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Energy Management
in a Carbon Constrained World

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Biographical note:

- **Training:** technology – economics – political economy
- **Fields:** energy, economics, environment, climate policy, political economy
- **Impact:** halt Belgian atomic power expansion (1981-1989); closure coal mines (1989); state-of-the-environment reporting & policy planning (1988-1998); water sanitation in Flanders (1999-2001); IPCC (1998-2014), EU & UN energy & climate policies and politics

Overview

1. Carbon constrained world
2. Energy from Sun & Earth
3. Central role of Electricity
4. Three eras of energy use & related civilization
5. Energy & Societal Transformation for the public good

6. About Energy and Money
7. Billions of super profits from oil & gas
8. Who decides on oil& gas pricing?
9. Quantum physics for big evil or for good nanosciences?
10. Atomic power generation
11. Nanosciences bring key new energy technologies

- 12. Societal factors blocking transformation:
Lobbyism and Delusive-truth*
- 13. Energy revolution*
- 14. Neoliberalism: attributes and pillars*
- 15. Captured regulation → masterminding strategic socio-economic processes*

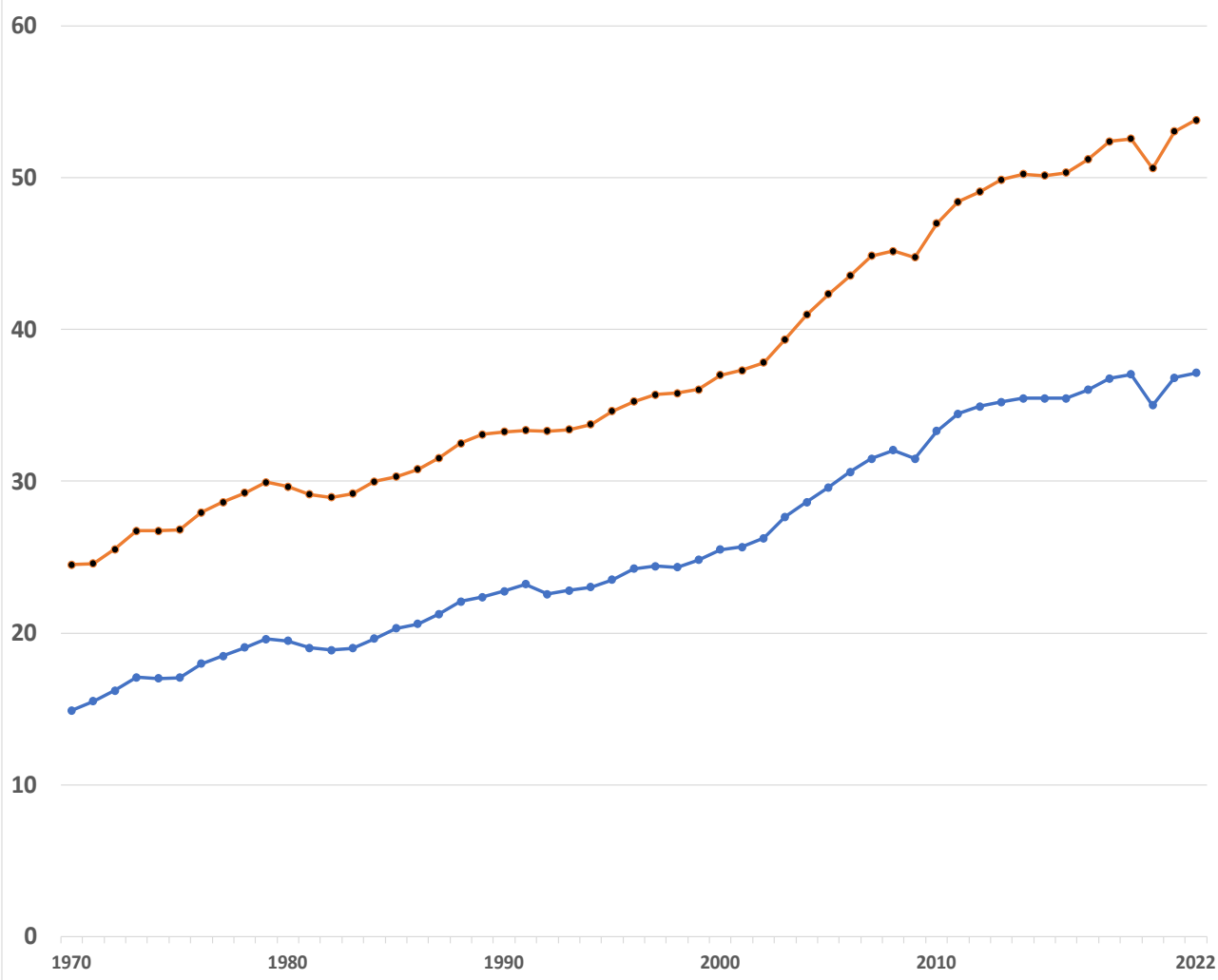
Emissions of CO2 and CO2-eq. Greenhouse Gases

cause

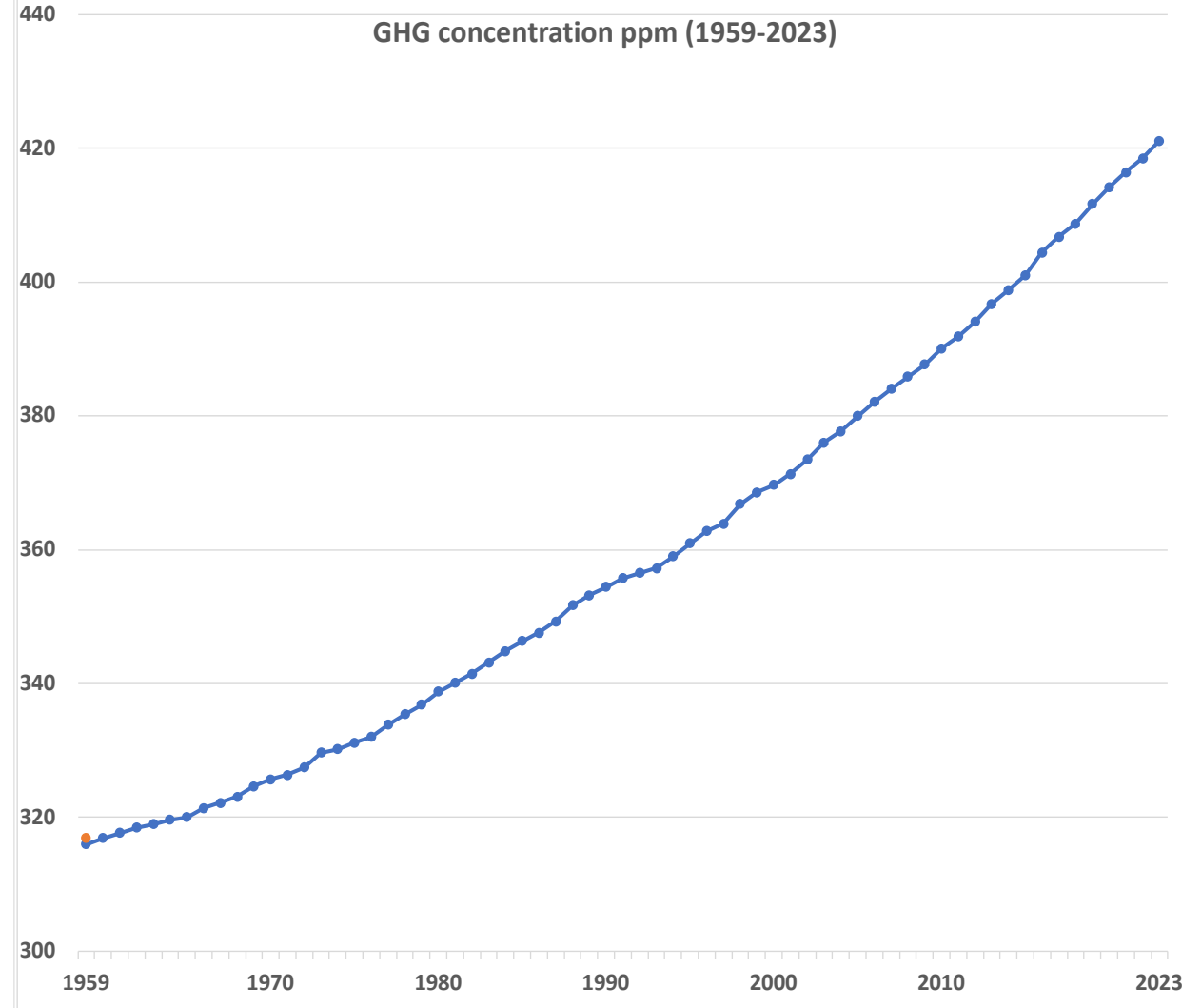
steadily increasing GHG concentration in the atmosphere.

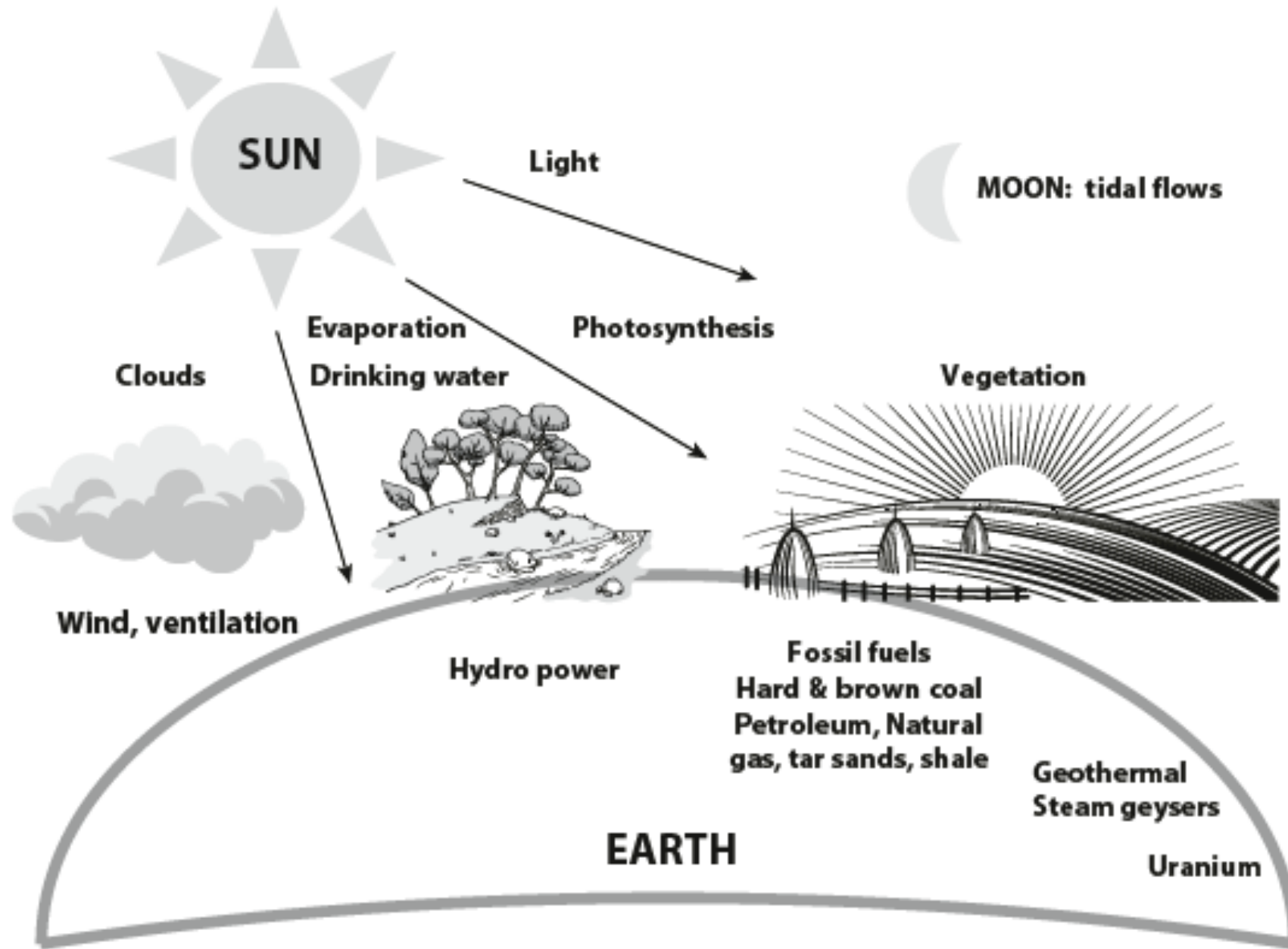
Mounting emissions and concentration reflect failing climate policies.

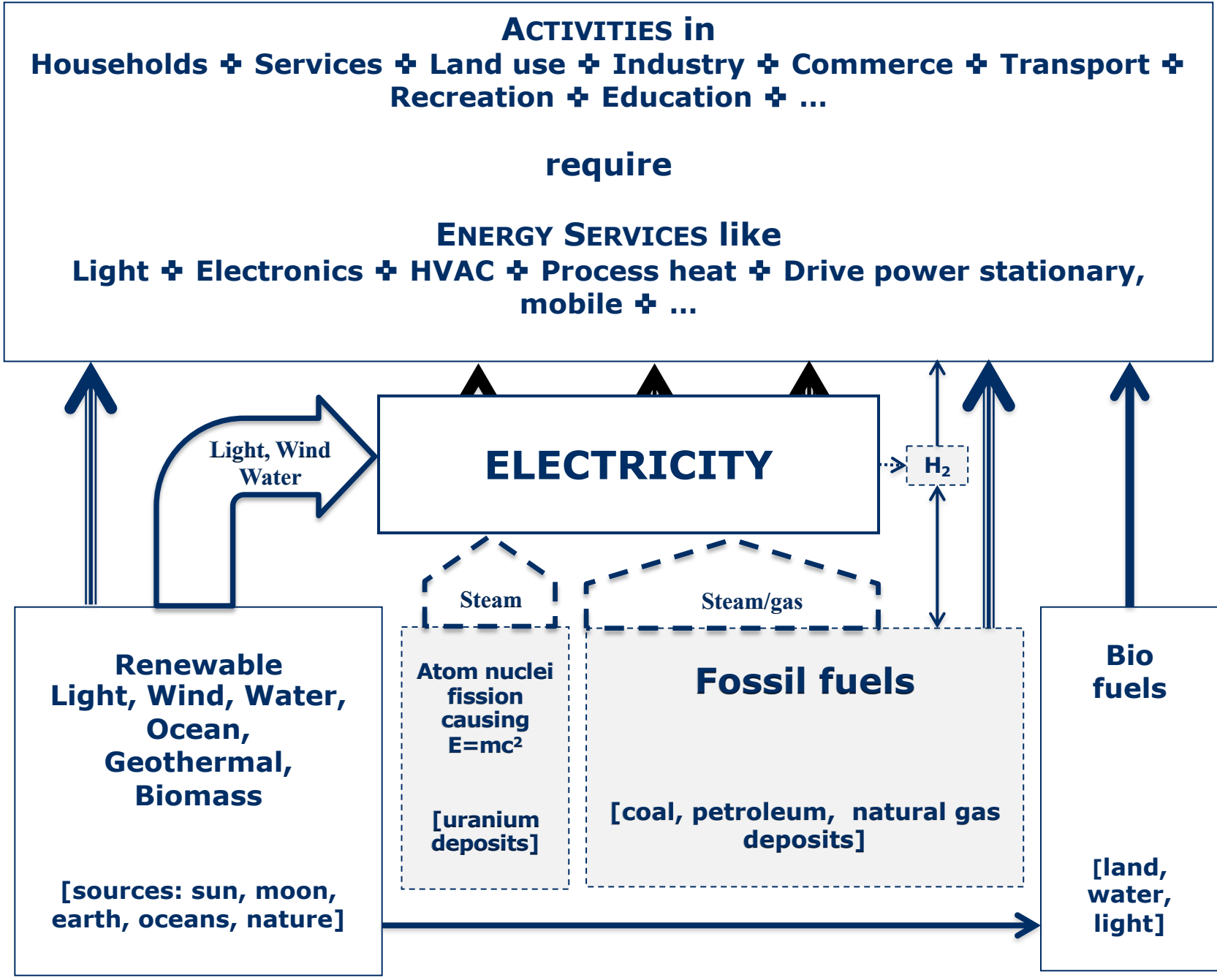
CO2 (lower curve) & CO2-eq (upper curve) Gigatons emissions in the years 1970-2022



GHG concentration ppm (1959-2023)





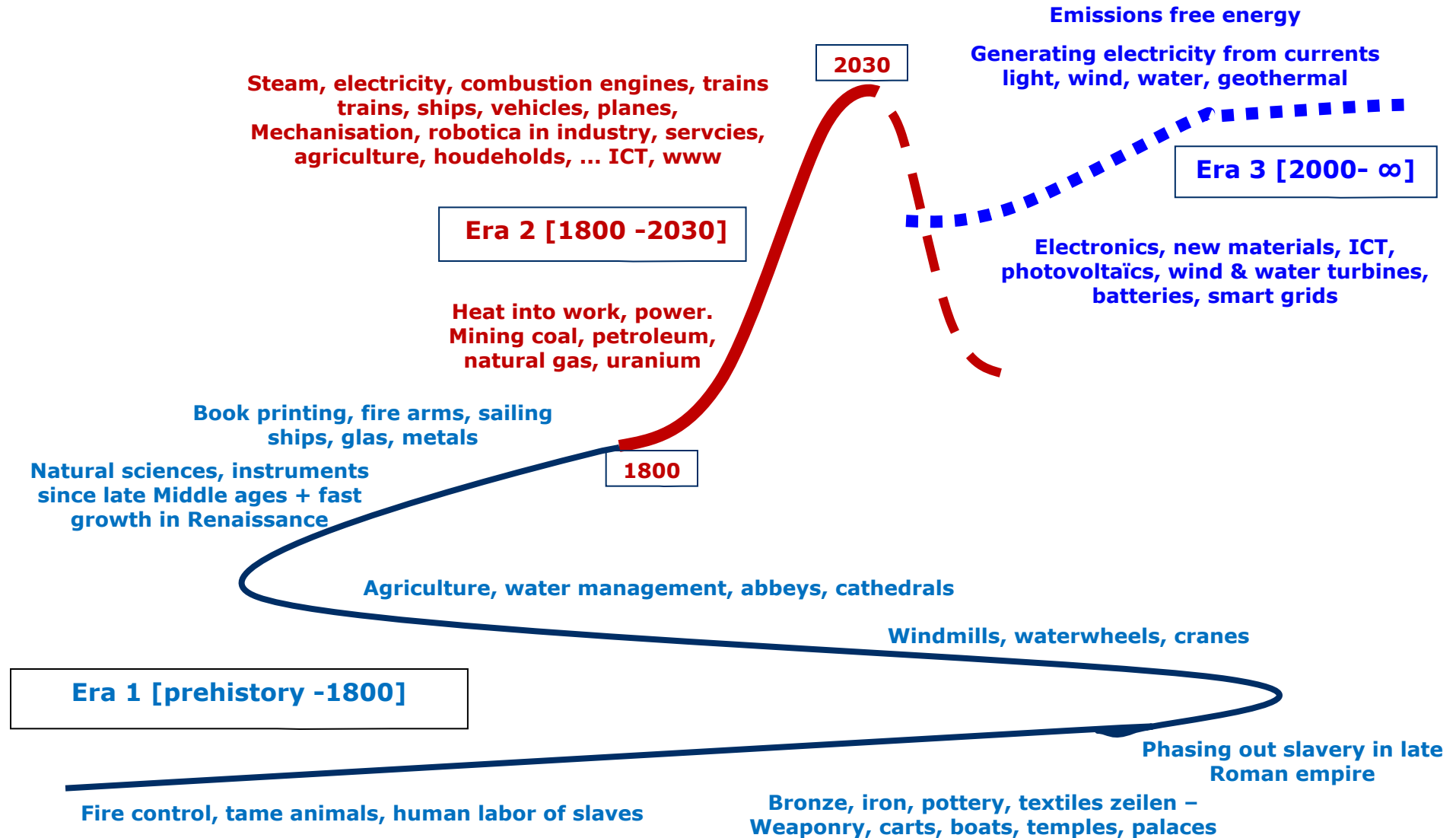


Three main eras of energy use and related civilization

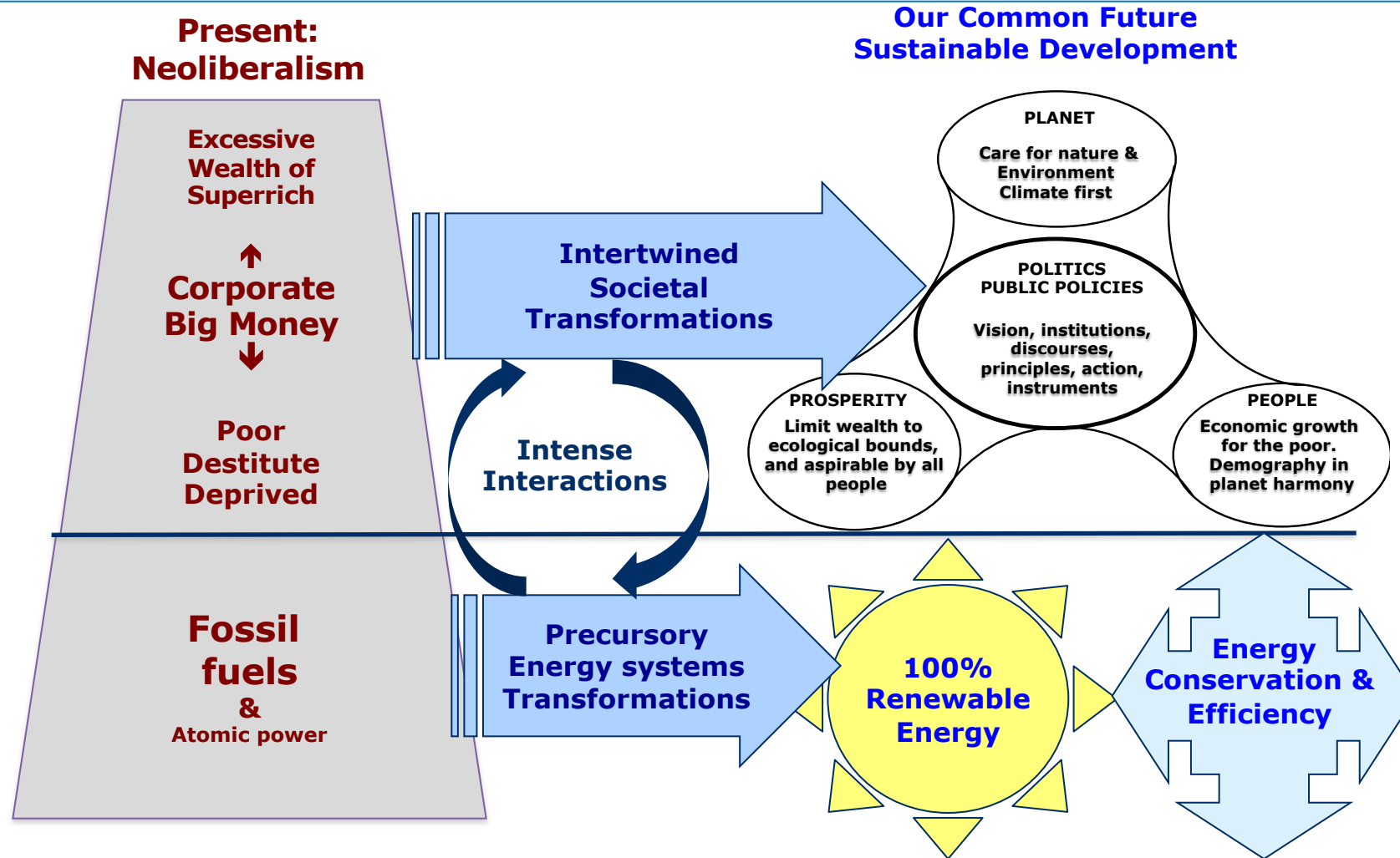
Era 1 [prehistory-1800]

Era 2 [1800-2030]

Era 3 [2000-∞]



Energy and Societal transformations for the public good: Sustainable Development based on 100% renewable energy



About Energy and Money

Energy resources are fabricated by Sun and Earth cooperating
Why do free energy resources turn in high-priced energy commodities?

- 1. During industrialization: mining Stocks crowded out harvesting Flows in economic activities**
- 2. Property Rights rules: the owner of the land/sea above a stock, also owns this stock**
- 3. Under capitalist regimes: most stocks of the nation are privatized**
- 4. Giant companies largely control the mining of encroached stocks: they capture shocking super-profits = rents = profits without effort, paid by end-users of commercial energy**

Pernicious environmental impacts of using energy Stocks

Oil & Gas Super-Profits

1970-2020:
52,544 bn
US\$-2020

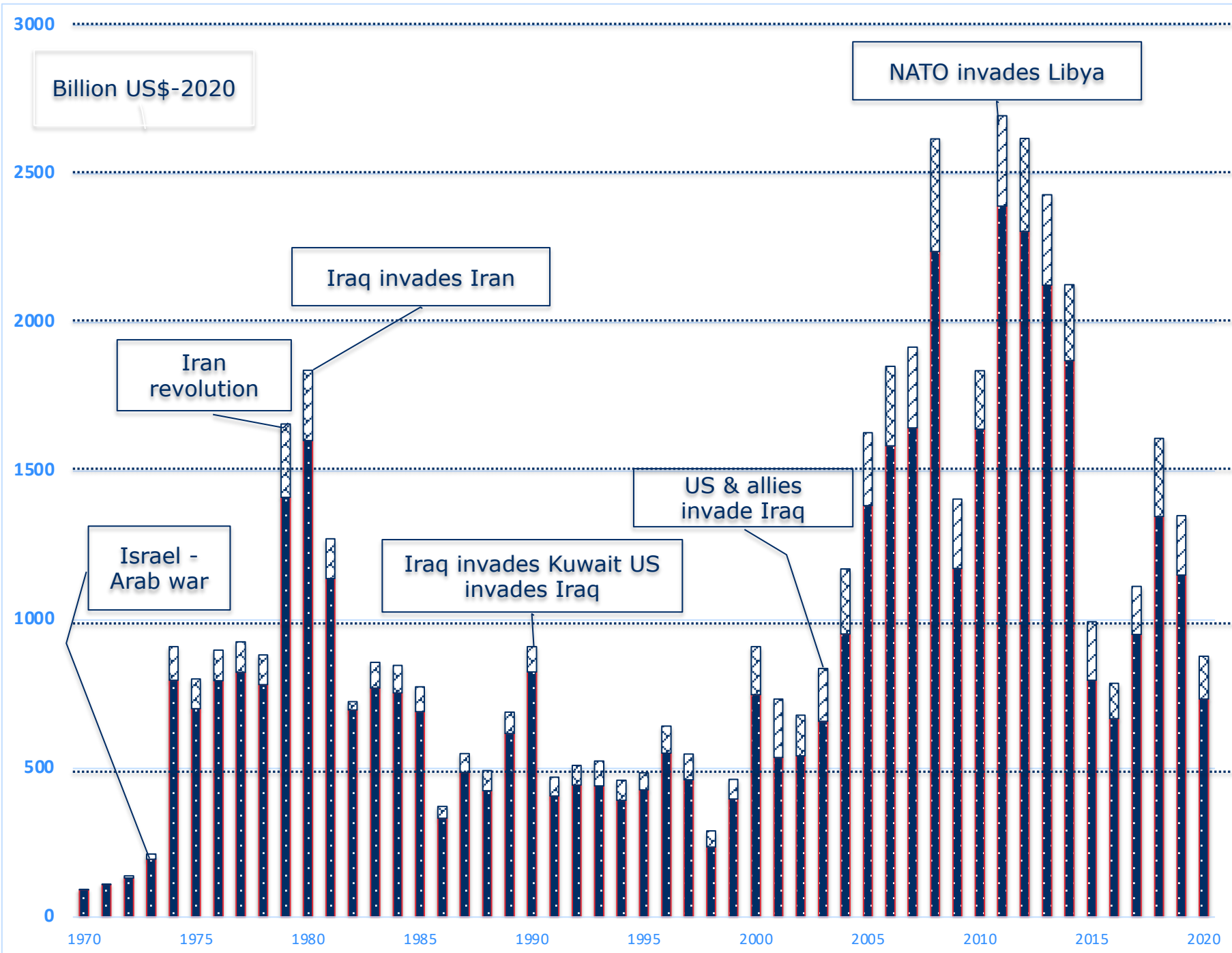
on average:
1,030 bn/yr

WARs
are

Coincidence
of excessive
rent volumes

or

Causality?



**Sanctions
+
War in
Ukraine
+
Embargos**

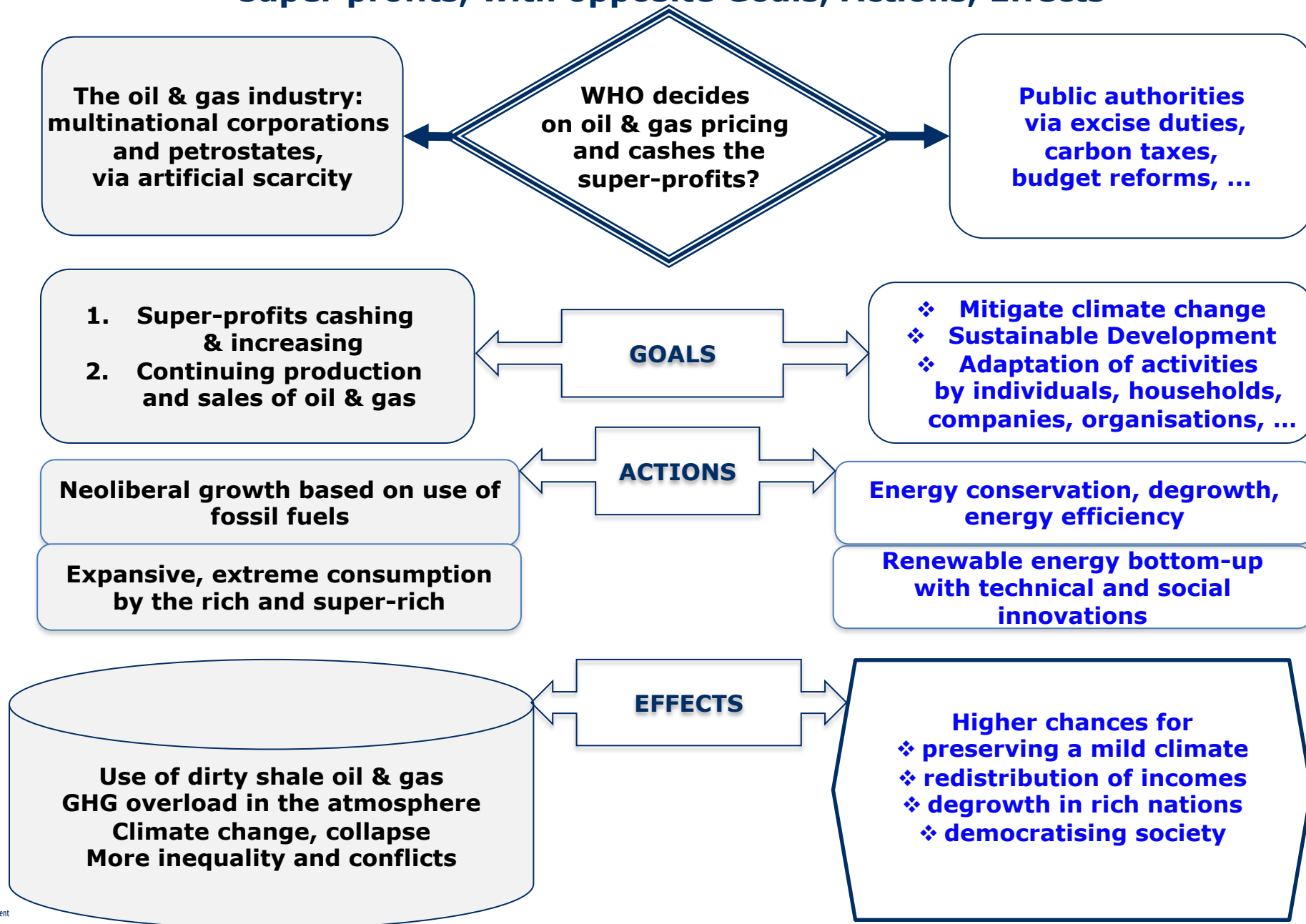
=

**Super -
profits
again
excessive**

**IEA (2023)
estimate for
2022
amounts to
3750
billion US\$**

2021-2022

Opposite paths for determination of oil and gas prices and for collecting the associated super profits, with opposite Goals, Actions, Effects



Quantum physics, used for big evil or for good nanosciences ?

1900 Max Planck: quanta in electromagnetic radiation

1904 Albert Einstein: equivalence mass & energy, $E=mc^2$

1926-28: Heisenberg – Schrödinger - Dirac => QUANTUM theory

1938: Otto Hahn & Lise Meitner discover and explain nuclear fission

Direction $E=mc^2$

1941: start US Manhattan project to develop atomic bombs

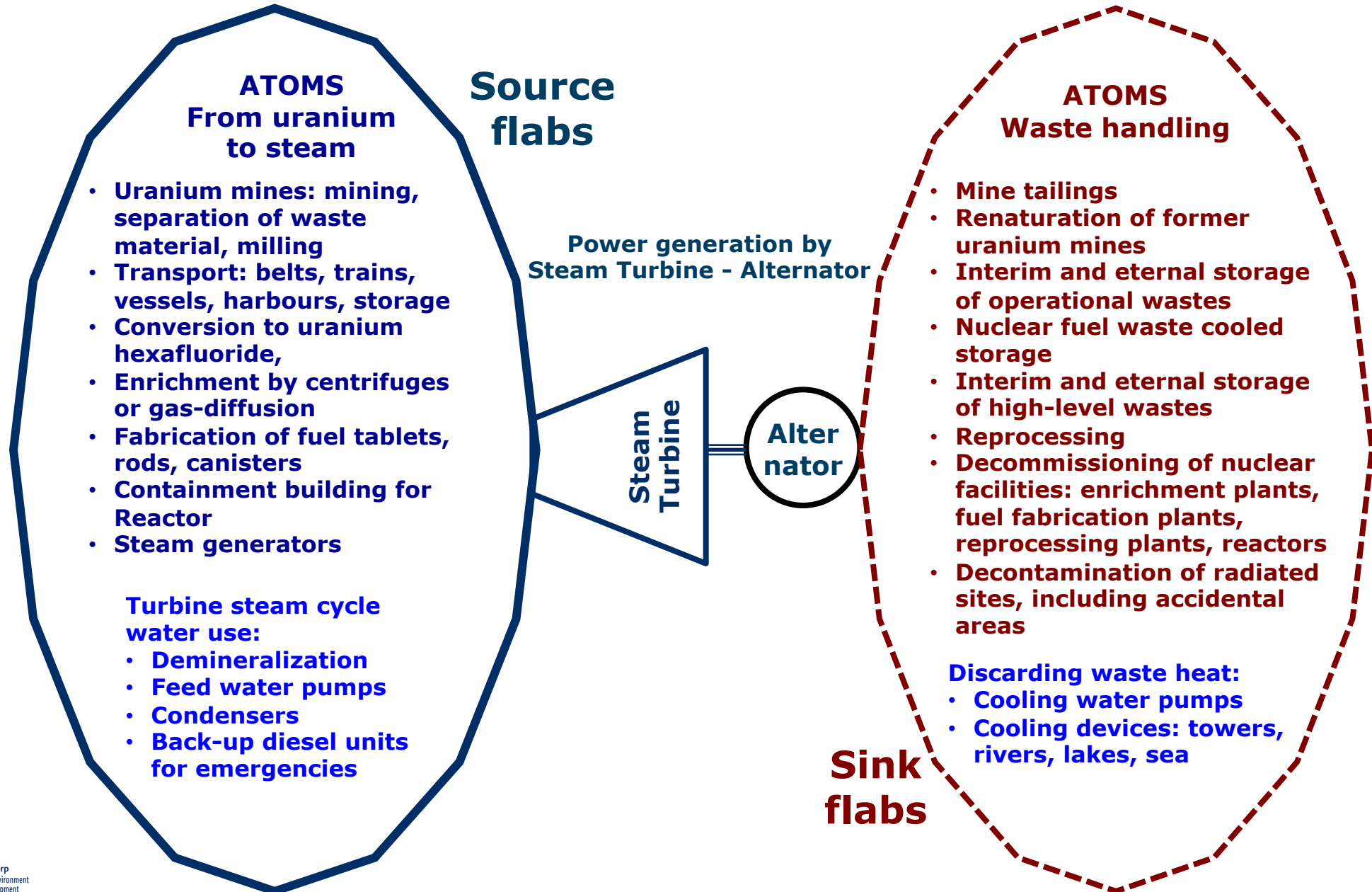
1945: uranium bomb on Hiroshima and plutonium bomb on Nagasaki

1953: Eisenhower launches *Atoms for Peace* for the *Atomic Energy Economy*

Performance and results are problematic:

- **thorough sustainability assessment needed**
- **Saatchi&Saatchi & IAEA advocacy means deception**

Atomic power generation implies expensive, risky source & sink activities



Nanosciences bring KEY NEW ENERGY TECHNOLOGIES



Photovoltaics

Power generation

- Direct generation of electricity from sunlight
- >20 times more efficient than photosynthesis
- Lowest electricity costs
- Decentralised generation
- Fluctuation with solar radiation



Power Electronics

Power transformation, transport and control

- Electricity converters
- Wind power to grid
- Digital control of electricity systems
- Efficient grids, HVDC, superconductors
- Digital frequency control → efficient e-motors



Batteries

Power storage

- High-density electrochemical battery cells
- Flow batteries for longer-term-storage
- Strong density improvements and cost reduction
- Fuel cells
- Improved electrolyzers



Electricity → Radiation

Material processing & light

- LED, Laser, Microwave...
- 3D-printing: up to 75% material savings
- High life-cycle energy savings
- Efficient decentralised small series production

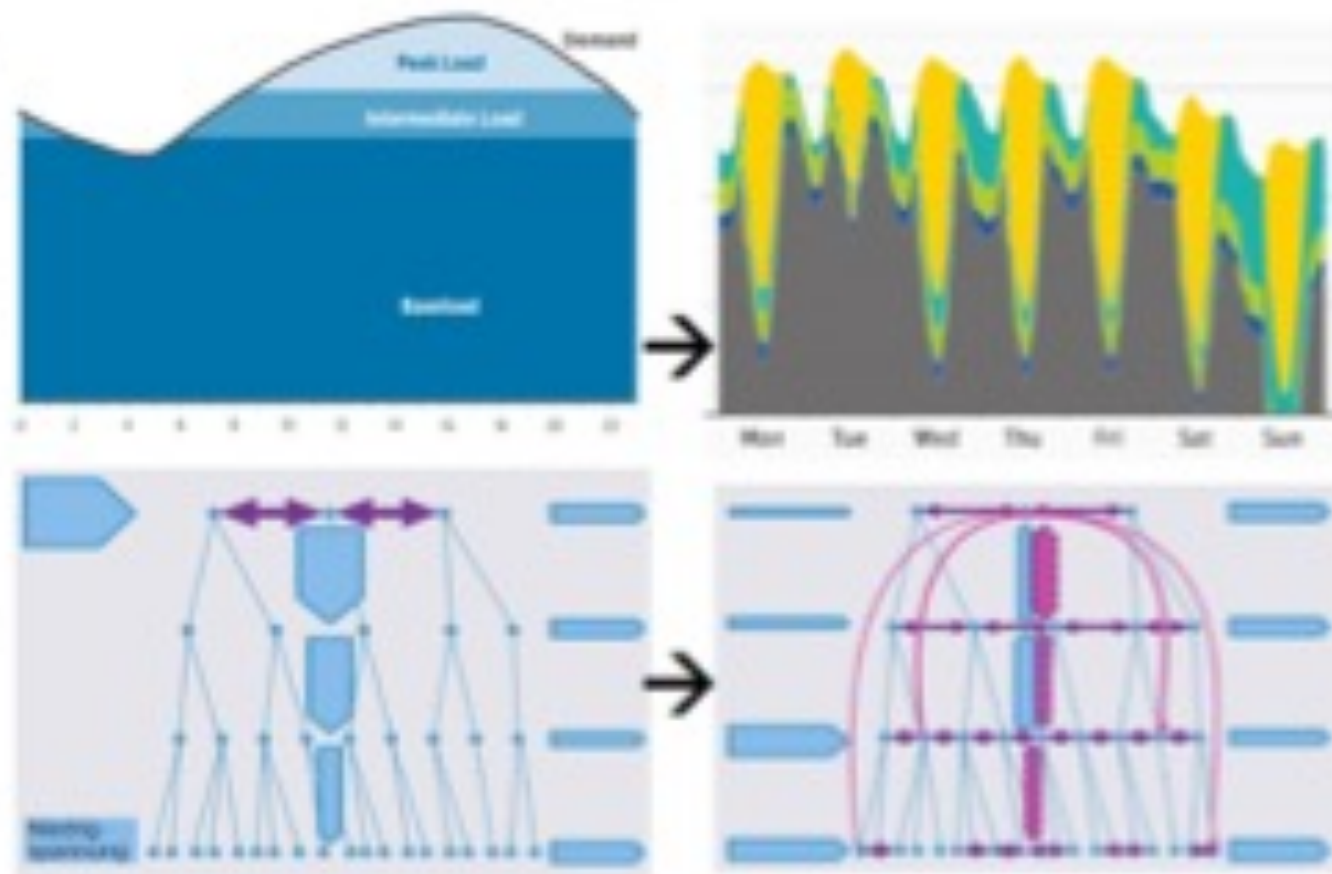
**Very rapid performance boost and cost reduction well above macroscopic process learning curves:
miniaturisation and speed/efficiency increase due to improved processes at nanoscale**

Direction Nanosciences

Ruggiero Schleicher-Tappeser
sustainable-strategies

Flexibility sources allow full coverage with renewable electricity

Flexibility source	New technologies
Demand side management	power electronics, communication
Flexible generation	power electronics, materials
Energy storage	batteries, hydrogen conversion, power electronics
Sector coupling	power electronics, heat pumps, electric transport
Grids: Transmission & distribution	power electronics, digitalisation, superconductivity
Bottom-up system control logic	power electronics, local energy markets

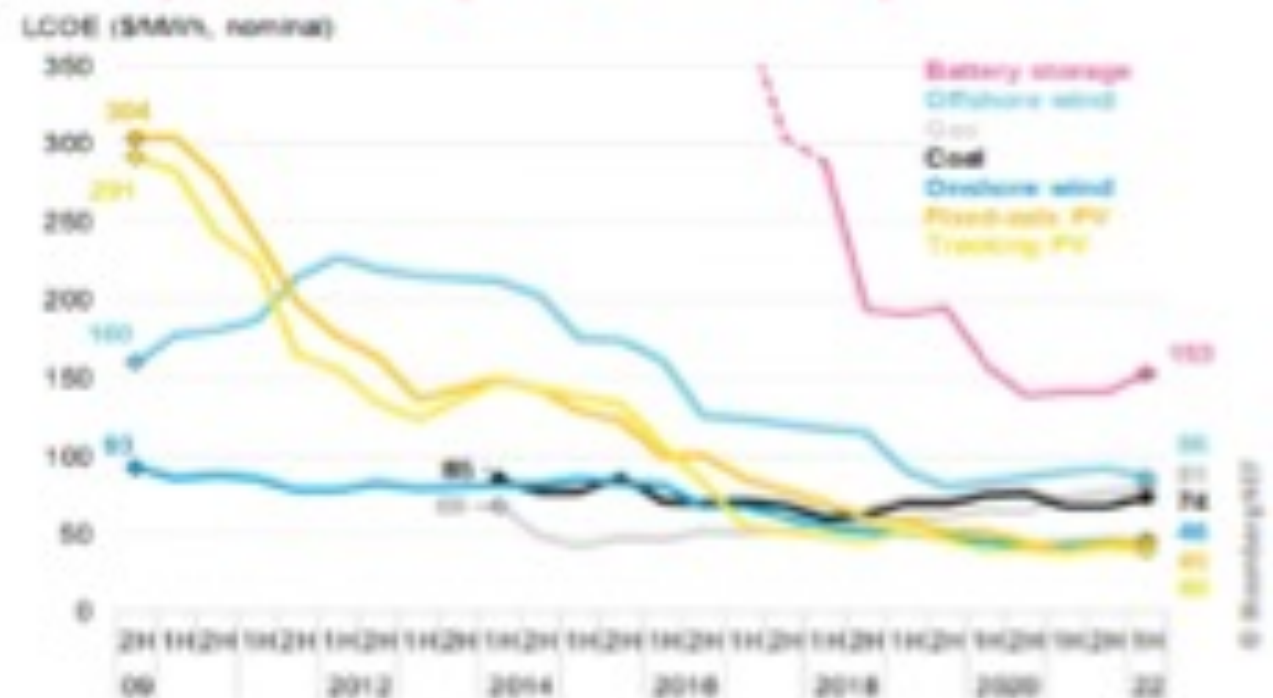


Calculations show: Combinations of these approaches can guarantee a fully renewable energy supply in Europe and the US at lower costs

Photovoltaics are unbeatable due to nanoscience: Cost reduction stronger than in all other energy sources

1. **Extremely reliable.** No moving parts, no fuel, very low risks. Last for 30 to 40 years
2. **Mass production.** Classical economies of scale. New factories: 50 million modules per year
3. **Rapid innovation at nano-scale.** 2010-21: module efficiency 14% → 22%
4. **Extremely scalable, up and down.** Energy transformation occurs at nano-level
5. **Rapid deployment.** Factories 2a, plants 1/3 a → 10 x shorter innovation cycles
6. **Strong potential for further cost reduction.** Perovskite cells , material reduction with BIPV

- No other energy source has matched efficiency gains, cost reductions and growth rates of PV
- **Nanotechnical innovation is the main driver for the extraordinary cost reductions – mass production experience comes only second**



PV and system change – strong resistance for 50 years

EXAMPLES

1973: **Nixon's** national energy research plan: no PV despite potential

1981: **Reagan** and U-turn of oil industry kill fledgling PV industry

2000: Introducing feed-in-tariffs: Success required parallel action to established structures

2009: Foundation process of **IRENA**: tedious

2011: European **governments slash PV** surge, 120'000 jobs lost in D

2014: No chance for large PV industry in Europe – **French-German xGWp** project fails

2008 → **China** did not play by the big boys rules → 80% of global market, 34% of installations

2022: The **hydrogen hype**

Lobbyism

Lobbyism in Washington, Brussels, in Member State Capitals, in Universities, in ...

End 2022: Qatar lobbyists paid Members of the European Parliament for a better imago in the upcoming soccer games

=> loud media outrage over this trifle

Questions

Q1 Why is there no outrage about extensive and continuous lobbying by big money, by corporations?

Q2 Is outrage at lobbying reconcilable with praise and support for the outcomes of lobby processes?

Q3 What explains media's constancy in supporting the products of lobbying and deceit?

Q4 Why is the impact of corporate lobbying on energy and climate policy not revealed?

Delusive-Truth

“Delusive-truth” (far more effective deceit than “fake news”)

Construct counterfeit on a truth: a mathematical theory, law of physics, observable fact, ...

Archimedes well-known, innocent example on the lever.

Truth is the lever mechanism. *Delusive is ‘With a fixed point and a lever, I can move the Earth’*

LESS INNOCENT:

- ***The EU Emissions Trading System* (Truth is axiomatic mathematical theory of perfect markets; Delusive is proper application of the theory in the real world => a ‘market’ façade conceals free permits for industry, and for electricity companies ‘money pumping’)**
- ***The EU Electricity Exchange* (Truth: marginal cost pricing is optimal if MC-curve holds all supply in optimally composed generation park; Delusive is considering only the fringe of supply for capturing huge super-profits).**
- ***Atomic power generation* (Truth is $E=mc^2$; Delusive is applying the atom fission processes in a guaranteed safe and economically beneficial way).**
- **Hydrogen (Truth: $H_2 + O_2 \rightarrow H_2O$, no Carbon; Delusive is the sustainable hydrogen energy economy).**

Energy Revolution

Neoliberal powers defend their interests

- Continue the use of fossil fuels, sideways with CCUS, 'Sustainable Fuels', hydrogen hype
- Economic growth for more accumulation by the superrich
- Energy conservation is skipped
- Subsidizing atom power goes on, and waste problems are rolled of on common people
- Giant electric corporates capture the renewable energy projects

2014 Putsch by energy corporations, lobbying the European Commission

- Large-scale renewable electricity projects are prioritized
- Favorable regulations for supporting small-scale projects are missing

“Small-scale renewable electricity generation realized bottom-up” is

- **Possible:** PV, wind are micro,mini technologies. 'Large-scale' is the aggregate of many PV-cells, panels. Windturbines are overstretched to 15MWe. WindkWh levelized cost prices in US\$ct-2022/kWh (IRENEA 2023): 3.3 onshore and offshore 8.1 (7.5 in 2021).
- **Desirable:** end monopolistic profit-making, alias preclude super-profits
- **Necessary:** climate change and collapse are global issues, to be addressed globally. Small-scale PV, wind, water, geothermal are affordable by communities in all countries

Neoliberal, Neoliberalism - attributes

Often named without clear meaning, contents

Three main attributes (based on Wolin, S. 2008, Democracy Incorporated. Princeton Univ.Press)

1. Financial power, concentrated in big money clans and giant corporations, dominates obedient politicians in strategic socio-economic decision-making.

Politicians function as façade and may care for socio-economic and ecological debris

2. Economic growth for profit is stimulated, augmenting the fortunes of the superrich, while many ecological barriers are trespassed

3. More social justice is not a political priority.

Inhumane inequality is considered as something 'normal', as evident difference between the poor (falling short in taking initiative) and the superrich (the ones that stimulate the growth machinery).

Charity patronage is said to suffice.

Neoliberalism is built on three main pillars

1. Intensive and unlimited use of fossil fuels.

Without this concentrated energy supply, available on human command, the neoliberal economy will disintegrate.

While the emissions of greenhouse gases visibly increase climate calamities

2. Control over money creation, money flows and stocks

With the money handles, superrich clans and giant corporations dominate politicians in money-based economies, and know to mastermind strategic socio-economic decision-making.

While populism is flourishing, totalitarian regimes shift to fascist extremism, inhumane inequality grows and 'illegal' migration from poor countries is ungovernable

3. Prevailing discursive power in market economies (and beyond)

Media controlled by big money repeat the mantras of 'free markets', of the superiority of Western ideology, ... culminating in the mantra "***there is no alternative for neoliberalism***"

While '*only alternatives make sense*' for maintaining human life conditions on Earth. 'The specter of inverted totalitarianism' in a 'managed democracy' (Wolin, 2008) is palpable

Demolish the three pillars to preclude neoliberal breakthrough 2 wrecking humans future.

Acting Politically

BigMoney is omnipresent in top-level politics, also observable in UNFCCC-COP meetings, IPCC Working Group 3, ...

Under liberalism: “captured regulation”,

i.e. there was still a sovereign public authority making regulations that BigMoney and giant corporates tried to capture

Under neoliberalism: “masterminding of strategic socio-economic processes”,

i.e. the initiative goes out from BigMoney and giant corporates with neoliberal power .