from abrasion and potential tsunamis, and all will prosper with the industry of the future - freeing the earth from aviation emissions!



Biomass To Biofuels (B2B)

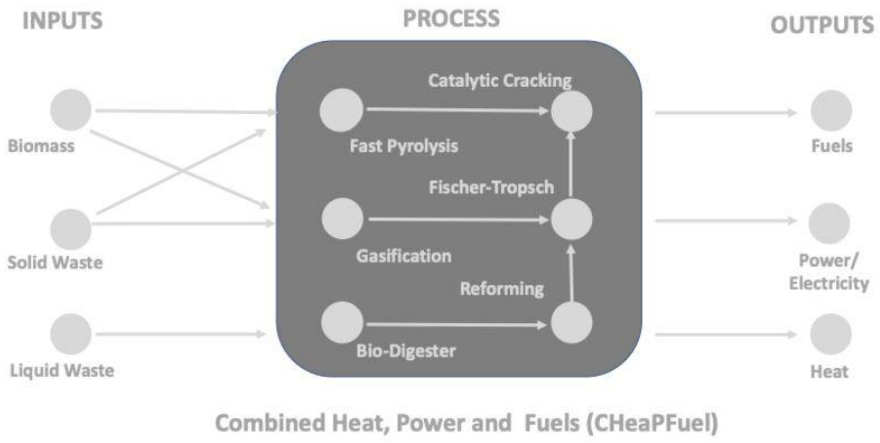
If 77 years have passed since this country's independence, the fuel issue still continues to be an obstacle in the relationship between the government and its people, I see that there are two parties who are most at fault in this matter. First, the government does not pay enough attention and budget for R&D, and second, scientists have not gone to the field to solve all problems - which should be solved with their knowledge.

The fuels that we have been fussing about so far, namely LPG, gasoline and diesel, can all be processed from the waste that is abundant around us, be it agricultural, plantation, forestry or urban waste. Science and technology is also very mature, it has been used for almost a century in the world.

If I want to convert that biomass into the fuel I need, for example, I have at least two paths. First I can make bio-oil first through fast pyrolysis, then I upgrade it with catalytic cracking to become the fuel I

need.

Or the second way, I first gasify biomass to become syngas, after that I synthesize it through a process called Fischer-Tropsch synthesis to become LPG, gasoline, diesel and other hydrocarbon feedstocks, the latter can also be reprocessed into gasoline and diesel using catalytic cracking .



Combined Heat, Power and Fuels (CHeaPFuel)

Indeed all of these processes require a large amount of energy to produce high temperatures, fast pyrolysis takes 500 C, catalytic cracking 500-700C, gasification takes about 1000 C, and Fischer-Tropsch takes 200-350 C. But this high heat problem has been resolved when we found out a way - which we later patented - to produce high heat very cheaply. The language of our workshop is oranges eat oranges - and the scientific language is autothermal, i.e. sacrificing a small amount of biomass for heat, then the heat to process most of the biomass.

Almost all reactors for this, about 80% of which we have made in our workshop. Why not 100% yet? - yes because of the above-mentioned first-party ignorance. There is no concern for this kind of R&D, let alone funding. As a result, as researchers we do bootstrapping as much as we can to help overcome common problems. Those who are interested in replacing the function of the first party can contact us.

Introducing CHeaPFuel - Circular Economy in Energy

Fuel and electricity will tend to be more expensive from time to time, the community and especially industry players must have a strategy to reduce energy costs so that production costs are not overburdened by these energy costs.

With a little innovation, industry players actually have a great opportunity to reduce energy costs, and this can be done with the same opportunities, whether the industry is in urban areas or even in islands or remote areas. Opportunities for this country to simultaneously develop 17,500 islands that we have, because if our energy costs are cheap, industry can be built anywhere based on local resources.

This concept, which I call CHeaPFuel (Combined Heat, Power and Fuels), relies on three types of raw materials, namely biomass, solid waste and liquid waste - one of which must be available wherever you are. Then the process is a combination of 6 options like the graph below.

If our raw material is biomass or solid waste, the choice can be fast pyrolysis and then upgraded with catalytic cracking, or through gasification followed by Fischer-Tropsch Synthesis and then upgraded with catalytic cracking. If the available material is liquid waste, the choices are bio-digester, reforming, Fischer-Tropsch synthesis and then upgraded with catalytic cracking.

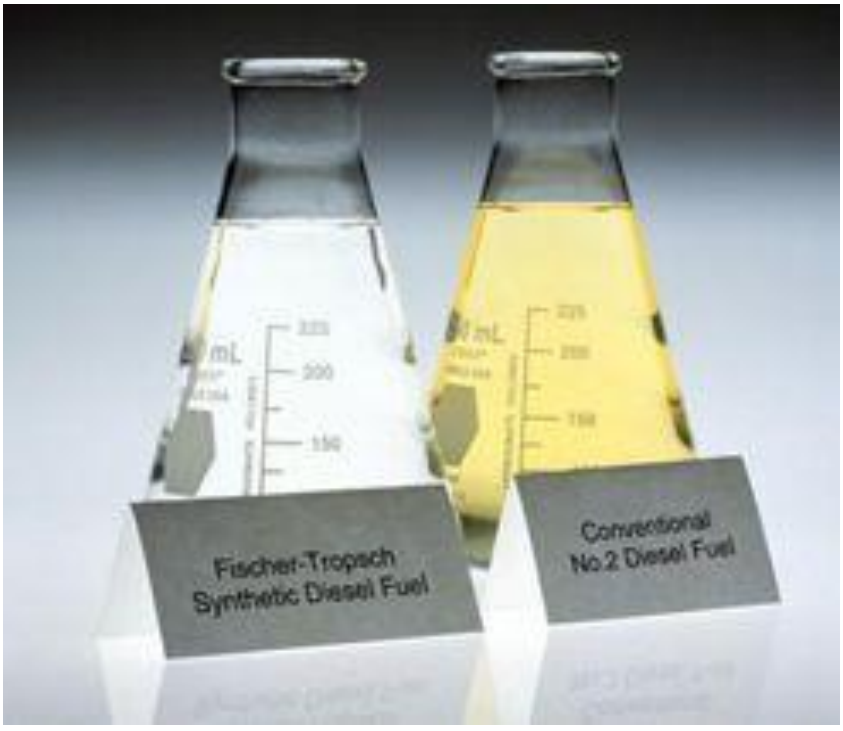
It looks cumbersome and wasteful of energy, in fact the opposite. The whole process will produce three forms of energy, namely heat, electricity and liquid fuel. This whole process does not use energy from outside the system except only for wind gusts at the beginning - after the process is running - even this wind gust can be from electricity generated by the system itself.

Energy for this process uses waste heat from fast pyrolysis (500 C), gasification (around 1,000 C) and catalytic cracking (500-700 C), while the high heat is generated by sacrificing a small amount of biomass or solid waste that is ignited and 'blown' with a gust of wind.

This high heat waste can be used to process all agricultural and industrial products that require heat or electricity. While the conversion from waste heat to electricity itself can use various methods according to the required scale. It can be powered by steam, organic rankine cycle (ORC), external combustion engine (Stirling), thermo electric generator (TEG) or the latest using thermo photo voltaic (TPV).

With this CHeaPFuel concept, God willing, prosperity can be evenly distributed throughout this country because not only there will be cheap fuel, but also energy for industrial processes in the form of heat and electricity which is also very cheap - because it comes from waste of waste.

Synfuel, Synthetic But Better Than The Original



When we talk about synthetics, generally it is for imitations that can't be as good as the original. However, this is not the case with fuel. Synthetic Fuels (Synfuel) can be much better than the original fuel from fossil hydrocarbons.

Synfuel as in the photo, it is a very clean fuel not only from the appearance but indeed it is free from NOx and SOx, it is a straight chain hydrocarbon and almost no aromatic elements. Can be made for gasoline, diesel, jet-fuel and even LPG.

The irony is that clean fuel with abundant raw materials in this country - has not been noticed by the

fuel stakeholders in this country at all. Why is that? As long as there are fossil fuels that are relatively affordable - people will tend to be reluctant to change, even though we know that fossils are dirty, pollute our air, heat our earth, change the climate on this earth, and even we also know that it may run out within this decade.

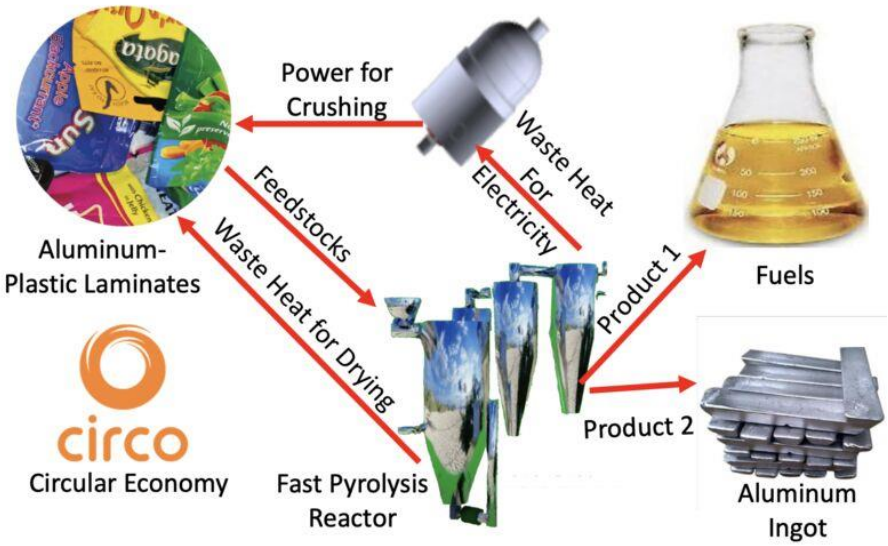
Another factor is the process, which is generally expensive, requires high temperatures which in fact is high in energy cost - so the cost to produce it is not considered to be economical. But the latter is constantly changing along with the development of technology. The autothermal technology that we have developed for example, has made it possible to produce the above mentioned very clean Synfuels at very low energy costs - even for free.

The synfuel can be processed from any biomass including agricultural, plantation, forestry waste to municipal solid waste and even from liquid waste. If from biomass or solid waste, the three stages of the process are gasification at a temperature of 1000 C, Fischer-Tropsch synthesis at 200 - 350 C, and then catalytic cracking at 500-700 C.

The high temperatures in gasification and catalytic cracking are obtained by engineered autothermal - a small portion of the biomass or waste is sacrificed to process most of it, whereas in the Fischer-Tropsch synthesis the reaction itself is exothermic - generating its own heat.

If the liquid waste is the raw material, then the process mentioned above is added by two stages, namely the Bio-Digester which does not require heat, and Catalytic Reforming at a temperature of around 750 C - but is also exothermic, producing its own heat. As a result, the whole process to produce this Synfuel requires very little external energy input.

Furthermore if we capture the waste heat and use it to drive the ORC microturbine, we still get a very large amount of electrical energy, so we can produce clean and cheap fuel, plus the bonus of clean and cheap electricity!



Save Environment, Create Value

Every day, almost all of us dispose of waste from the plastic category, even in line with the increase in food packaging safety - what is rife is packaging from the aluminum-plastic laminates (APL) category. Good for the safety of the food it packs, because it is airtight, water and light, so that micro-organisms also don't enter. Food is kept safe for a long time because of it.

The problem is that APL's packaging technology is not as easily recycled as pure plastic packaging. While plastics generally begin to melt at 100 degrees Celsius, Aluminum only melts at 660 degrees Celsius. So the garbage scavengers are reluctant to take the used packaging from the APL category, because they can't sell it. Plastic recyclers don't want to buy them because they require very high temperatures - which means they are expensive to process.

As a result, APL's plastic waste continues to be scattered at garbage collection points, in landfills and even in the sea. When it is buried in the ground it will interfere with the fertility of the land because the circulation of air and water is disturbed, if carried into the sea it becomes a threat to marine life.

But herein lies the opportunity in the midst of adversity. Our highly energy efficient autothermal fast pyrolysis technology could be the solution. Our reactor as in the illustration below can easily reach 700 degrees Celsius without the need for external heat energy - all it takes is a small gust of wind (air).

At this temperature the APL plastic decomposes into two, the plastic element returns to hydrocarbons and the aluminum element melts into ingots. Hydrocarbons can be directly used as fuel, while ingots can be used as industrial raw materials - without having to mine them in the bowels of the earth.

Moreover, high heat waste from autothermal fast pyrolysis can be recovered into two more energies, the heat recovery can be used to heat anything including drying wet waste to be ready for processing. Second waste heat can also be used for electricity generation through the Organic Rankine Cycle (ORC) microturbine which is very efficient for generating electricity. The electricity can be partially used for pre-treatment of plastics to be processed - such as crushing and milling, it can also be sold as cheap electricity because it comes from waste of waste.

Interested in the application for your institution or corporation? There are also opportunities for startups in the sustainability sector who are interested in synergizing with us.

MENA Green Opportunities

What we can see from the world map today is a vast arid region, stretching from Oman in the far east and Morocco in the far west. This is the territory of 21 countries called MENA (Middle East and North Africa). Currently, the majority are still arid from end to end, but this is precisely where the greatest potential for green economic growth in the next three decades is. Why is that?

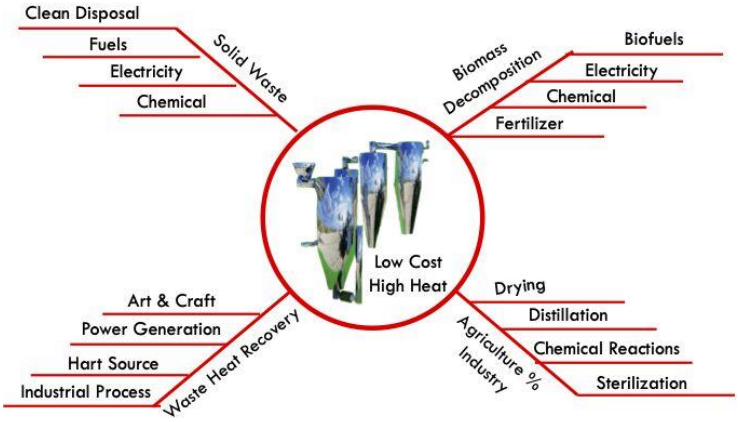
In the Net-Zero Emission 2050 scheme, countries in the world must be able to reduce their net emissions to zero percent by 2050. This target can be achieved in two ways, first is 'do your best' in reducing emissions, and the second is 'remove the rest' for emissions that are still exist after you do your best to reduce it.

One of the most natural ways and has a very wide impact is to plant trees, but

planting trees that can be counted as carbon removal is only planting trees in areas that were originally arid. It is not considered as carbon removal if we have to cut down the forest first and then replant it with new trees.

So planting trees in the MENA area, which has been barren for thousands of years, is definitely included in the carbon removal scheme. Most of these MENA countries are also oil producers today, so they need a lot of this carbon removal activity to achieve Net-Zero Emissions by the agreed time.

It is not surprising that a number of visionary countries in the region have declared their country to be green even in this decade. Saudi Arabia for example will plant 10 billion trees this decade in its Saudi Green Initiative, together with other countries in the Arabian Peninsula they will even plant 50 billion trees throughout the Arabian Peninsula in the same time frame.



The colossal nature of the work of greening the desert can be a great opportunity for anyone who has the skills needed to do this. The results of our discussions with a number of parties from 7 countries out of 21 countries in the region, here are what they need.

Tree seeds that can live with seawater - because fresh water is scarce, technology for very massive nurseries, effective irrigation technology, nano clay to make the desert arable, plant nutrition technology, independent energy for remote areas, plant product processing technology , field operators for the entire MENA region, investor, entrepreneur, inventor/problem-solver etc.

Those of you who are in this area, or are interested in this potential and have the relevant competencies, you can contact us at the contact here.

Fire Civilization 2.0

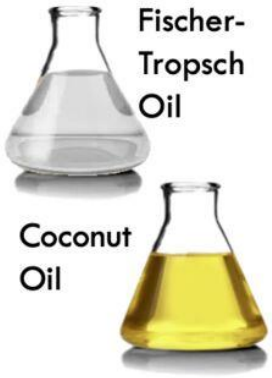
The first civilization of fire was when humans succeeded in making fire from stone and wood, with that fire they began to be able to eat cooked food, make tools from pottery and even began to be able to make weapons. This fire civilization continues to this day, but modern humans are still dependent on natural resources in the form of oil and natural gas to produce fire or energy.

This raises a number of problems in itself because of the effects of pollution, sustainability and also the unequal existence of its sources on earth - making most countries dependent on the few who own the sources.

But fire civilization 2.0 is now in sight, we can make fire in quantity and quality that is not inferior to fossil fires - cheaply, cleanly and can be made anywhere. This second-generation fire is not only very cheap, but also its emissions are offset by plants that produce their biomass when the plants grow.

Imagine now, with our 'blower' we can make fires with very high temperatures - 1000 degrees or even more, at a very low cost. What can we do with this cheap high heat?

We can break down all organic matter into its basic elements, clean energy in the form of fuel and electricity can be generated from here, as well as all forms of green chemicals. We can provide cheap, high heat (fast pyrolysis) coconut shells, bamboo, tamanu shells, etc. for the pharmaceutical, wellness and food industries, for example, which need phenols for antioxidants and antimicrobials.



biojet ASTM D7566

Specifications		Standard values
Acidity (total mg KOH/g)	Max	0.1
Sulfur (total mass %)	Max	0.003
Flashpoint (°C)	Min	38
Density at 15°C (kg/m^3)		775–840
Freezing point (°C)	Max	−40
Net heat of combustion (MJ/kg)	Min	42.8

With cheap high heat, iron, gold and pottery craftsmen can work competitively. Clean electricity can be produced cheaply, as can all processes in the agricultural industry such as drying, distillation and sanitation - all can be done cheaply.

Cheap high temperatures also produce even cheaper waste heat, this waste heat can be gradually reduced for various other purposes that require heat at different temperature levels, such as household water heating, essential oil distillation, ethanol distillation etc.

Whatever your industry, whatever temperature you need, now in fire civilization 2.0 - you will be able to get cheap, clean and renewable heat sources. For detailed application that suits your needs, please contact us.

BioJet : Opportunities for a Greener Flight

It is good to compete in virtue, and this is also happening in the world of aviation. Although the motive is to build a green image in the aviation world, a number of aircraft industries, airlines, aviation fuels blenders and even countries are involved in providing green energy for the aviation world. Our neighboring country is even building the largest factory for this so-called Sustainable Aviation Fuels (SAF).

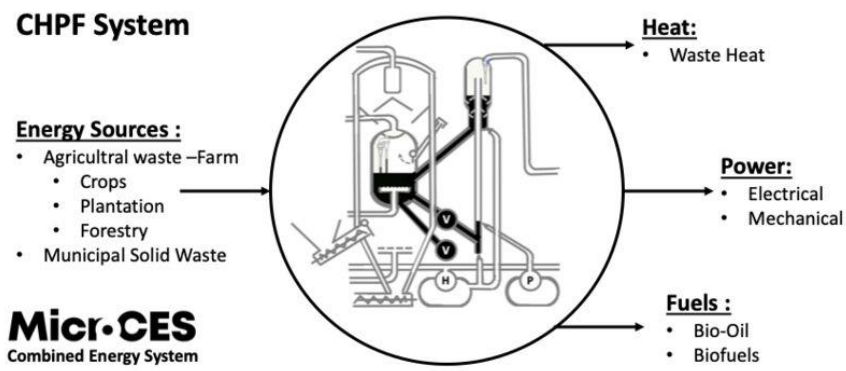
We may not be the fastest in this race, we may not be the best, but it is very possible that we have the greatest opportunity to provide the raw materials or blendstocks for the greener aviation fuel.

Currently there are technical specifications for sustainable aircraft fuel. It is stated in ASTM D7566 (Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons) or also called Drop-in Aviation Fuels.

There are four types of hydrocarbon molecules needed to blend this aircraft fuel, namely n-alkanes, iso-alkanes, cyclo-alkanes and aromatics. All four can be produced from abundant materials that exist

in this country, both in the form of vegetable oil and biomass.

If vegetable oil is used, the most suitable are coconut oil and palm kernel oil. The process is also simple through hydrotreating or through catalytic cracking - about 75% of these oils will already be broken down into n-alkane molecules in the C8-C16 range needed for aviation fuel.



However, if only using vegetable oil, aircraft fuel will tend to be expensive and the continuity of its supply is also not necessarily reliable. Fortunately about 75% of aircraft fuel mixtures require iso-alkanes, cyclo-alkanes and aromatics. All three can be obtained from bio-oil produced by fast pyrolysis of biomass, this is an abundant and inexpensive source.

Furthermore, 25% of the material derived from vegetable oil can also be replaced from biomass, through a gasification process into Syngas, then through Fischer-Tropsch synthesis into FT-Oil, and then cracked to become appropriate n-alkane chains

So we have two choices to make Sustainable Aviation Fuel (SAF) very competitive, namely with 75% waste raw materials plus 25% coconut or palm kernel oil, or even 100% direct from waste through a combination of the processes mentioned above. Since our neighboring country is building the factory, it is becoming a big opportunity for us because we have the abundant raw materials. Those who are interested in this BioJet project can contact us to participate in the race in virtue - fastabihul khairat.

Introducing CHPF, Renewed CHP After 140 Years

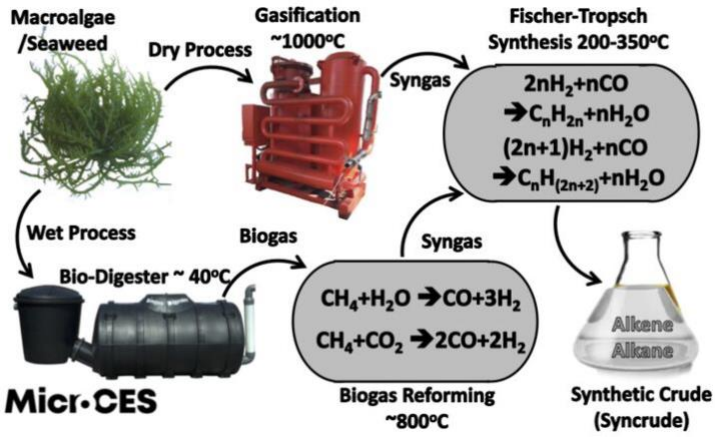
The concept of Combined Heat and Power (CHP) was first introduced by Thomas Edison 140 years ago (1882) at the first power plant in the United States. Since then this good concept for energy efficiency has been used until now, almost without any meaningful changes.

But now times have changed, the earth's population has doubled, non-renewable energy sources, derived from fossils - continue to shrink and their use has clearly impacted on the pollution of the earth's atmosphere, causing global warming and climate change effects. Even the very good concept also needs adjustments.

The result is what we introduce as Combined Heat, Power and Fuels (CHPF). The improvement is in the use of raw materials and the addition of the final product. CHPF uses 100% renewable materials in the form of agricultural waste and municipal solid waste. While on the product side, apart from combining heat and energy (electric and mechanical), this system also produces various types of renewable fuels which are very much needed in this day and age.

We call this machine for CHPF as MicroCES (Micro Combined Energy System), the heart is in Fast

Pyrolysis (FP) for converting biomass into bio-oil, and Fluidized Catalytic Cracking (FCC) for upgrading bio-oil into desired bio-fuels. .



Since both processes involve high temperatures which usually require a large amount of external energy, we improved it by sacrificing a small amount of biomass to deliver high heat. Because the high heat originating from this internal (autothernal) material is more than sufficient to meet the needs of the FP and FCC processes, the waste heat can still be recovered and used to generate electrical or mechanical power - using Organic Rankine Cycle (ORC) Microturbine.

Although in terms of system, CHPF only adds a little of what has been produced by Edison, from the application side it can be 180 degrees reversed the direction of electricity generation that started from the Edison era. If Edison and his CHP pioneered centralized power generation, CHPF would actually pioneer distributed, even off-grid power generation.

What are the advantages of distributed or even off-grid power generation? First, biomass and waste raw materials are always spread out, only economical if they are processed in-situ, on the spot and as quickly as they appear. The second, communities wherever they are, located in remote areas or islands, will be able to produce their own electricity and fuels.

And third - in the era of the rise of electric cars, the demand for electricity will soar, for battery recharging stations that must be able to spread wherever electric cars run, only distributed systems or off-grid systems that will be able to respond very flexibly to these needs.

Bidollars Islands

We know a number of small and wealthy countries from petrodollars, such as the gulf countries and our neighboring country Brunei Darussalam. They have in common that their production of energy (oil) is more than they need, their wealth is from exporting this energy.

We cannot imitate them because our own oil is not enough, we need to import it. However, we can take these petrodollar countries as inspiration, that when the world moves towards an energy transition, from dependence on petroleum to switch to renewable energy - we should be the ones who are victorious, not from petrodollars but from biodollars, namely foreign exchange that we will earn from exports of new and renewable energy (NRE).

How are we going to produce NRE which is so abundant that it is more than enough for our own needs and we can still export a lot of it? We can produce it from the year-round growing biomass in this country. There are agricultural, plantation and forest wastes, but it's more than this - we can also grow fast growing biomass and don't compete with agricultural land, plantations and forests.

One of them is by farming macroalgae in our sea which is almost 3 times our land area. Macroalgae such as various types of seaweeds are easy to grow and do not require a large investment. Seaweed biomass can be directly processed into biogas without the need for drying - a wet process, or it can be dried first and then gasified into syngas - a dry process.

Both of them can be further processed to produce synthetic crude, which is a clean and renewable version to replace dirty and non-renewable crude oil. Since both processes can produce the same end product, we have flexible choices regarding the technology, the investment and the different types of seaweed we can grow - the result will all be able to replace petroleum.

So how can we begin this great work? We can start from our small islands whose seas have not been utilized and are not disturbed by the traffic of large ships. What we have discussed with a number of related parties is the Karimunjawa Islands, this is a sub-district which has 27 islands.

The sea area is 100 times larger than the land area - so ideal for the model of small islands that will be transformed into Biodollars Islands - small islands that can become rich because they will become oil exporters - no longer crude oil, but syncrude - clean and renewable.

Apart from the 27 islands of which only 5 are inhabited in Karimunjawa, we still have around 11,500 islands which are still uninhabited. Imagine if we can empower these islands in this energy transition era to become the basis for syncrude production, we will be able to provide solutions for a world that is in dire need of clean and renewable energy alternatives.

Waste-Solar To Energy (WASTOE) - Municipals Projects

Cities in Indonesia are generally still experiencing waste management problems, nationally there are still around 35% of unprocessed waste. In Greater Jakarta and its surroundings (Jabodetabek) there is around 500,000 tons of waste per month, the area for landfills is almost 200 hectares – and most of them are full or almost full.

On the other hand, the energy problem is also pressing the population of this country. Half of our fuel

oil must be imported and almost all of our LPG is also imported, not only is our foreign exchange depleted for this energy import, the burden of domestic subsidies in the energy sector is also very heavy.

So the big idea that we brought from this project is to use the lands for the final disposal of waste – landfill areas, along with the existing waste on the land as new and renewable energy mines. Part of the land where the landfill is located can be used to build a solar farm to generate electricity. Most of the electricity it generates is then used in-situ to process waste into bio-oil and then upgrade it to various bio-fuels.

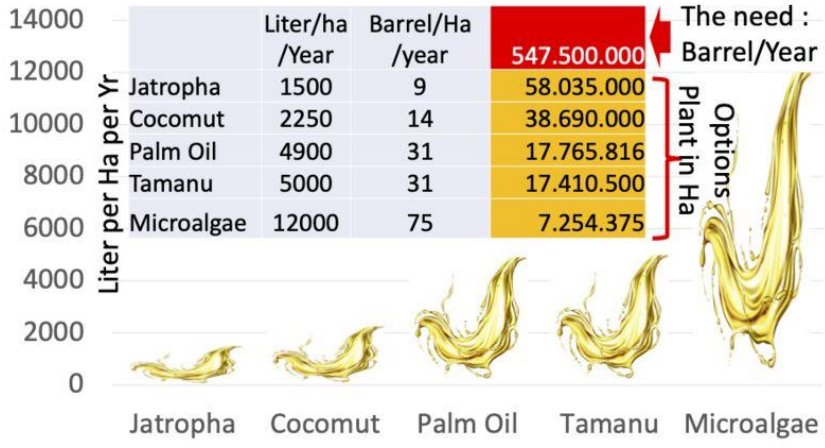
With this concept – the return on investment of solar farm does not depend on purchases from the utility company, but by in-situ off-grid users who use electricity for the production process from waste to fuels. Selling various types of fuel is much easier than selling electricity because there are so many buyers. Even if there is excess production of biofuels, it can also be exported to other countries easily.

On the other hand, units that process waste into bio-oil and from bio-oil into various types of biofuels will get a low energy price, which is the same as the purchase price of the utility company – if the electricity is sold via the utility company. Solar farm investors get a buyer's guarantee and at the right price, while users can get energy directly from producers, not through a utility company.

What we have provided from this project are all kinds of technologies needed to process waste into various types of biofuels. There are three of our inventions that we have patented for this, namely the Esse reactor to process waste into bio-oil, the Fuzzy reactor to upgrade bio-oils into various types of biofuels, and the new type of fuels in the form of bio-hydrocarbon in various forms and sizes that we call it BioLite.

For solar technology because it is already very well developed in the world, we will partner with these technology providers from various countries who are willing to compete in healthy competition to be involved in this project. Likewise, the financing and investments of this project will involve finance and investment institutions at home and abroad who share the same vision with us, namely the vision to improve the planet we are living in. Interested ?

Surviving the Global Energy Crisis



The energy crisis has been very imminent all over the world, after Sri Lanka had problems with fuel and LPG, successive waves of similar difficulties hit Ecuador to South Africa. A wave of demonstrations for the increase in fuel prices also hit Panama, Argentina, Cameroon, Ghana and who knows which other countries will soon follow.

In Indonesia, we are lucky that our government is still able to subsidize energy even though it is getting heavier. However, this also does not mean that the threat of a global energy crisis does not apply to us, about half of our fuel must be imported and almost all of our LPG is also imported - meaning that if there is a shortage or price spike at the global level - we will also be affected.

The threat of a crisis like this will be more intense in the future because oil reserves, which tend to decline amidst increasing demand, are also exacerbated by global geopolitics that are not always conducive. At the same time, the world has also felt the negative impact of the excessive use of fossil energy - in the form of a high heat wave that has hit a number of European and American countries - which has never happened before.

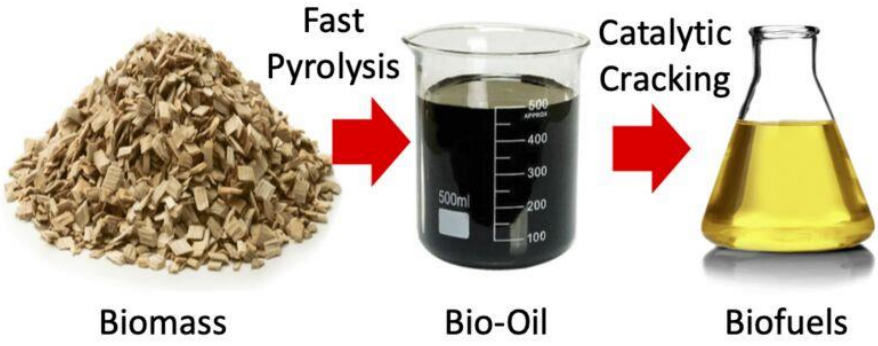
So not only do we need to survive the threat of the energy crisis, but at the same time we must be able to improve our energy mix so that we are less dependent on fossil fuels, and increase the carbon neutral energy components.

In Indonesia we have a number of common oil-producing plants. These include Jatropha - we recommend using existing plants but do not recommend expanding them due to low productivity. There are also coconuts and oil palms, we recommend using them for energy but only over production or un-needed production for food.

What we propose to plant massively and widely in our arid lands - we have 14 million hectares - is tamanu. Besides not competing with food, it also doesn't compete with agricultural land nor forests. Its ability to grow in arid lands even with salty water - makes it the best candidate not only for Indonesia, but also dry countries that still have access to seawater - such as Middle East and North African (MENA) countries.

In addition to tamanu, there is another plant with great potential, namely microalgae, some of which live in seawater and have the highest energy productivity among other plants. It can also be planted very quickly and can be harvested in a matter of days. Only it still has one weakness, namely the initial capital intensive. However, if we in Indonesia willing to plant just 7.25 million hectares of this plant (approximately half of our current oil palm plantations) - we will already be independent in the need for fuel, and not just self-sufficient - our fuel will also be completely green. More than that, we are also free from the threat of a global energy crisis!

3Bs Plan To Anticipate the Global Energy Crisis



As of today, 9 countries have officially entered the energy crisis, including Sri Lanka,

Laos, Argentina, Cuba, Cameroon, Nigeria, etc. Each of the major continents has been represented in this crisis, namely Asia, America and Africa. Other continents, namely Europe and Australia, although not yet in crisis but also not completely safe.

This means that even though this kind of crisis is not expected to hit our country, we still have to anticipate it. What can we do if the energy crisis hits this country? As the saying goes, prepare an umbrella before it rains, in fact we have to be able to prepare right now to anticipate it - because if we act after the crisis reaches our doorstep, what we can do is not optimal at that time - because it will be difficult for us to move at that time.

So these three things, which I briefly refer to as 3Bs, can be considered by top decision makers, whether at the state, regional, corporate, institutional or community levels. The three B's are Biomass, Bio-Oil and Biofuels.

Biomass is anything that grows between the earth and the sky, be it plants or animals. Everything stores energy, from photosynthesis for the plant and from the food it eats when it's an animal. As long as there is biomass around you in any form, God willing, you will still have the opportunity to produce energy from the energy stock stored in the biomass. Even if you don't have any biomass around you, you can still grow anything that can grow. If you want it fast, you can use microalgae which can be harvested in a matter of days.

The second is Bio-Oil, Biomass can be converted into Bio-Oil with the help of high heat in the range of 500-700 degrees Celsius. High heat can be generated from the concentration of sunlight, the conversion of the sun to electricity and to heat, it can also be from burning some of the Biomass itself in a fast pyrolysis reactor. Bio-Oil can already be used as industrial fuel, power plants, commercial businesses and even as a substitute for LPG in households.

The third is Biofuels, this is the result of upgrading Bio-Oils through the Hydrodeoxygenation (HDO) process or the Catalytic Cracking process, we chose the second because it does not require high pressure, while the heat for the process can be generated from the process waste itself in the form of carbon scale (coke). Biofuels are the ultimate solution to the energy crisis, because they can be in the form of Bio-Gasoline, Green Diesel, Jet Fuel, Bio-Mazut and even Bio-LPG.

If we do this 3Bs from now on, God willing, we will be very prepared to face the global energy crisis if it happens. If the energy crisis does not occur, thank God - we have been able to prepare clean, renewable and carbon-neutral energy. We have curated all the science and technology needed for this 3Bs, available in the form of in-house seminars, discussion group forums, etc.

Karimunjawa : Net-Zero Islands

If in the future there will be an archipelago that can be used as a model for achieving the first Net-Zero target in Indonesia or even in the world, the Karimunjawa archipelago will be the most suitable for this. Why these islands? These islands have built a tradition of sustainability that is almost six

centuries old.

The beginning was in the middle of the 15th century (1450s), when a a Guardian prayed on Mount Muria (Sunan Gunung Muria), when facing north "kremun-kremun" (in the local language meaning vague) he saw a cluster of small islands . The Guardian then worried that these islands would sink under the sea water, so he then sent his son Sheikh Amir Hasan to fortify the island with a tree called Nyamplung - which means the fruit 'nyemplung' or fell into the sea.

This island that looks "kremun-kremun" from Java is finally officially named Karimunjawa. The planted tree is named Nyamplung or its international name Tamanu and its scientific name is Calophyllum inophyllum. When the world now has a vision for a Net-Zero Emission in 2050 - exactly six centuries Since Sunan Muria saw 'kremun-kremun' in the Java Sea which he later preserved, then this island is most worthy of being the sustainability role model - these islands have a beautiful story to tell as the beginning of thinking about sustainability.

But more than just a story, the tree that Sheikh Amir Hasan - later called Sunan Nyamplungan - planted was actually a tree that contains very high oil, which is more than 70% of its kernel. The oil is non-edible, so it is perfect to be used as a fuel that does not compete with food, agricultural land or forests.

Because this tree lives by the sea and even its fruit falls into the sea, it can be an inspiration for arid countries around the world such as MENA (Middle East and North Africa), that while they still have access to the sea - they can also plant this tree.

The Karimunjawa Archipelago consists of 27 islands and only 5 islands are inhabited. The seas between these islands are relatively calm seas and are not traversed by large ships, making the sea which is about 100 times wider than the mainland of the 27 islands - a very good potential for the cultivation of seawater microalgae - which is also an ideal feedstock for biofuels that do not compete with food, agricultural land nor forests.

If only 10% of Karimunjawa's sea area is made into microalgae land, then the islands that look 'kremun-kremun' from Java can produce fuel equivalent to 2,000 barrels per day or about 1.4% of our national fuels needs. That's why it deserves to be used as a model for the Net-Zero Islands, as well as making these beautiful islands in the north of Java as edu-eco-tourism objects. So that the world also can learns that we have 6 centuries old sustainability wisdom!

Duomikro For Carbon Capture To Biofuels

Industries that consume large amounts of energy are having difficult days due to the current

high energy prices, in the future it will also not be easier because fossil energy reserves continue to run out. On the other hand, the pressure to start using clean energy comes from all directions, from local government regulations, from financial institutions, even from consumer demands and the public in general.

The good news is that all current science and technology is very advance - to be able to solve these two problems at once, namely the problem of clean energy needs and environmental issues. One of them is the technology that we introduced as Duomikro, which combines our microalgae cost effective cultivation technology and our microrefinery technology.

Microalgae is a single cell plant that grow by dividing itself so it can grow exponentially - very fast. Because of this rapid growth, this plant can absorb very high CO2 emissions. It can be harvested in a maximum of two weeks, and during its growth each kilogram of microalage can absorb about 1.88 kg of CO2. This means that every 1 kg of CO2 which was originally a liability for your industry due to emission, now has the potential to produce around 0.53 kg of microalgae biomass.

But naturally converting CO2 contaminants into microalgae is not necessarily attractive, if you can't take advantage of the microalage biomass. For food, we do not recommend it because although it is not prohibited, it is not ethic - because it is processed from CO2 waste. So the most appropriate is to process the microalgae biomass into biofuels. Because you can definitely use the biofuels yourself to replace your dependence on fossil energy, and if there are excesses, they are also very easy to sell.

But converting biomass into ready-to-use fuels is also not easy, the technology tends to be expensive because generally it takes giant refineries to process it. This is where our second technology lies, namely micro refinery - which can be made on a micro scale according to your CO2 emission volume.

With the existence of cost-effective microalge cultivation technology plus a micro refinery whose size is adjusted to the existing CO2 emission capacity, your industry can easily convert CO2 emissions that were originally a liability, into energy assets in the form of Biofuels in-situ, processed and utilized in your own industrial location. Two benefits are achieved at once, your environmental issues are resolved and energy needs are also met.

Too good to be true? No, Industries that are interested in becoming our development partner will be able to enjoy this advantage faster than others, you can contact us for this opportunity. There are also opportunities for those who are interested in representing us in their respective industrial sectors and abroad.

New Perspective on Food and Fuel

The cooking oil crisis has not end yet, we are already faced with a potential increase in fuel prices. These two things that are often contradicted, food and fuel - alternately haunt us and also the people of the world.

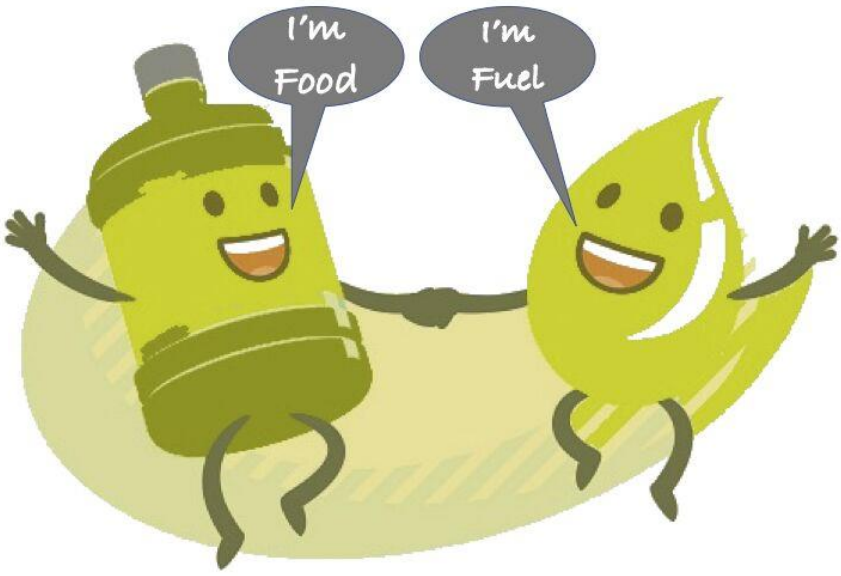
Just as two food and fuel problems can come together, the solution is actually always the same - in every difficulty there is ease. We in Indonesia still have to be grateful that the threat of a crisis in these two things is not as bad as other countries, why?

We have a very large oil palm plantation, more than 15 million hectares. It is from these oil palm plantations that we can still get cooking oil - although sometimes it is expensive. From there also, we can still reduce fuel imports, because we dare to declare the use of B30 fuel - 30% biodiesel, the first in the world!

There is no need to argue between food and fuel, if the supply is limited, food will take precedence, but if both can be met from the same source - why not? Even the best fuel, which is referred to in the Qur'an as light upon light, is also edible oil, namely olive oil. Referred to as fuel in Surah Am-Nur: 35, and referred to as a food seasoning in Surat Al-Mu'minun: 20.

Even the source of fuel that is idolized by the world today will eventually return in the form of edible oil, namely oil from microalgae. Algae oil is an excellent oil as an alternative to current cooking oil, not only because of its health benefits - it contains very high levels of Omega 3, Omega 6 etc. This oil is also very likely to be produced by the wider community who do not own land, live in urban areas and even people who live in the desert.

There are still a few technological obstacles that we must overcome, indeed, related to increasing productivity and the high cost of bioreactors/fermenters for effective micro-scale cultivation. But it's only a matter of time to solve it, those of you who have skills in the field of cultivation as well as those who know the ins and outs of bioreactors may already be able to help us - so that the wider community can immediately get involved in the production of this food and fuel.



With the current level of technology, algae oil on the market sells for around US$ 2.5/liter - so it's only worth it for high end cooking oil or other high value products. But as soon as the technology problem is solved, it is very likely that the cost of production will drop drastically so that it can even be economical for fuel.

Cooking oil for food will be cheap, and affordable and clean fuel (SDG no 7) can also be achieved.

Moreover, the production of cooking oil and new and renewable fuels will meet the 3D criteria needed in the era of sustainability and energy transition, namely Democratized, Distributed and Disruptive - meaning this is an opportunity for all of us!

Bio-Gasoline 2.0

The previous post discussed the first generation of Bio-Gasoline (Bio-Gasoline 1.0) which still uses vegetable oil as raw material. Due to the limited raw materials in the first generation, we must accompany it with the next generation biofuels which has a much wider source of raw materials - namely lignocellulosic biomass.

These fuels that use lignocellulosic biomass as raw materials are called second generation biofuels or in this gasoline case we call it Bio-Gasoline 2.0. Raw materials that are abundant in Indonesia include rice husks and straw, corn cobs and stalks, empty fruit bunches of oil palm and even oil palm trunks that are cut down for rejuvenation. But how do we process these ingredients into Bio-Gasoline 2.0?

After carrying out general processes such as chopping and milling, the most crucial step is to convert solid biomass into what is called Bio-Oil. The key engine in this process is the autothermal fast pyrolysis reactor as shown in the photo below.

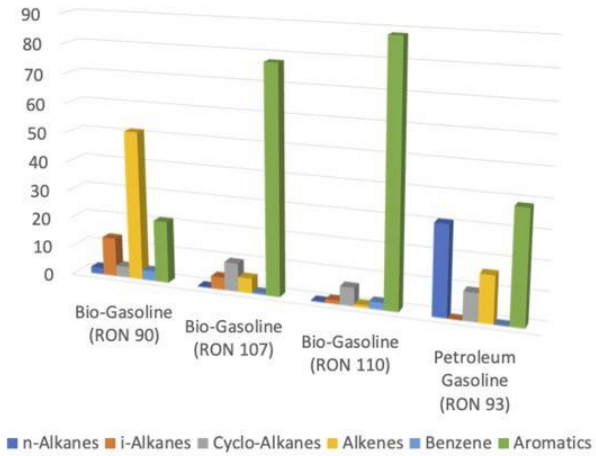
This reactor that we designed and built ourselves is capable of converting solid biomass into Bio-Oil only by wind breeze, because the high temperature of 500-700 degrees Celsius it requires is generated from a small part of the biomass that is sacrificed to generate heat, to process most of the biomass - from This is where the term autothermal comes from.

However, the majority of Bio-Oil produced by this reactor is still in the form of oxygenates - compounds containing oxygen and water, so Bio-Oil can only be used for boiler fuel or special stoves/burners. To become fuel for motor vehicles, three more processes are needed.

First, Bio-Oil is separated by distillation between the heavy and light ones, the heavy ones are directed to diesel and the lighter ones are directed to gasoline. Second, the lighter ones are processed through catalytic cracking which will produce the majority of short chain alkenes such as ethylene and propylene.

These short chain unsaturated hydrocarbon compounds cannot yet become gasoline because gasoline needs a bit longer chain in the C5-C10 range, so another process is to joint few short chains into longer chains in a process called Oligomerization.

From the last process, the medium chain hydrocarbons needed for gasoline will be achieved. The product composition can be adjusted from the temperature used in the last two processes, namely cracking for cutting and oligomerization for joining. With these last two processes, we can produce any class of gasoline we need, from RON 90 to RON 110 if necessary.



In essence, we do have other option other than dilemmatic choice between inflating subsidies or increasing fuel prices. The third option is called innovation! because it is from this kind of innovation that affordable and clean fuel can be produced from the waste that is abundant around us.

Microces For Accelerated Energy Transition

The energy transition scenario commonly adopted by the world, the change from dependence on fossil energy to clean and renewable energy will take place in three decades or even more. But on a micro scale, this energy transition can take place much more quickly.

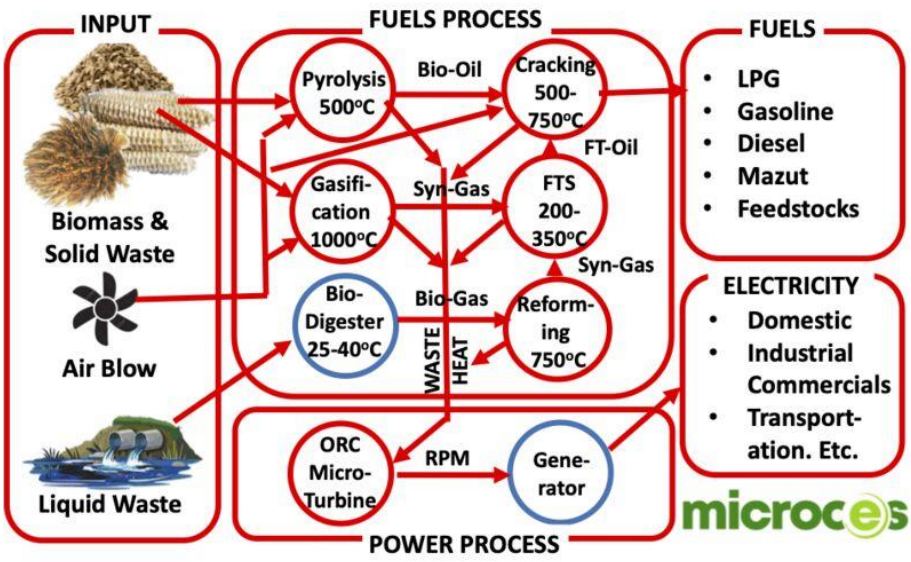
On a company scale, clean energy communities, communities with the same profession like fishermen, people in remote areas or islands, urban communities who care about climate change, etc. they will be able to enjoy clean and renewable energy faster than the world target of 2050.

The enabler is a number of technologies that we integrate and refine, the result is what we call Microces - from Micro Combined Energy Systems, as illustrated below. In essence, this is a series of technologies to process biomass, solid waste and also liquid waste into various forms of energy that we need, either in the form of fuel, electricity or heat energy.

The process seems complicated because of the variety of raw materials that can be processed and the variety of products produced. But in overall the Microces process is very energy efficient. The high heat energy required to produce fuels are met autothermally - heat from within the process itself.

There are two types of autothermal that we use, the original reaction is autothermal - that is, it produces its own heat (exothermic), as happens in the catalytic reforming process and in the Fischer-Tropsch synthesis. The second is the engineered autothermal, a small part of the material is used to produce high heat, the high heat is then used to process most of the raw materials. We use the second one in fast pyrolysis, gasification and catalytic cracking processes.

The production process of various biofuels which involves very high heat of course also produces a very high waste heat, this waste heat which we then recover to produce electricity. So far, what we have chosen is Organic Rankine Cycle (ORC) technology because of its effectiveness in harvesting waste heat, besides that we will be able to make all machine components ourself and even also the working liquid media.



Because these Microses can produce both fuels and electricity, two of our energy needs are answered at once by this one system. The need for fuels for more than 150 million motorized vehicles in this country will continue to be met, as well as the demand for urban electricity which will soar along with the growth of electric cars. Both can be fulfilled by Microses by utilizing biomass - if in the village, or urban waste, both solid and liquid - for those of you who live in cities.

For the time being, these opportunities are open for those who want to be involved in the development process, for institutions, companies and communities. Public in general to follow once it ready for commercial use.

The Sustainability of Waste

The world is increasingly busy looking for new sustainable fuels, to reduce dependence on fossil energy in the short term, pursuing the 2030 SDGs targets for the medium term and Net-Zero emission 2050 for the long term. On the other hand, especially in developing countries, abundant sustainable resources are still being wasted and even become a liability.

In our country, for example, a very small part of urban waste has been turned into electricity, another small part is burned for nothing through incinerators - just to throw this garbage away so it doesn't pile up, but most of our waste is still a pile of garbage that is increasingly piling up in landfills.

Whereas household waste and urban waste are sustainable resources, we will continue to produce them as long as we live and do activities. If only we could process these sustainable resources into energy, either in the form of fuel or electricity, then we would have our own sustainable energy. This may not meet all of our energy needs, but it will help a lot to clean up our environment and cities as well as reduce our dependence on fossil energy.

To be able to convert liability into assets mentioned above effectively, you need at least a 3D transformation which I have also shared in my previous upload. The first D is the 'Democratized', community groups who live in one housing complex, commercial or industrial complex, must be willing to try to handle their own waste and not depend on the local government.

The second D is 'Decentralized', when waste is handled centrally - there must be many problems because it spreads an unpleasant odor along the transportation road, causing a huge workload and transportation costs, and people are reluctant to turn the area into a landfill area. Therefore, waste management must be handled 'in-situ' at the place where the waste is generated and as quickly as possible.

And the third D is 'Disruptive', there must be at least some people who are ready to disrupt. At least changing the perception of waste, which was originally not our job, someone else's job to deal with it, becomes our business and duty. It is our duty to keep our environment clean, reduce dependence on fossil energy, reduce carbon emissions, stop global warming, stop the pace of climate change and it is our duty to make ourselves energy independent.

For the conversion technology from waste to energy in the form of fuel or electricity as shown in the illustration below - God willing, we from the WastoE (Waste to Energy) community are ready to share with those of you who need it. We are currently preparing a camp that we call the WastoE Studio in Depok, West Java which will soon be ready to accept apprentices for this.

Production and Road Test for Green Diesel D100

In our search for the most suitable fuel for this country of 17,500 islands, we found that the current fuels are not ideal. Fuel from petroleum is only produced in big islands with imported raw materials. The impact regardless of world oil prices - the cost of providing fuel to the entire inhabited island is very expensive. It takes a sea trip up to several days to reach these islands, fuel transportation is heavily subsidized.

Fuels such as biodiesel can actually be produced in the islands even on a small scale, the only drawback of biodiesel is that it still requires a high content of methanol or ethanol to produce it. To bring in methanol from big islands, of course, it is also very expensive in terms of costs, as is the case with the delivery of fuel mentioned above. Making your own ethanol on the island is certainly

possible, but it will also increase production costs.

So, since the International Energy Agency (IEA) socialized the concept of Drop-in Biofuels in 2014, we see that this is the ideal fuel for this archipelagic country. Why is that?, because it is plant based - from any vegetable oil and even from biomass oil or called bio-oil, the material can be grown anywhere. On small islands, there are already there some oleo trees like coconuts, tamanu, malapari etc., all you have to do is process it into biofuels.

Drop-in Biofuels does not require methanol or ethanol in its production process, it only needs a catalyst but the catalyst can be used repeatedly so shipping costs are not a problem. Drop-in Biofuels in the form of Bio-Gasoline and Green Diesel (to distinguish it from Biodiesel) - each of which can be directly used in gasoline and diesel vehicles without being mixed with fossil fuels at all.

So if in the world of Biodiesel it is known as B30 for example (30% Biodiese and the remaining is petroleum diesel), in the Drop-in Green Diesel world it uses the initial "D" . And what we produce and use ourselves is D100, which means 100% Drop-in Green Diesel. While we have just tried it ourselves, fellow researchers, interested corporations and institutions are invited to join in for the development.

On the left of the photo is the production machine, which we call the Fuzzy Logic Reactor, essentially a catalytic cracking reactor with two versions to choose from. For experiments on a small scale we use Thermo Catalytic Cracking (TCC), while later in the commercial production version we will use Fluidized Catalytic Cracking (FCC). Both can be made on a micro scale, so we call it Microrefinery.

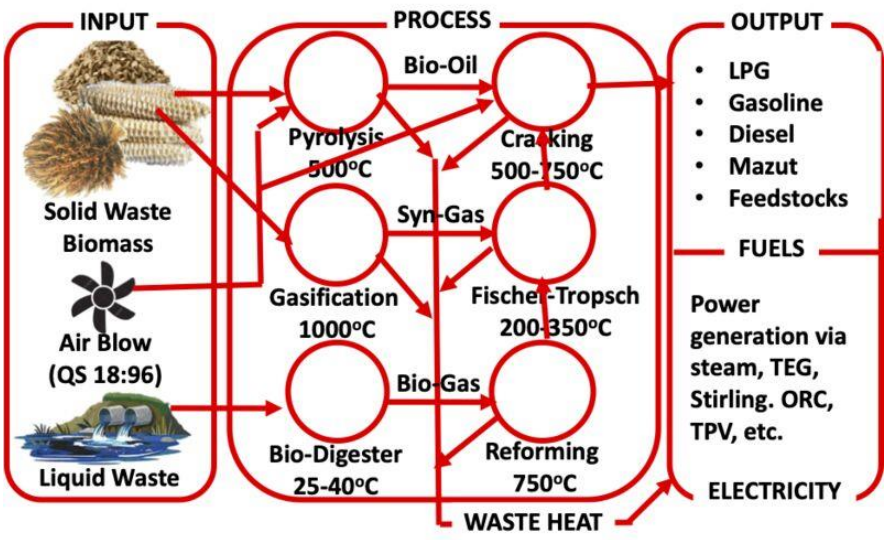
These days we are starting a road test for this completely natural, green and domestically produced fuel - 100% local content. As soon as the results of this test run as expected, you too will be able to participate in producing your own fuel - wherever you are.

Waste of Waste Energy

The energy gap has become one of the causes of unequal prosperity across the globe. In Indonesia, for example, a country of 17,500 islands - it is very, very difficult to distribute prosperity, partly because this energy problem is not completely resolved. The abundant fish around the small island cannot be caught if there is no fuel, the natural potential is difficult to be processed if electricity is expensive and so on.

Cheap and clean energy is actually everywhere, in cities there is urban waste, even in remote villages there is agricultural, plantation and forestry waste. Processing waste into complete energy in the form of fuel and electricity also does not require a rocket scientist to build the machines. All the technologies are mature, it's just a matter of building skills and best practices.

Treating all types of solid and liquid waste also doesn't have to be expensive, it doesn't need a lot of energy, all it takes is a breeze of wind (God willing, I'll share this specific issue later, but the inspiration is in QS 18:96). With this breeze of wind Dzulkarnain can melt iron and copper.



This high temperature is what we use for the entire process of solid and liquid waste to become liquid fuel or electricity. In the illustration of the whole process consisting of 6 reactors below, five of them are high temperature - only the Bio-Digester Reactor is low temperature. Of the 6 reactors, 4 of them require heat from the outside (endothermic), namely pyrolysis, gasification, reforming and cracking. While the other two, namely Bio-Digester and Fischer-Tropsch are exothermic or produce their own heat.

The four endothermic reactors meet their heat requirements on an autothermal basis - sacrificing a small amount of cheap raw material, namely waste, to produce the heat needed for the process. The heat generated from the little that is sacrificed will always be in excess, so the excess which becomes waste heat can be used for power generation.

Various generation technologies now allow converting waste heat of any scale into electricity. Low-temperature waste heat can be converted into electricity, among others through Thermo Electric Generator (TEG), Thermo Photo Voltaic (TPV) and Stirling engine. High-temperature waste heat can be converted into electricity through steam power plant, Organic Rankine Cycle (ORC), and on a small scale it can also be by Stirling engine.

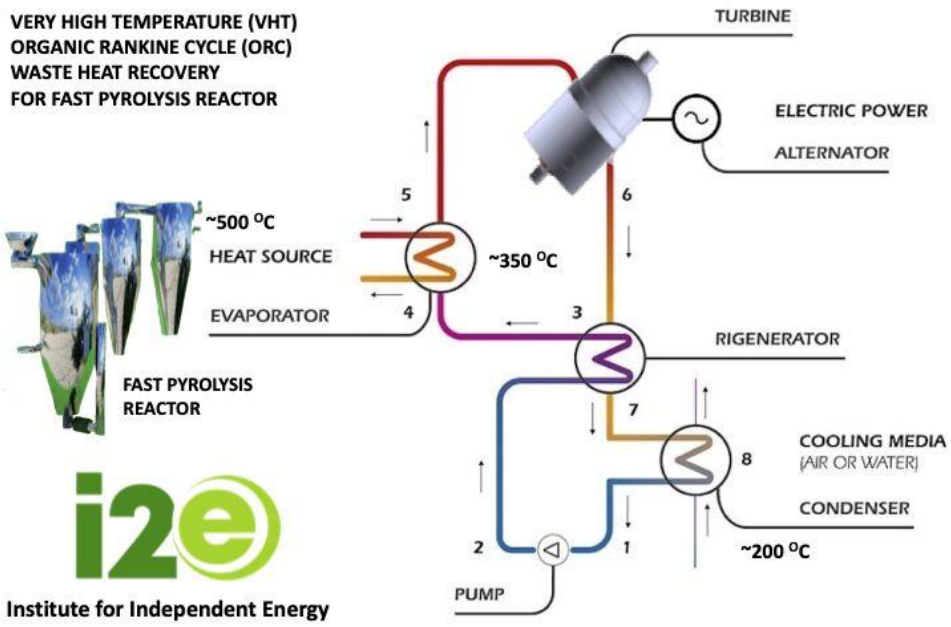
From the illustration below, we can also know that only with the wind breeze mentioned above, we can produce cheap energy from solid or liquid waste - wherever you are. It doesn't matter whichever you focus on, producing liquid fuel with a bonus of electricity, or vice versa - producing electricity with a bonus of liquid fuel. This is what I call Waste of Waste Energy - WoW Energy, even waste of waste can be turned into energy! Will the energy crisis still continue?

Energy Transition Challenge

The wave of change that is spreading around the world with the so-called energy transition, the shift from dependence on fossils to clean renewable energy, has contributed to broad benefits for an archipelagic nation like Indonesia.

This country with 17,500 islands has its own challenges in meeting its energy needs. In the era of fossil

energy, small islands are supplied with fuel by exorbitantly high transportation costs. Likewise, electricity is generally supplied by diesel generator. As a result, apart from being expensive, both fuel and electricity in the islands have a very high carbon foot print.



In the era of developing clean energy solutions, such as the various types of biofuels that I have introduced through a number of previous uploads, fuel not only be made from biomass - it can also be made locally. The biomass itself is carbon neutral, and the carbon foot print is very low because the fuel is produced and used in the same area, this is what we call local fuels.

There is still one more homework left, which is how about electricity? It is also possible to produce electricity with local fuel sources and even only by using waste heat from our local fuels production units. The high heat from the fast pyrolysis, gasification and catalytic cracking processes ranging from 500-1000 degrees Celsius leaves waste heat that has the huge potential to generate electricity.

The technology we chose is to use Organic Rankine Cycle (ORC) Microturbine. The working principle is like a steam power plant, only that what is evaporated is not water but a liquid organic medium that has a higher molecular mass than water. With this medium we do not need a steam boiler, and do not require high pressure operation. So it is cheaper and safer for the island community to operate it even on a small scale.

The challenge is just to make a reliable and inexpensive ORC Microturbine, so that as many islands and remote areas as possible are met for their electricity needs from local sources. We have designed and made this ORC Microturbine ourselves, but because this is not our specialty the results are less than optimal.

Therefore, through this upload we invite partners who are familiar with the production of ORC Microturbines, especially ORC systems designed for very high temperatures - because the waste heat from our reactors is much higher than the average heat source used by the ORC systems that are already in the market.

This could be a great opportunity for those of you who have competence and experience in this field. For the energy transition, thousands of islands in Indonesia need this system, and tens of thousands of

other islands will become livable and suitable for development if the islands can be energy independent. Those who are interested in this challenge can contact us.

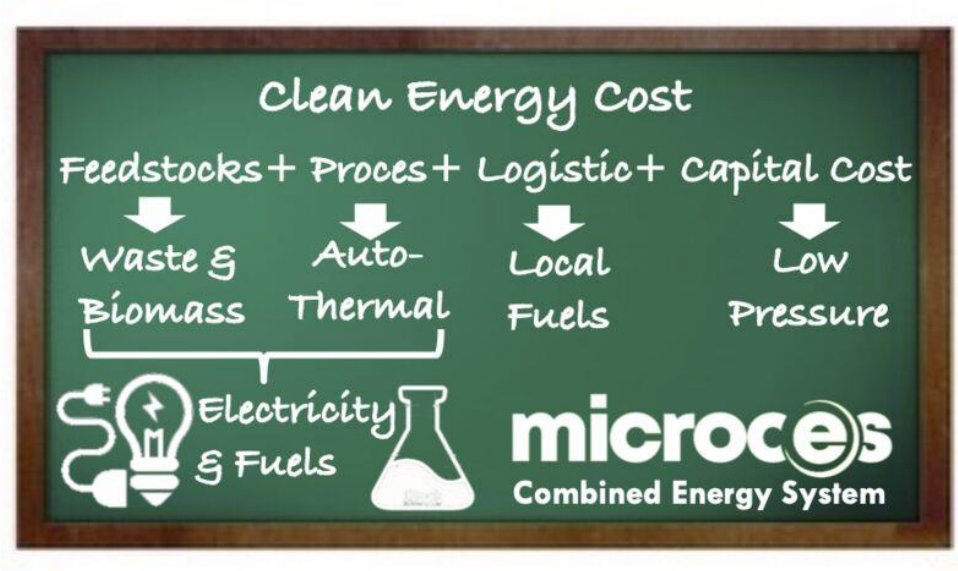
Affordable Clean Energy, How Low Can You Go?

Since it was proclaimed in 2015, the world's goal of affordable clean energy for the entire population of the earth (SDGs no 7), is still far from being achieved. Half of the journey to 2030 has been passed, the world is still very dependent on dirty (fossil) energy and is increasingly unaffordable.

So are these goals unrealistic because they are impossible to achieve in the remaining half of the time? We at New Energy Asia remain optimistic that this goal is still possible to achieve within the targeted time. More than just being optimistic, we have also mapped out a path to achieve these goals.

The formulation on the blackboard below is our way to be able to realize the target of affordable and clean energy - even before 2030. There are 4 components to this achievement, first the feedstock used must be carbon neutral, renewable and cheap. Our choices are agricultural waste, municipal waste and if you have to grow biomass specifically, the choice is algae - both micro and macro.

Second is the process, the biggest element of processing feedstocks into ready-to-use energy is the energy cost for the process itself. Our choice is to use autothermal energy sources - i.e. sacrificing a small portion of feedstocks to process the rest into fuel and electricity. The fuel comes from the decomposition of hydrocarbon elements from biomass or waste, while the electricity comes from the recovery of waste heat - from the autothermal process.



Third is logistics, in an archipelago like Indonesia - the logistics costs for storing and shipping fuels to all corners of the country are very expensive. Our solution is to produce both fuel and electricity 'in-situ', processed using local biomass or waste to serve the local's own fuels and electricity needs. We also refer to the fuel as local fuels.

The last or fourth is the cost of capital, if to produce electricity and fuels requires an expensive investment, the depreciation charged to production costs will be expensive. So the entire investment

must also be cheap. This can be done with the process choices taken.

For fuels upgrades, for example, we choose to use catalytic cracking at atmospheric or low pressure, because if we use high pressure, such as through the hydrodeoxygenation (HDO) process, the investment costs will be expensive. Likewise, to generate electricity, we chose the ORC Microturbine, which not only has the engine entirely self-made - but also the organic fluid media can be made from n-alkane and toluene - which are produced from the biomass or waste process itself.

As a result, affordable and clean energy (SDGs no 7) is still very likely to be achieved even before 2030, if the stakeholders who have the resources for this are really involved in pursuing it.

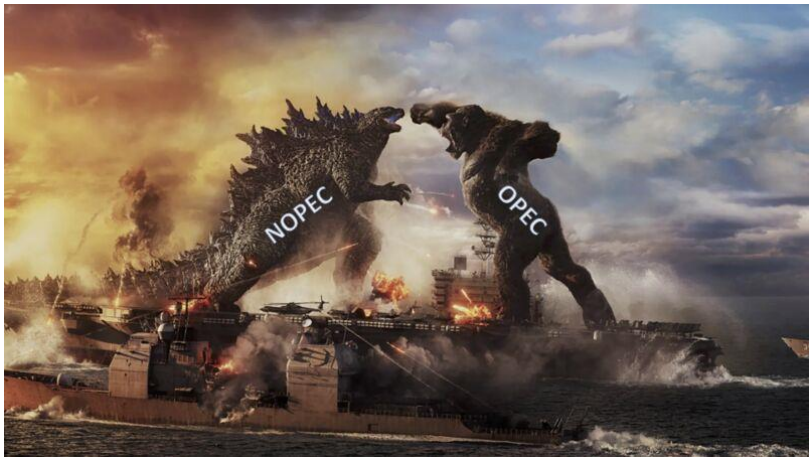
OPEC vs NOPEC, How The Rest Of Us Can Survive

This is a proverb that we know since elementary school, when an elephant fights against an elephant, the one who dies in the middle is the deer. This means that when there are two great powers at war, the victims are always the common people. And this is what is happening in the world these days.

Not even the crisis of the Russia-Ukraine war over, the world is threatened with a new crisis. The trigger was the agreement of 23 OPEC+ countries, namely OPEC plus several other countries such as Russia and Mexico. The agreement reached through a meeting in Vienna on Wednesday last week essentially stated that OPEC+ would reduce its oil production by 2 million barrels per day starting in November.

Why is this such a big problem in America especially? Because the country already has a 77-year-old agreement with Saudi Arabia - OPEC's biggest oil producer, essentially in exchange for security guarantees from the US - Saudi Arabia is obliged to supply oil to the US as long as Saudi oil production remains. When oil production falls, prices soar - then American consumers and industry will suffer even more economic burdens.

But the increase in world oil prices will not only have an impact on the United States economy, the majority of other countries including us in Indonesia will be affected as well. OPEC alone controls about 30% of the world's oil market, but the oil reserves they control are about 80% of the world's oil reserves. This means that countries outside the 23 OPEC+ countries have very very little oil reserves.



Due to the seriousness of the threat of a decline in OPEC+ oil production, a number of parties in the United States have threatened to go for a law called NOPEC (No Oil Producing or Exporting Cartels). This NOPEC bill has its own very serious threats, because basically all OPEC activities can be considered to violate the country's laws - which results in the country being able to freeze trillions of assets of OPEC countries or related companies in the

country - of course this will have a huge serious impact only to the economy but also the geopolitics of the world.

But we don't have to be slow dead in the midst of the struggle of the two elephants mentioned above, those of us who are still very dependent on oil and gas, the majority of which must be imported, must be very very serious about pioneering new energy alternatives whose raw materials do not have to be imported.

If only 14 million hectares of critical and very critical land in Indonesia be planted with Tamanu trees, we would have additional vegetable oil production equivalent to 1.2 million barrels per day or 60% of the reduction in OPEC+ oil production which reached 2 million BPD mentioned above. Not to mention our other resources, such as agricultural waste, plantations, forests and urban waste, which can all be converted into clean and renewable fuels with the technologies that I uploaded in series earlier.

Fuel Solution: One Stone for Two Birds

One difficulty in the form of a fuel crisis that is looming before our eyes - in the form of subsidies that will soon run out while raising fuel prices will be very burdensome for people who have not yet recovered from the pandemic crisis, actually has the potential for two easy solutions - if our fuel stakeholders are open to alternative solutions that are not common.

One of them is a solution from biomass, namely converting biomass into a liquid fuel similar to gasoline - Gasoline Like Fuel (GLF) or similar to diesel - Diesel Like Fuel (DLF). The technology for this is relatively mature, it's just a matter of building the best practice.

What biomass is the most massively prepared? These are what I call the two conveniences. When we urgently need alternative fuels, in front of our eyes there is a very massive biomass that has been waiting for a long time for someone to process it - namely biomass from the rejuvenation of our oil palm plantation of more than 15 million hectares.

Old oil palm trees become a heavy burden for the owners, continuously maintaining them is no longer economical, while rejuvenating them is very difficult in terms of cost and energy. It is not easy to dismantle old palm trees, especially not many who can take advantage of the results of felling old palm trees.

Through the concept that we offer, the old palm trees are dismantled with a tree crusher to be converted directly on site into wood chips. After being dried maximally using waste heat from the fast pyrolysis process, the wood chips size can be reduced again with a hummer mill. In a matter of seconds, our fast pyrolysis technology will be able to convert the palm tree dust into Bio-Oil. The resulting Bio-Oil has become the ASTM D7544 Bio-Oil standard, which can be directly used for industrial fuel.

If desired, it can also be stabilized by a process we call internal esterification - that is, reacting all forms of organic acids present in Bio-Oil with all forms of alcohol also already present in it - with the help of a catalyst, which will produce what we call Alternative Crude Oil (AltCrude), which is a substitute for petroleum crude oil which we have imported so far at an increasingly expensive price.

Of course, Bio-Oil can also be directly upgraded to GLF and DLF - that is, green fuel that is already cheap without any subsidies. The process uses catalytic cracking technology that we have also developed, both in the form of Thermo Catalytic Cracking (TCC) and Fluidized Catalytic Cracking (FCC).

So what are two conveniences in one difficulty? First we have a sustainable solution for our green and cheap fuel, the 15 million hectares, if replanted gradually - will be a never ending job. Second, the productivity of our oil palm land will be maintained because it is always replanted before the trees are too old and no longer productive. Indeed, with the hardship there are eases!

3 Ways To Affordable and Clean Fuels

This is one of the world's noble goals to be achieved by 2030, the so-called Sustainable Development Goals (SDGs). SDG number 7 is affordable and clean energy. Unfortunately we still have too little clean energy, either from geothermal, wind, solar etc.

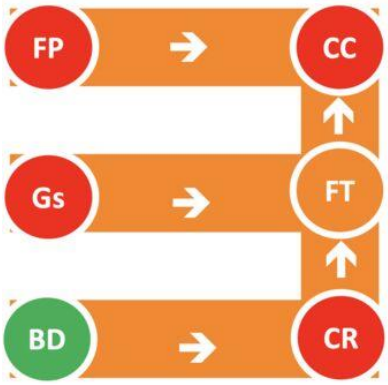
We also make electric cars, but our own electricity will only be carbon neutral in 2060, so even electric cars will only be clean in 2060. Not to mention there are more than 150 million Internal Combustion Engine (ICE) vehicles, both diesel and gasoline. What fuel do you want to use for these vehicles in the foreseeable future?

Don't worry, we still can be optimistic with the noble ideals mentioned above, there is still 8 years to achieve it. If we are serious, God willing, there is still more than enough time to achieve. In my previous uploads, I have also shared how all types of vegetable oil can be used as clean fuel. It's just that this vegetable oil fuel will not be cheap, because the oil itself is definitely expensive.

As a result, we really have to be able to find fuel that is clean but also affordable. To achieve this goal, the basic ingredients have to be very cheap or even free, and so is the process - must be cheap. We have to make the machines to process it ourselves, so the investment burden is also low.

Of all these criteria, the choice we recommend is in the illustration of ' 3' below - to make it easy to catch and remember. This '3' represents three choices of materials and three choices of ways to process these materials into clean and affordable fuels.

The first choice of material is biomass in general such as agricultural, forestry and plantation waste, the second is urban solid waste and the third is general liquid waste - urban, residential and industrial waste.



Option 1

- **2 Steps** : Biomass Fast Pyrolysis (FP) ➔ Catalytic Cracking (CC)

Option 2

- **3 Steps** : Biomass Gasification (Gs) ➔Fischer-Tropsch (FT) Synthesis ➔ Catalytic Cracking (CC)

Option 2

- **4 Steps** : Bio-Digester (BD)➔ Catalytic Reforming (CR) ➔ Fischer-Tropsch (FT) Synthesis ➔ Catalytic Cracking (CC).

Then the process also has three options. The first option can be used to process biomass and municipal solid waste, which is a two-stage process, fast pyrolysis and then upgraded with catalytic cracking. The products are affordable and clean fuels that resembles gasoline, diesel and so on.

The second process option can also be used for biomass and municipal solid waste, the process is in three stages, starting from gasification, then synthesizing gas into liquid through Fischer-Tropsch synthesis and then upgrading through catalytic cracking. The products are super clean fuels, free of NOx and SOx. Besides being clean, it is also flexible to be directed into gasoline, diesel, jet-fuel, LPG, etc.

The third option is only for liquid waste or high water content waste. There are four stages of the process, start with a bio-digester to produce biogas, then converted into syngas through catalytic reforming, from syngas to liquid through Fischer-Tropsch Synthesis, and finally upgraded through catalytic cracking. The result is like option two, only the raw materials are different.