SVENSKA ARALSJÖSÄLLSKAPET

Swedish Aral Sea Society

3. Energy

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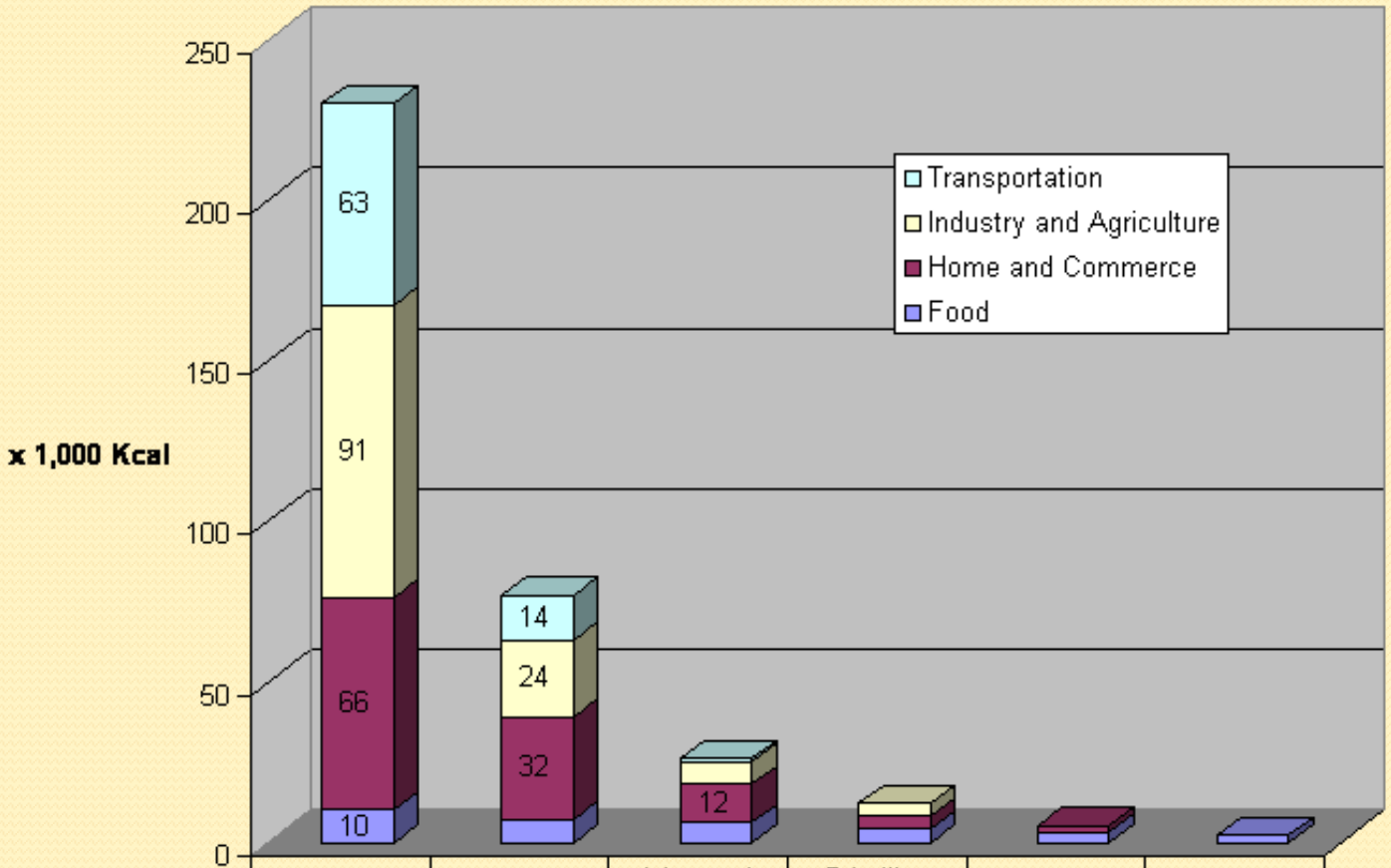
Energy supply and use

Energy use per capita in different societies

• Biological	2.4	kWh/day
• Gatherers, hunters	10	kWh/day
• Agriculture	25-50	kWh/day
• Industrial society	50-100	kWh/day
• Contemporary	250	kWh/day

Daily Consumption of Energy Per Capita

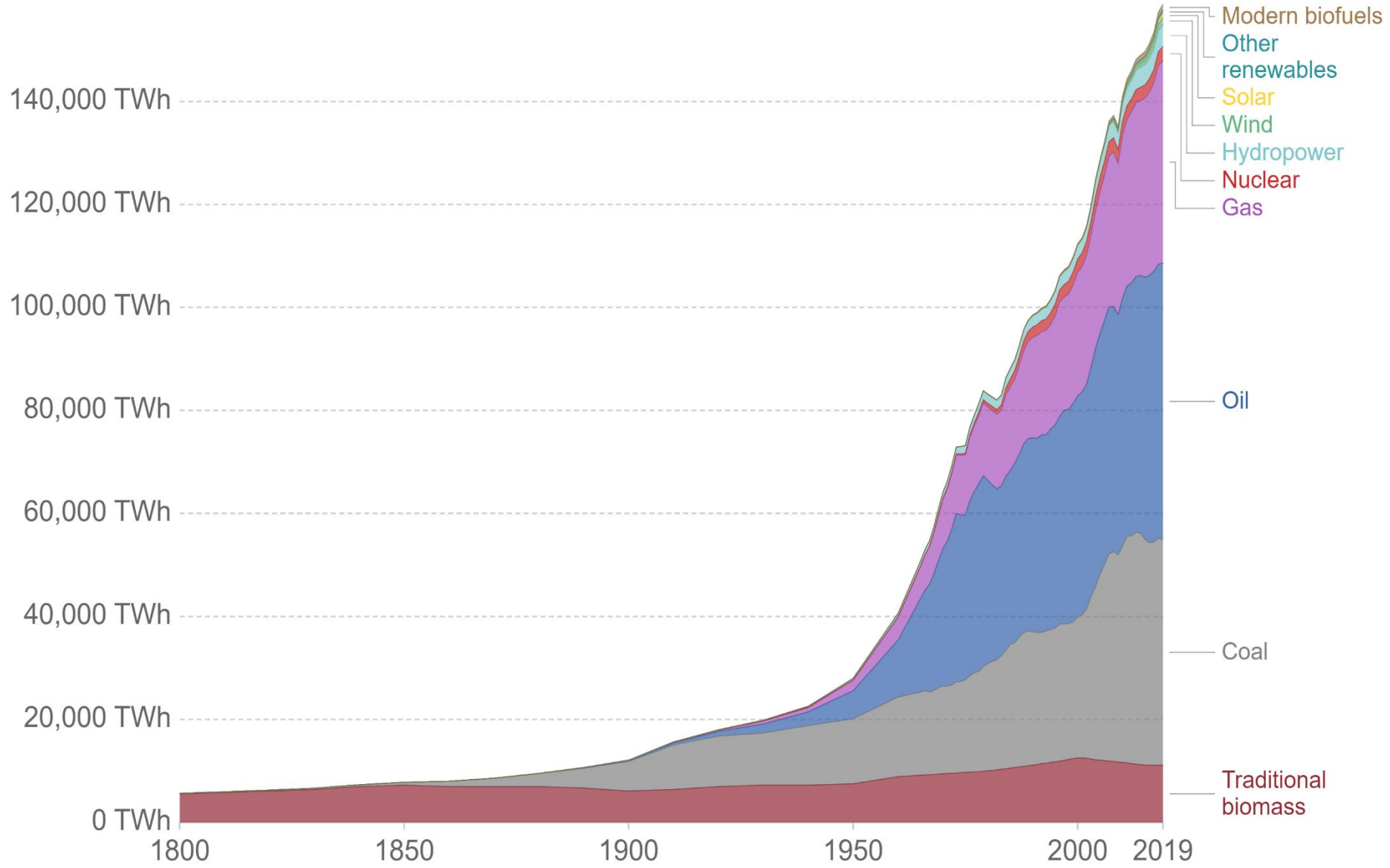


	Technological Man	Industrial Man	Advanced Agricultural Man	Primitive Agricultural Man	Hunting Man	Primitive Man
Transportation	63	14	1			
Industry and Agriculture	91	24	7	4		
Home and Commerce	66	32	12	4	2	
Food	10	7	6	4	3	2

Global direct primary energy consumption

Direct primary energy consumption does not take account of inefficiencies in fossil fuel production.

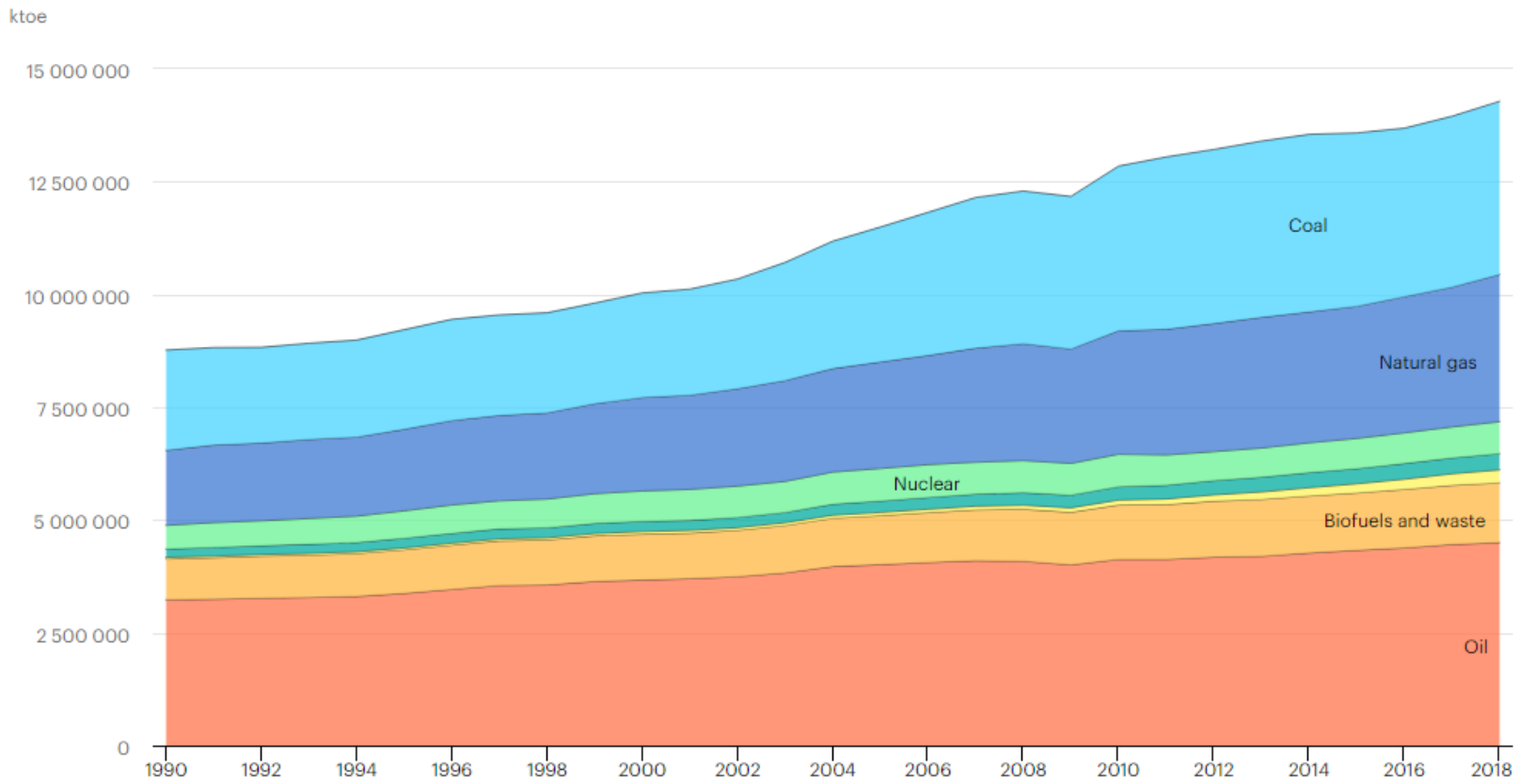
Our World in Data



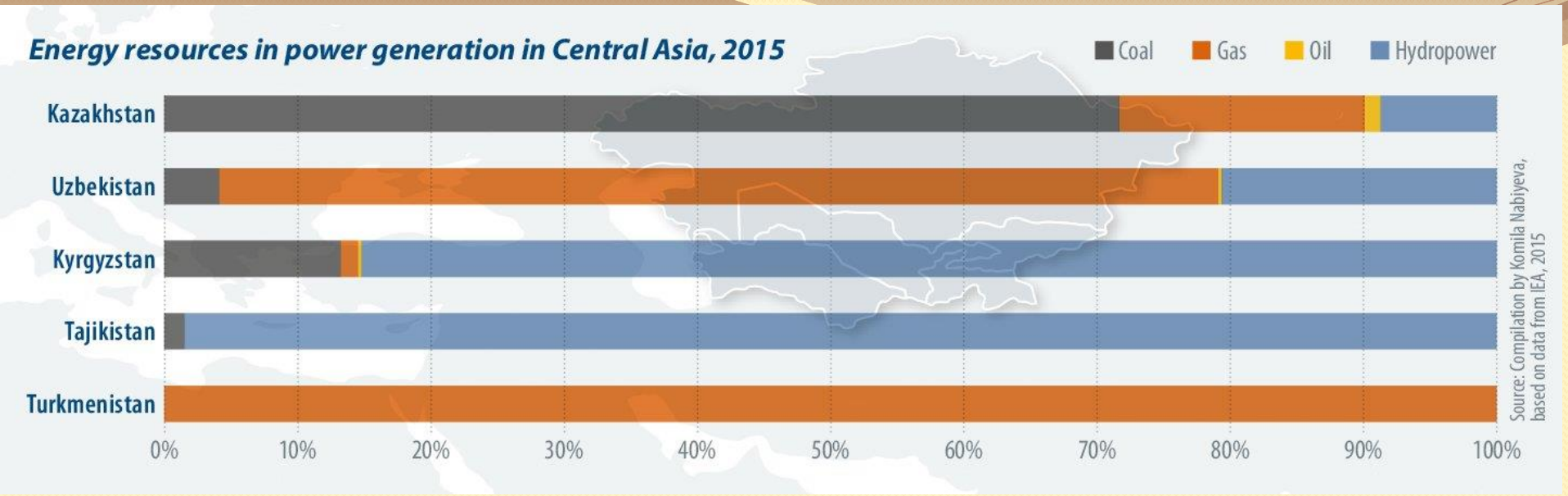
Source: Vaclav Smil (2017) and BP Statistical Review of World Energy

OurWorldInData.org/energy • CC BY

World Energy Outlook 2020 – Analysis – International Energy Agency, IEA

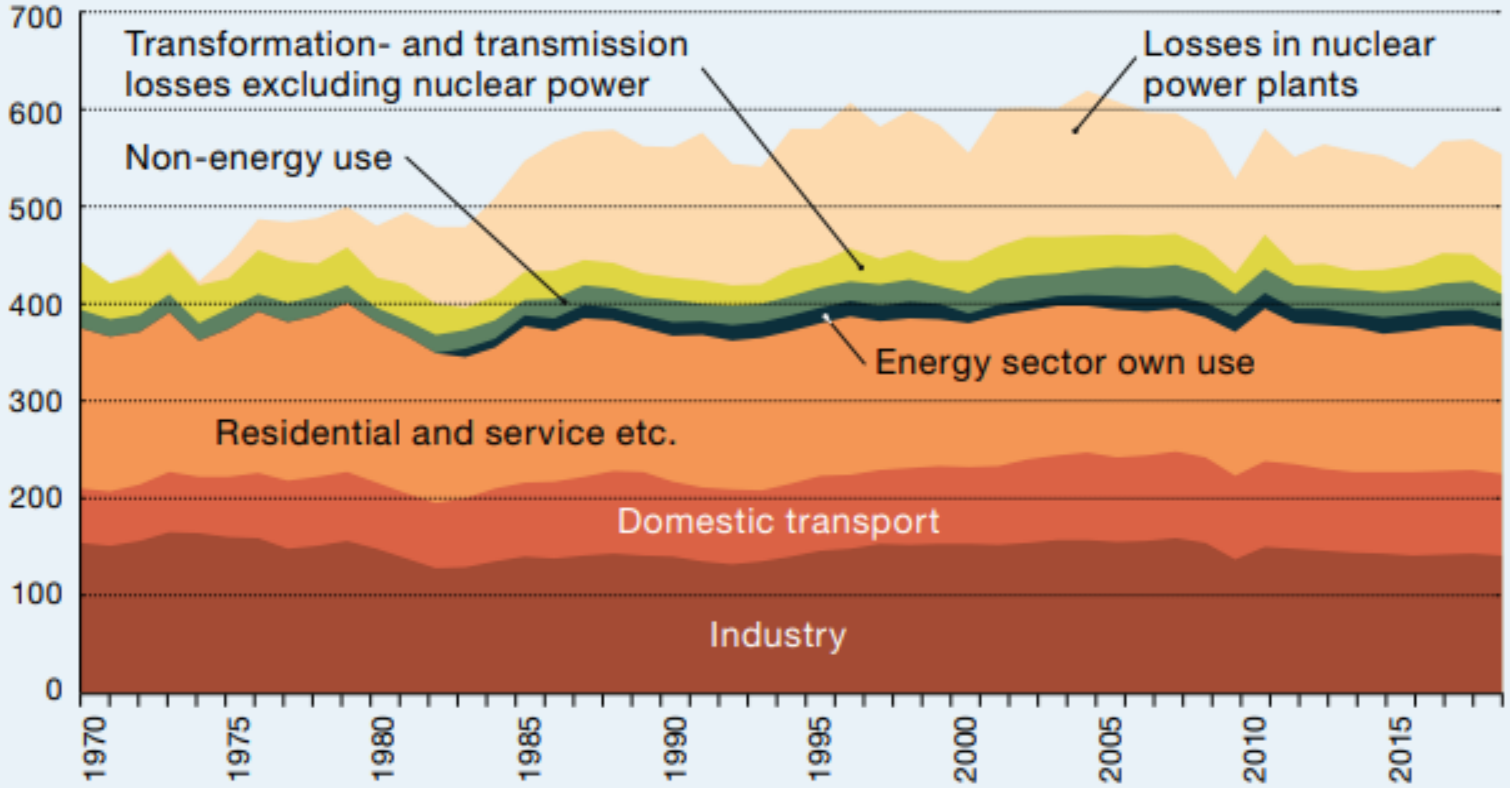


https://www.iea.org/data-and-statistics?country=WORLD&fuel=Energy%20supply&indicator=TPESbySource

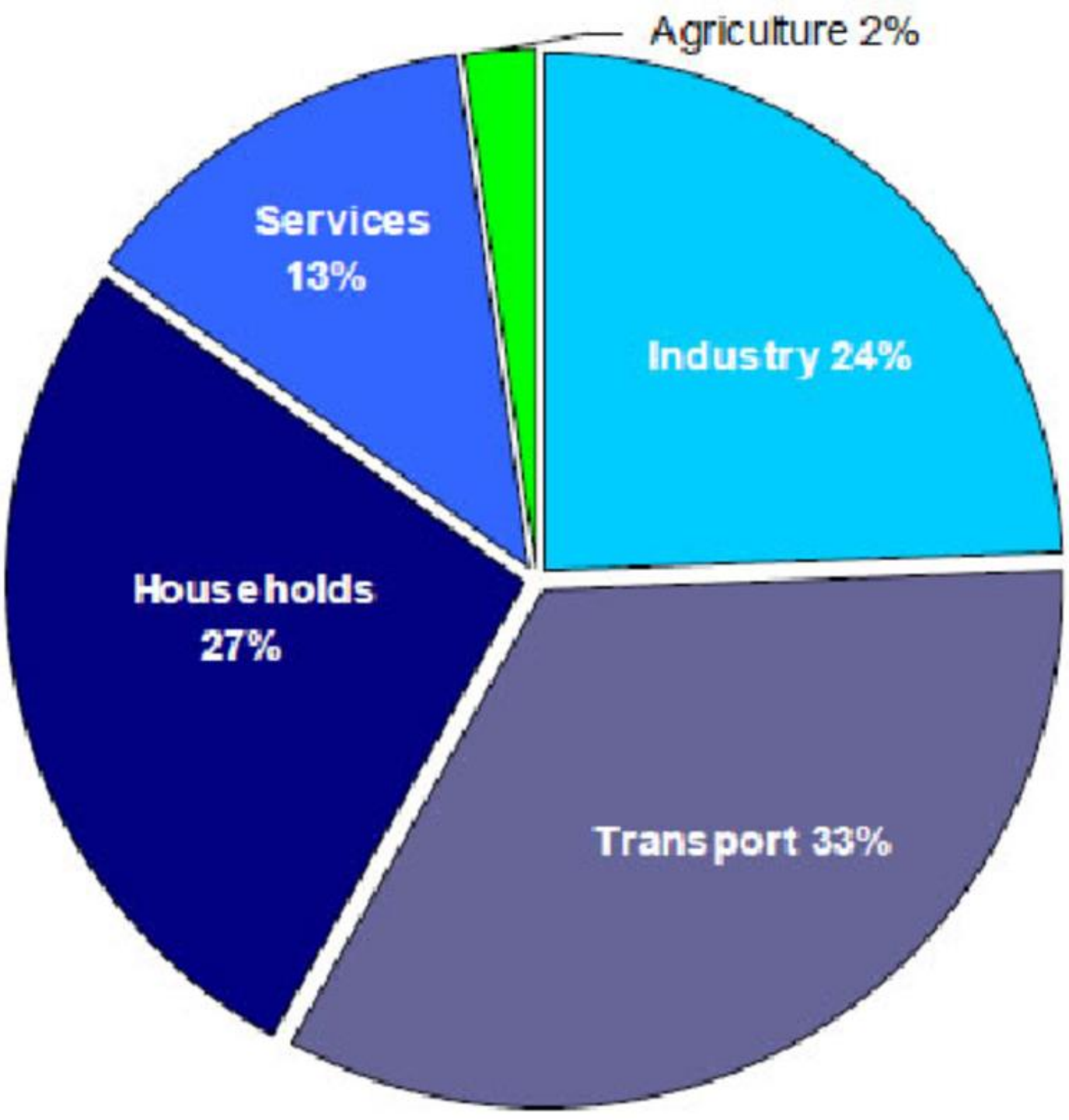


https://energytransition.org/2018/06/central-asias-green-horizons/

Total final energy use, 1970–2018, TWh



Sources: The Swedish Energy Agency and SCB (Statistics Sweden).
Remarks: 1) Foreign aviation was included in final energy use until 1989.
2) Own use within the energy sector was included in transformation- and transmission losses until 1982. 3) Losses in nuclear power plants are calculated according the method used by the UN/ECE to calculate supplied energy from nuclear power.


Agriculture 2%
Services 13%
Industry 24%
Households 27%
Transport 33%

Energy intensity (J/h)

Very low (zero)

Use of appliances: medium high

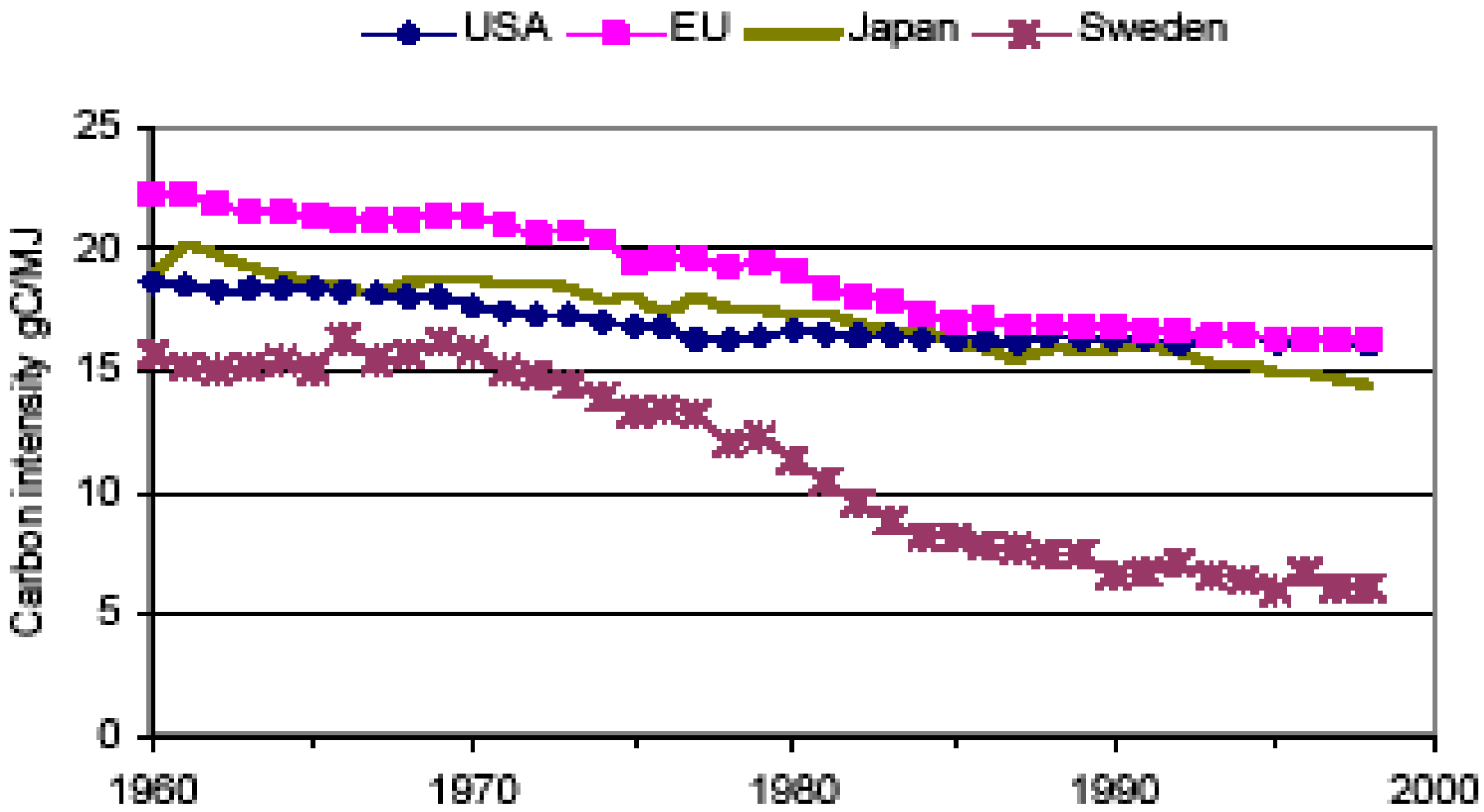
Commuting: high

Activity	Happiness
Sex	4,7
Socialising	4,0
Relaxing	3,9
Praying/meditating	3,8
Eating	3,8
Exercising	3,8
Watching TV	3,6
Shopping	3,2
Preparing food	3,2
Talking in phone	3,1
Taking care of children	3,0
Computer/internet	3,0
Housework	3,0
Working	2,7
Commuting	2,6

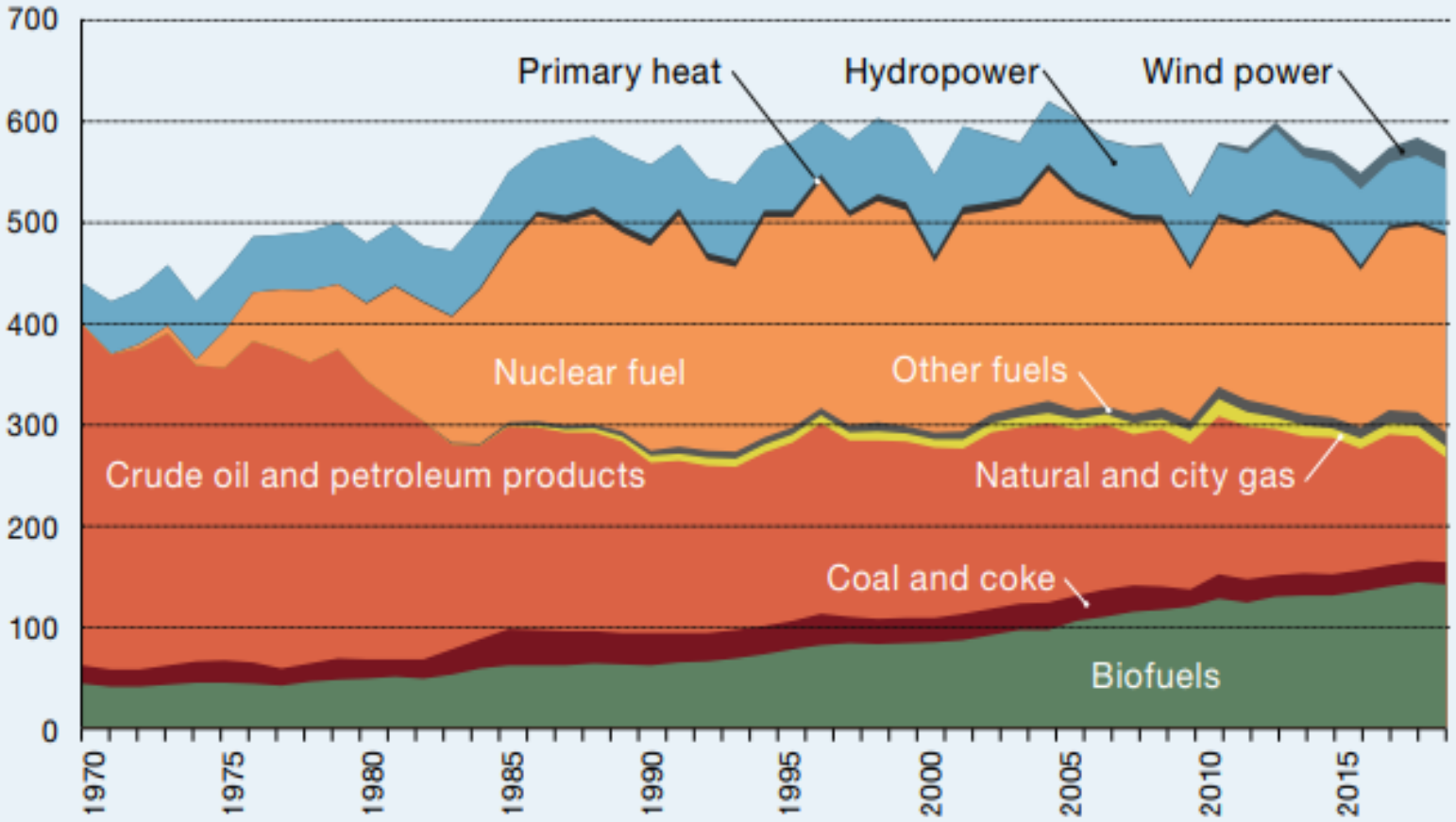
Carbon content of energy

Carbon content of energy

From *Decoupling*, Azar, Holmberg and Karlsson, Chalmers University of Technology, 2002 based on IEA statistics

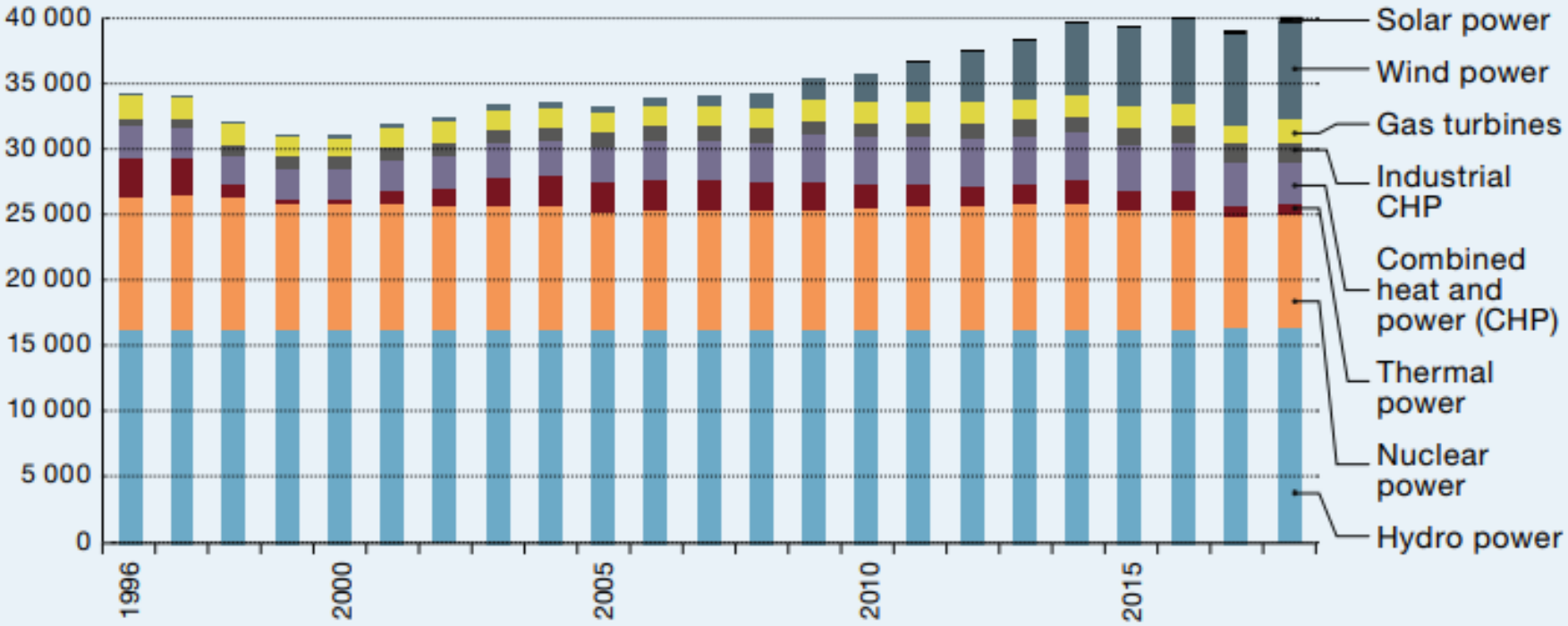


Total supplied energy 1970–2018, TWh



Sources: The Swedish Energy Agency and SCB (Statistics Sweden).
Remarks: 1) Other fuels are included in biofuels until 1983. 2) Domestic aviation fuel is included in crude oil and petroleum products until 1989. 3) Nuclear fuel is calculated according to the

Installed electricity generation capacity by type of power 1996–2018, MW



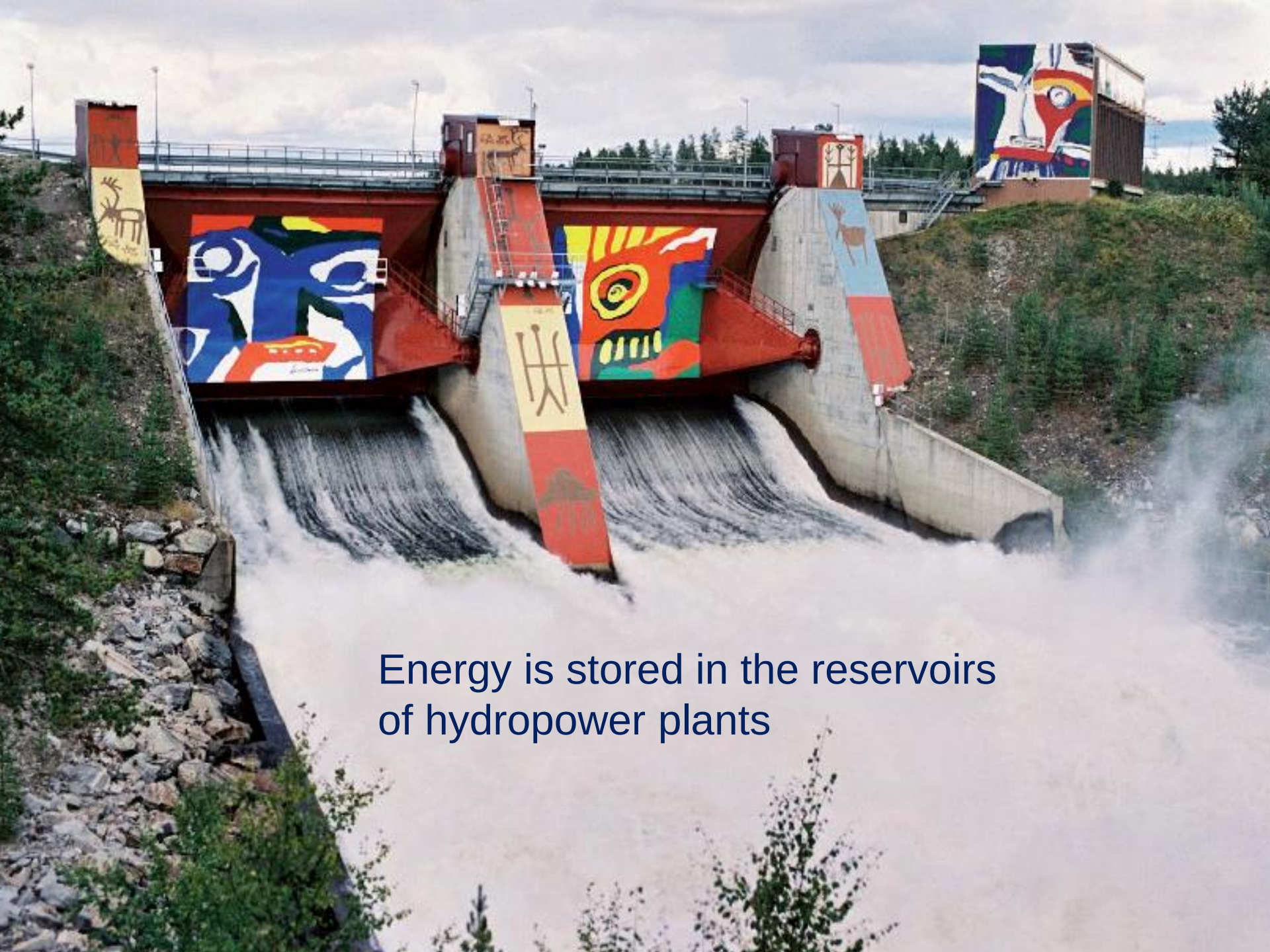
Source: Swedenergy – Energiföretagen Sverige. Note that not all installed electricity generation capacity is available at the same time. Availability also varies between the different types of power, as they are weather-dependent in a variety of ways.

file:///C:/Users/LARSR14Ladmin/Downloads/Energy%20in%20Sweden%202020%20-%20An%20overview%20(1).pdf

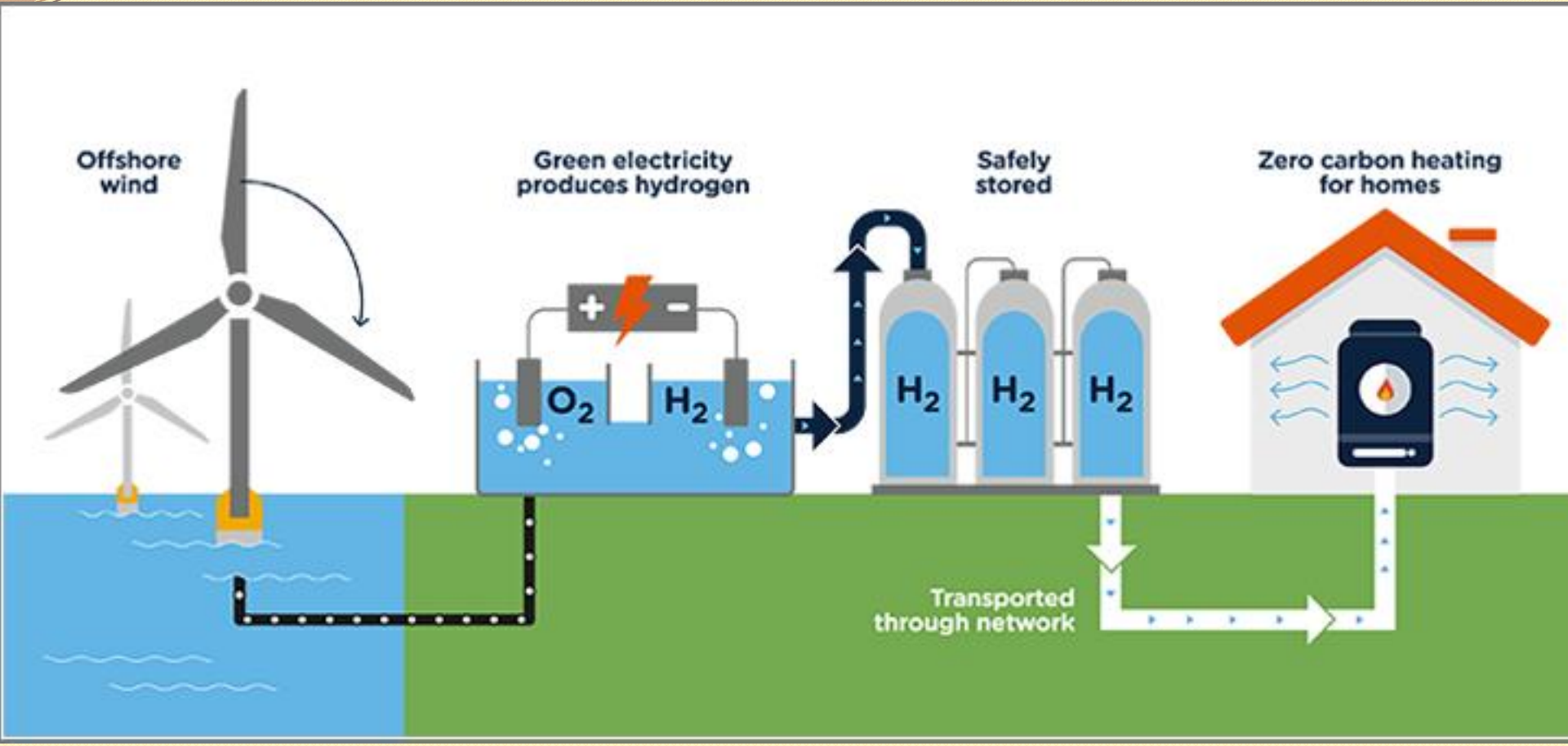
Storage of energy

Enormous amounts of energy is stored in biomass

How can best harvest the biomass?

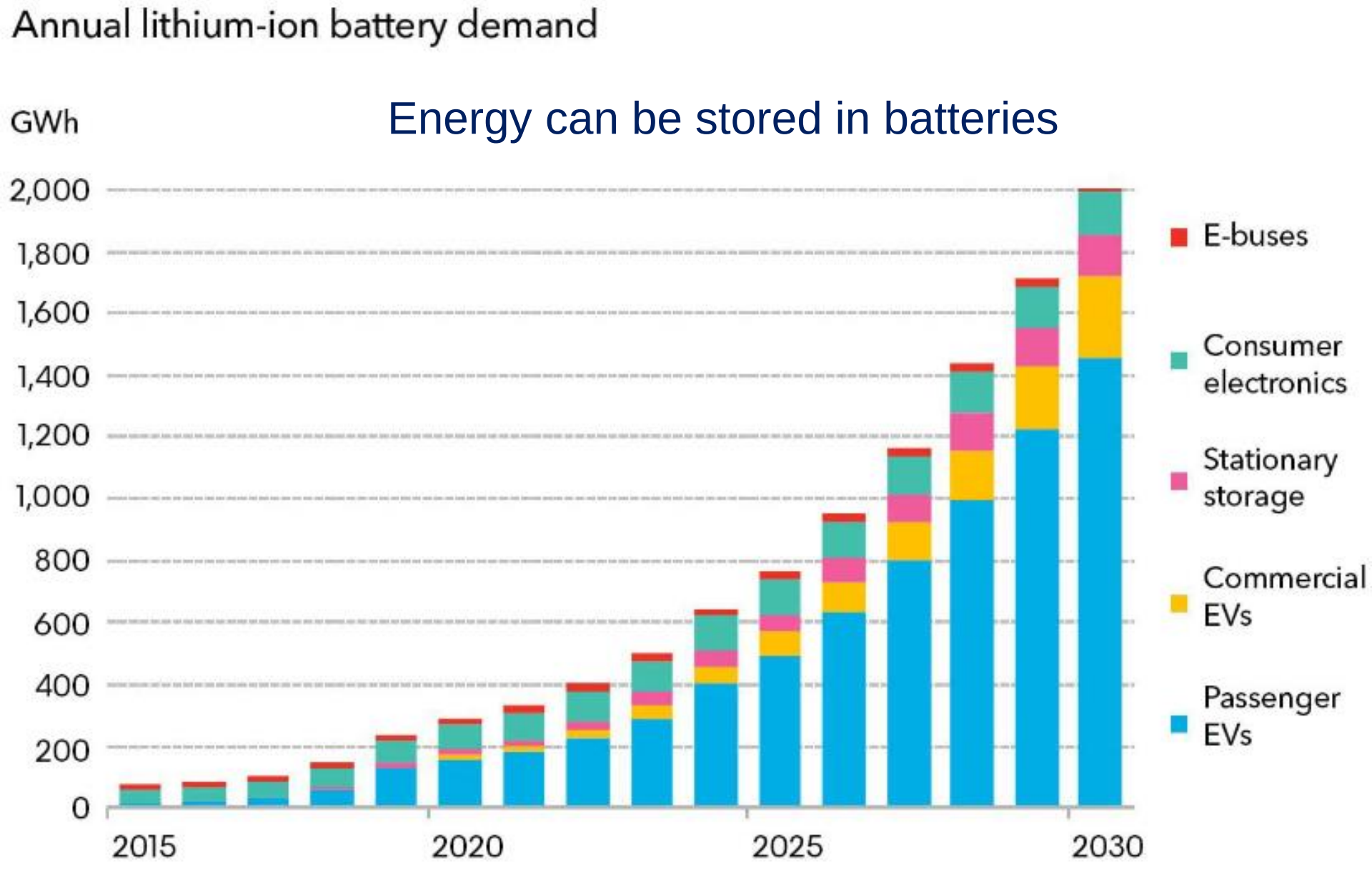


Energy is stored in the reservoirs of hydropower plants



Energy can be stored as hydrogen gas

Energy can be stored in batteries



Source: Bloomberg NEF 2019 Electric Vehicle Outlook

Energy efficiency

Energy conservation: Insulation of pipes and covers on containers

Building a passive energy house

A passive energy house

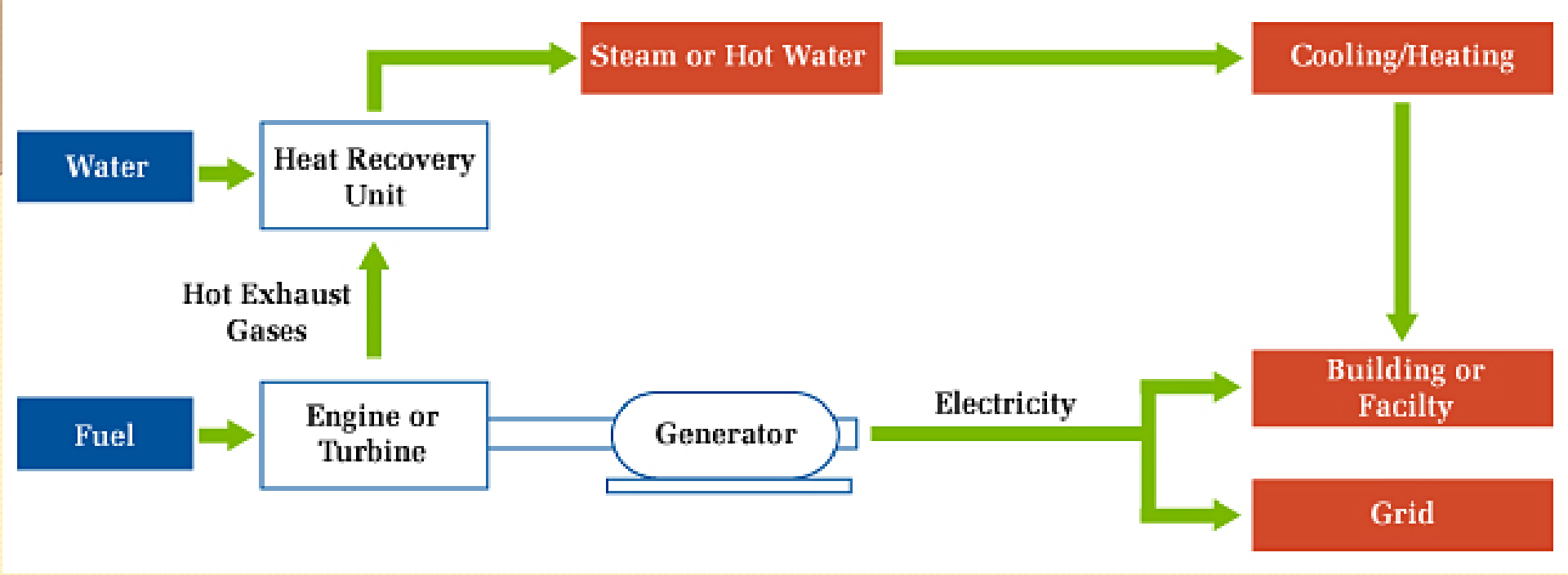
Improved technology

Torraca, Italy, has LED for all street lights

Improved technology

Electric cars

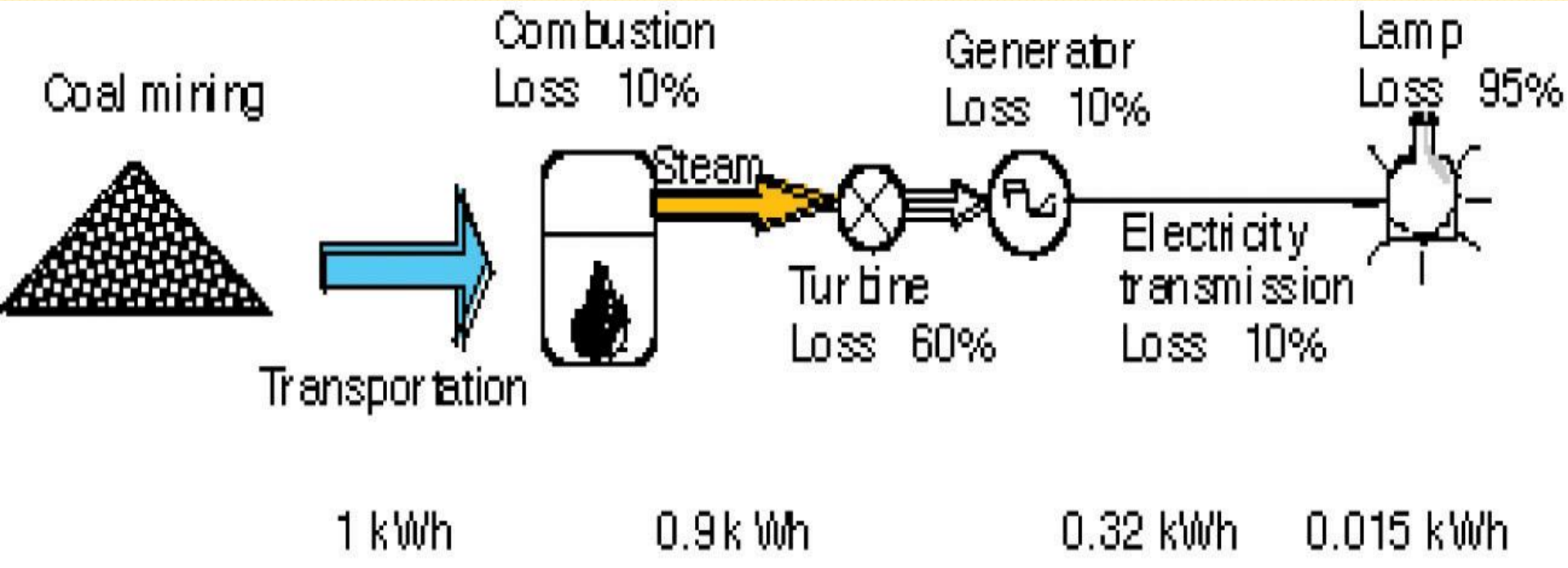
Combustion engine: 15 % of energy comes to the wheels
Electric engine: 90 % of the energy comes to the wheels



Power stations

Careful use of energy:
Combined heat and power - cogeneration

Why demand management is better than increased production



PFE - Energy Efficiency in Large Companies

Swedish Energy Authority

- 100 companies took part
- All made a complete energy use mapping
- All introduced a certified energy management system
- 1247 projects and 1.47 TWh less electricity annually
- 708 MSEK in investments
- 400 MSEK less energy costs annually
- Average return of investments 1.5 year
- Tax reductions 150 MSEK annually

Mapping Energy use, project proposals

1. Background
2. Photos
3. Energy efficiency proposals
4. Drawbacks of each
5. Calculations – kWh, Investments, Return on investements

52 projects during 2 years

Primary improvements

- Temperature adjustments
- Heat recovery
- New valves
- Insulation
- Changed routines
- New lighting
- Toilets

Secondary improvements

- Reduced water use
- Decreased fire risks
- Less air pollutants
- Less noise

Results after 2 years

- Accomplished 19 304 MWh /year
- Under planning 32 942 MWh /year

Increased use of renewable resources

- promoting local development
- creates new jobs
- combats climate change
- requires competence
- creates social capital
- promotes sustainable development


The power plant in Enköping
produces heat and electricity
to the town
© Henrik von Klopp

Biofuel - waste

Uppsala biogas station use organic waste, including food waste from households etc

83 buses in Uppsala are running on locally produced biogas

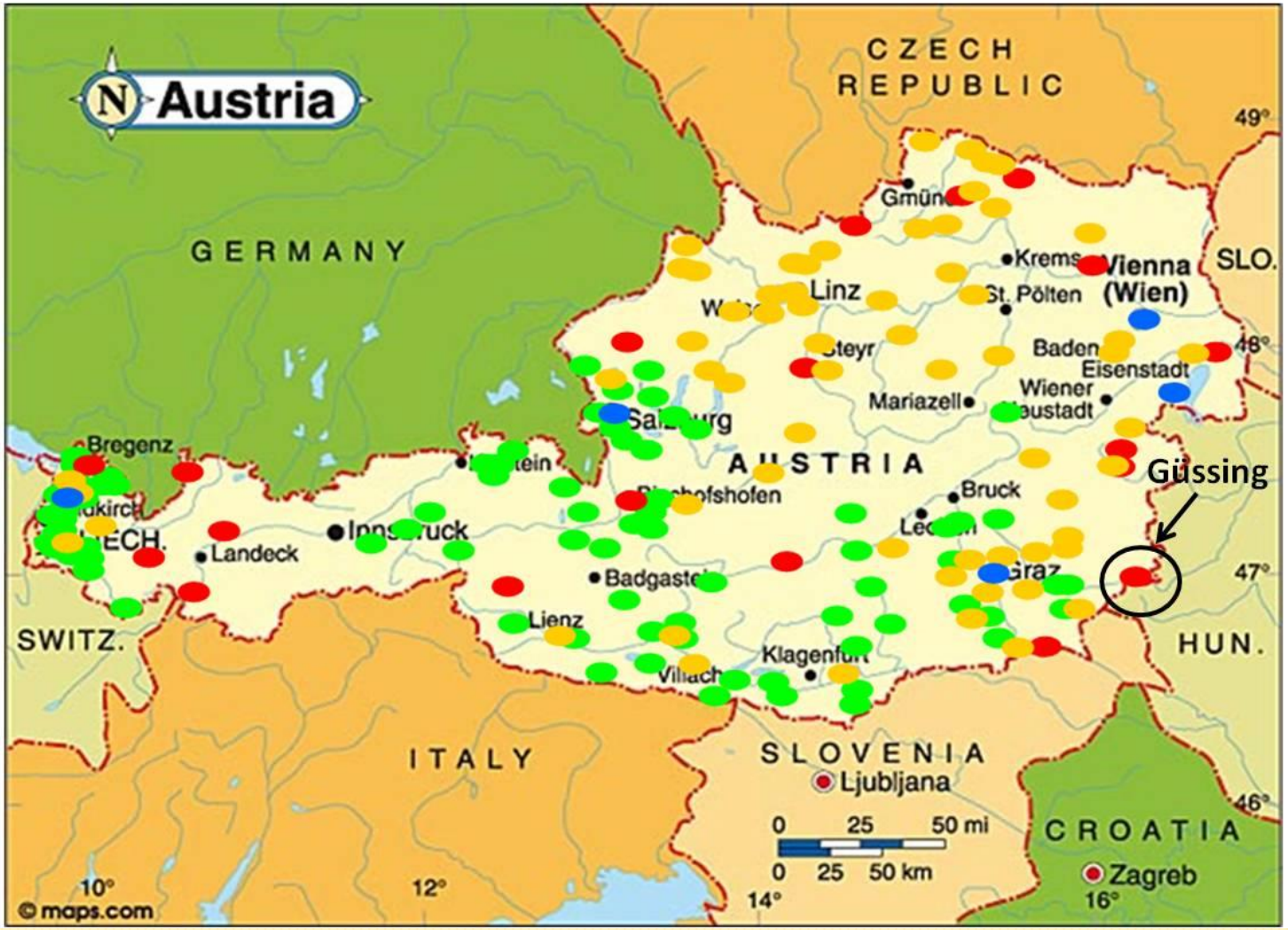
Güssing, Austria

From 1992 and in 11 years, Güssing became self-sufficient in electricity, heating, and transports. In the process 60 new companies with more than 1,500 new "green jobs" were created and commuting decreased to 40 %. On top of this Güssing now sells green energy outside the municipality to $28 million yearly and emissions of CO2 decreased by more than 80%.

https://www.100-percent.org/gussing-austria/

Energy Independence
Growing on Regional Level

Regions Independent in Electricity, Heat and/or Transportation **E-Mobility Pilot Projects**
Regions with growing Energy Independence **Regions with high Energy Efficiency standards**



Networks of fossil-free municipalities in the world

- ***Post carbon cities***, USA based
- ***Local Renewables Initiative*** run by ICLEI (local authorities for sustainability)
- ***Solar Cities*** network Australia
- ***52 cities in Japan*** develops energy autonomy
- ***Transition Towns*** A network for munciplities with local transition initiatives to tackle the double challenge of peak oil and climate change.
- And many more!

30 minutes

- Discuss which kind of energy you use
- Discuss which kind of energy your university uses
- Discuss how can you save energy

After 10 minutes we meet and talk together!