

CATCH the solar energy efficiently,
that is the **START** ...

Possible (within short) at “competing prices” :

- Via solar photovoltaic ... results in electricity
- Via solar power concentration ... results in heat
- Via windmills ... results in electricity
- Via hydro-energy ... results in electricity
- Via tidal-energy ... results in electricity
- Via heated environment ... results in heat

STORE THE ENERGY ...That is the REAL problem , the REAL answer !

- Affordable BATTERY system are important ...
- Clever GRID-SYSTEMS , loading individual batteries the moment abundant (cheap) electricity is available, are important ...
- Storage of "HEATH AND COLD" (in the earth for example) is important logically connected to cold-heat pumps ...
- Storage of "HYDRO ENERGY" in upper-lakes or earth reservoirs , is interesting ...
- Using NATURAL STORAGE of heath or cold can be used (cold seawater for air conditioning/cooling for example)
- BUT WE ARE FORGETTING THE MOST EASY ONE.....
STORAGE IN BIOMASS-PRODUCTION

THE LOGIC OF BIOMASS (or "young fossil") – 1 –

Not more than a few hundred years ago, biomass was the logical source of energy for humanity ... however fossils became

- So "easy"
- So "cheap"
- So "multifunctional"
- So "convenient" to propel the world's industrialisation

That without much further thought and without checking the other "easy" alternatives, humanity based its "future" on old fossils !

BUT: WE SHOULD REALISE THAT "OLD FOSSILS" ARE JUST "OLD BIOMASS RESERVES, WHICH CAPTURED SOLAR ENERGY (and CO₂) MILLIONS OF YEARS AGO ...WHEREAS "YOUNG FOSSILS" CAPTURED ENERGY AND CO₂ RECENTLY

THE LOGIC OF BIOMASS (or "young fossil") – 2 -

That apparent endless source of "old fossils" – energy (and feedstock), when used, however does release all that extra CO₂ (and energy)

SO:

FAR BETTER TO USE RECENT "YOUNG FOSSIL"
which in massive quantities catches solar energy
which in massive quantities binds CO₂ (a GROWTH GAS)
which in massive quantities "consumes" waste nutrients

which in massive quantities does not only provide GREEN ENERGY,
but at the same time:

GREEN FEEDSTOCK (for example for the chemical industry),

GREEN FOOD/FEED (the part used from some agro-crops),

GREEN FUEL

GREEN "FIRE" (warmth)

SO: indeed a total solution !!!!!!!!!!!!!!!!!!!!!!!

THE LOGIC OF BIOMASS (or "young fossil") -3-

Is it that easy ?????

YES, as there is more than sufficient biomass available

YES, as we can use the complete plant via BIOREFINERY

YES, because we can easily expand growth, and in doing so: BIND CO₂ (easy storage) // USE (waste cheap) NUTRIENTS and USE idle land !

YES, because in using biomass in that way, we may prevent biomass from just 'rotting away", forming methane-gas which is far more harmful to the world (24 times worse !), than CO₂ (although in less quantities in the atmosphere and with relatively short 1/2 time of 7 years)

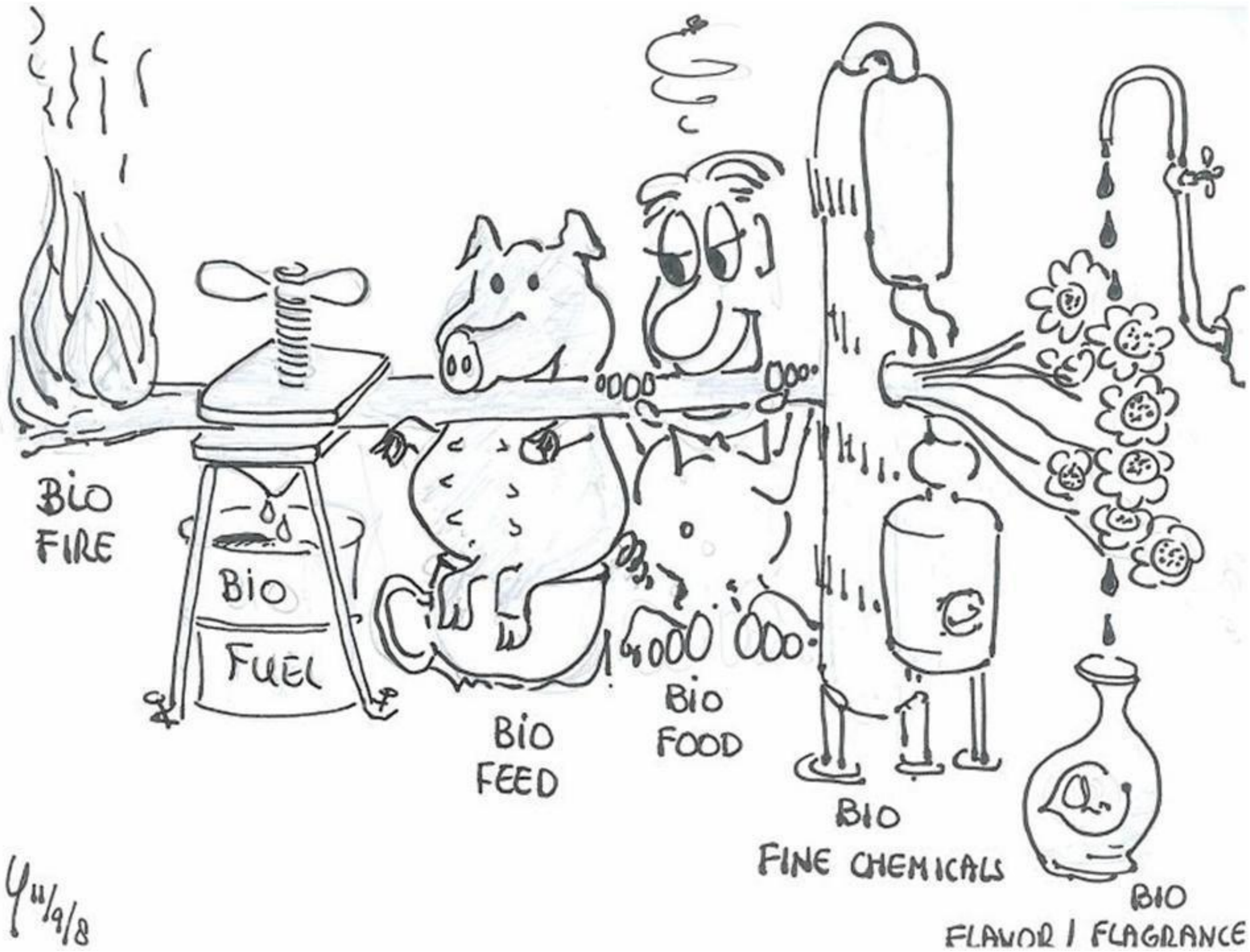
HOW MUCH BIOMASS IS AVAILABLE?

Today's biomass produces: (less than 1 % of agricultural land)	7 EJoules
Humanity consumes today:	500 EJoules
Available "residues" (today's waste):	100 EJoules
Energy crop on land can add:	100 EJoules
Algae on land (sweet water) can add:	100 EJoules
Algae in coastal sea strips can add:	150 EJoules
Algae in "sea deserts" ocean's can add:	6000 EJoules

So indeed, we will certainly look at MICRO + MACRO
ALGAE !!!

Conclusions: Bio refinery, the BRIDGE between Agriculture, Chemistry and CO₂ reduction

- Bio refinery increases the value of the individual biomass components
- Functionalized chemicals can be derived from biomass under economic conditions.
- Functionality in general can be obtained early in the chain without large energy inputs.
- Opportunities for small scale operations.



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AND WHAT DOES BIOREFINERY MEANS ??

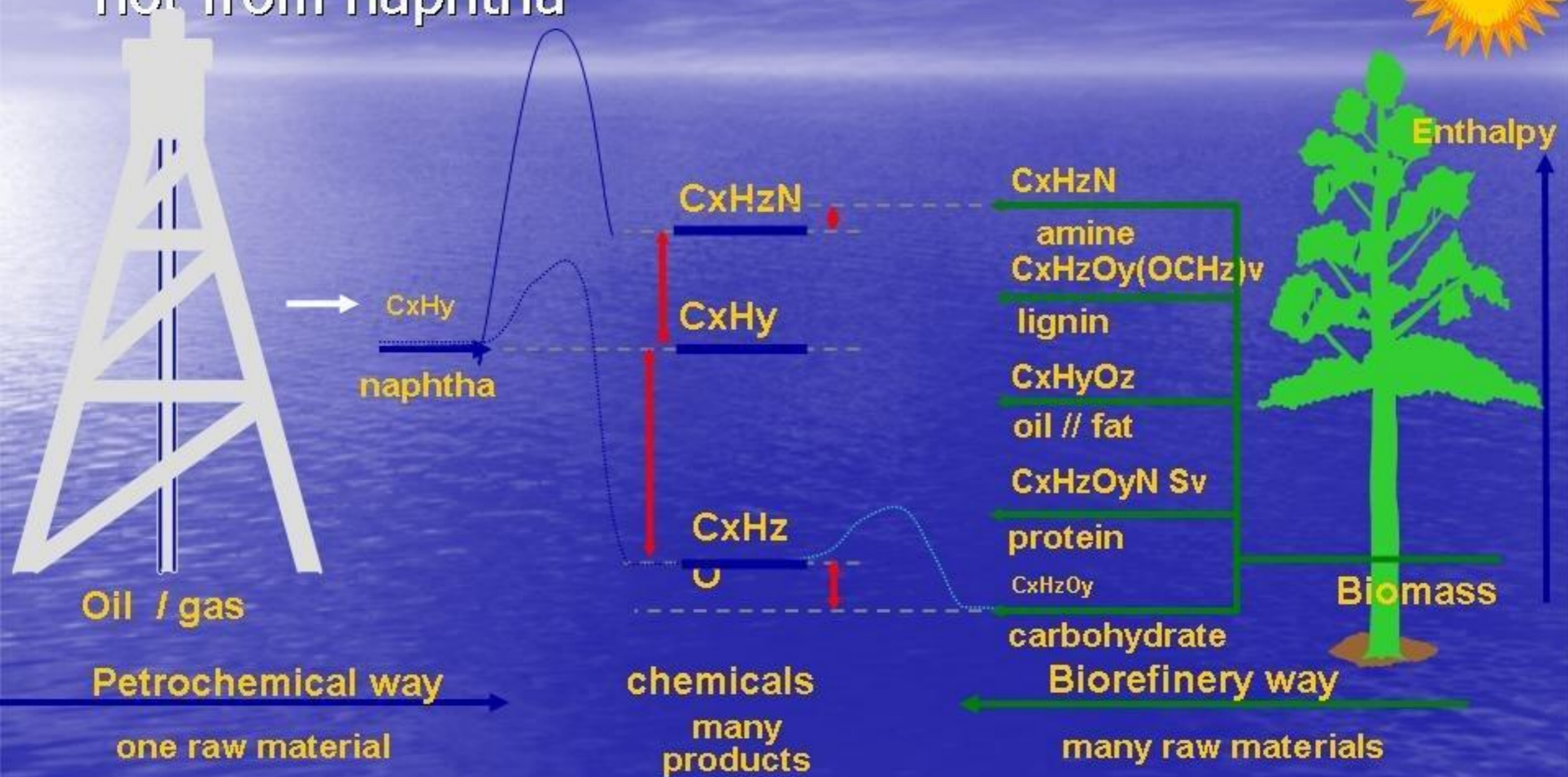
An answer which everybody familiar with refining "old fossils" can give:

TAKE THE BIOMASS APART IN FRACTIONS
USABLE FOR DIFFERENT APPLICATIONS LIKE:

- A fraction for Fine Chemicals
- A fraction for Food
- A fraction for Feed
- A fraction for Fuel (in this way, no "food VERSUS fuel" debates
- A fraction for Firing

This can already be done using the "traditional methods" (mechanical separation, extraction, distillation) or using the new biotech methodologies (fermentation, enzymatic katalysation, modifications)

Functionalised chemicals can be made from Biomass without major enthalpy differences, but not from naphtha



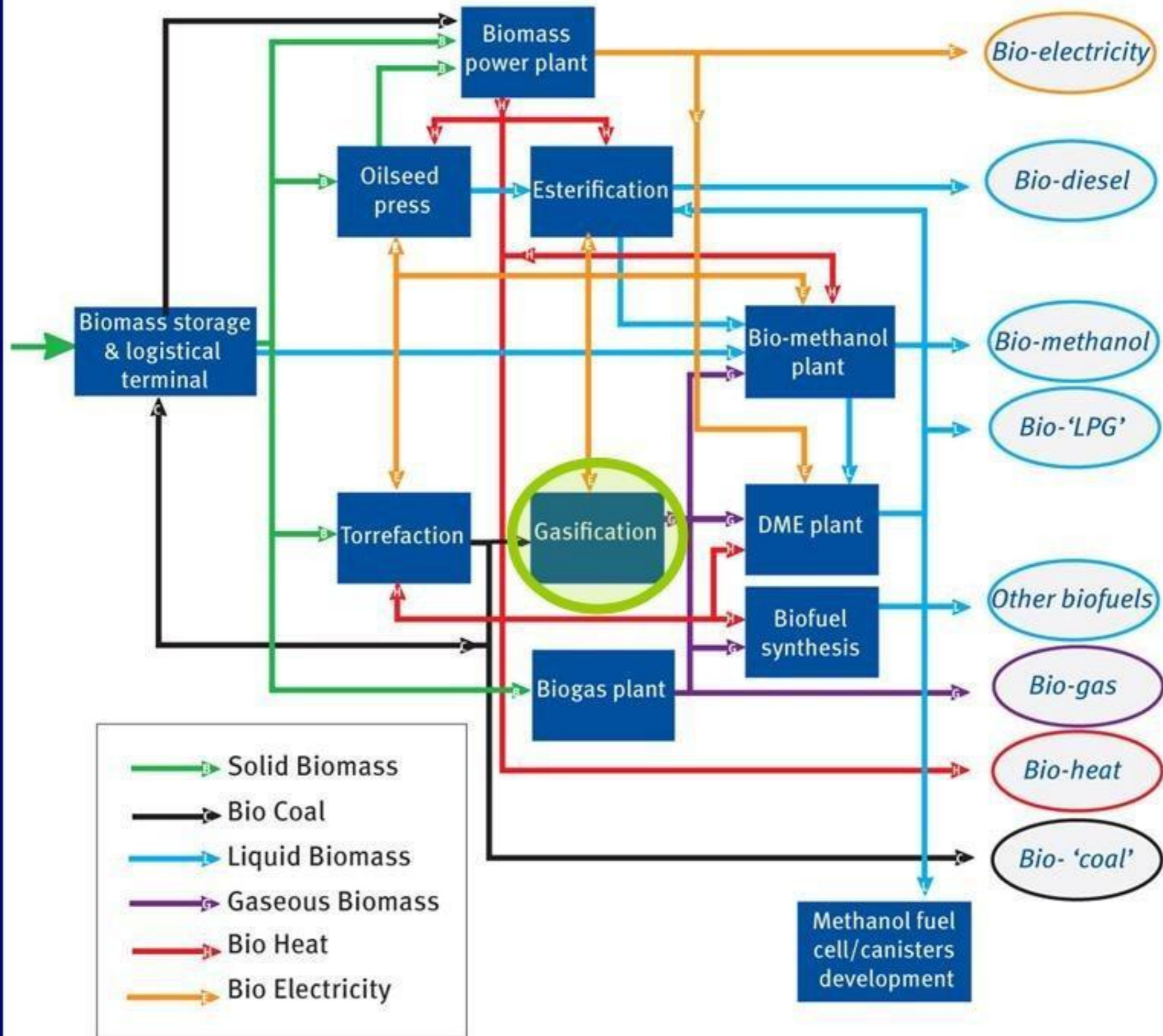
DuPont /Tate & Lyle BioProducts :1,3 Propanediol factory,
Loudon, USA



Bio-Methanol ... process and factory created already in 2007/2008
by Mr. Sieb Doorn and Mr. Paul Hamm (patented process)
Today in full production"on recognised SECOND GENERATION
biofuel (Name plate capacity 2 x 500.000 tons/year)

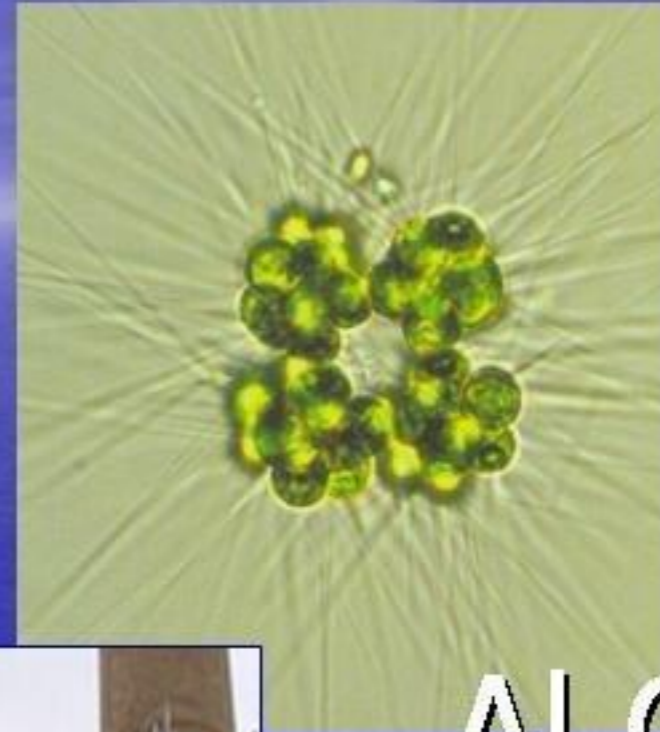
Bio MCN[®]





AND AGAIN , IT IS ALREADY THERE

- For Nutraceuticals
- For Food / Feed
- For Biodiesel & Biogas



Al G.

