BIOPALIVA
Česká technologická platforma

BIOECONOMY
PLATFORM
of the Czech Republic

OPOLE – POLAND – INTERREG

CZ.11.4.120/0.0/0.0/17_028/0001648

A look at the current situation in the energy sector and the possibilities for the development of eco-energy

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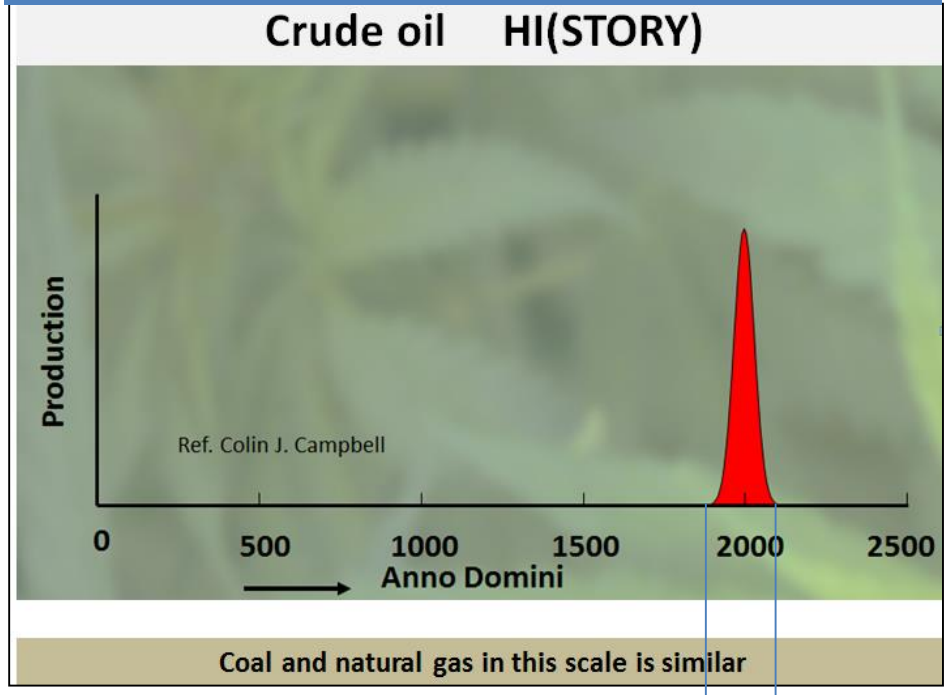
OGÓLNOPOLSKI · FESTIWAL · EKOENERGETYKI · EE

OPOLE
8-9 GRUDNIA 2021

Fossile – excellent energy source but … negative outlook:

1. FACTOR – long term availability



2. FACTOR – CO2 ALLOWANCES

EU ETS

European Union

Emissions Trading System

PENALTY for CO2 EMITENTS

EU ETS - XI 2021 - record level 70€/t !!!

Happy and comfortable life we live now

Lets come to talk about RES (Renewable Energy Sources) future

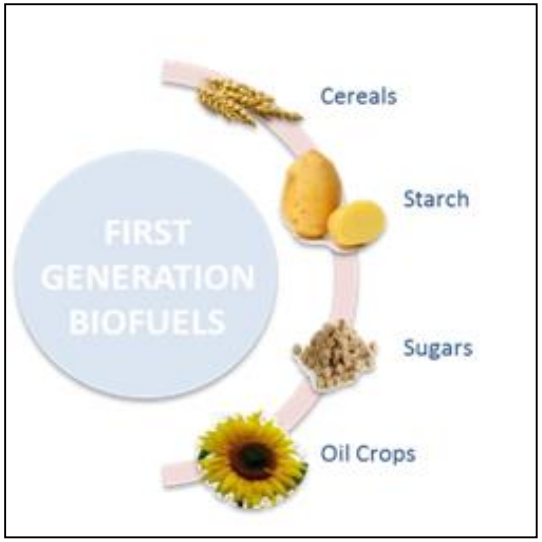
RES in the Czech Republic - feedstock for bioenergy analyse

Primarily for power generation	YES, PERSPECTIVE FOR ENERGY

4. Energy crops (arable land)
5. Short Rotation Coppice - poplar, willows, miscanthus,…
6. Forest Residues, thinning … (bark beetle)
7. Animal waste (manure, grease)
8. Plant waste (agricultural residues, straw, husks,...)
9. Waste from food production (molasses, meal,...)

Primarily for food-feed (proteins) + cosmetics + medicine	NO FOR ENERGY
Primary use within the paper production cycle	NO FOR ENERGY
Primarily for heat production	ONLY HEAT
Available resources for biofuels	YES, PERSPECTIVE FOR ENERGY & BIOFUELS

BIOFUELS (R)EVOLUTION
B1G – Biofuels first Generation



DIESEL FUEL: FAME - Fatty Acid Methyl Ester
feedstock - oil plants (rape seed…)

PETROL FUEL: EtOH – Ethanol
feedstock - sugar/starch plants (sugar beet, sweet corn,…)

Agriculture production
Proved technology
FAME, EtOH

A lot of conflicts

B1G BARIERS & CONFLICTS

BIOMASS FEEDSTOCK – **B1G** – a lot of conflicts:

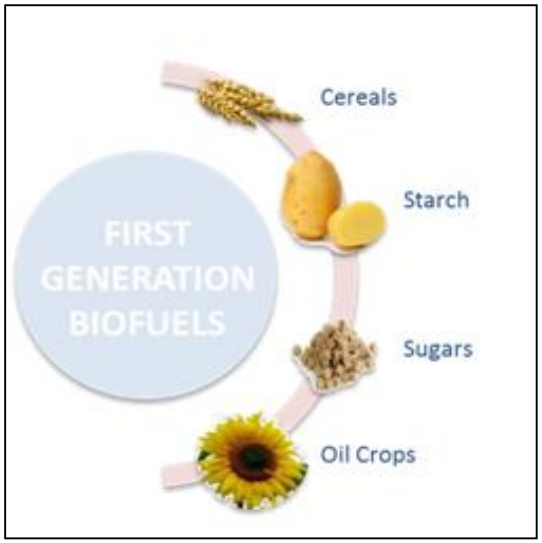
LCA	Life-Cycle Assessment
iLUC	Indirect land use changes
GLADA	Land Degradation
EIA	Environmental Impact Assessment
SIA	Social Impact Assessment
SEIA	Socio-Economic Impact Assessment

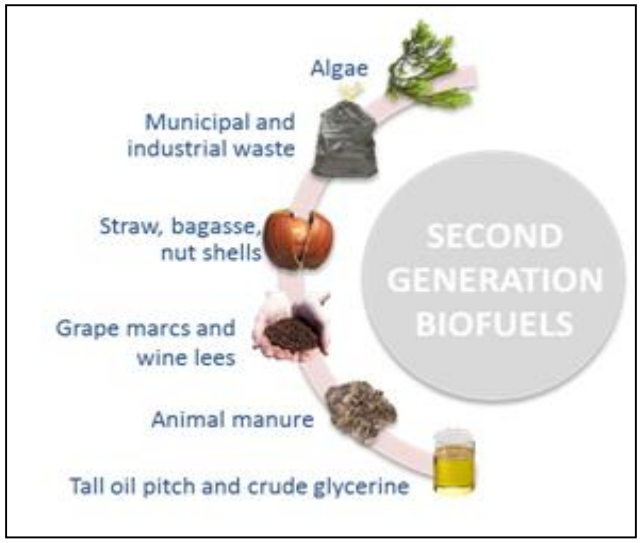
Well–known conflict

An undefined but scary factor

EU reaction 2018 – RED II
FEEDSTOCK DEFINITION = WASTE

BIOFUELS (R)EVOLUTION
B2G – Biofuels second Generation





DIESEL FUEL:
FAME
UCO –Used cooked oil

PETROL FUEL: EtOH

Feedstock: RED II annex IX

Agriculture production
Proved technology

Residues, waste..
Proved technology

Conflicts

Food –Feed -Fuels
BIODIVERSITY

However, conflicts remain

SOC, Feedstock availability
New - BIO-BASED INDUSTRY

B2G BARIERS & CONFLICTS

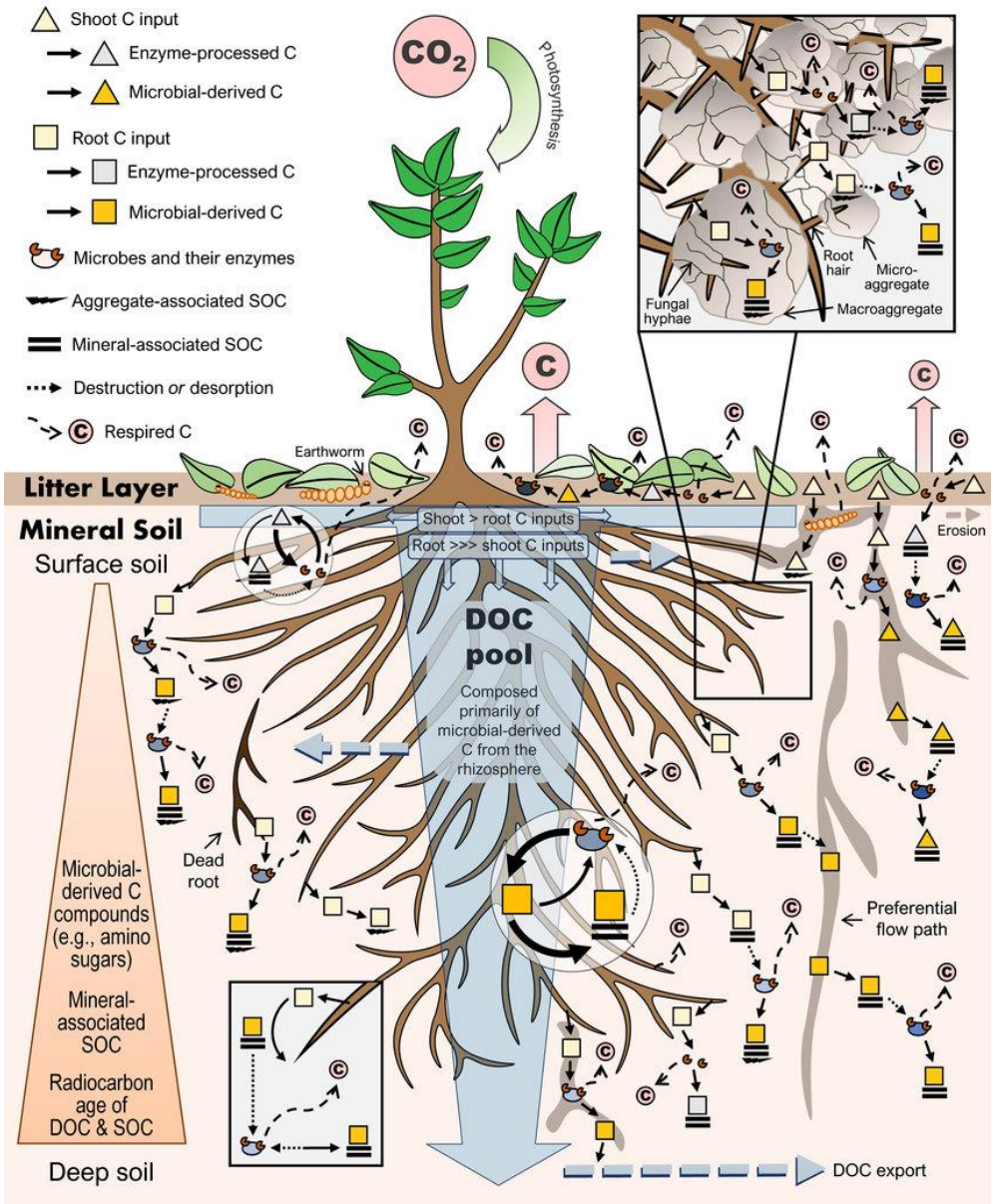
BIOMASS FEEDSTOCK – **B2G** –conflicts remain:

More or less
barriers from B1G has been solved
but……
new barriers occurs:

1.Long-term conflict of soil organic carbon loss Carbon loss

2. Much more efficient use of biomass exist

1. FUNDAMENTAL BARRIER – SOC – SOIL ORGANIC CARBON LOSS



Litter layer = organic residues is very important to **transmit organic carbon into soil.**

CZECH Ministry of Agriculture CERTIFIED METHODOLOGY RESULT:

Available straw volume for bioenergy is marginal !!!

Straw - plow, tillage

https://www.researchgate.net/figure/Proposed-model-for-soil-organic-carbon-SOC-cycling-showing-root-carbon-C-inputs-as_fig1_332318874

BIOMASS FEEDSTOCK – **B2G** –conflicts remain:

More or less
barriers from B1G has been solved
but……
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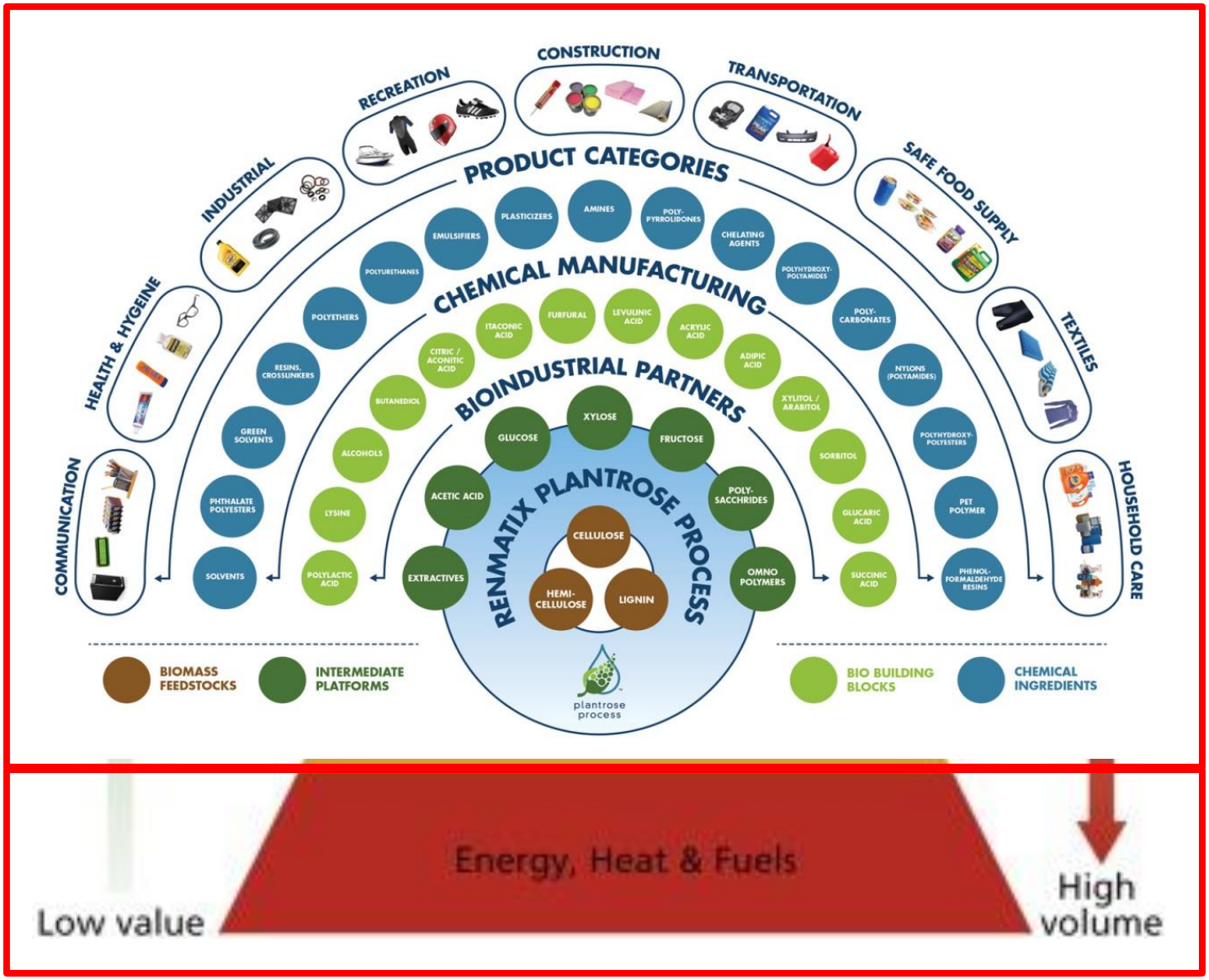
1.Long-term conflict of soil organic carbon loss

2. Much more efficient use of biomass exist

Biomass value

2. FUNDAMENTAL BARRIER for biomass BIO-BASED INDUSTRY

BIOMASS VALUE PYRAMIDE



Energy demand – low price + big volume

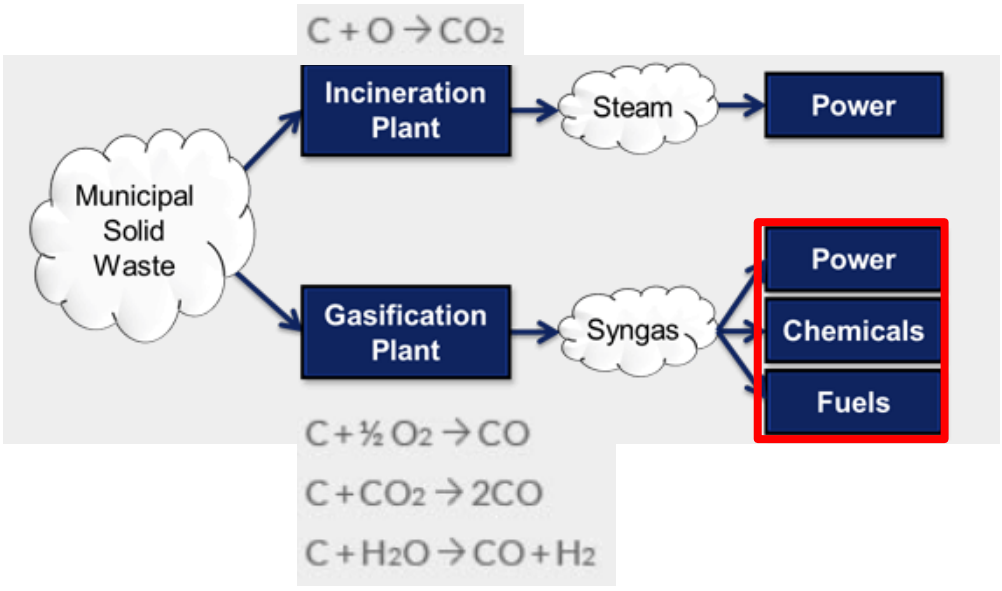
RES in the Czech Republic - feedstock for bioenergy analyse

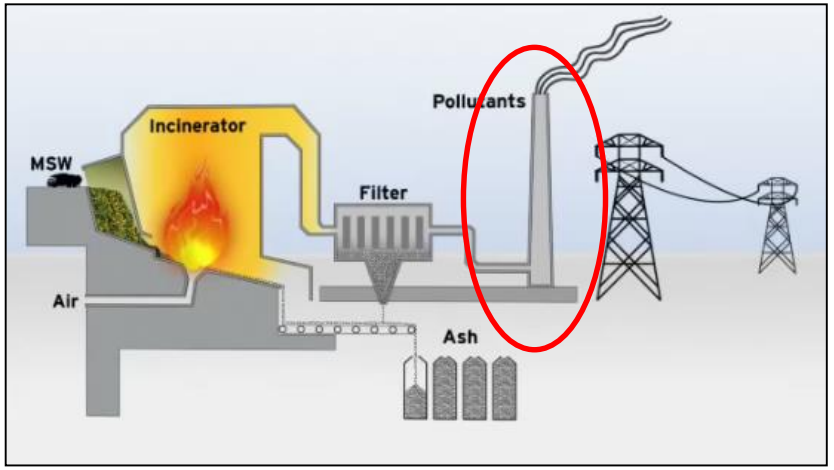
Primarily for power generation	YES PERSPECTIVE FOR ENERGY
Only a mix of biomass and in a limited volume	VERY LIMITED VOLUME
Primarily for food-feed (proteins) + cosmetics + medicine	NO FOR ENERGY
Primary use within the paper production cycle	NO FOR ENERGY
Primarily for heat production	ONLY HEAT
Available resources for biofuels	YES PERSPECTIVE FOR ENERGY & BIOFUELS

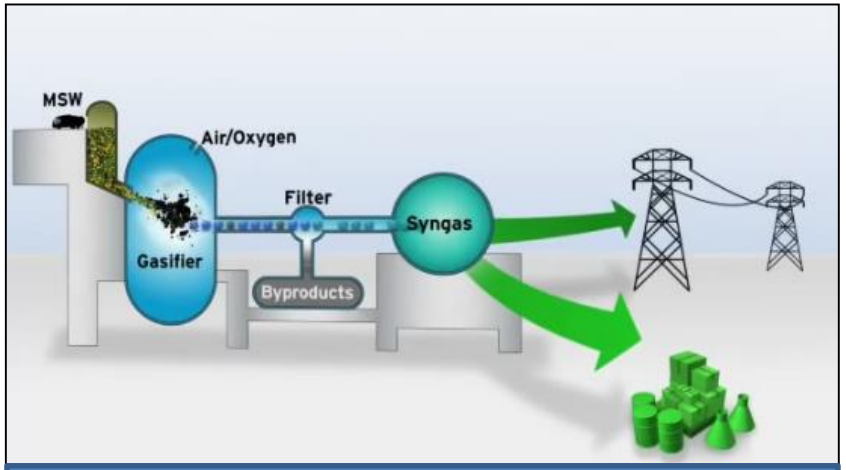
Municipal solid waste

The end of landfiling 2030

Sewage sludge
Biomass mix
Municipal solid waste







No chimney – minimum emission

RES in the Czech Republic - feedstock for bioenergy analyse

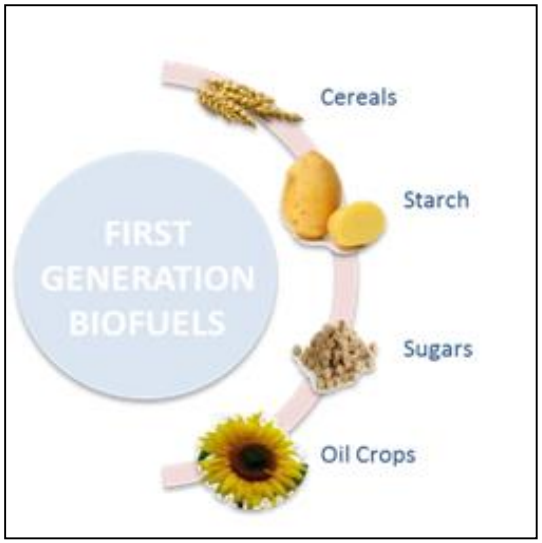
1. Sun Energy
2. Wind Energy
3. Hydro Power Energy

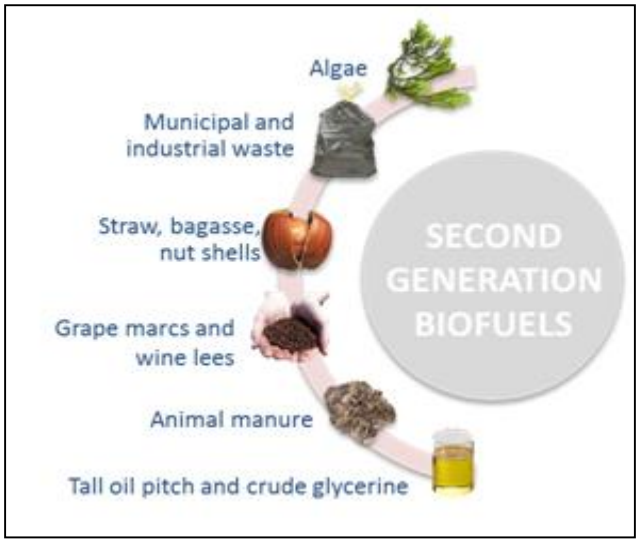
the primary energy sources

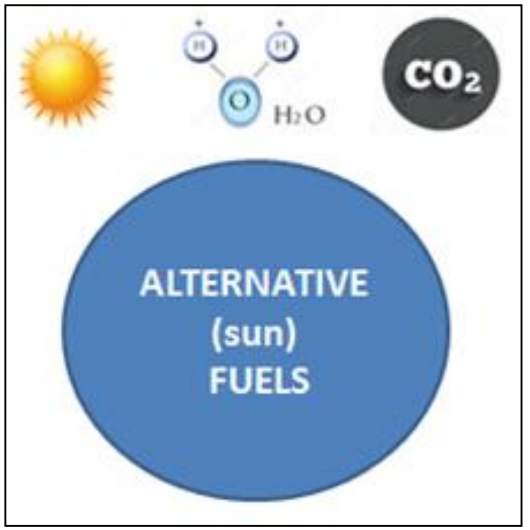
4. Energy crops (arable land)
5. Short Rotation Coppice - poplar, willows, miscanthus,…
6. Forest Residues, thinning … (bark beetle)
7. Animal waste (manure, grease)
8. Plant waste (agricultural residues, straw, husks,...)
9. Waste from food production (molasses, meal,...)
10. Algae, microalgae, cyanobacteria
11. Waste from the paper industry (liquers)
12. Underground thermal energy
13. MSW - sorted municipal solid waste or plastic waste
14. WWTP – Waste water treatment plants – (sewage sludge, sediments)
15. $CO_2 + H_2O$

$CO_2 + H_2O$

Biofuels & ENERGY feedstock road > 2020







No feedstock available

Strong Conflict :
Food-Feed-Fuel

Sewage sludge
Biomass mix
Municipal solid waste

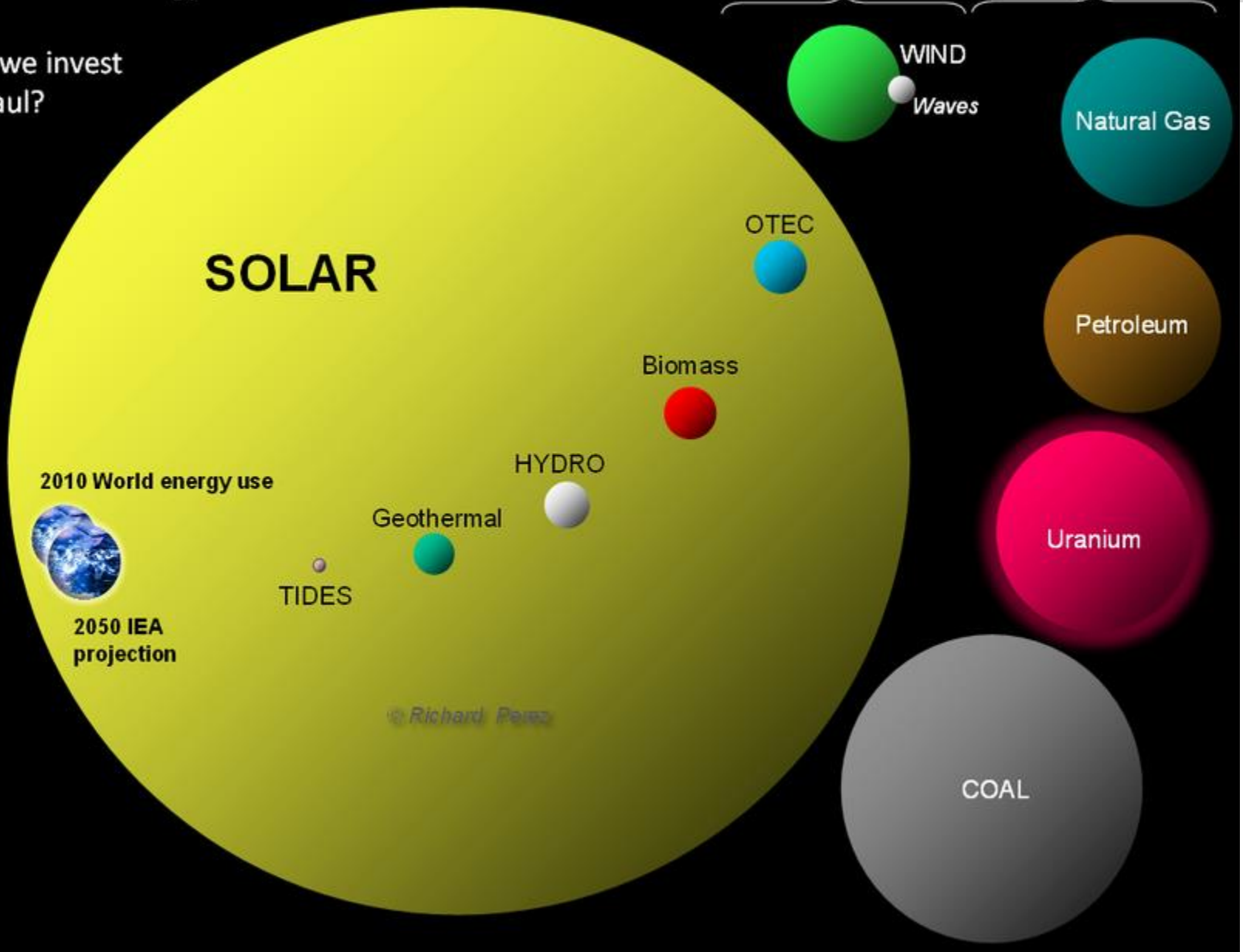
Conflicts:
Biodiversity, iLUC, LCA

SUN + CO_2 + H_2O

No conflicts
Unlimited sources

Comparing the world's energy resources*:

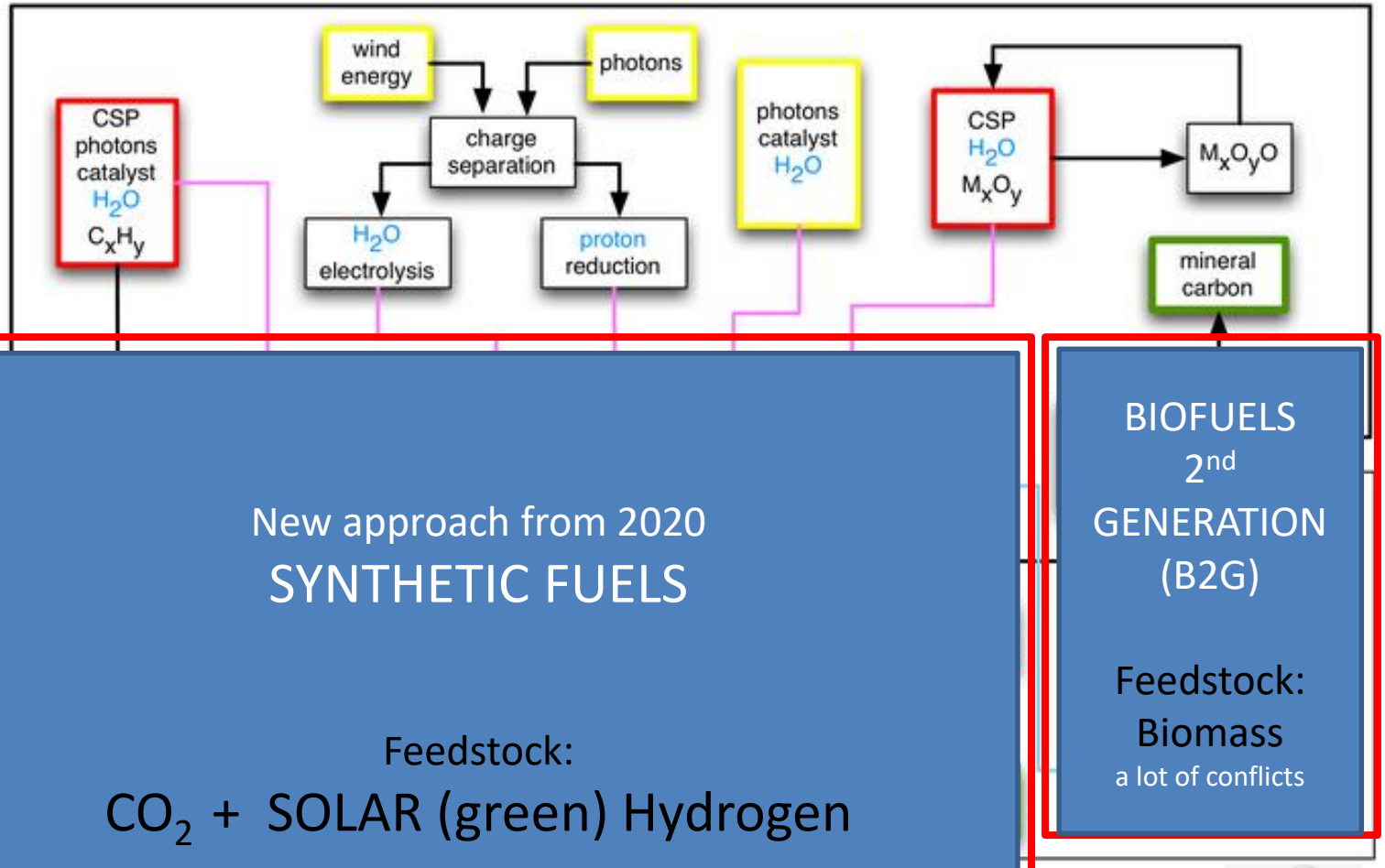
Where should we invest
For the long haul?



Yearly potential is shown for the renewable resources. Total "use it lose it" reserve is shown for the finite fossil and nuclear resources. World energy use is annual

More energy from the Sun hits the Earth in one hour than humans use in an entire year.
http://nsl.caltech.edu/home/solar-fuels/

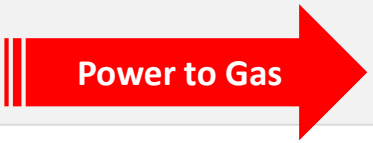
SOLAR DRIVEN CHEMISTRY



Prospective areas - GREEN DEAL (not only biofuels)

SECTOR COUPLING

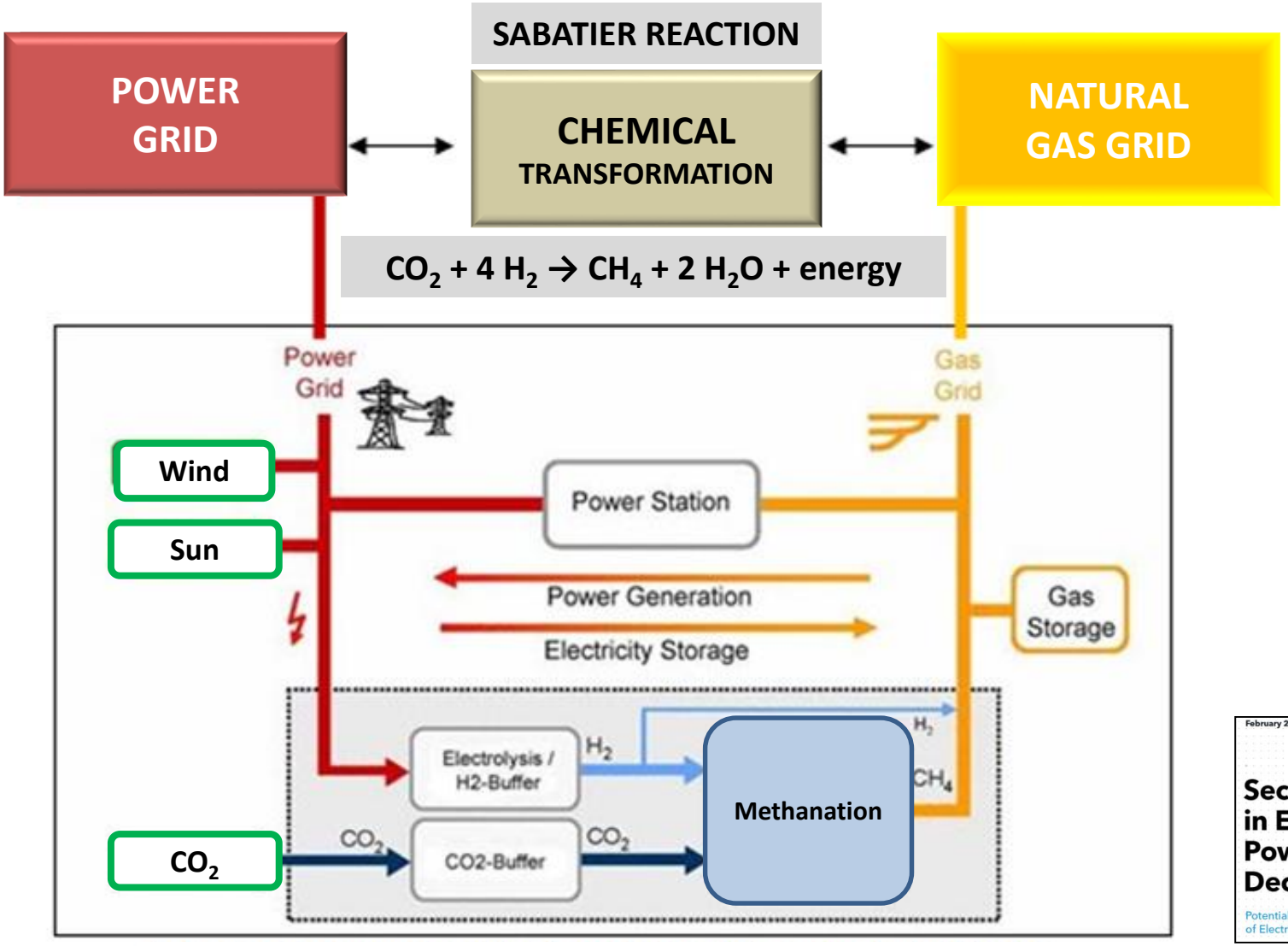
Power to Gas



POWER to X

Generally

SECTOR COUPLING – sektorové provázání



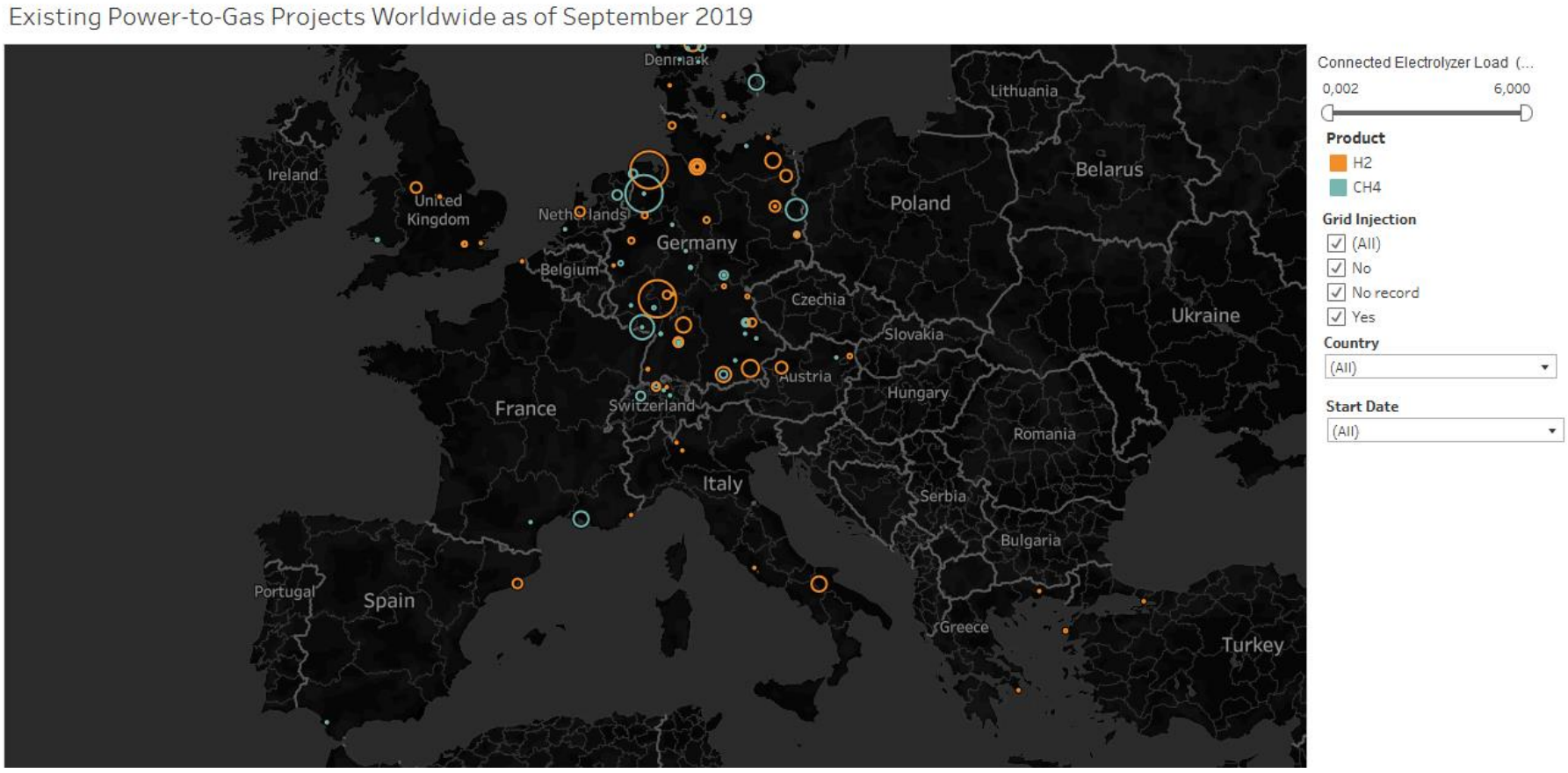
February 2020

Sector Coupling in Europe: Powering Decarbonization

Potential and Policy Implications of Electrifying the Economy

P2Gas - versatile, cross-sector technology
supports the integration of RES volatility into a stable energy system

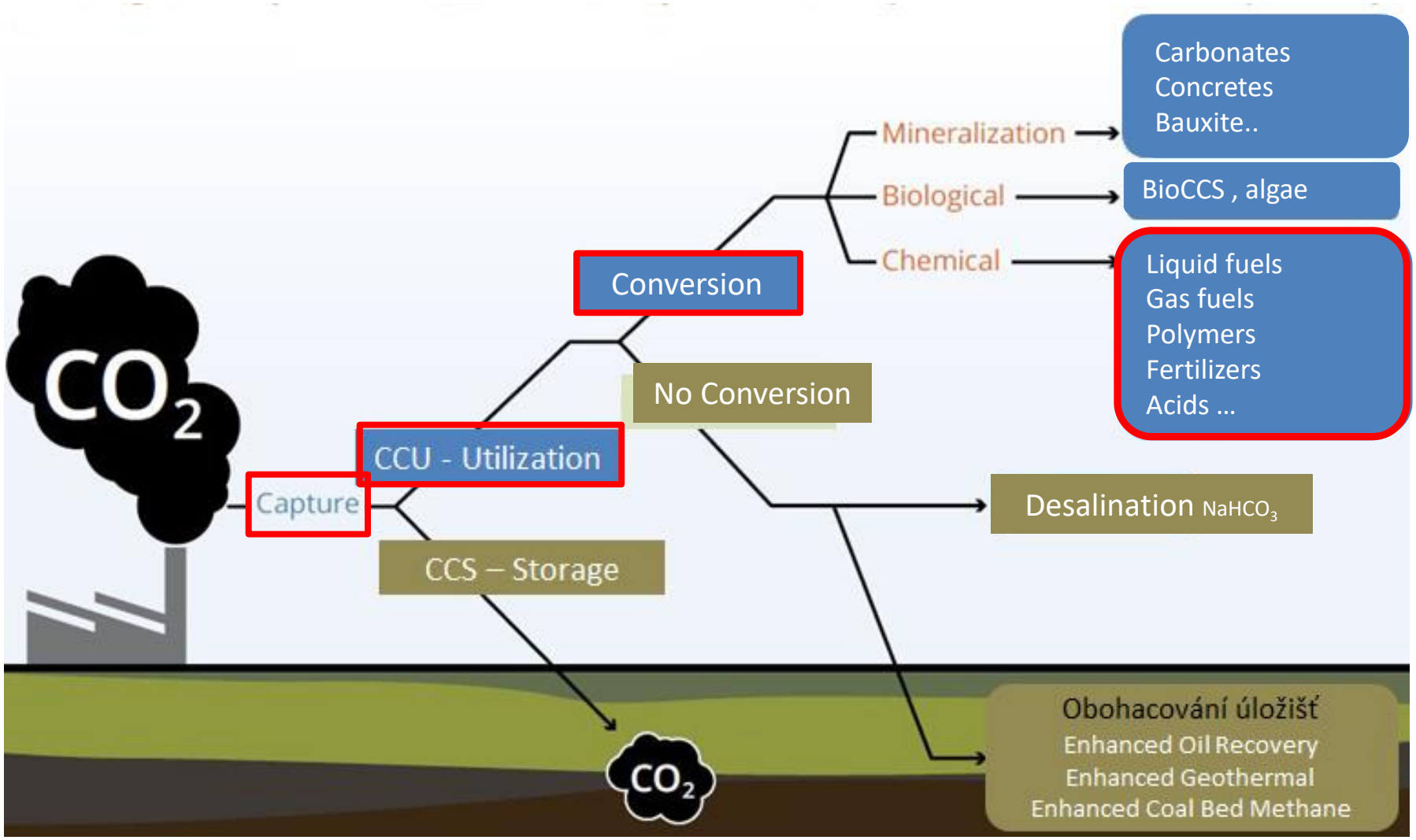
POWER TO GAS (hydrogen, methane)



We would like to initiate the first demonstration facility in this area in Czech Republic

https://public.tableau.com/views/AReviewofPower-to-GasProjectsToDate/Dashboard2?:display_count=y&publish=yes&:origin=viz_share_link&:showVizHome=no

CO_2 from industry pathways and our prior interest



We have established an expert association in this area: **CO2 Czech Solution Group**

Prospective areas - GREEN DEAL (not only biofuels)

SECTOR COUPLING

Power to Gas

POWER to X

Generally

GERMANY INSPIRATION

KOPERNIKUS P2X PROJEKTE
Die Zukunft unserer Energie

Runtime: 09/2019-08/2022

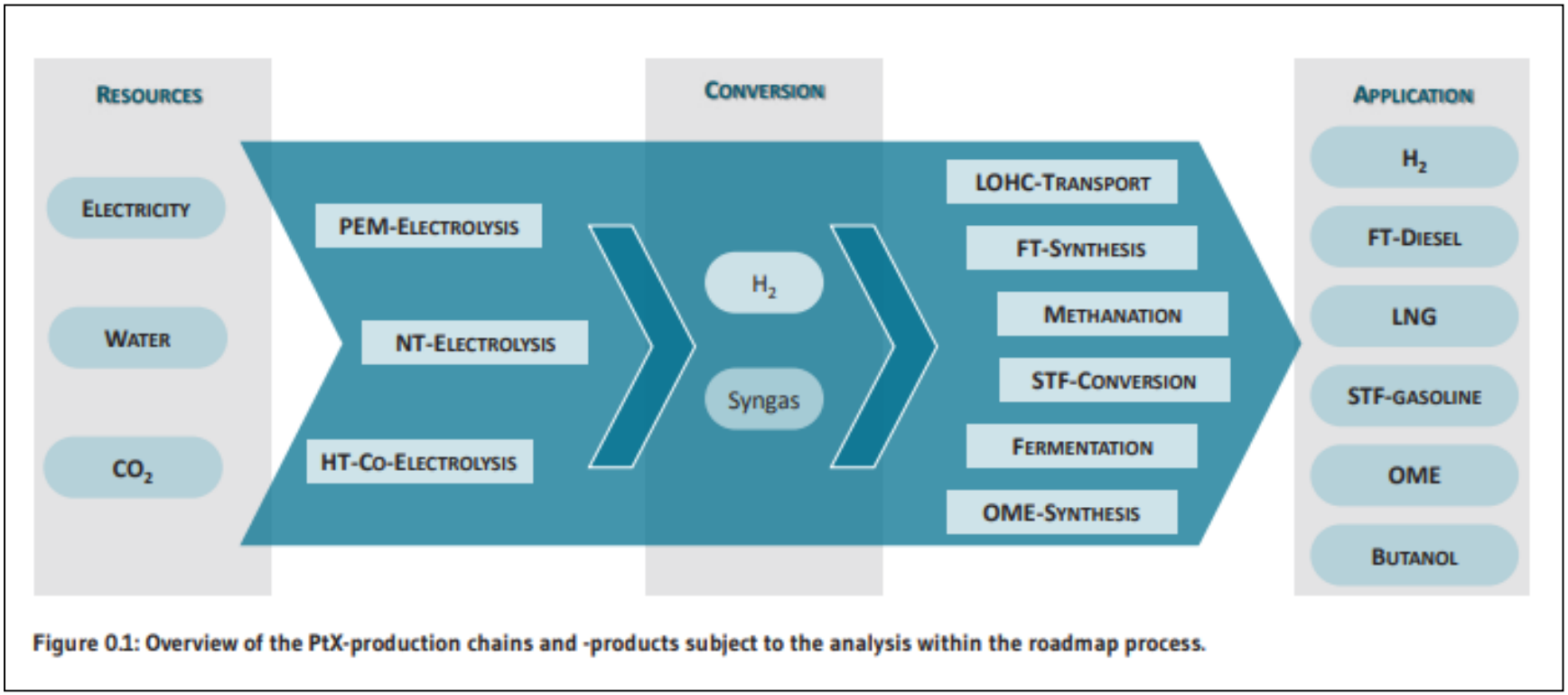


Figure 0.1: Overview of the PtX-production chains and -products subject to the analysis within the roadmap process.

NT ELECTROLYSIS – newtec salt water electorlysis
HT CO ELECTROLYSIS - high temperature SOEC
LOHC – Liquid organic hydrogen carriers (Toluene/methylcyclohexane, N-ethyl carbazole, **Dibenzyltoluene**…)
STF – Syngas to Fuel
OME SYNTHESIS - Polyoxymethylene dimethyl ethers

NT - https://www.newtec-berlin.de/en/electrolysis-disinfection

LOHC - https://www.youtube.com/watch?v=DW8UN-H_YwU

Power-to-X_Roadmap_2.0.pdf (kopernikus-projekte.de)

Fundamental for GREEN ENERGY FUTURE

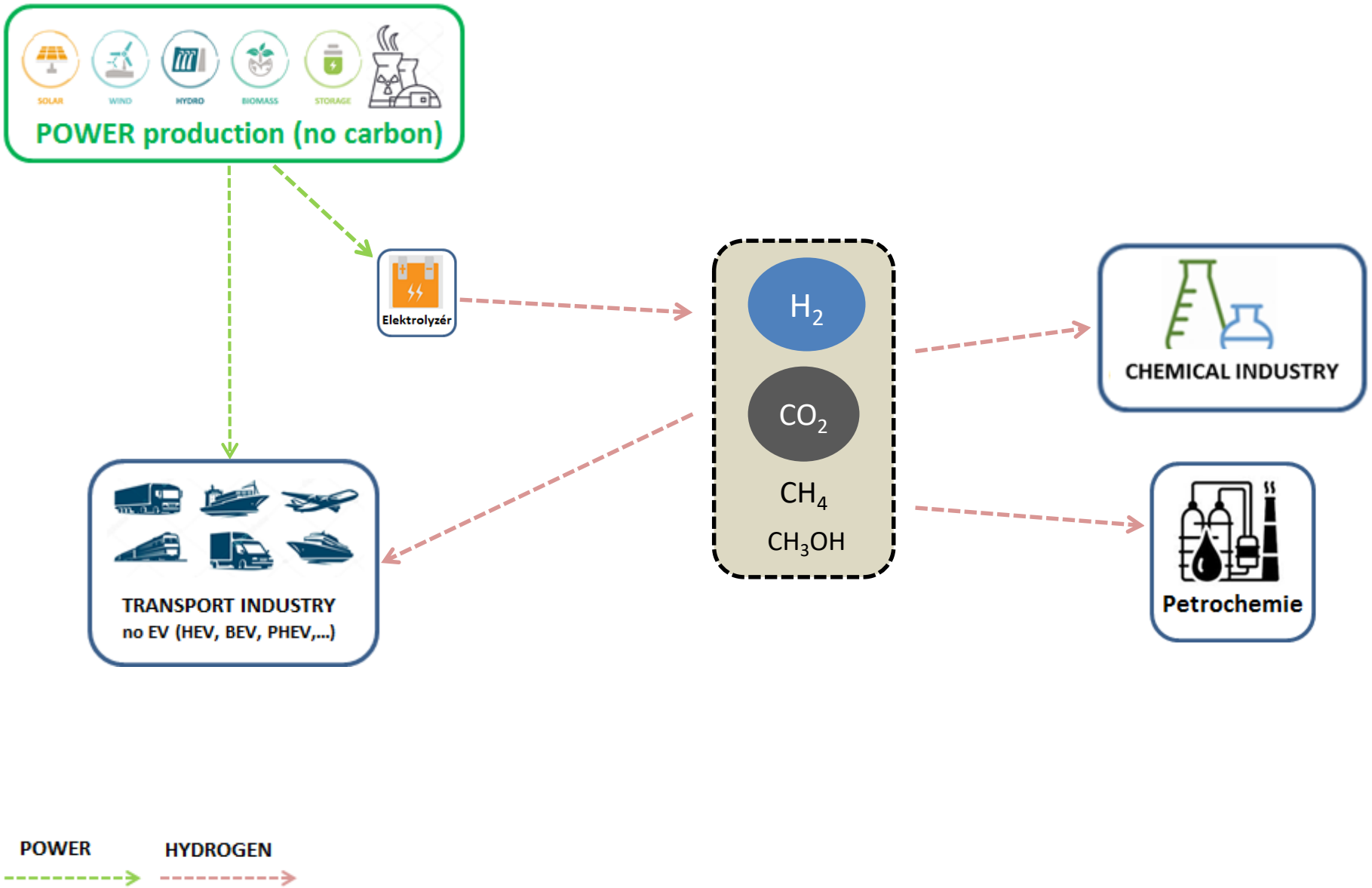
1. NO CARBON POWER

2. H_2O - GREEN HYDROGEN

3. CO_2 From industry or directly from the air

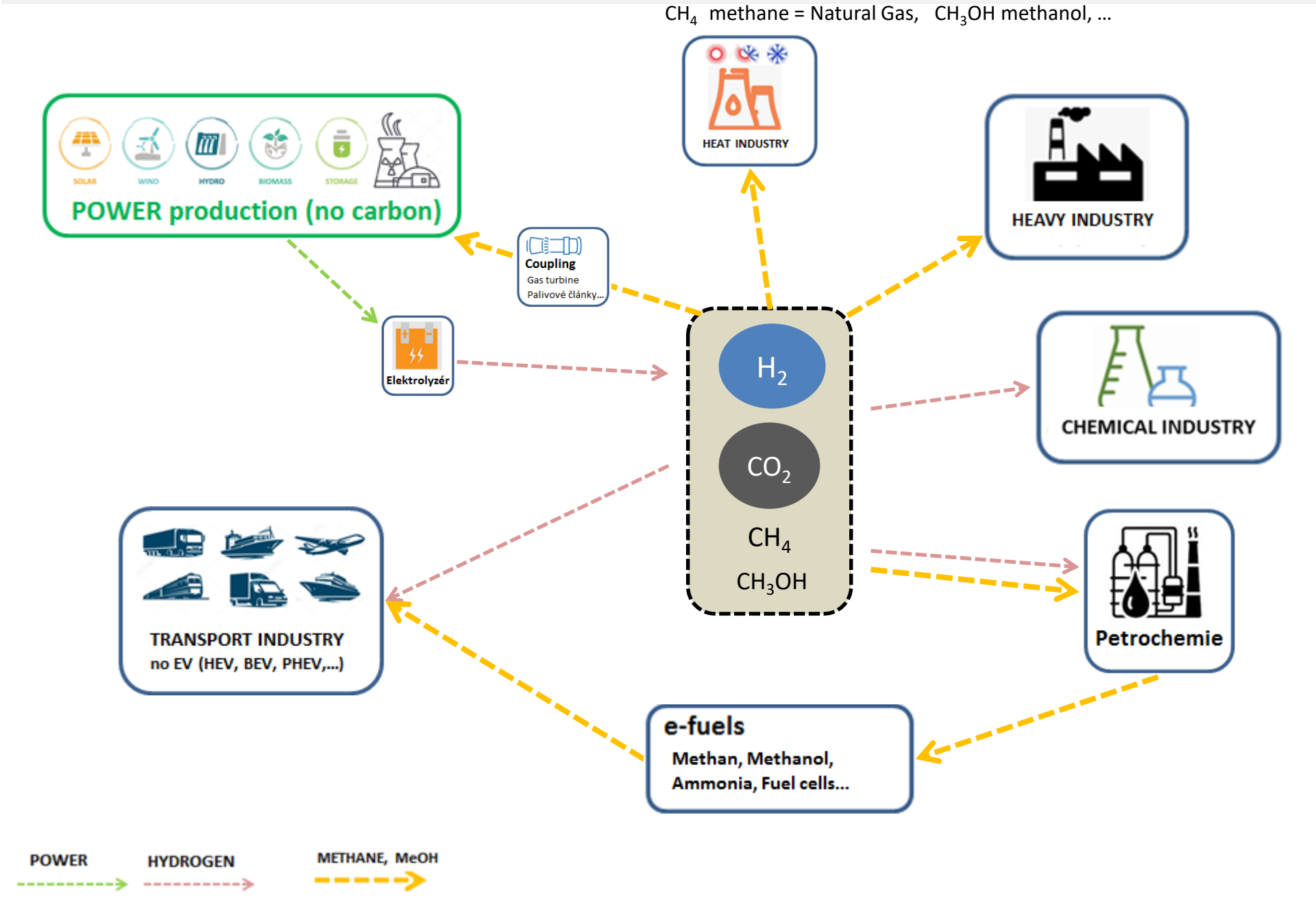
GREEN POWER to CHEMICAL INDUSTRY and MOBILITY

CH_4 methane = Natural Gas, CH_3OH methanol, …

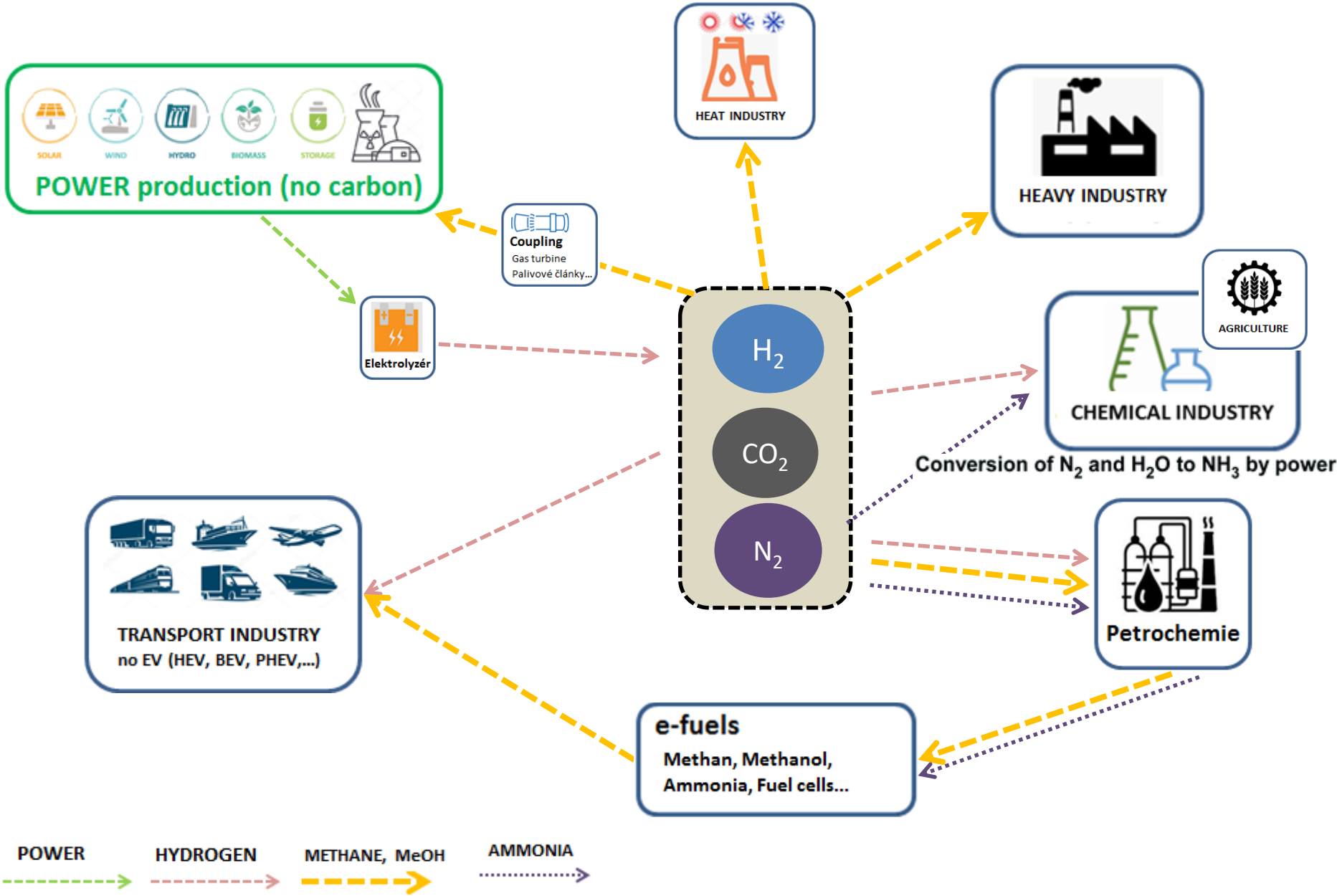


POWER to X

BROADER RANGE OF APPLICATION



POWER to X AMMONIA PERSPECTIVE



BIOFUELS
Czech Technology Platform

BIOECONOMY
PLATFORM
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Thank you for your attention
Looking forward CZECH & POLAND cooperation

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