

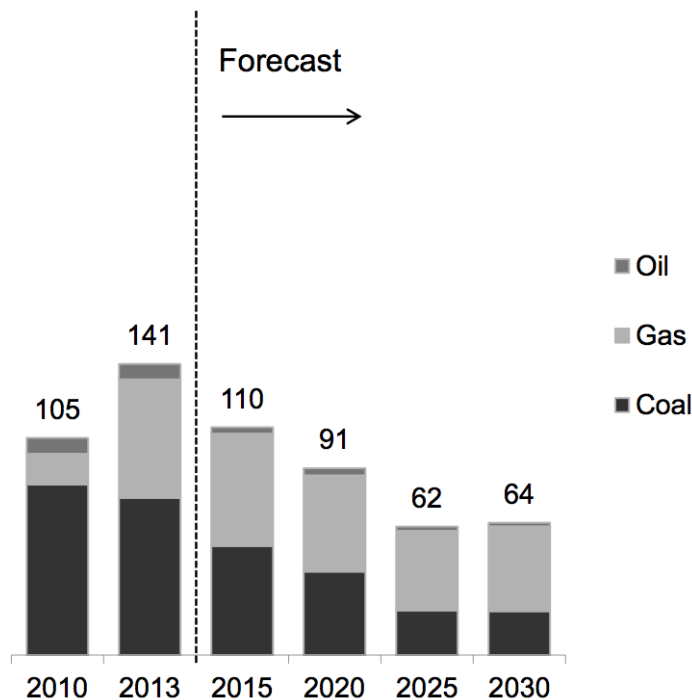
Trender inom energiforskningen

MAX ÅHMAN, AVD. MILJÖ- OCH ENERGISYSTEM

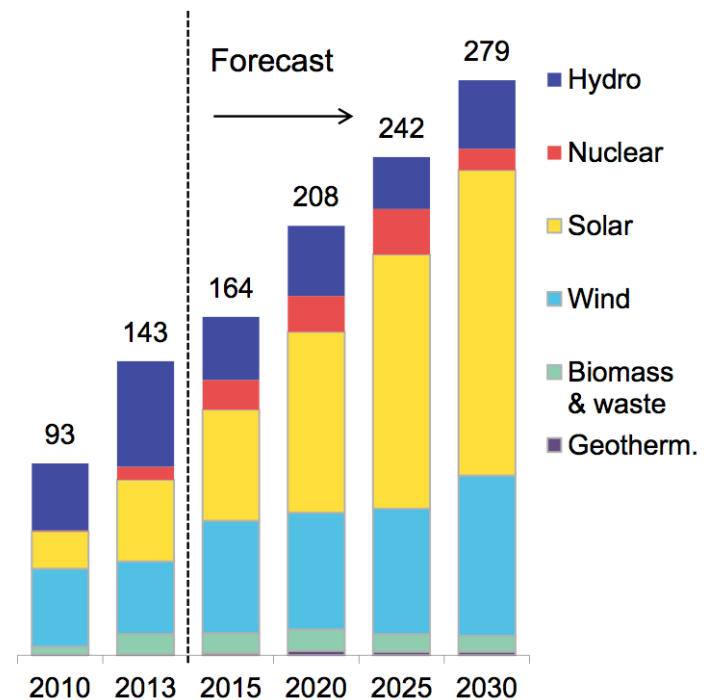


Energisystemen är inne i en revolution

FOSSIL FUEL



CLEAN ENERGY



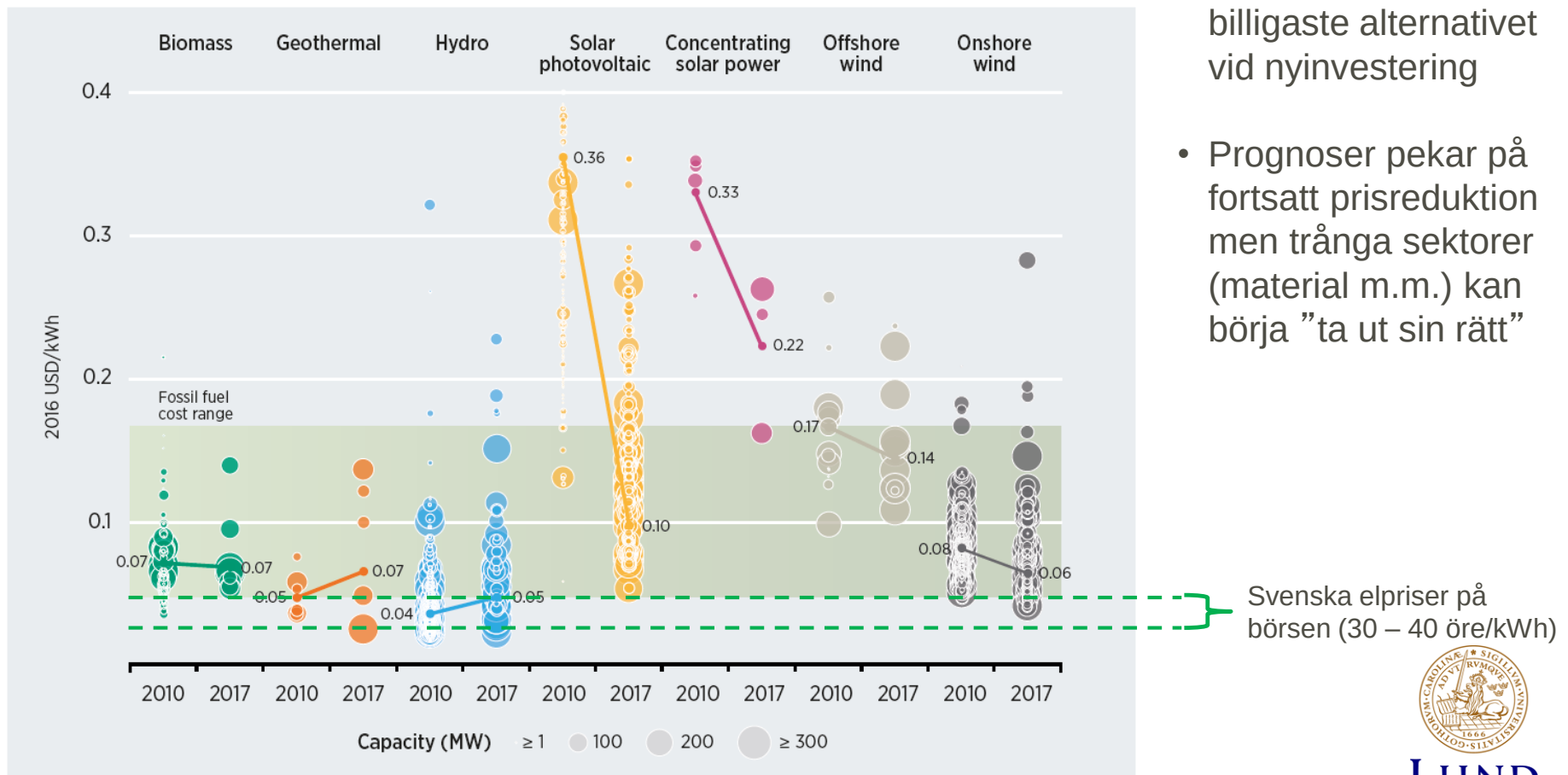
Power generation capacity additions (GW)
Källa : Bloomberg New Energy Finance 2016



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Kostnader för förnybar el sjunker dramatiskt

Figure ES.1 Global levelised cost of electricity from utility-scale renewable power generation technologies, 2010-2017



- Förnybar el ofta det billigaste alternativet vid nyinvestering
- Prognoser pekar på fortsatt prisreduktion men trånga sektorer (material m.m.) kan börja "ta ut sin rätt"

Svenska elpriser på börsen (30 – 40 öre/kWh)



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Acwa Power wins inaugural solar project in Saudi Arabia

The Saudi developer will develop the 300MW project at Sakaka on an independent power producer model basis



Jennifer Gnana

February 7, 2018

Updated: February 7, 2018 08:39 PM



Saudi Arabia plans to tender around 4GW of renewables projects in 2018. Fahad Shadeed/Reuters

Saudi Arabia's Acwa Power won the kingdom's first utility-scale solar photovoltaic plant, as the world's largest oil exporter starts its renewables programme to free up more crude for export.

Paddy Padmanathan, chief executive of the Riyadh-headquartered firm said it had won the bid for the 300-Megawatt project at Sakaka, in the northern Al Jouf area at "a new world record tariff" of US Cents 2.3417/kWh (8.781 halalas/kWh).

The kingdom, which meets its power requirements by burning oil and is increasingly pivoting to natural gas has made a recent

EDITOR'S PICKS



MARKETS

European stocks head for five-month low as global selloff continues



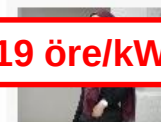
ENERGY

Dewa cuts approval time for industrial connections



OTHER SPORT

Viviani retains Dubai Tour lead as Sonny Colbrelli wins Stage 4



THE AMERICAS

Retail giant's to launch clothing range including hijabs



BUSINESS

Homefront: Landlord's concern over recovery of the

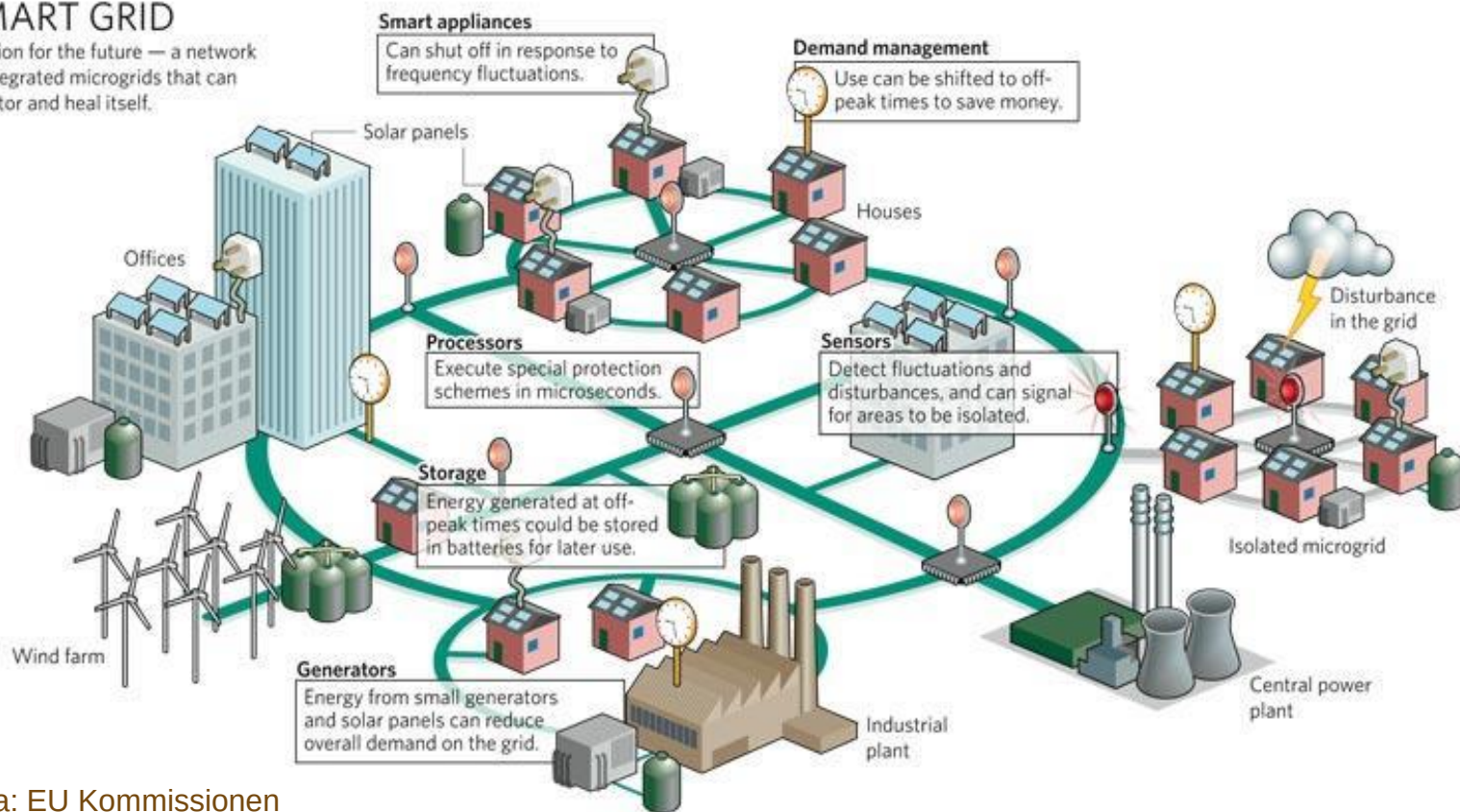
= 19 öre/kWh

Effekt #1 Elsystemet förändras i grunden

Från tidigare paradigm om "bas-el" till ett flexibelt system som "andas", d.v.s flexibel användning

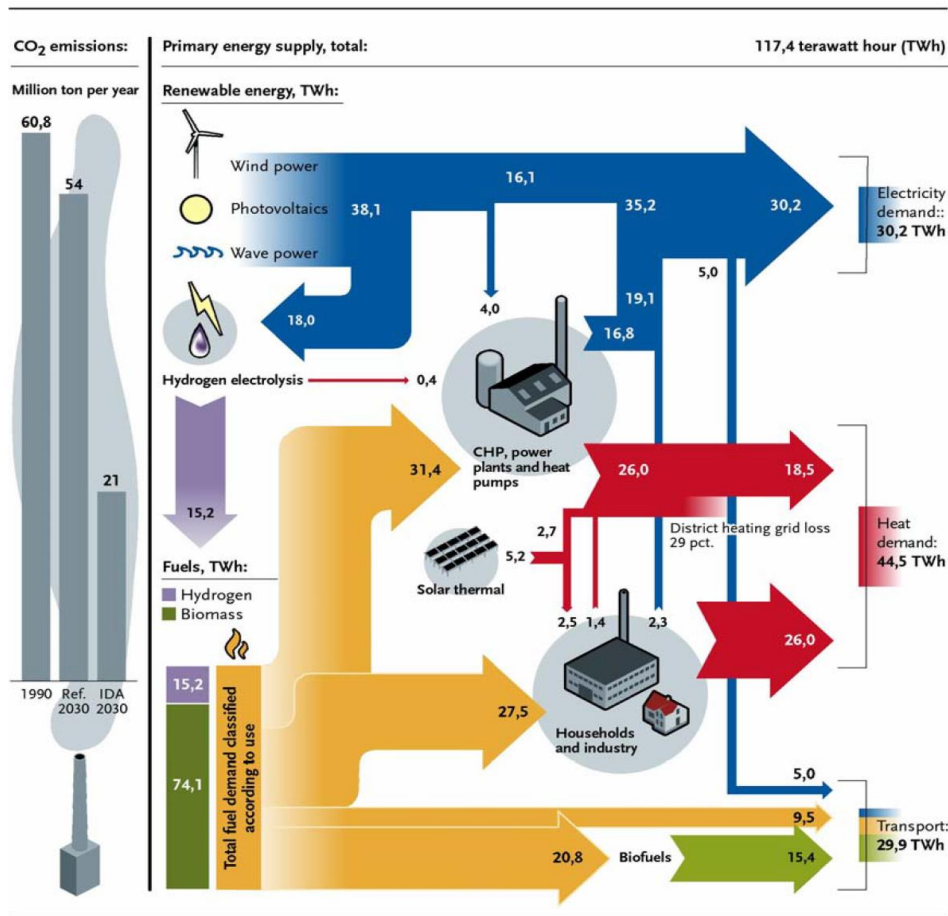
SMART GRID

A vision for the future — a network of integrated microgrids that can monitor and heal itself.



Effekt #2 Energisystemet förändras i grunden

100 PER CENT RENEWABLE ENERGY



I ett system som "andas" blir **integration** mellan energilag allt viktigare:

- Power to gas
- Power to heat

Kombination av nytänk drivet av prisrelation och tekniska möjligheter (IT)



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Figure 6. Flow diagram of the 100 per cent renewable energy system

Effekt # 3 : El kan bli det ”primära bränslet” i framtiden

Med mycket och billig el
som dessutom < olja/gas så
kan mycket hända

- Power to gas
 - Power to heat
 - Power to fuels
 - Power to chemicals
- För integration

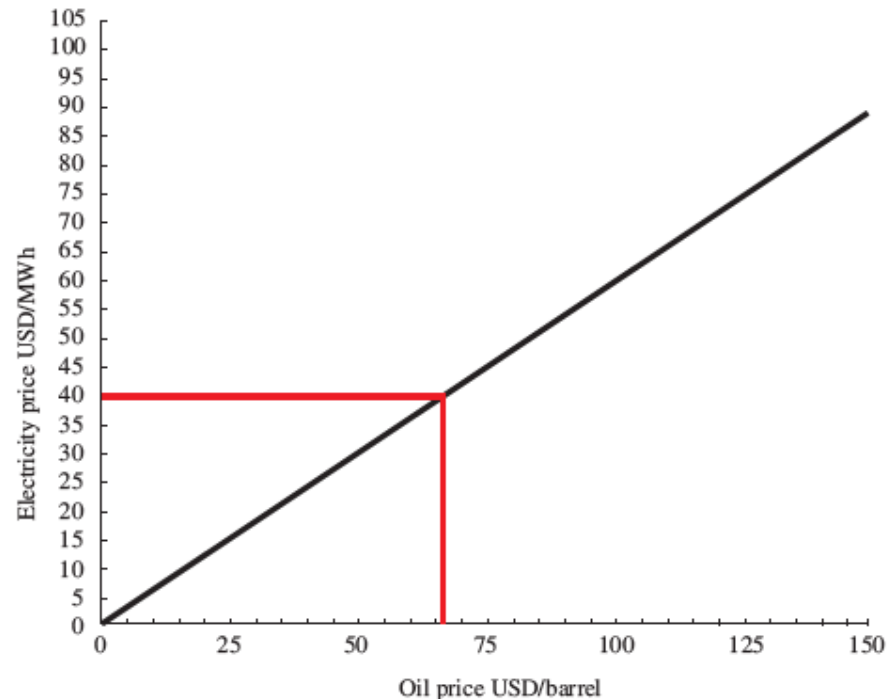
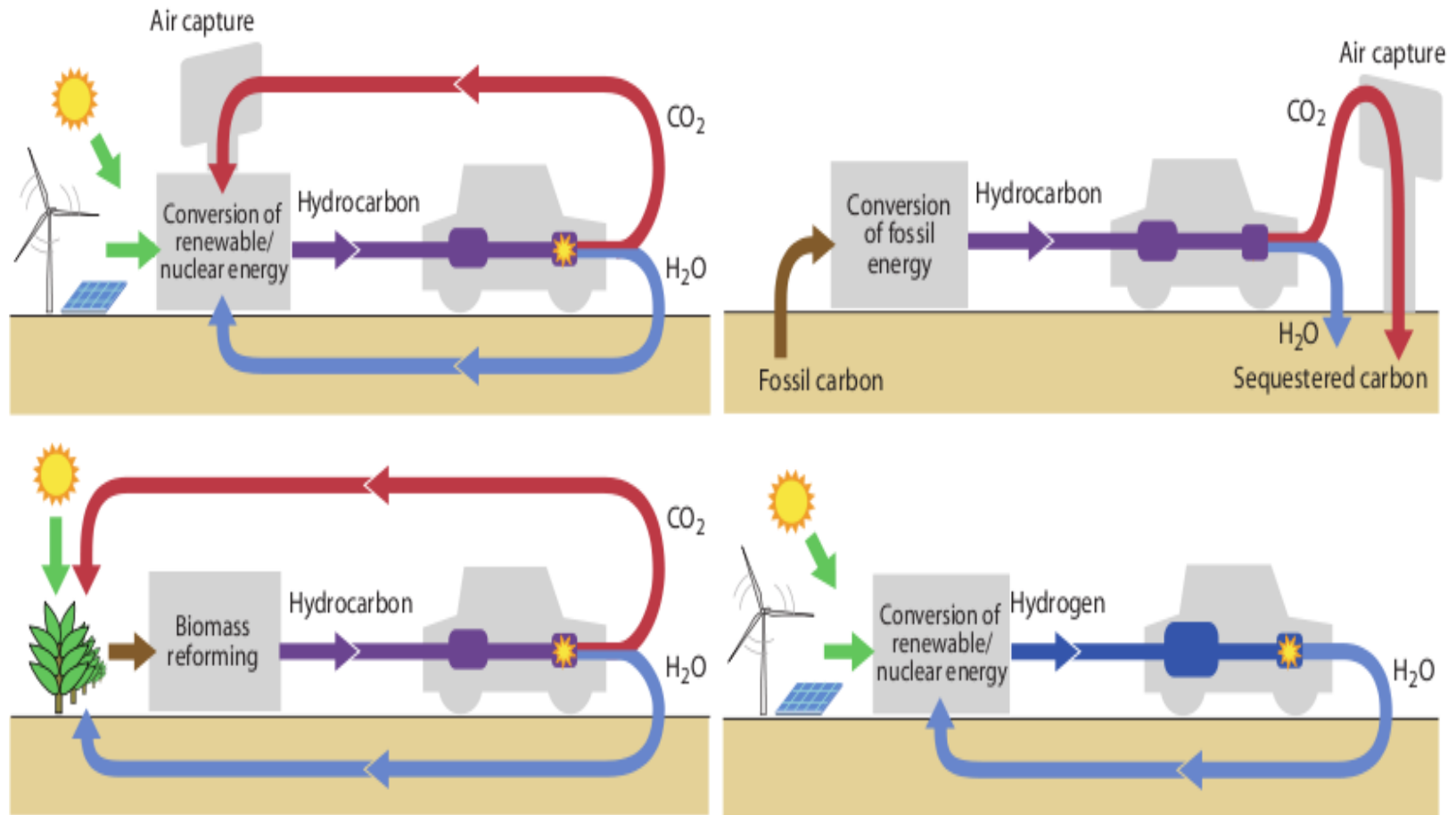


Fig. 1 The relationship between the energy price of oil and electricity

Källa: Kåberger 2018



Koldioxid: avfall eller resurs ?



Framtida råvara för plast?

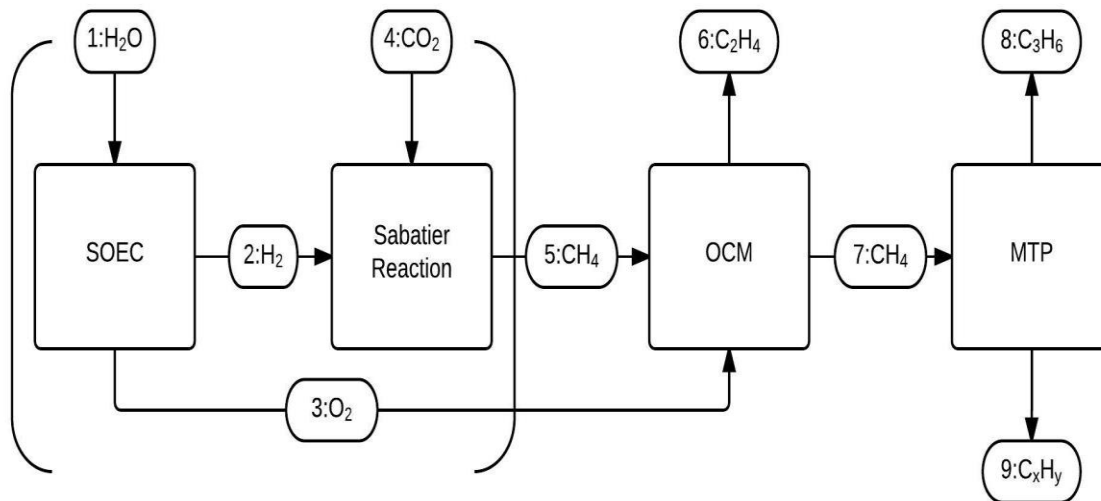
- Solenergi och koldioxid (CCU)



+



= Eten
Propen



Plasten blir dyrare (2-2,5 gg) än fossilbaserad

Ex från EU:

100 kg/år@ 20kr/kg blir 2000 kr/år

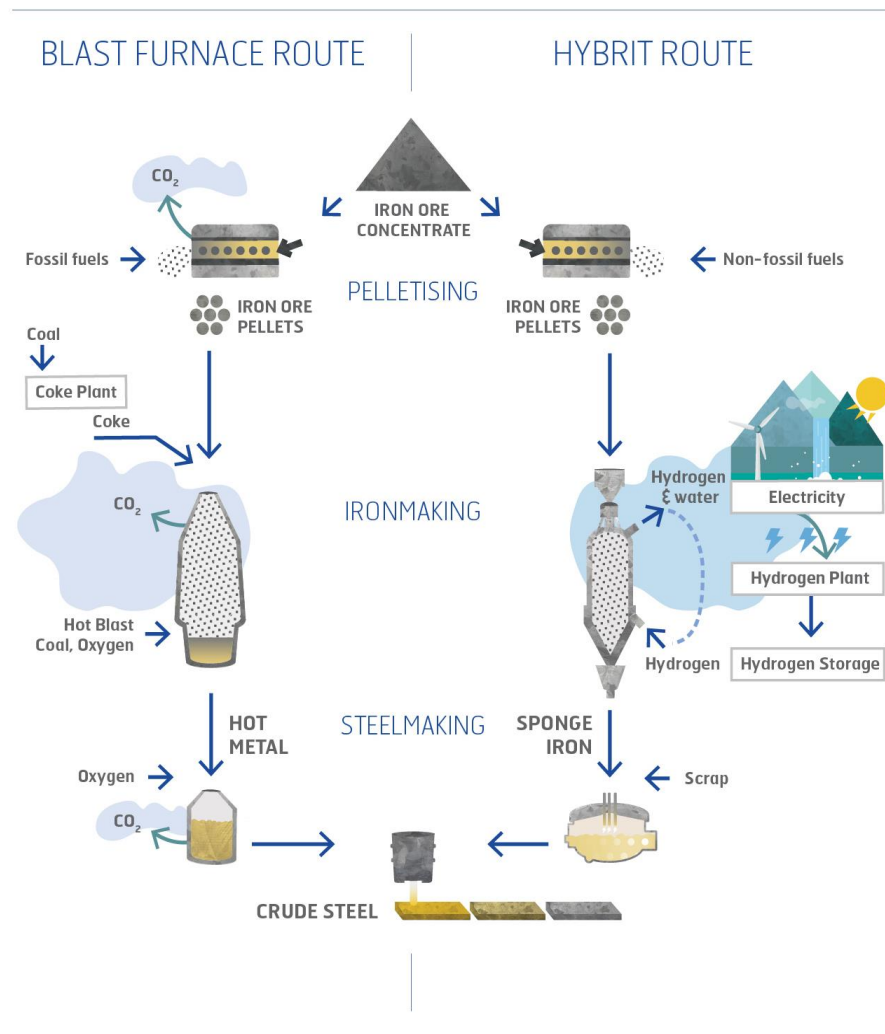
”CO2-plast”: 100 kg/år @40kr/kg blir 4000 kr/kg

MEN högre pris= mindre användning/mer återvinning

STEPS – Sustainable Plastics and Transition Pathways

Källa: Palm et al. (2016)

HYBRIT: Fossilfritt stål



- Utvecklingsprojekt mellan SSAB, LKAB, Vattenfall och Lunds Universitet
- Tidshorisont: 2025-2035
- Tillverka fossilfritt stål med hjälp av vätgas ; tar bort 10% av SE CO₂ utsläpp
- Kombinerar med en förväntad ökad skrotåtervinning
- En del metallurgisk utveckling behövs men inget ”breakthrough”
- Höga utvecklingskostnader. MEN....beräkningar visar att konkurrenskraftigt med masugn vid elpriser runt 30 - 40 öre/kWh

Källa: www.hybritdevelopment.com



Cykla säkert !



Plastics from electricity and CO₂?

Power-to-Methanol-to-Olefins (polyetylen(PE)/polypropylen(PP))

- Fossil-based feedstock gives PE/PP at 1400-1500 EUR/ton
- En plastic bottle (35 gram bottle) costs about 10 cent of which material is 5 cents
- El/hydrogen/CO₂-to-plastics gives PE/PP at 3500 EUR/ton
- Now the bottle costs about 17 cents
- Is that expensive?

