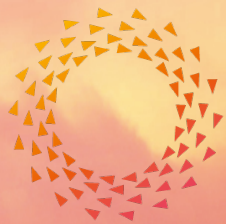


100% RENEWABLE ENERGY AND STORAGES

Pasi Vainikka

Principal scientist, VTT

Docent, LUT



**NEO
CARBON
ENERGY**

VAASA WIND EXCHANGE & SOLAR

21.03.2018

Social and economic transformations in human history are facilitated by new **energy** sources **and** means of **communication**



100 000–10 000 **HUNTER-GATHERER SOCIETIES**

Energy: Domestication of fire, cooked meat - increase in brain size.
Communication: Spoken language
Society: Organised tribes



10 000–1700 **THE AGRICULTURAL SOCIETIES**

Energy: Domestication of plants and animals
Communication: Written language
Society: Chiefdoms, kingdoms, city-states, empires, early nation-states



1700–2000 **THE INDUSTRIAL SOCIETIES**

Energy: Fossil fuels, steam engine, combustion engine, electricity, nuclear
Communication: Printed texts, radio ' and television, mass media, internet
Society: Democracy, the welfare state, information society, globalisation



2000– **A FOURTH INDUSTRIAL REVOLUTION? A GLOBAL BRAIN?**

Energy: Renewables, smart grids
Communication: "Internet of everything", artificial intelligence
Society: Peer-to-peer society of networked citizens, automation of both material and immaterial production

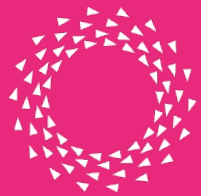


<http://bit.ly/2Attgu6>



/ DISRUPTION

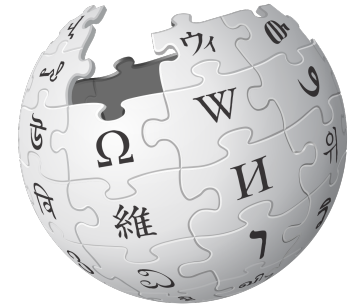
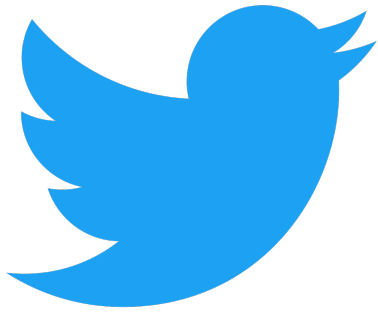
/ INFORMATION AND COMMUNICATION (ICT)



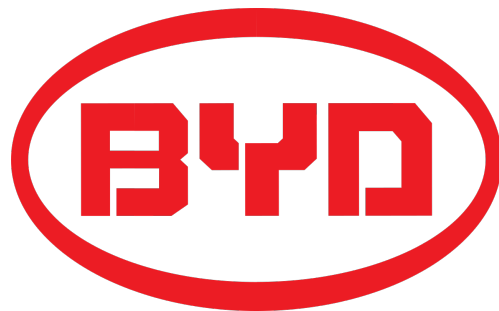
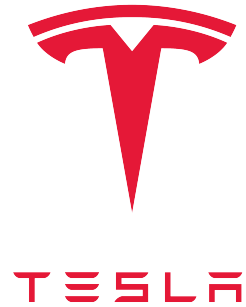
NEO
CARBON
ENERGY



NEO
CARBON
ENERGY



Google



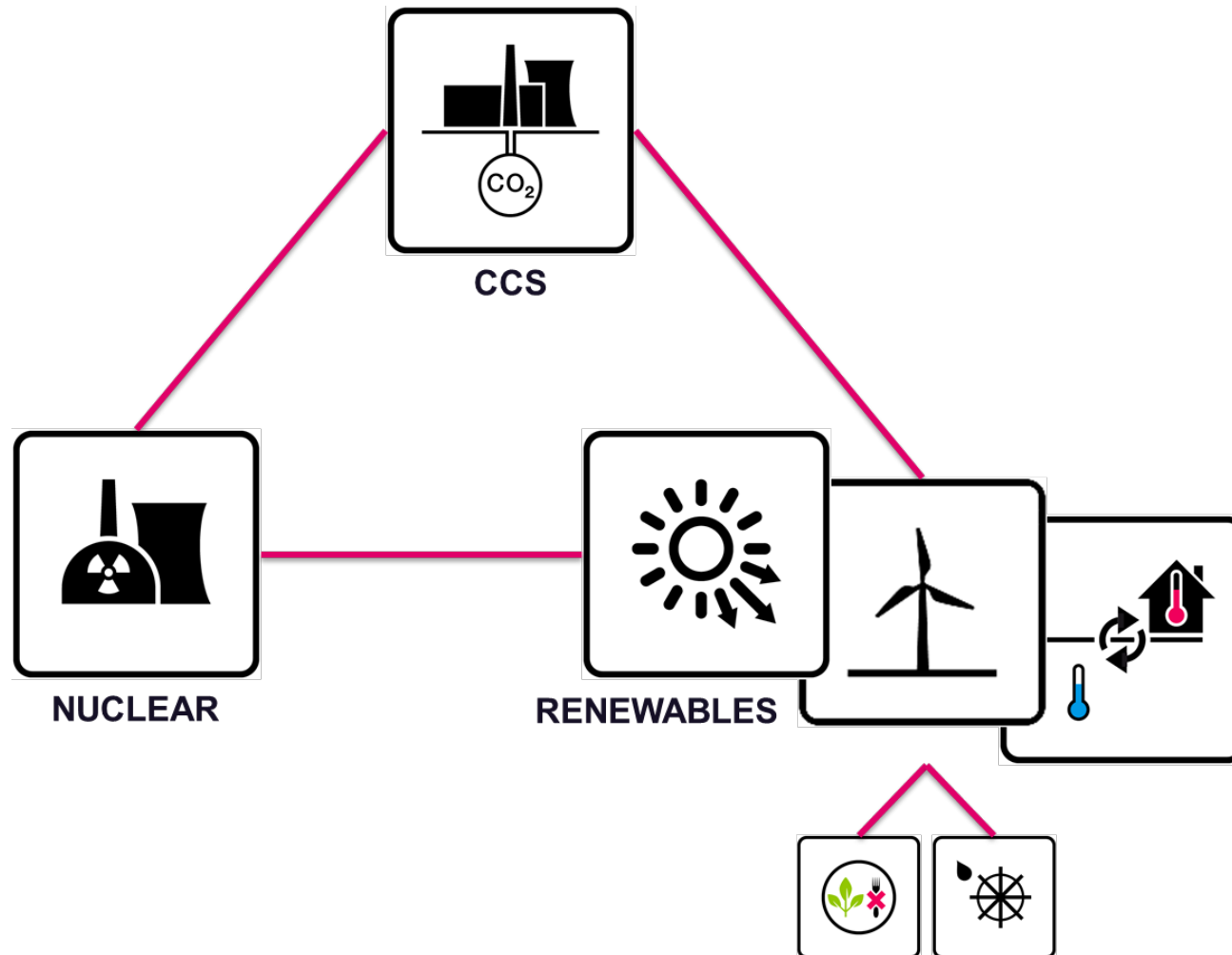
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ENERGY

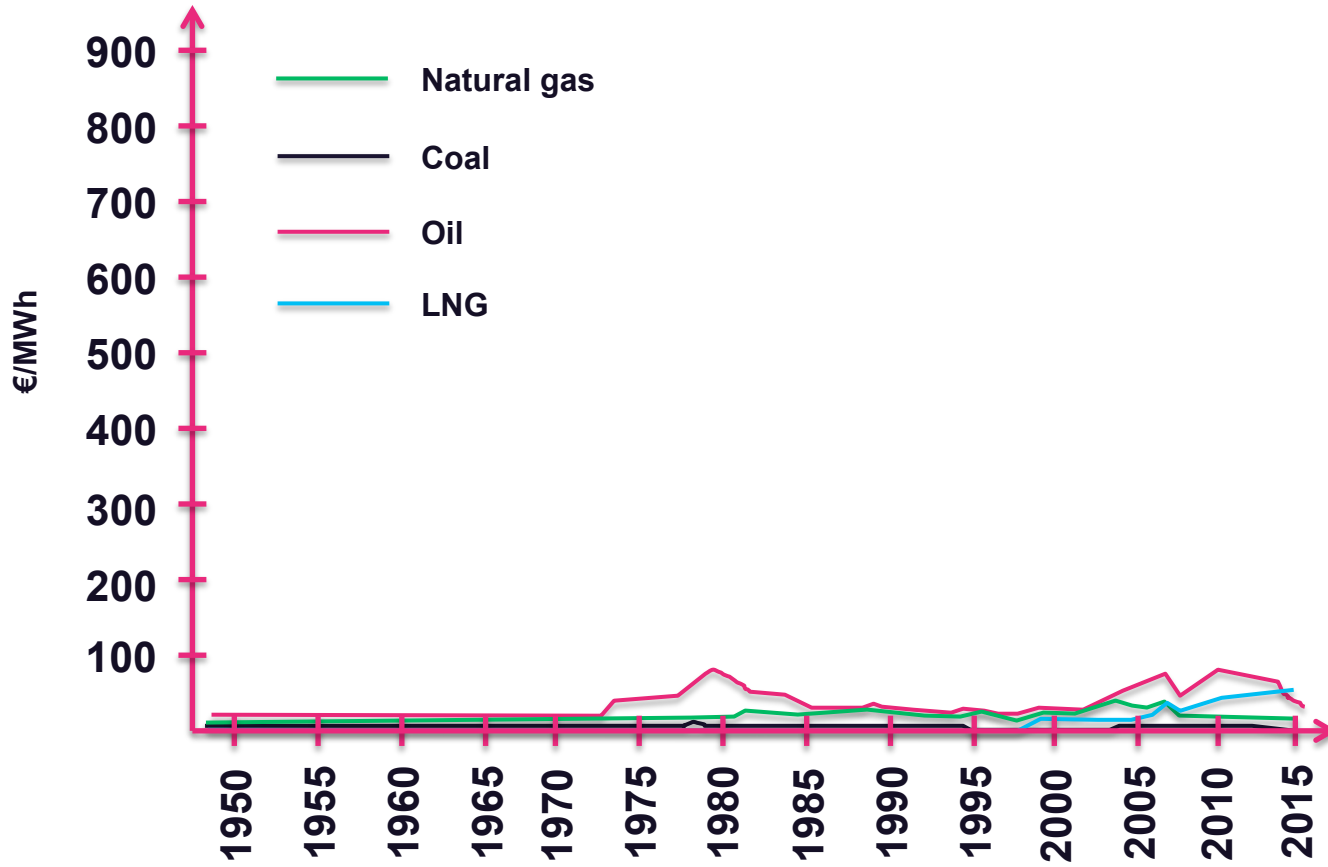


/ ENERGY TECHNOLOGIES

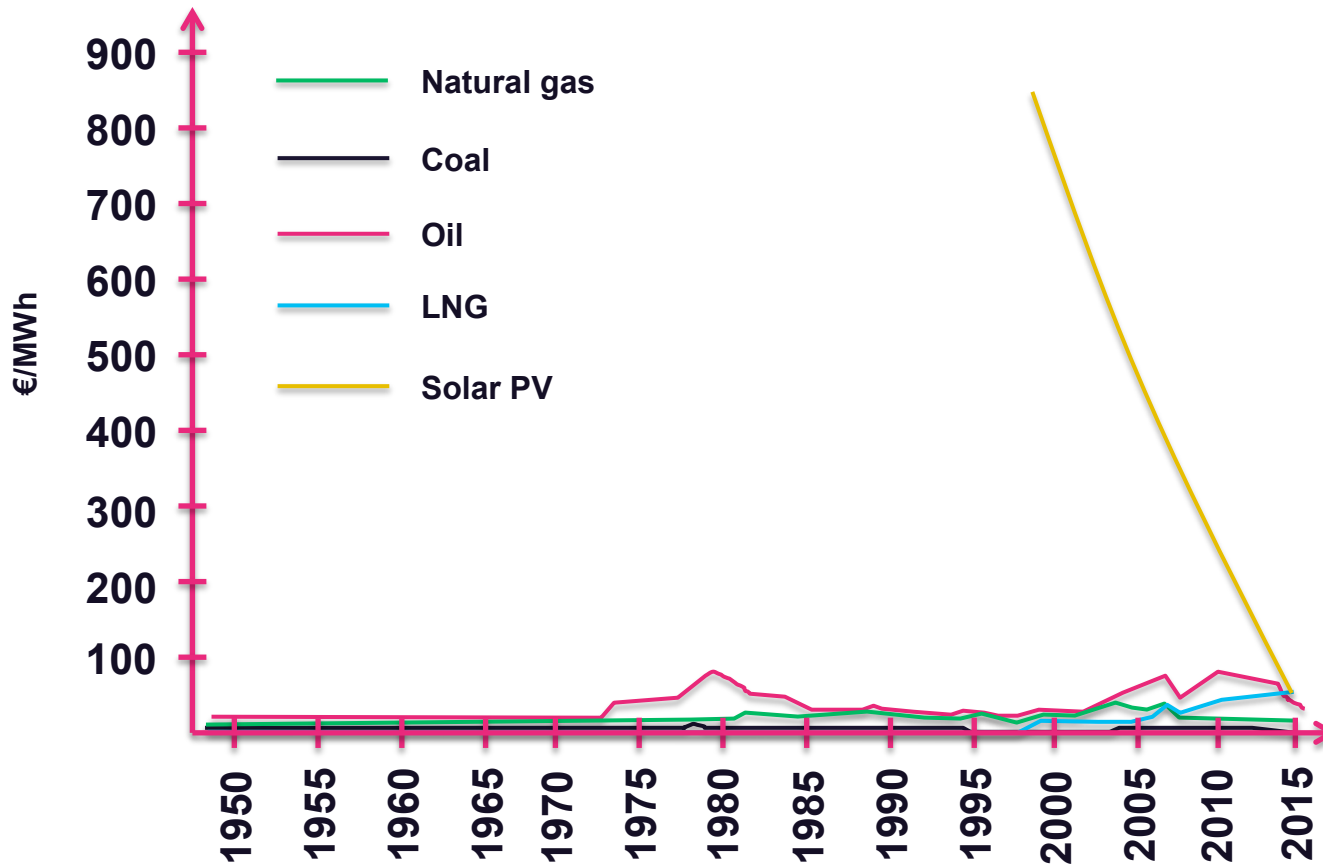


Electricity is the new primary energy

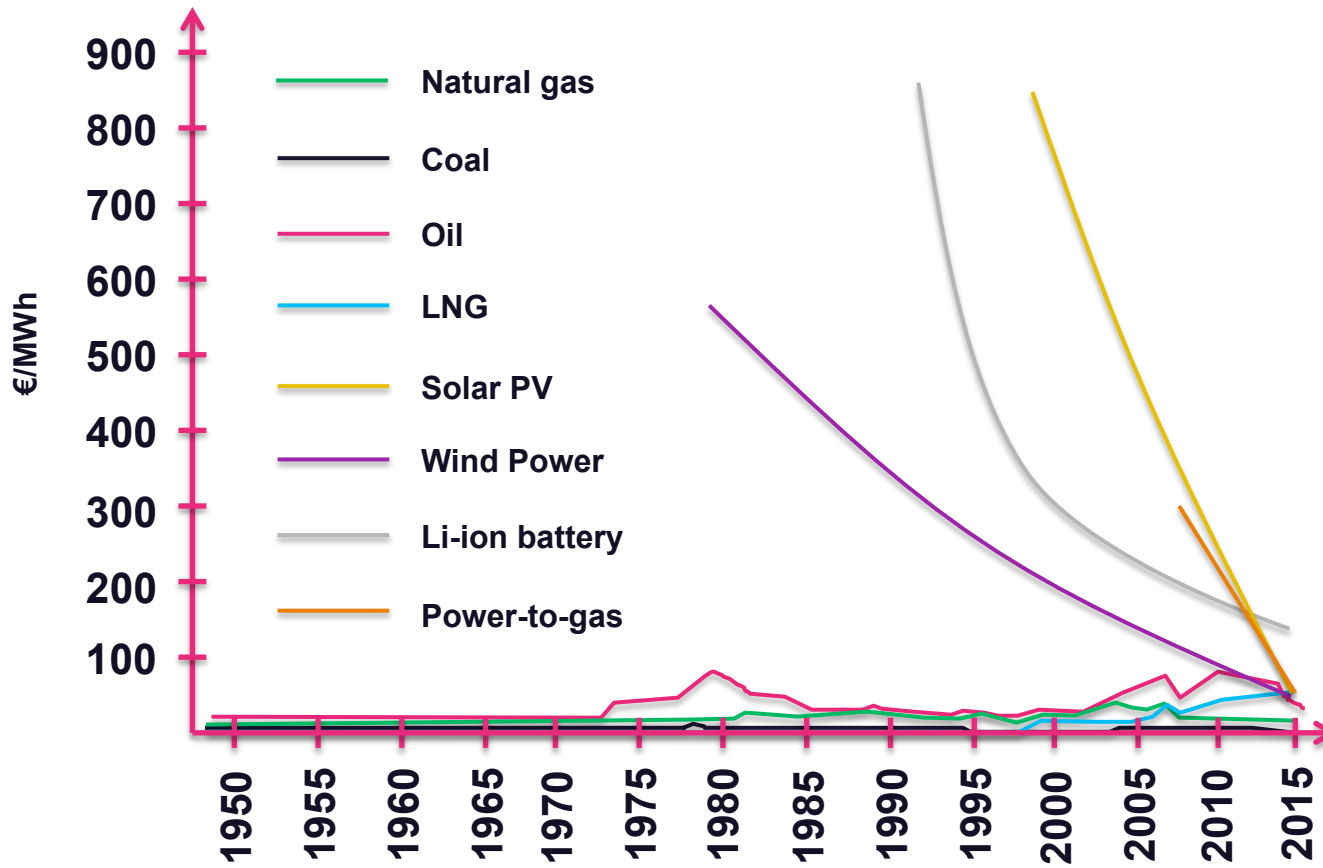




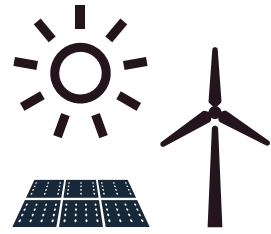
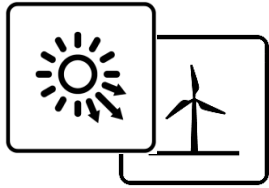
NEO
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ENERGY



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ENERGY

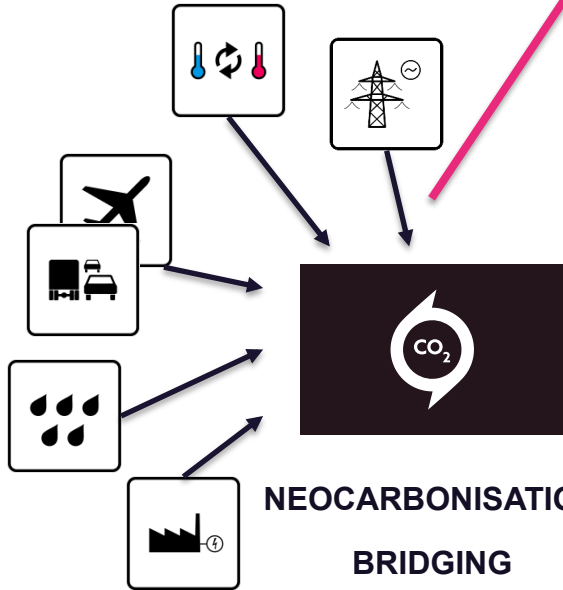


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CARBON
ENERGY

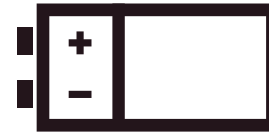
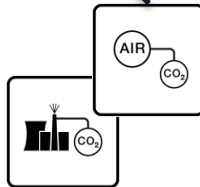


SOLAR AND WIND

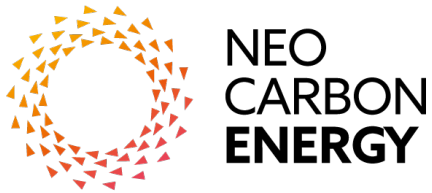
Current business



NEOCARBONISATION
BRIDGING



STORAGE



New business opportunities

/ PLUS THE VIRUS THEORY



NEO
CARBON
ENERGY



NEO
CARBON
ENERGY

2017



2015



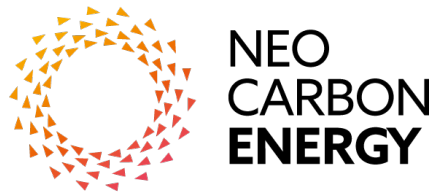
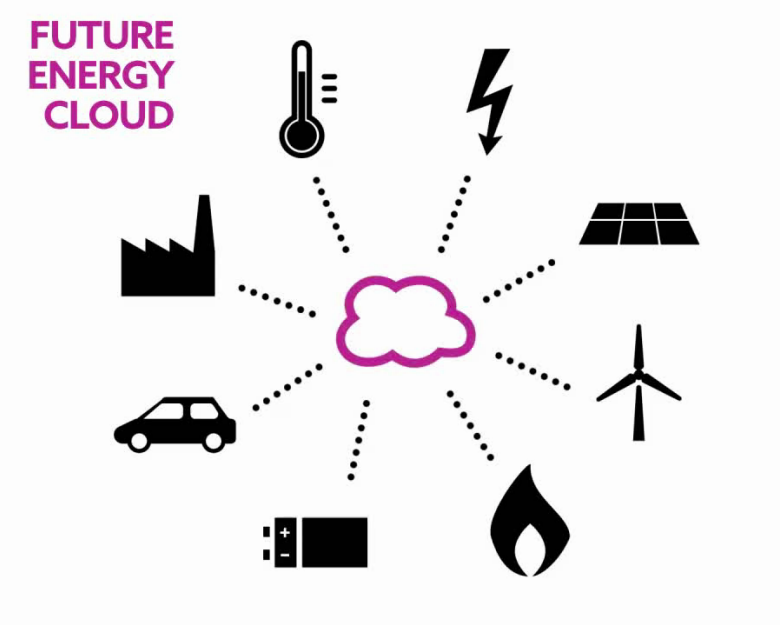
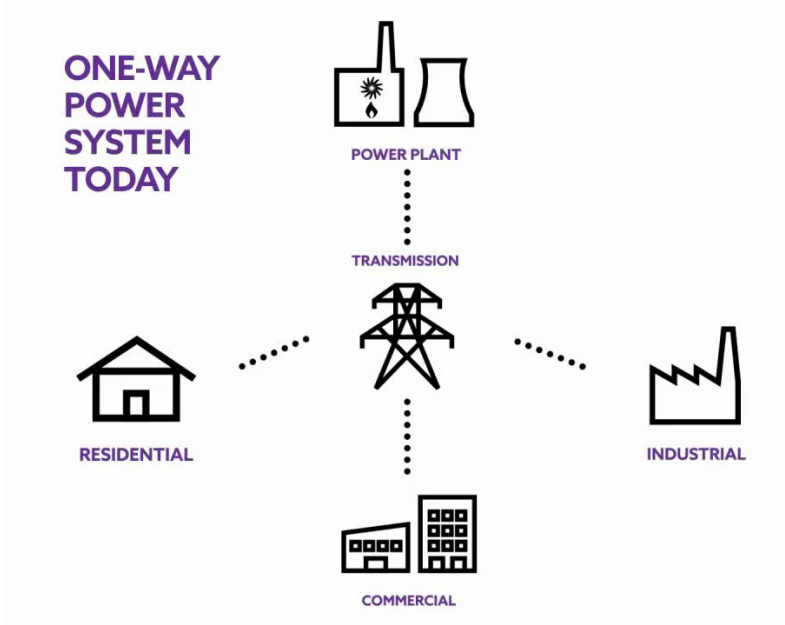
NEO
CARBON
ENERGY

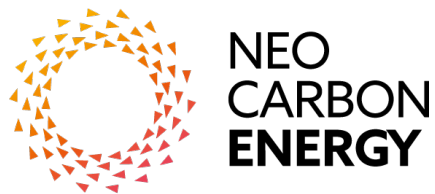
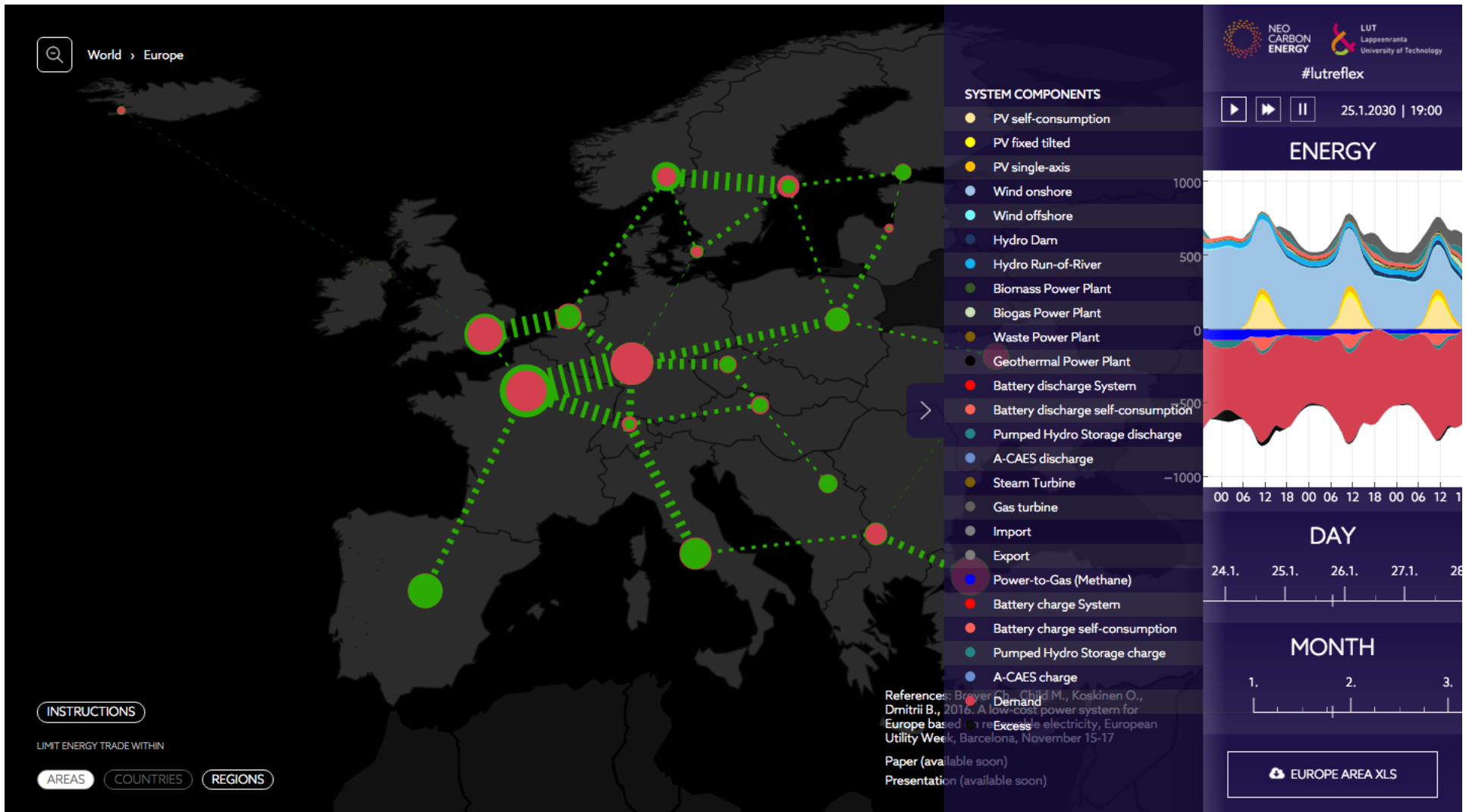


NEO
CARBON
ENERGY

A decorative graphic on the left side of the slide consists of a cluster of small triangles. The triangles are arranged in a roughly circular pattern, with their colors transitioning from bright yellow at the top to orange, then red, and finally to a deep magenta at the bottom. The background of the slide is a solid dark navy blue.

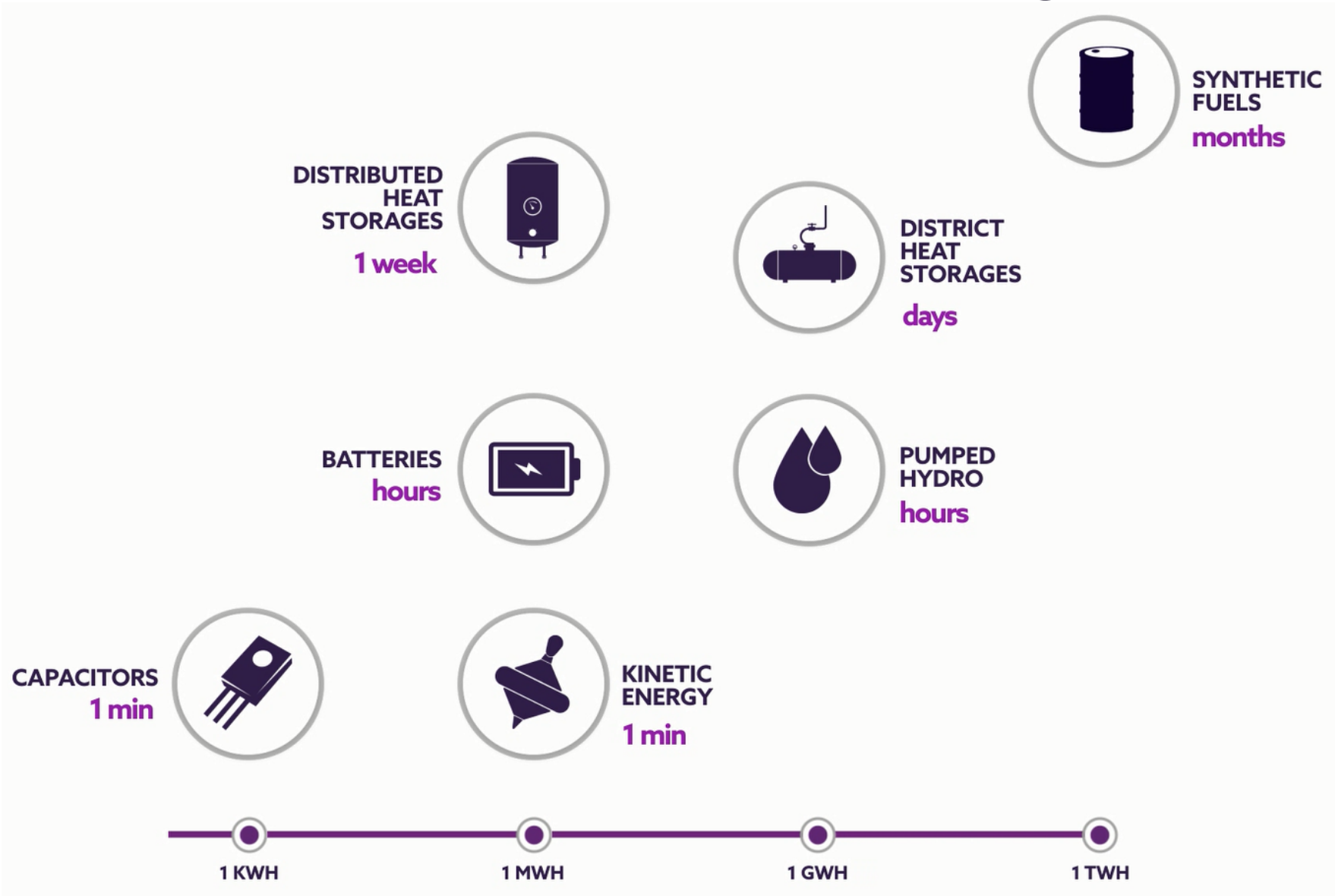
/ THE CONCLUSION



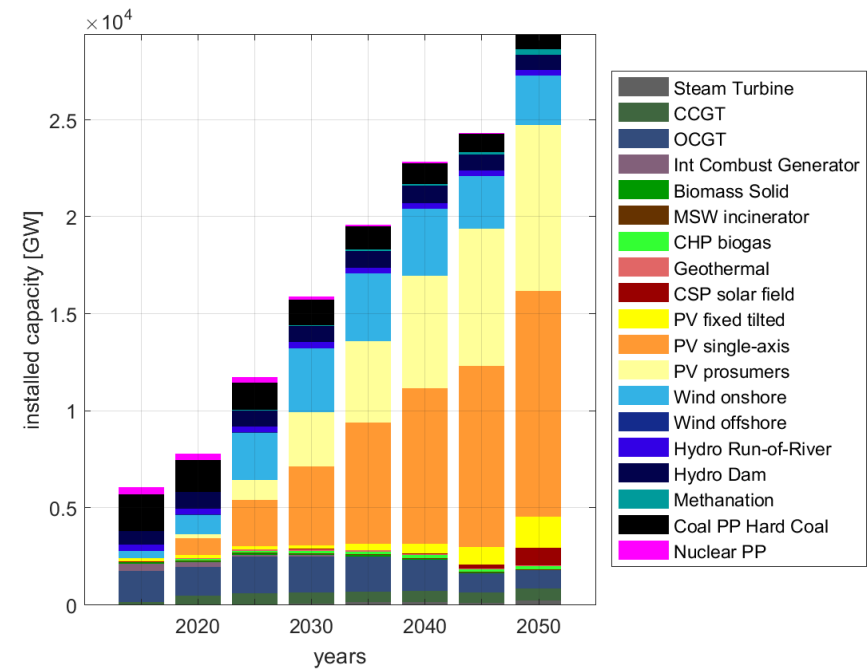
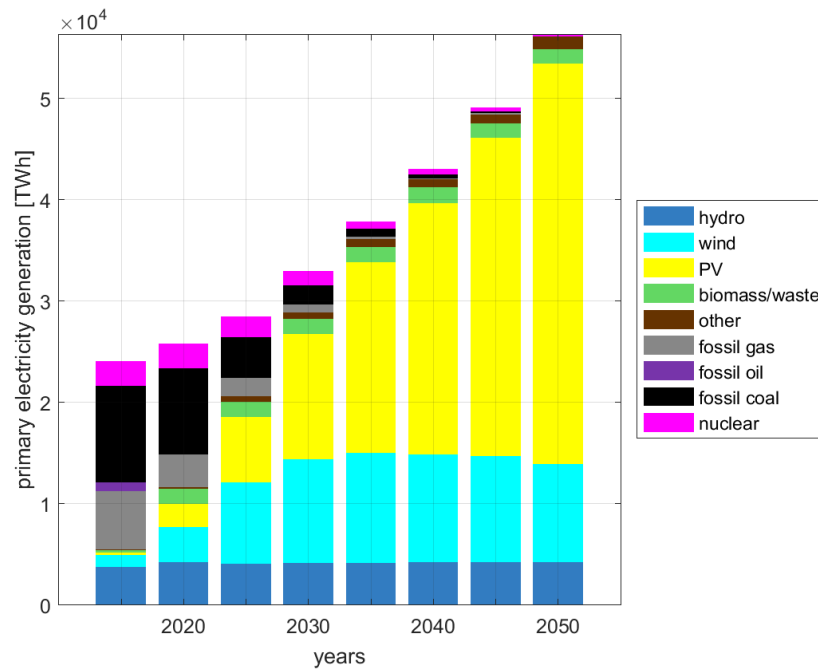


<http://www.neocarbonenergy.fi/internetofenergy/#>

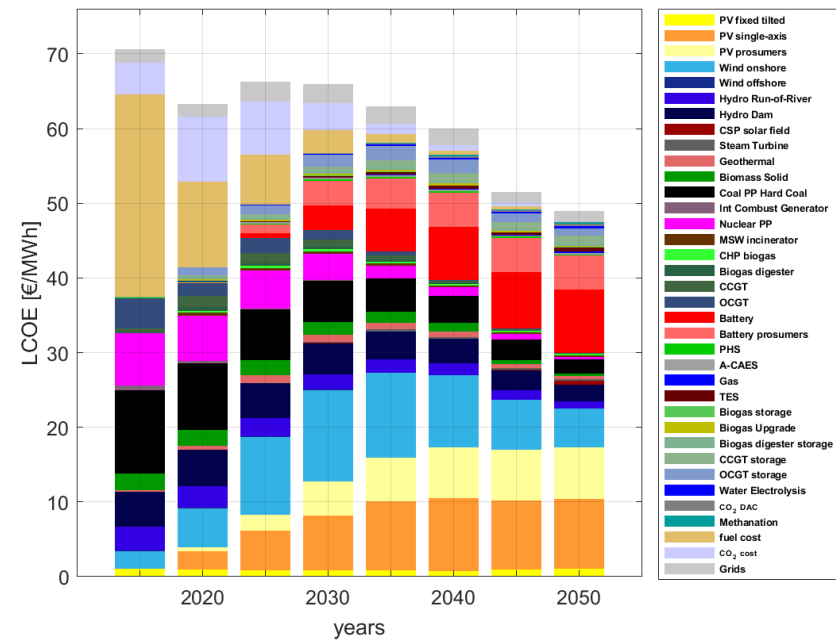
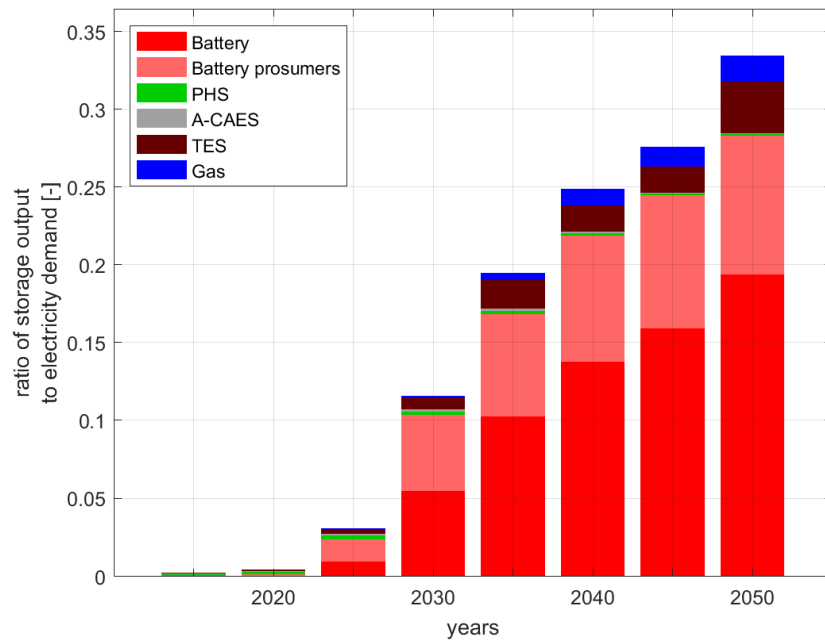
Different kind of storages

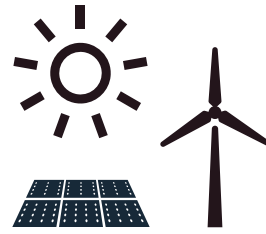
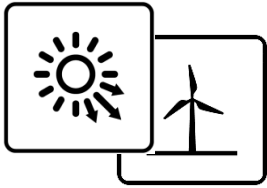


Global power mix

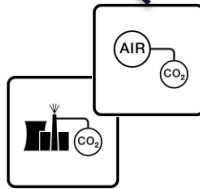
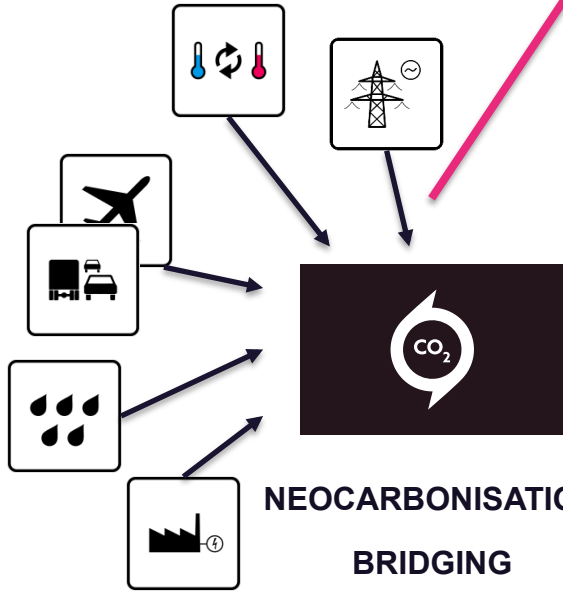


Global power mix

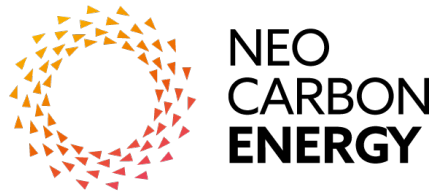




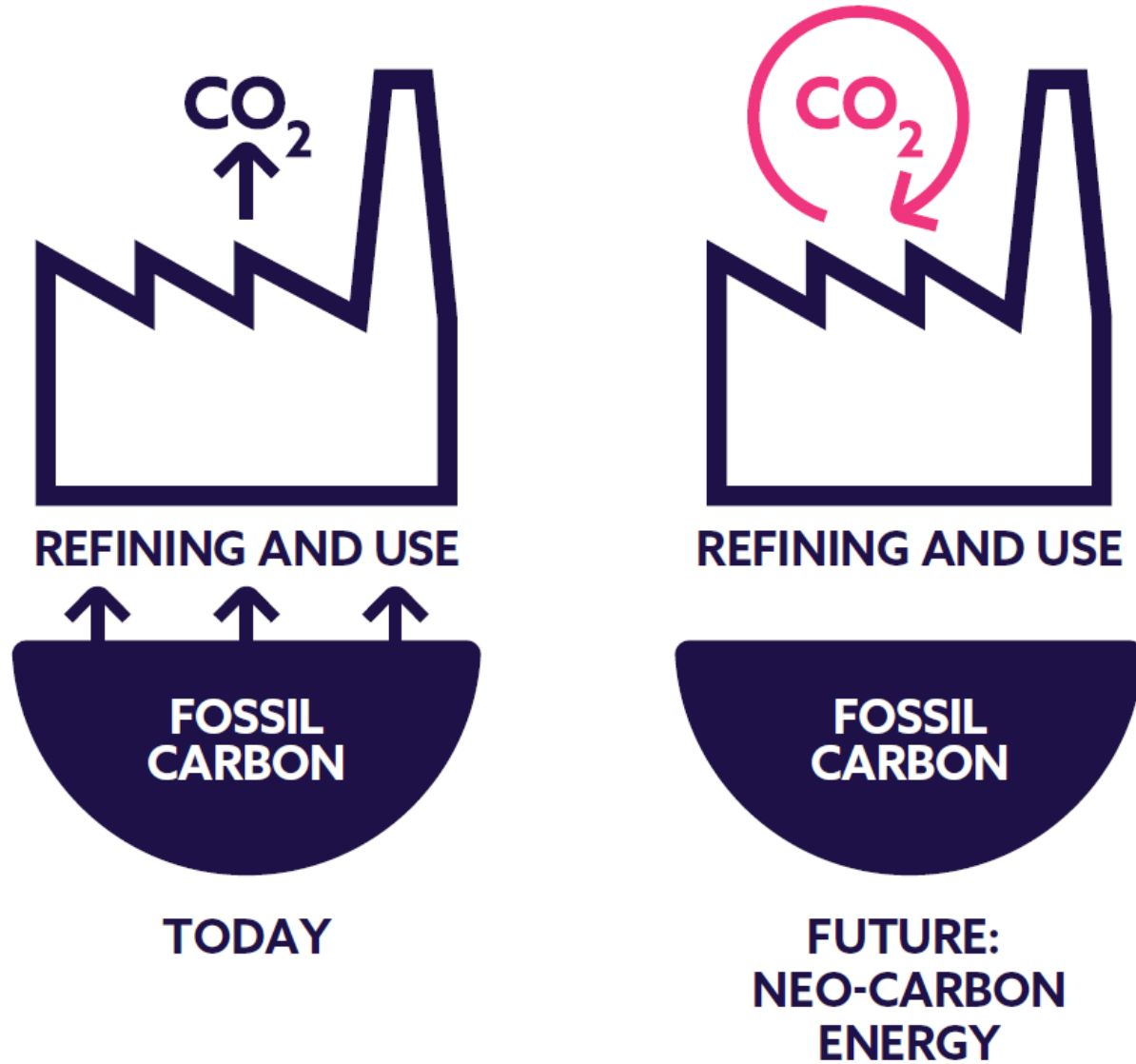
SOLAR AND WIND



STORAGE



No new CO₂ emissions – switching to a circular carbon economy



SOLETAIR



Photo: Teemu Leinonen, LUT

Hydrocarbon from air and sunlight



Electricity from solar power plant



Production of hydrogen from water using electrolysis



Carbon dioxide recovery from air



Hydrocarbon formed from synthesis



Hydrocarbons refined into fuels and chemicals



End products – gasoline, diesel, plastics, etc.

Source: Soletair-project

Yle Uutisgraafikka



FUEL FROM AIR

Fuel sample #1

SOLETAIR

SOLETAIR

POWER OY

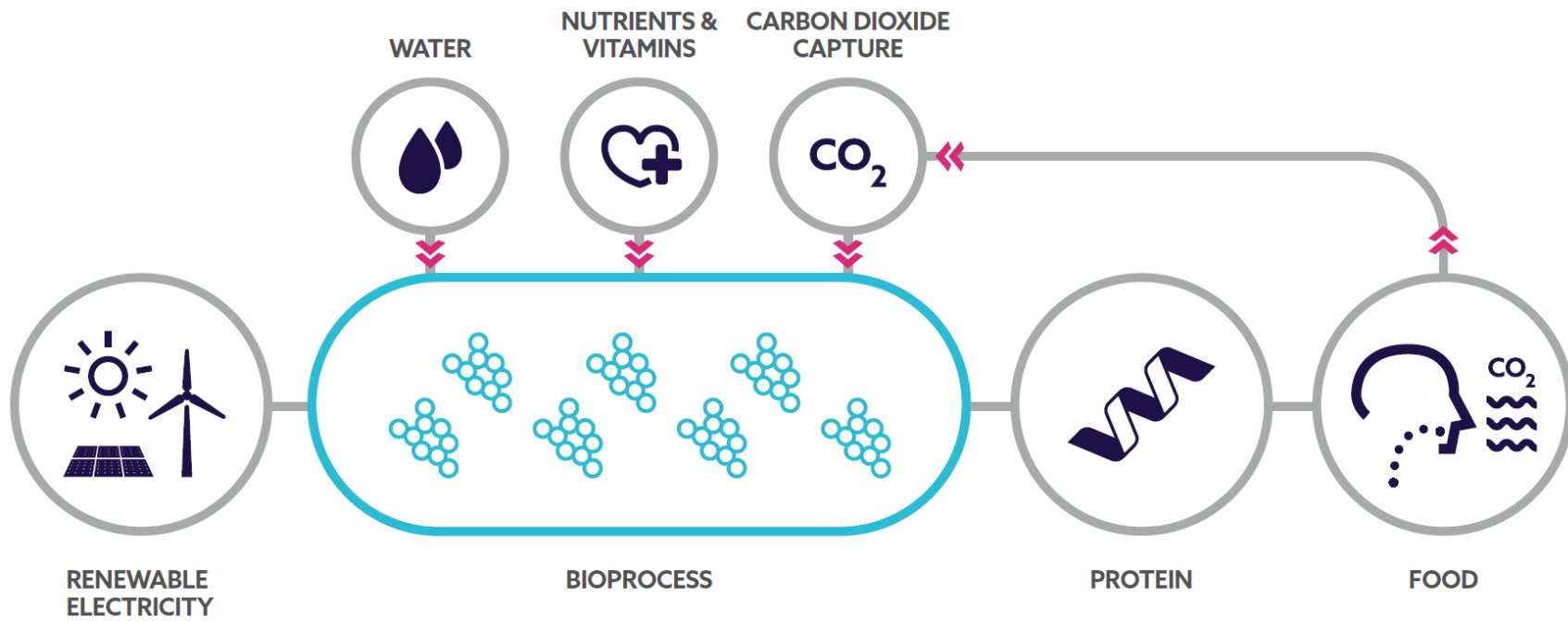


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<https://twitter.com/neocarbonfood>

<https://twitter.com/AJEnglish/status/909473295937839104>





SOLAR FOODS



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