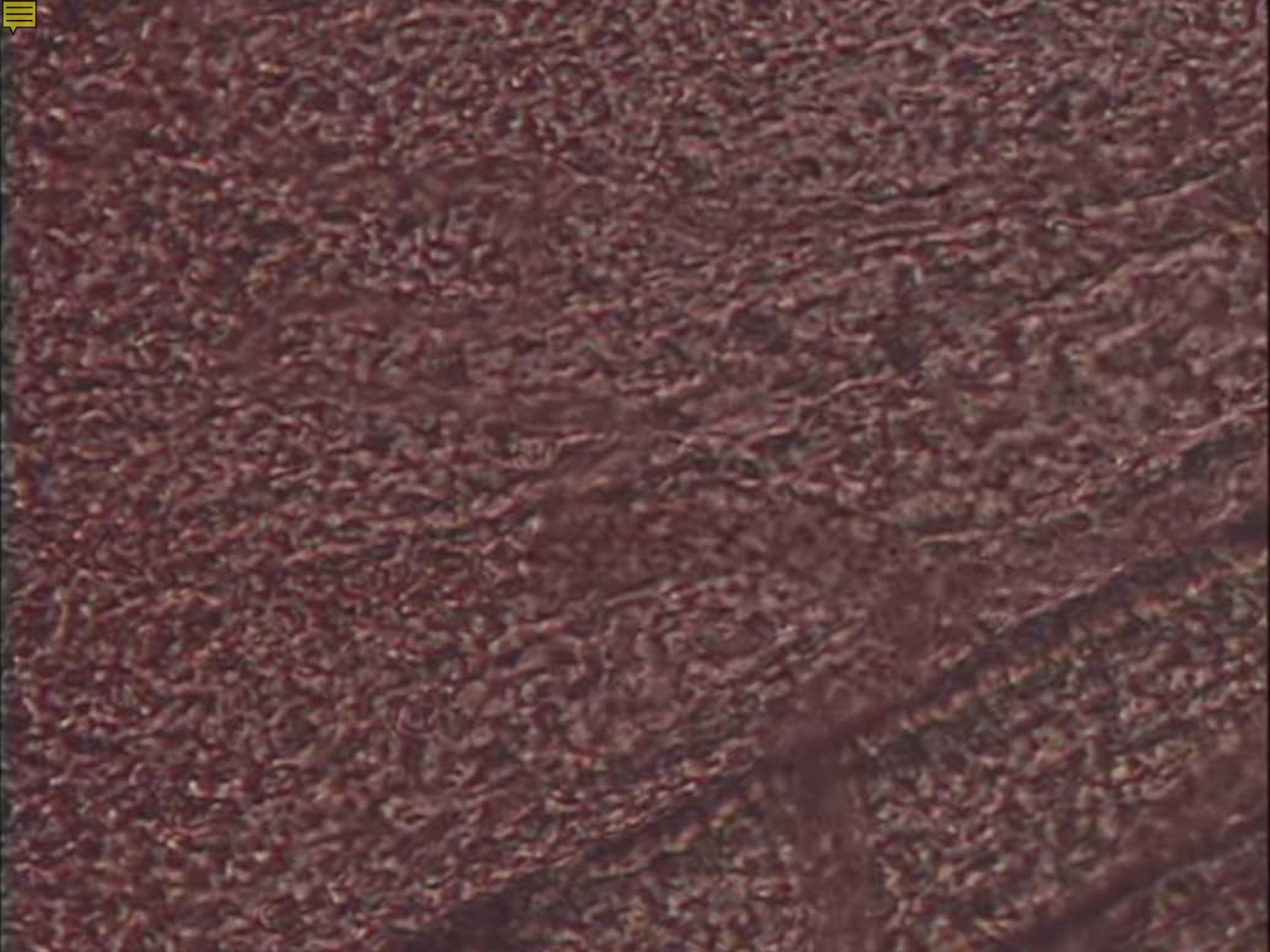
Environmental aspects of Energetics




KOYAANISQATSI


TV
14
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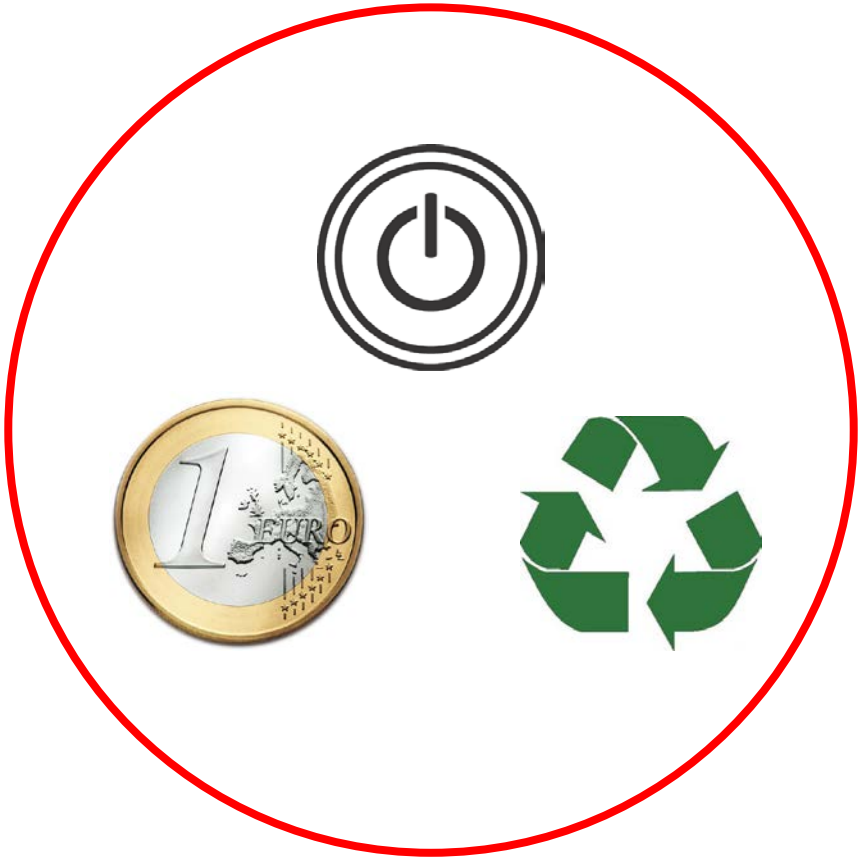
NATIONAL GEOGRAPHIC
PRESENTS

Energetic trilemma

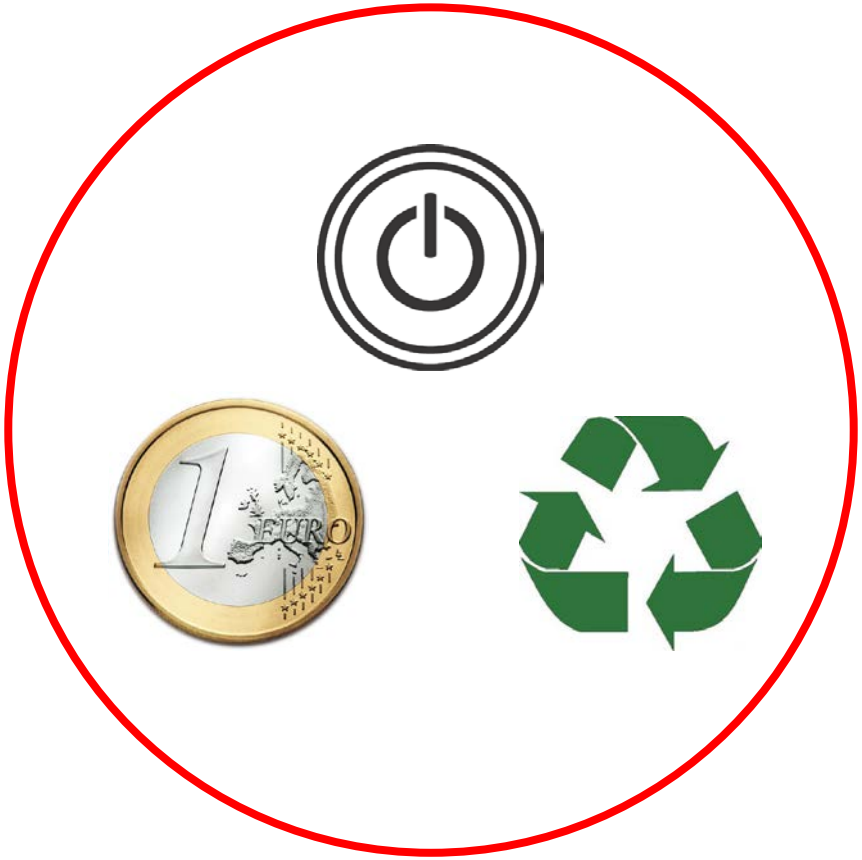


What energy we want (what we expect from the energy)?

Nobody has responded yet.

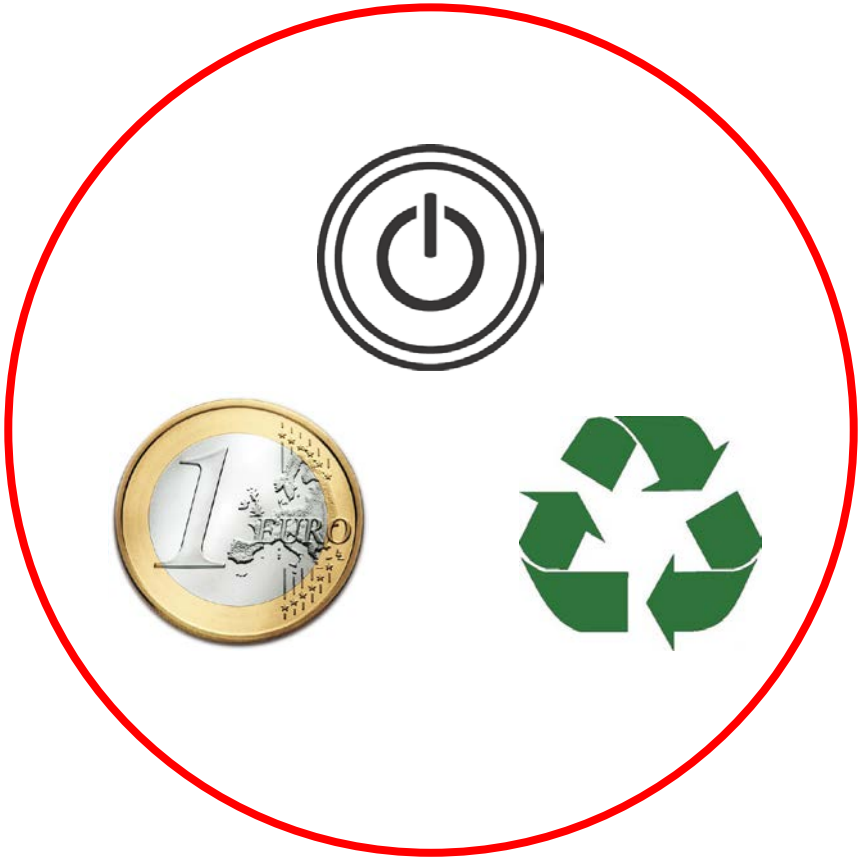
Hang tight! Responses are coming in.

Energetic trilemma



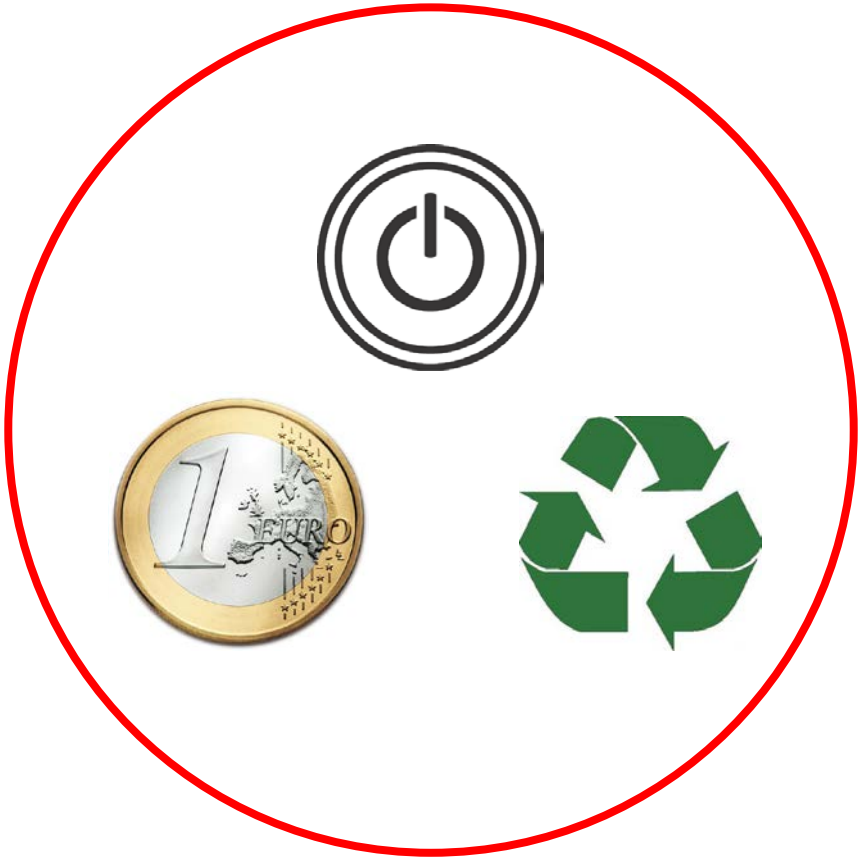
Cheap

Energetic trilemma

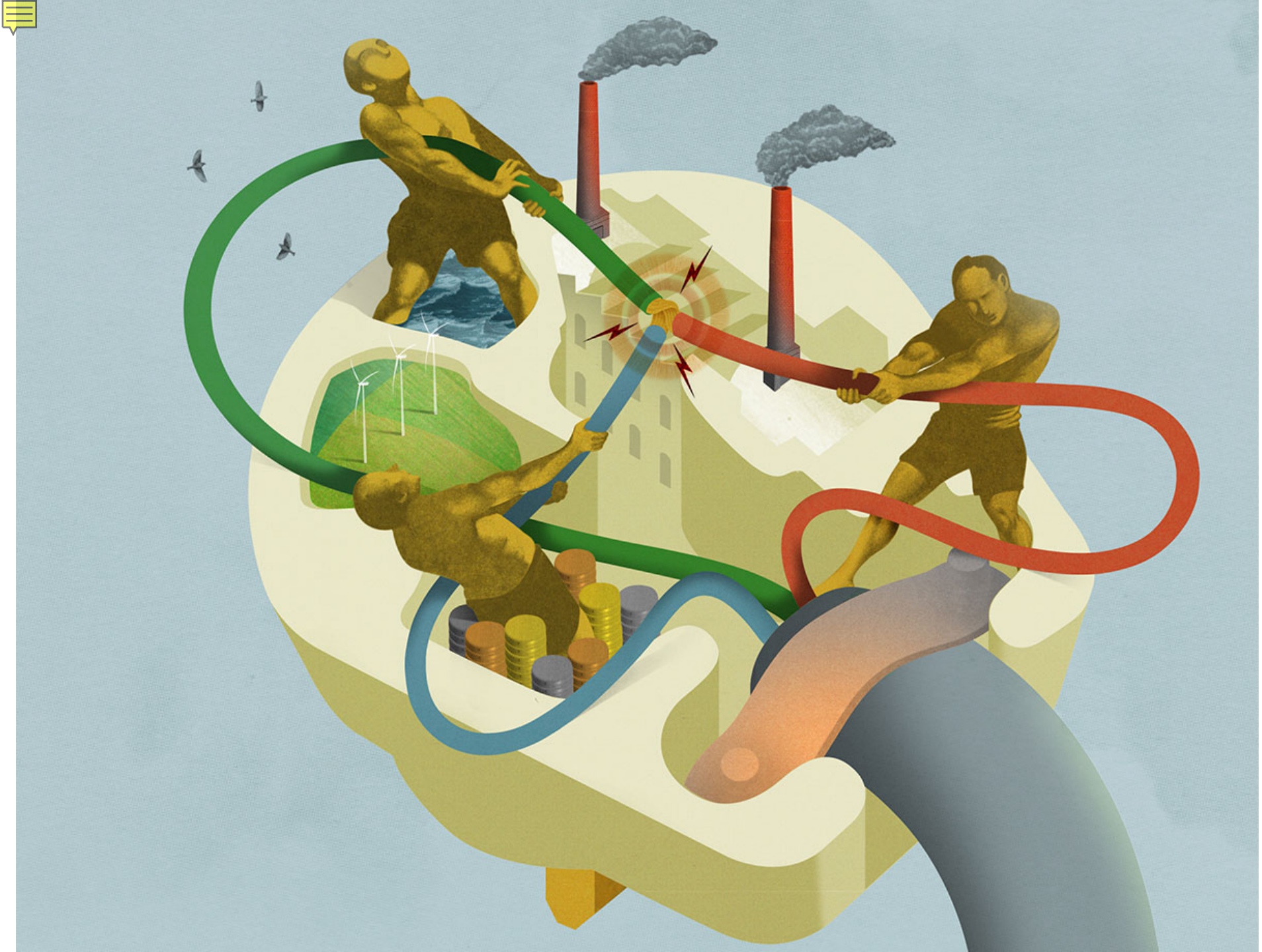


Cheap x clean

Energetic trilemma



Cheap x clean x reliable

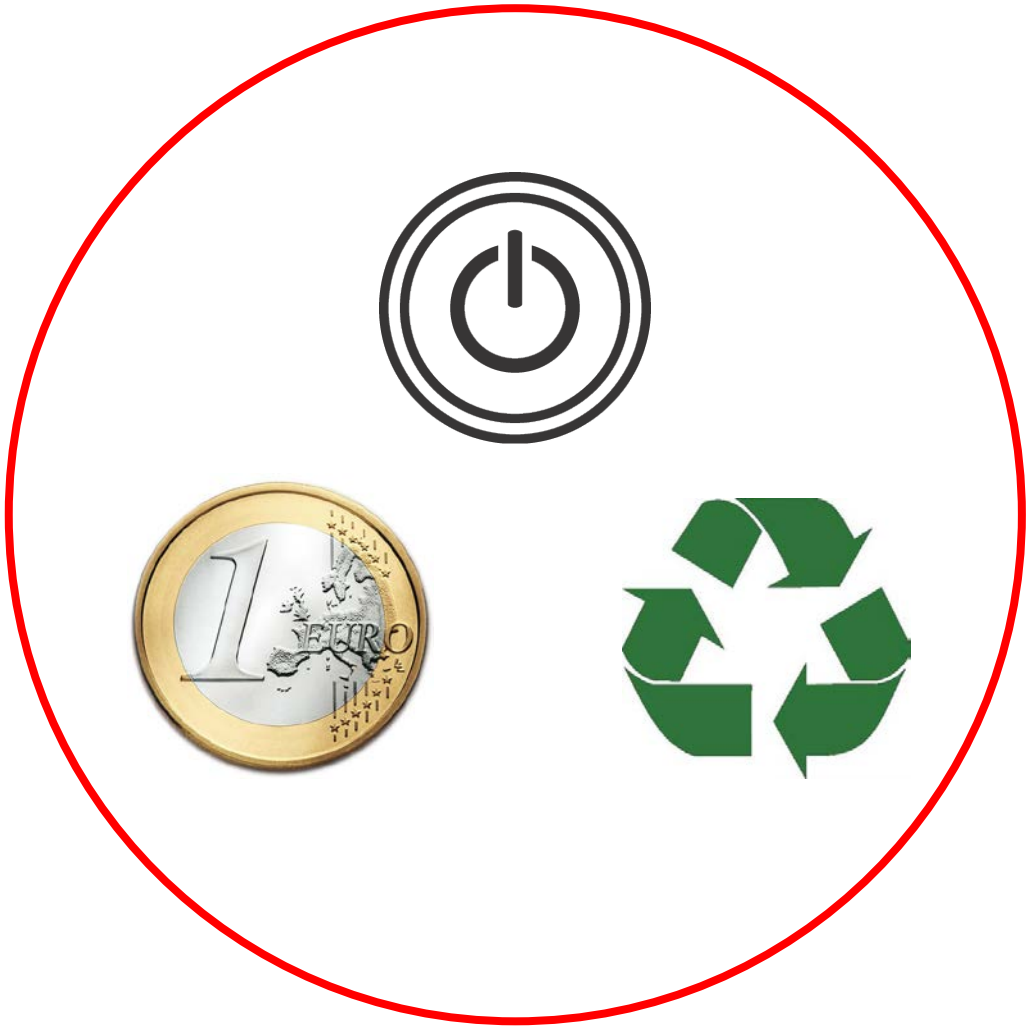



ตัวแทนรับพัสดุ
KERRY
EXPRESS

Energetic trilemma

Win-win strategy ?

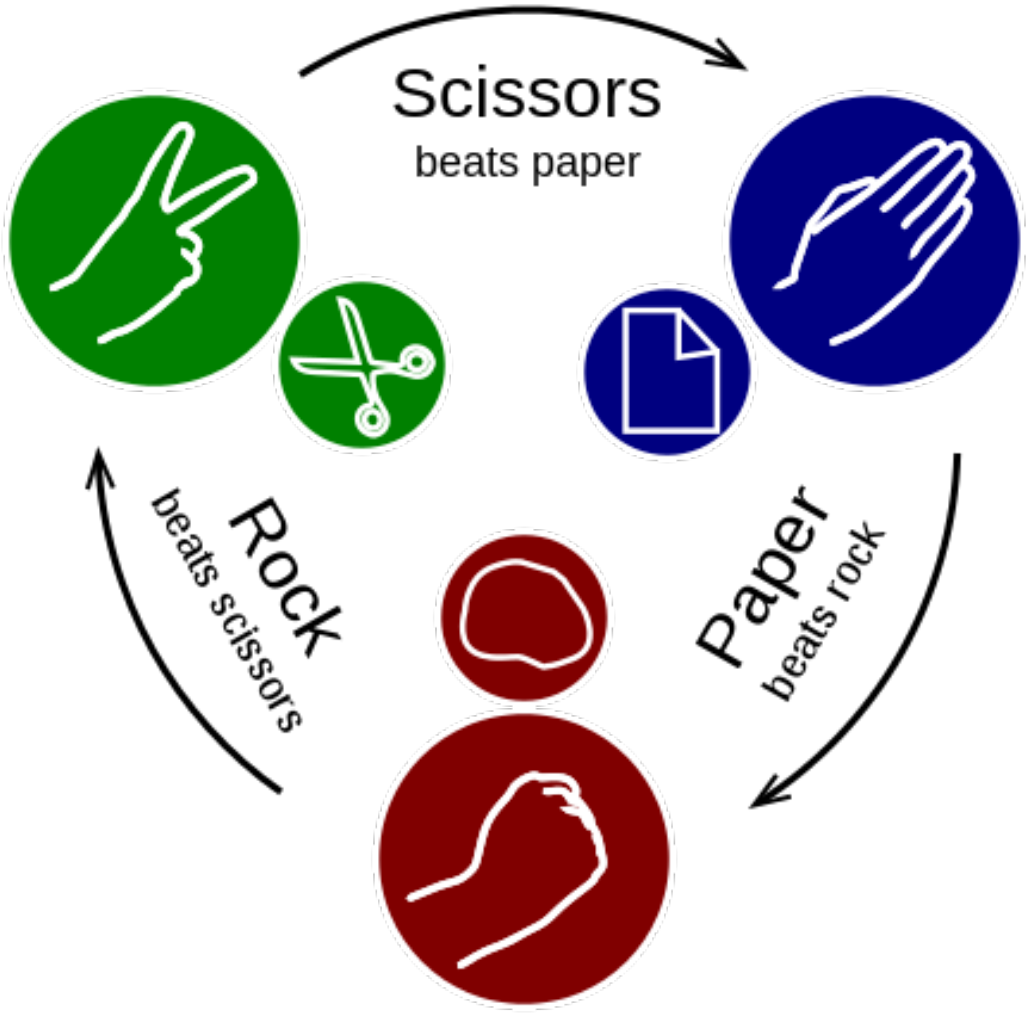
- support  = ?
- support  = ?
- support  = ?



Energetic trilemma

Win-win strategy ?

- support  = ?
- support  = ?
- support  = ?

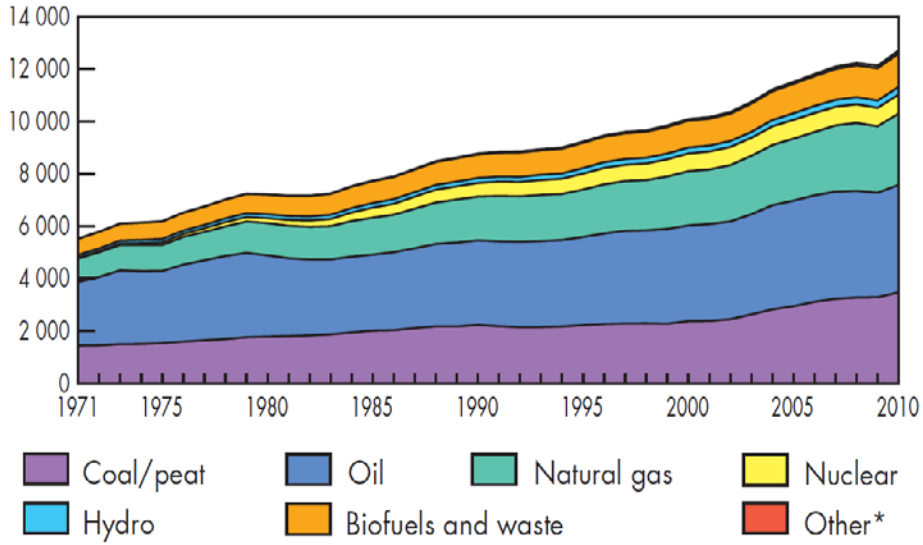


Energy use - consequences

- **non-renewable E** - coal, gas, oil, uranium
  → **significant env. consequences, but reliable source**
- **renewable E** – sun, wind, heat-pumps, biomass, etc.
  → **significant env. consequences, non-reliable source**

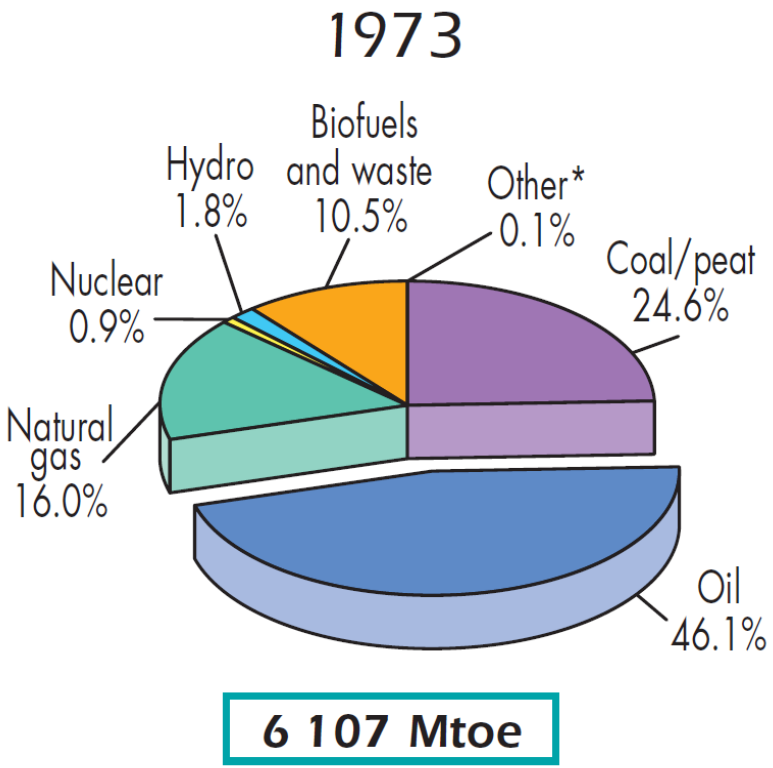
Steep increase of **E demand**:
- 1925 – 1,485 mil. coal (equiv.)
- 1970 – 6,821 mil. coal (equiv.)
- 2000 – 15 000 mil. coal (equiv.)

~ 3.2% increase per year



World E production 1971-2010.

*** incl. geothermal, solar, wind, etc.**



Share of sources on total E production (1973)

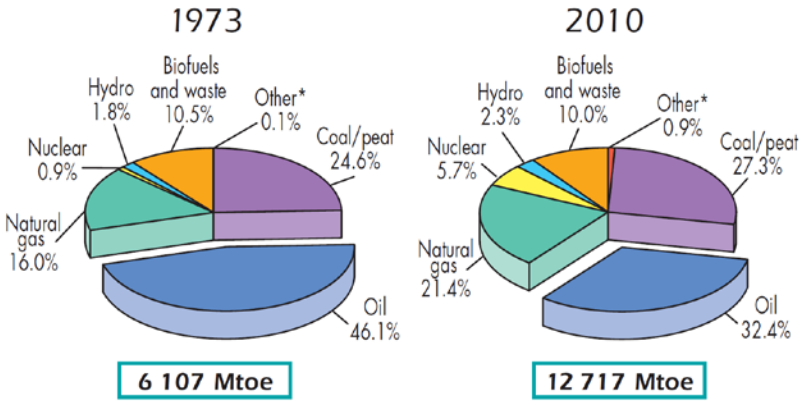
2016

A share of renewable sources of energy are today - compared to 1973

Higher

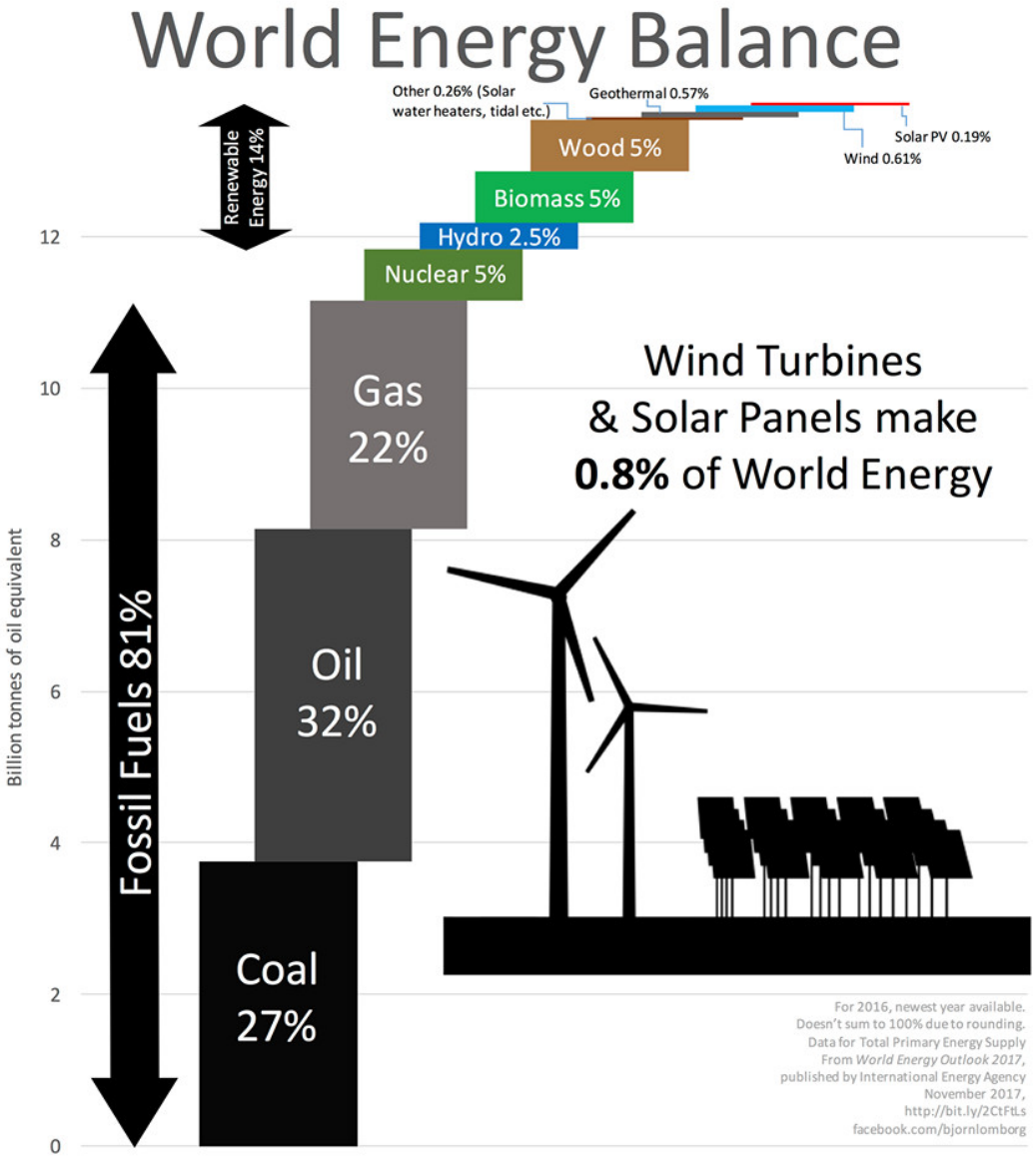
Almost the same

Lower



Share of sources on total E production 1973 and 2010.

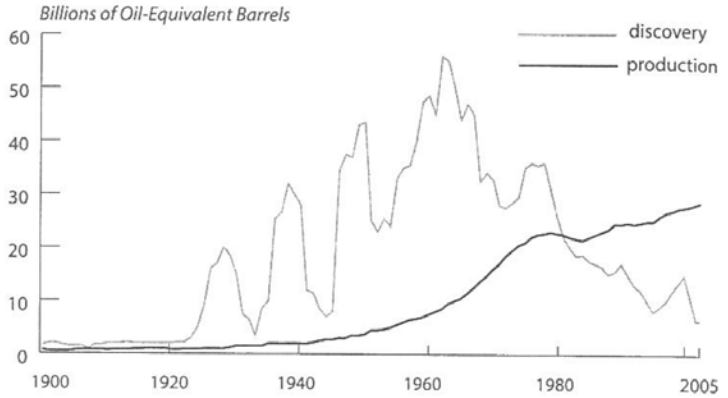
*** incl. geothermal, solar, wind, etc.**



2016

Dependency on fossil E

fossil fuels → 81 % world E consumption
- according to the etimates of world E reserves, they will be depleted till the half of 21. century

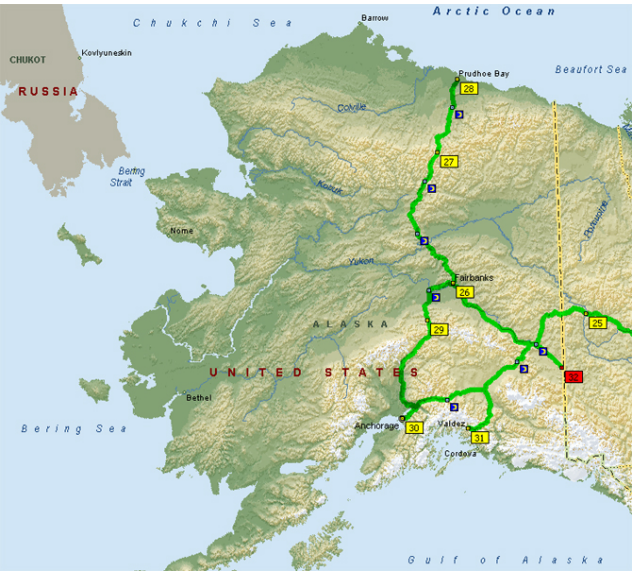


Oil crisis
- OPEC sharply increases oil prices in the 1970s
- price of oil from Abu Dhabi - $ 2.54 (1972) x $ 36.56 (1981) per barrel
- sharp price increases and supply constraints as a result of support of western countries to Israel in the Arab-Israeli conflict

Consequences
- queues at petrol stations,
- panic among business investors
- recession and uncontrollable inflation
- USA severely affected
  → 1977 - 70% of oil imports from OPEC

Lesson from oil crisis?

- to ensure own E resources in general
- to increase the extraction of large oil reserves in Alaska, Prudhoe Bay
  - however, the ecosystems of this territory are very vulnerable
  - threat - failure and sabotage of the Trans-Alaskan oil pipeline leading to the non-freezing port of Valdez



- dependency on non-renewable resources – real E-crisis solution?

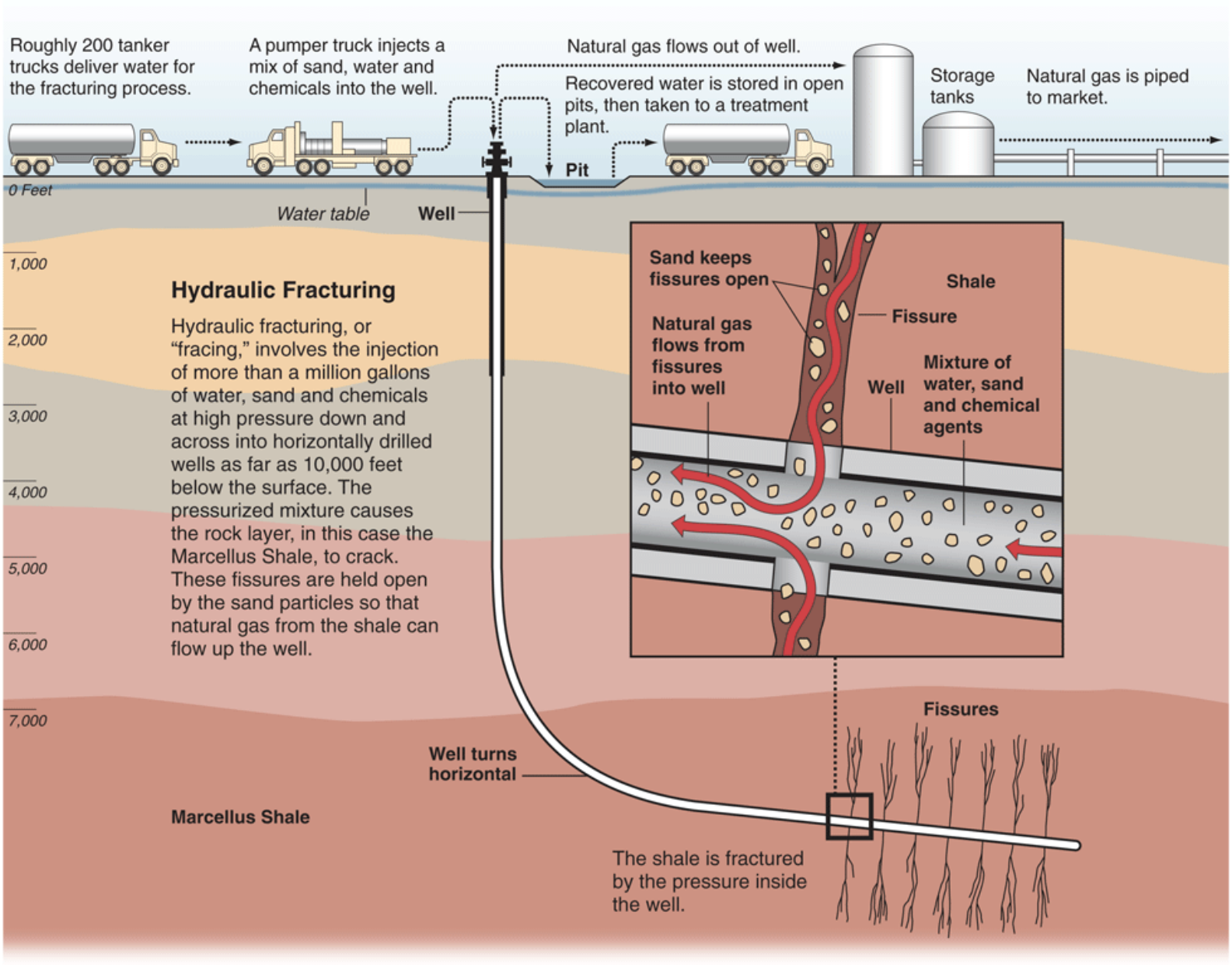
What is an advantage of low oil/coal prices (<50 US$/barrel or ton).

Nobody has responded yet.

Hang tight! Responses are coming in.

LEGO: Everything is NOT awesome.

Fracking – extraction of shale gas



Graphic by Al Granberg

Fracking – consequences of CH_4 extraction

Domů > Regiony

Na Náchodsku se břidlicový plyn těžit nebude, MŽP zastavilo řízení

7. 2. 2014 15:34, autor: ČT24

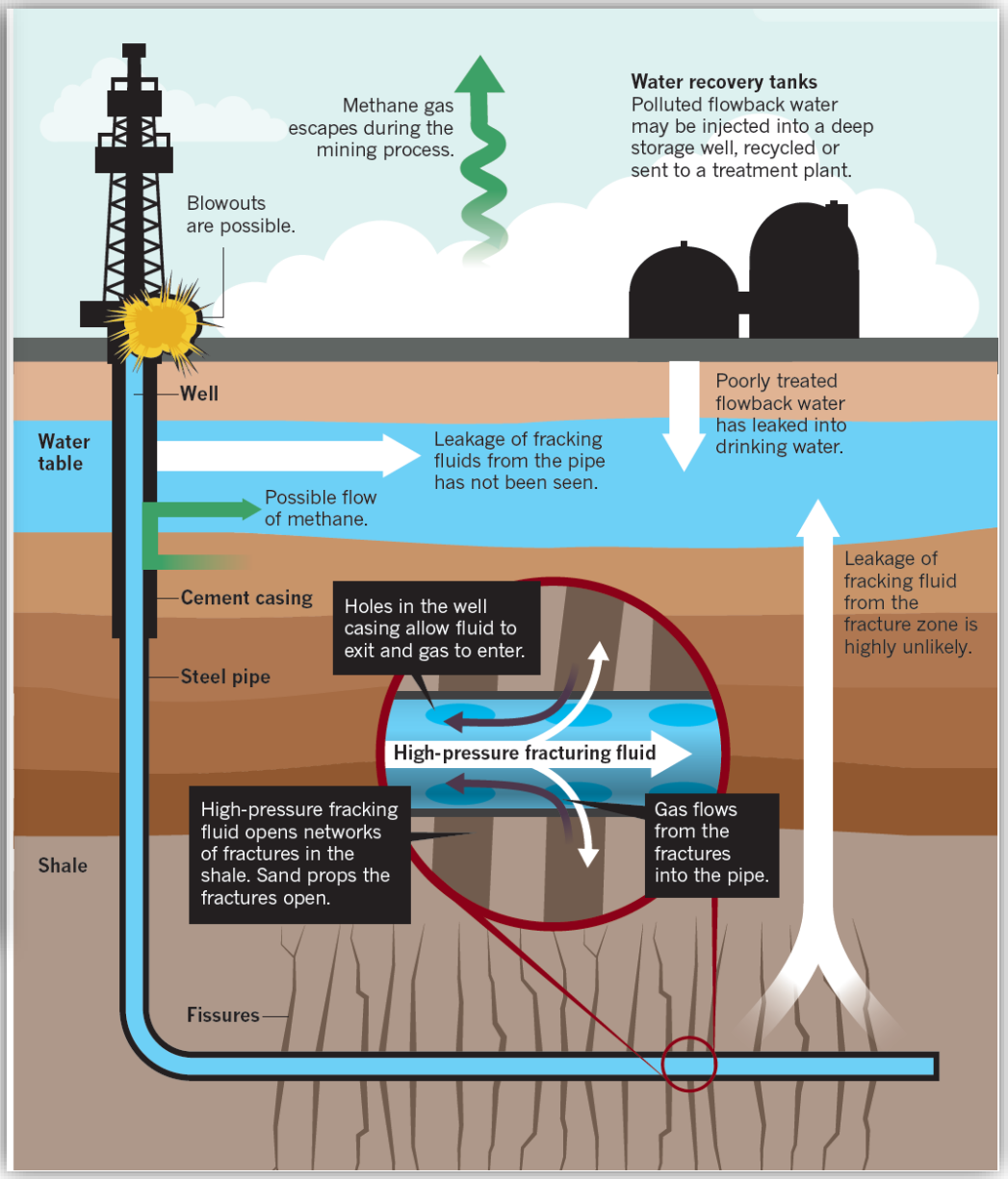
Velikost textu:

Doporučit 102 Tweet 1

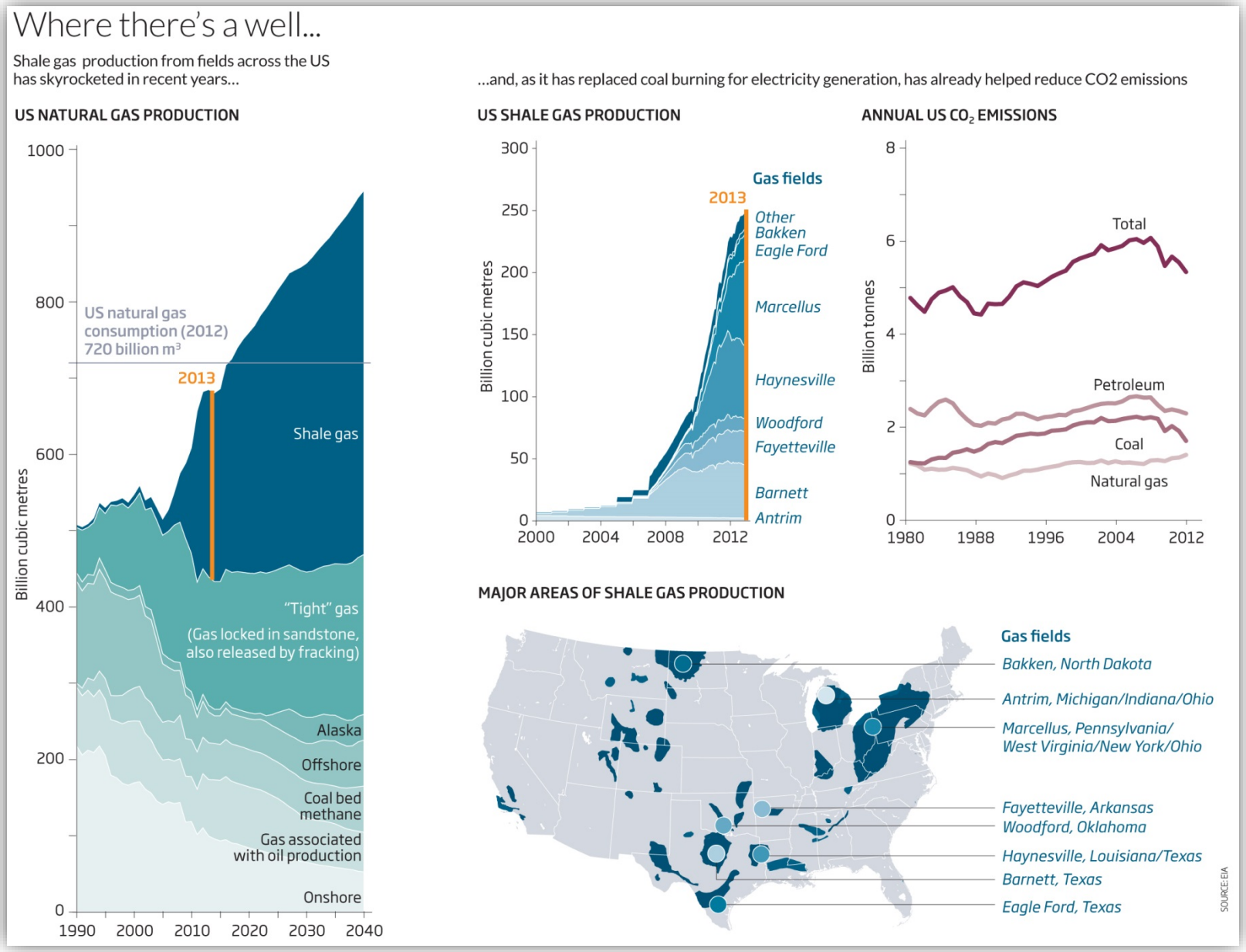
Náchod – Cesta k těžbě břidlicového plynu na severovýchodě Čech se zavírá. Těžaři měli zájem o těžbu na Trutnovsku a Náchodsku a požádali ministerstvo životního prostředí o povolení průzkumu. Ministerstvo nyní zastavilo řízení o stanovení průzkumného území.

Těžba břidlicového plynu

Těžební společnosti Basgas Energia Czech požádala nejprve o povolení k průzkumu na rozsáhlém území na pomezí Náchodska a Trutnovska, později průzkumné území zmenšila, aby



Fracking – CO_2 emissions decrease ?

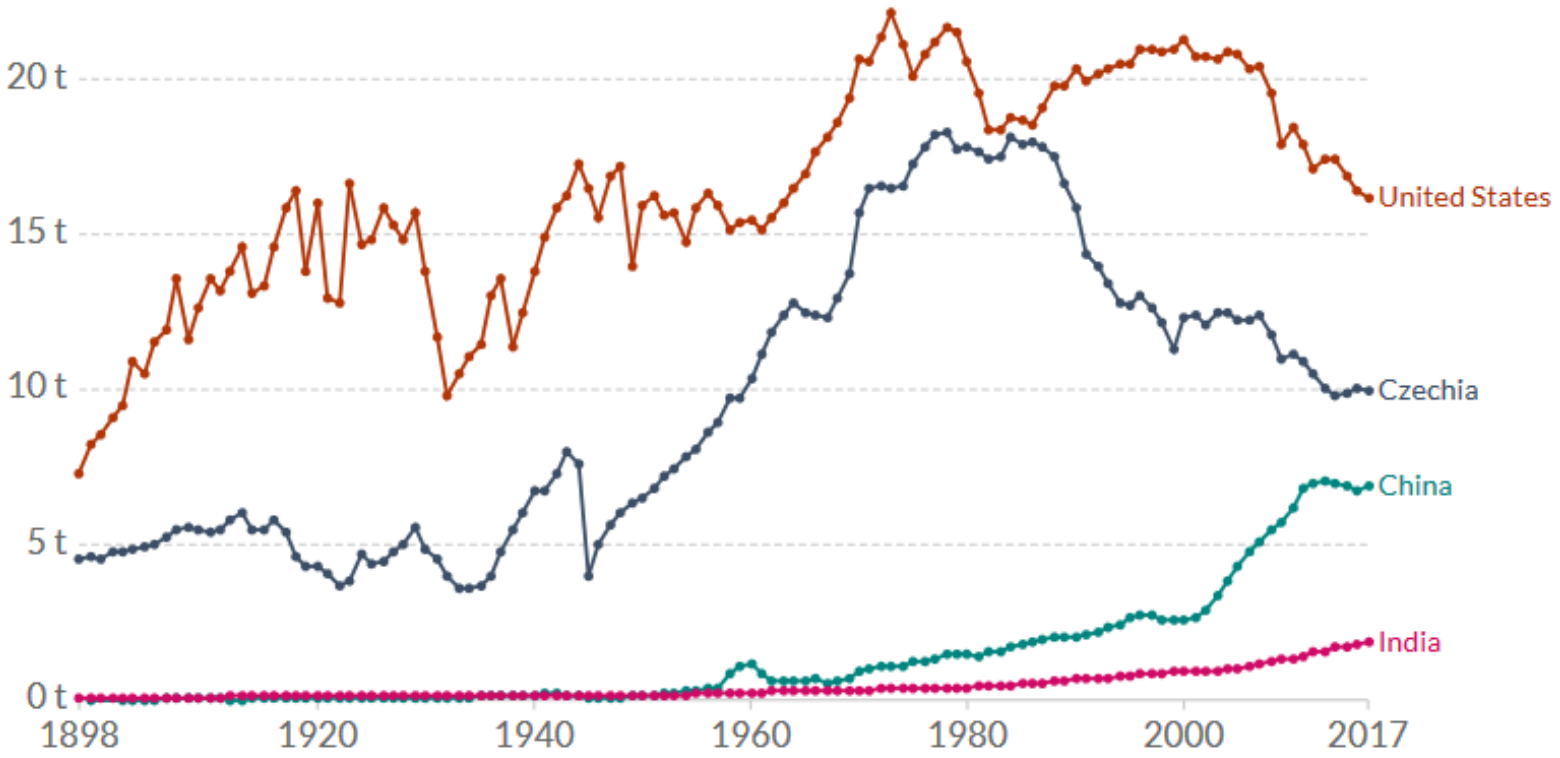


Per capita CO_2 emissions

Carbon dioxide (CO_2) emissions from the burning of fossil fuels for energy and cement production.
Land use change is not included.

Our World in Data

Add country Relative change



Source: Our World in Data based on the Global Carbon Project; Gapminder & UN
Note: CO_2 emissions are measured on a production basis, meaning they do not correct for emissions embedded in traded goods.
OurWorldInData.org/co2-and-other-greenhouse-gas-emissions/ • CC BY

1800 2019

CHART | MAP | TABLE | SOURCES | DOWNLOAD

Related: Where in the world do people emit the most CO_2?

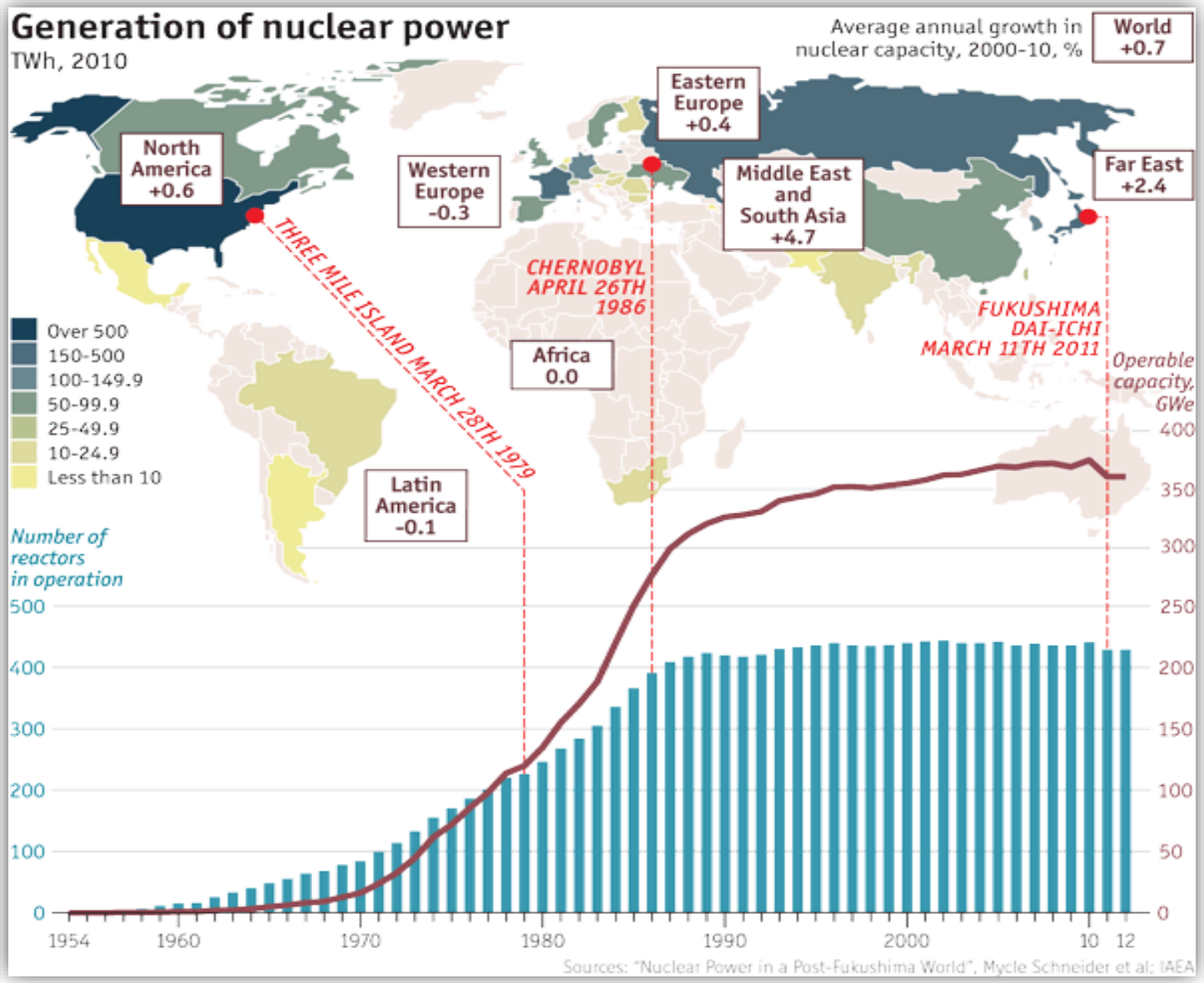
What is your first thought when you hear "A Nuclear Energy"?

Nobody has responded yet.

Hang tight! Responses are coming in.

Nuclear E – soluion of global warming?

- reliable, but very expensive and controversial E resource

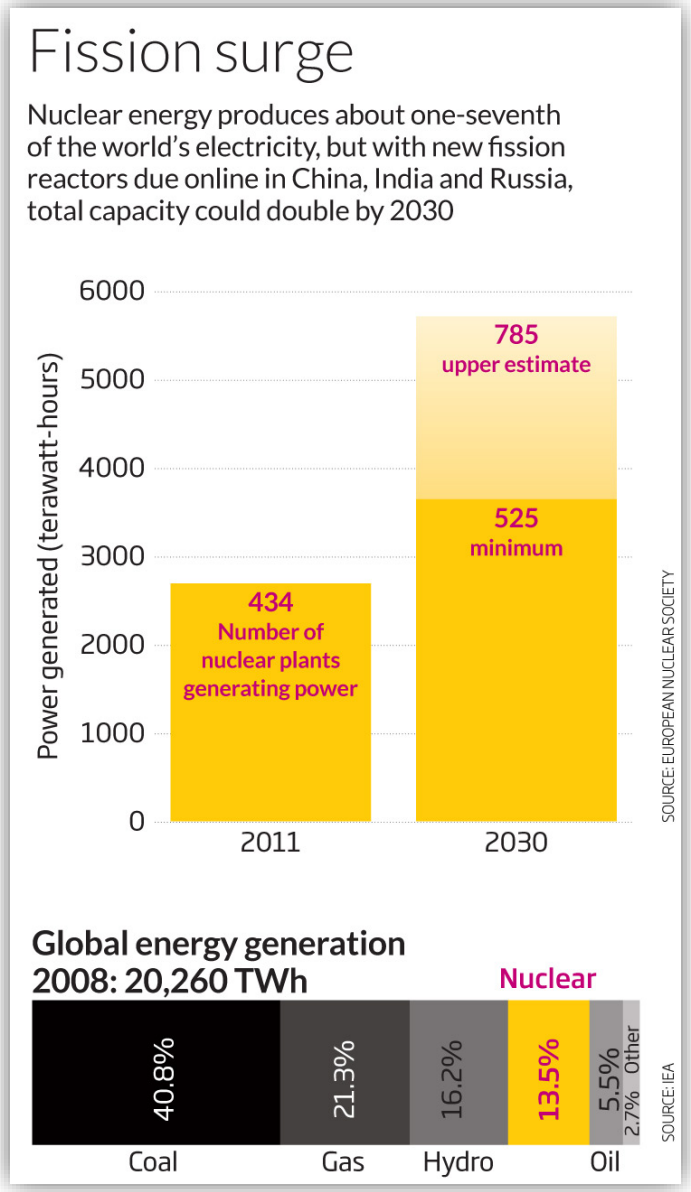


Nuclear E

Bin in, sink it, bury it – we still don't know what to do with our radioactive waste. Is Finland offering an answer with the world's first deep repository?

Nuclear waster stored at the Asse II salt cavern is threatened by water leaking into the mine *(Image: Helmholtz Zentrum Muenchen/Dapd)*

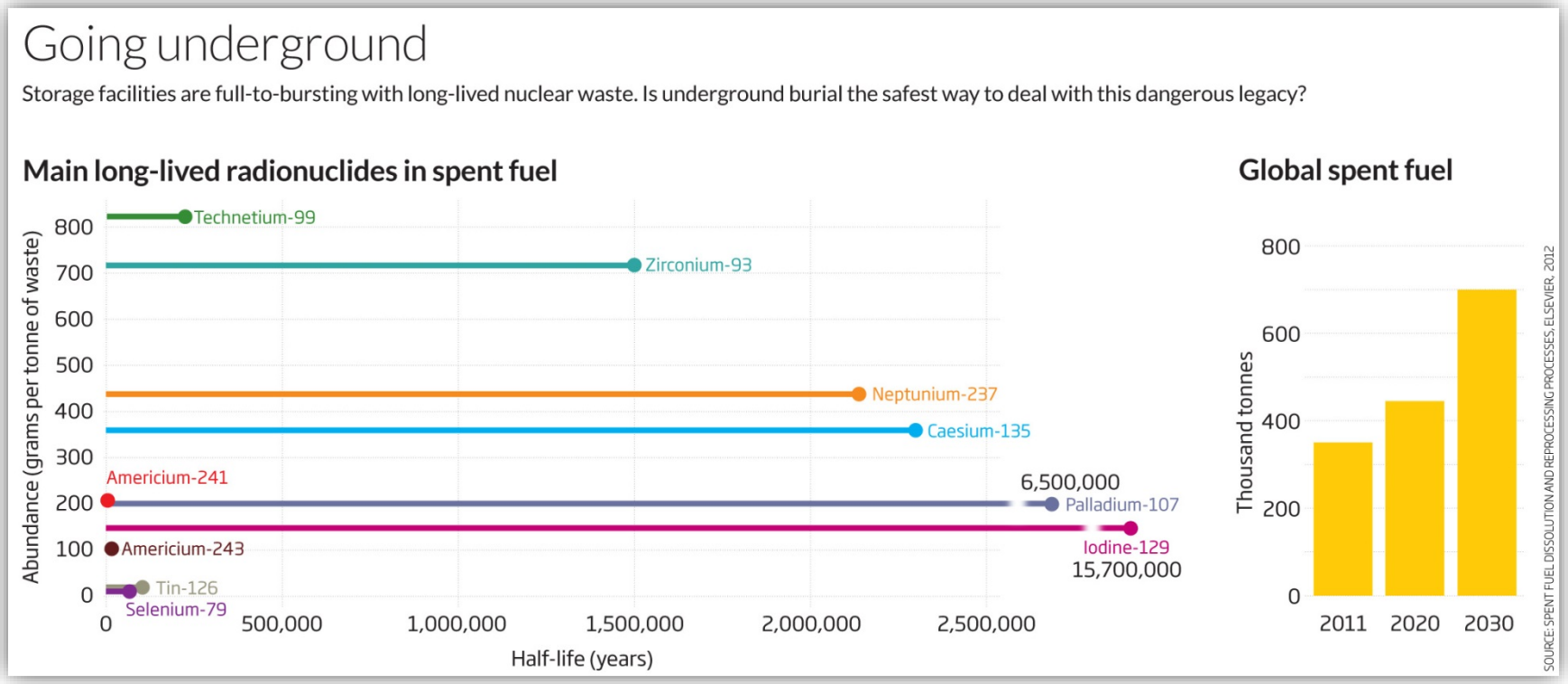
„time bomb“



- since 1988, salt water leaks to the cavern, contamination, water drained out
- 10^5 radioactive barrels, what to do, displace or let it be? (ground water...)

Nuclear E

- *Yuca mountains repository* – 11 bil. US$ spent for the project untill 2010
- unexpectedly strong resistance of the locals led to the abandonment
- why? - Nevada has no nuclear plant, but store it here?
  - People faced with the finished thing, no discussion.



How to store waste for 100,000 years? In a hot, humid, and corrosive environment...

Nobody has responded yet.

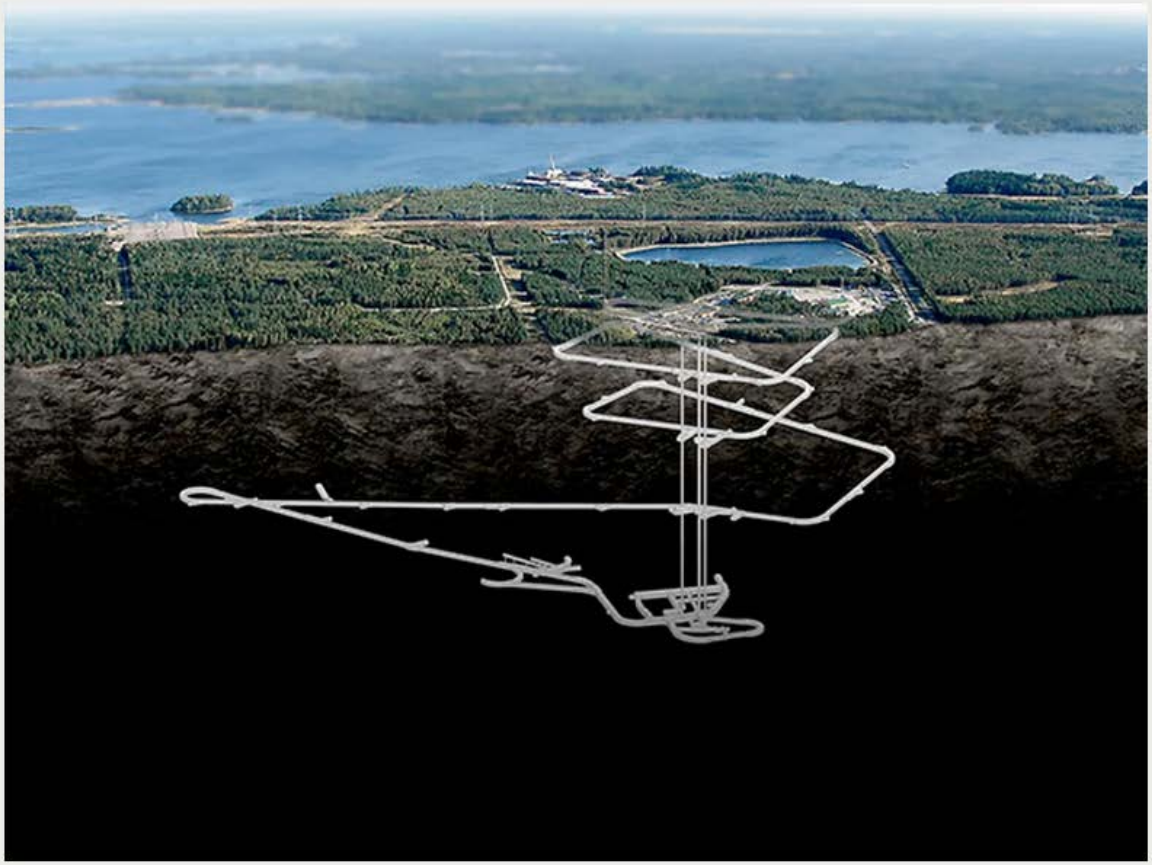
Hang tight! Responses are coming in.

NEWS | ENERGY

Nuclear Waste Deep Storage Plans Approved ›

Finland issues first permit for long-term nuclear waste repository

BY LUCAS LAURSEN | 17 NOV 2015 | 2 MIN READ |



Finland may be the first to build a long-term nuclear waste repository. PHOTO ILLUSTRATION: POSIVA OY

Finland's government issued a construction license to nuclear disposal consortium Posiva last week, Reuters reported. The license gives the group approval to build a storage facility on Olkiluoto Island, Finland, designed to last 100,000 years.

Renewable E (RES) – solution of E trilemma ?

- sustainable source → in the long term, probably the only way out

- as in the whole age of history, except for the last 300 years

Causes of low RES utilization

- easy availability of non-renewables
in the last 300 years → shutdown of RES

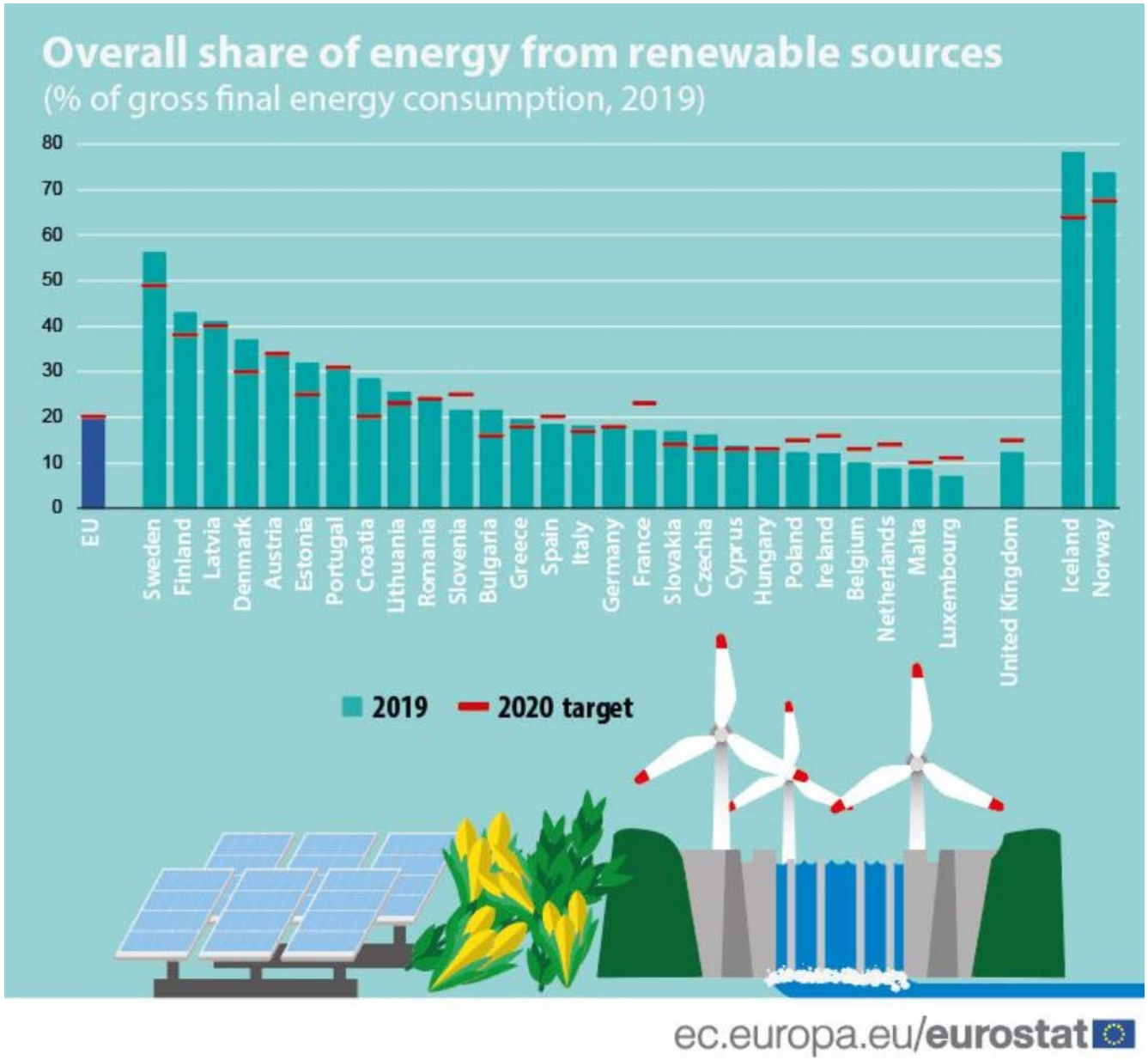
- world energy consumption increased 170x,
population "only" 10x

- infrastructure adapted to non-renewables
90% of public aid channeled funds and
resources for R&D in the energy sector

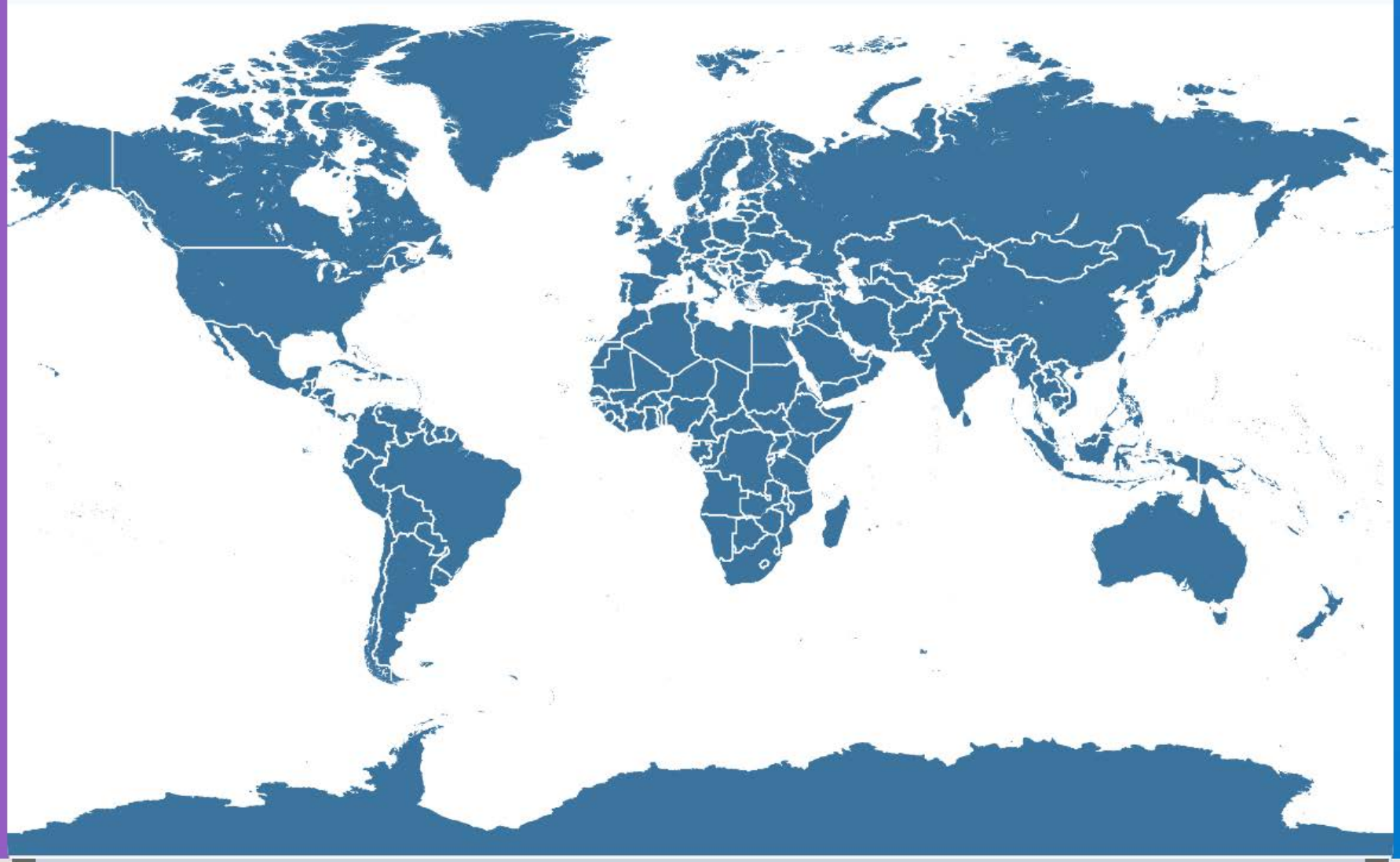
- the energy „density“ of RES is much lower than that of fossil fuels

- RES require different handling and change of mindset

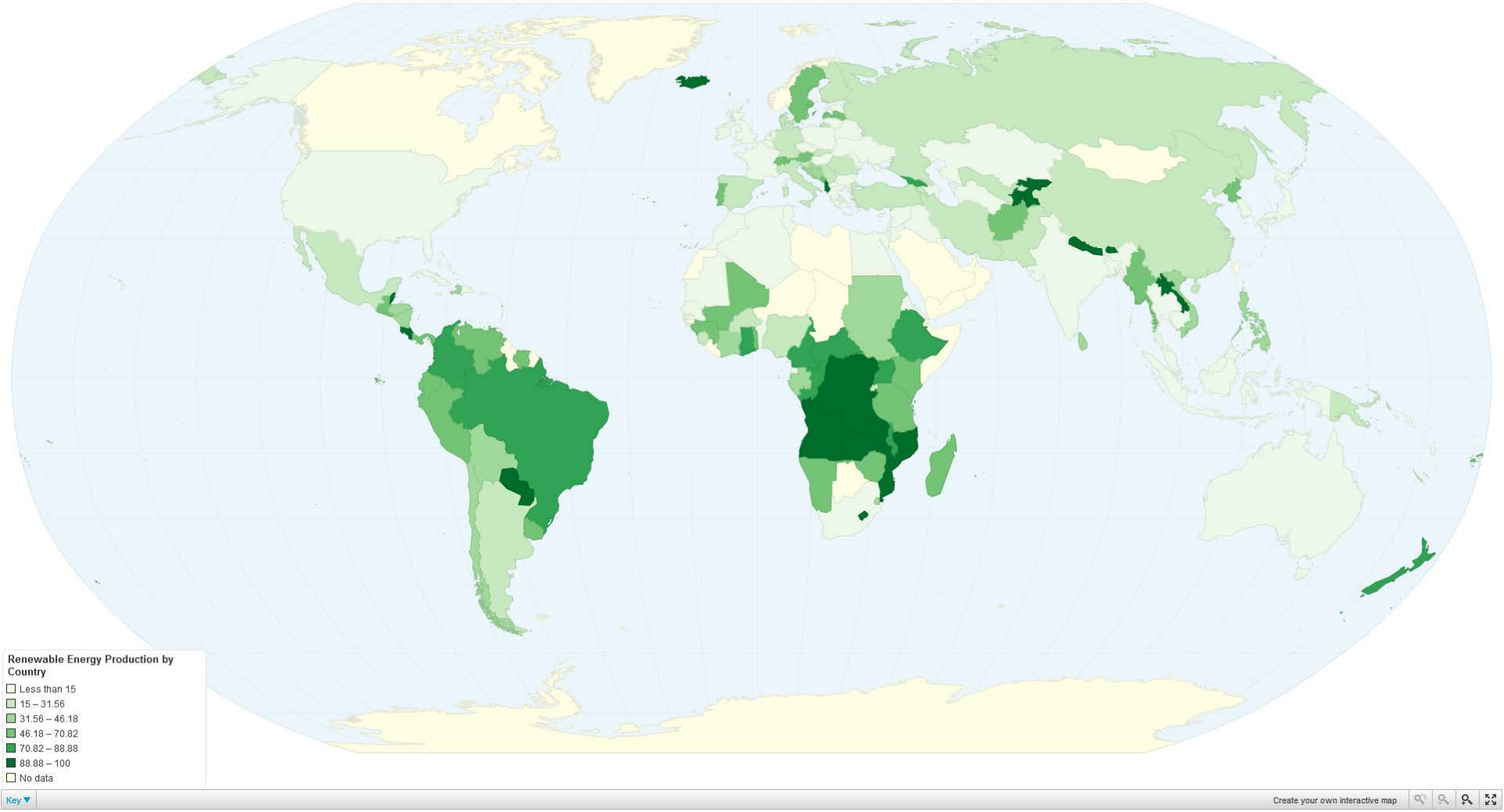
Share of RES in EU



In which countries has a renewable energy the highest share?



Share of RES in the World

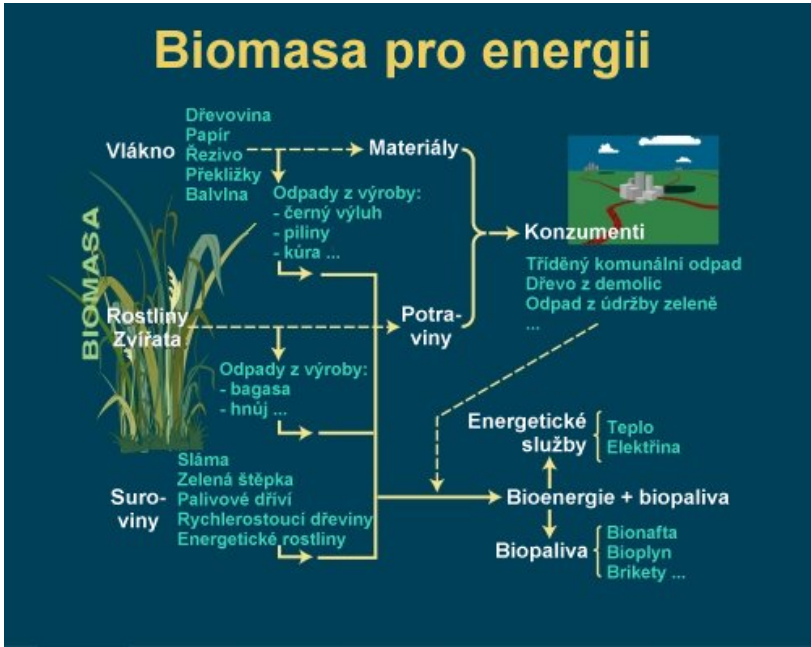


Consequences of RES utilization

- use of RES should be in synergy with the E savings, resp. with energy efficiency → the advantages of using RES become more apparent

Displaced emissions

- type and amount of displaced emissions (Part., SO2, CO2, NOx, CxHy), depends on the type of RES
- an essential contribution to climate protection by eliminating GHG emissions in the order of 10 mil. t of CO2 yearly (2010)



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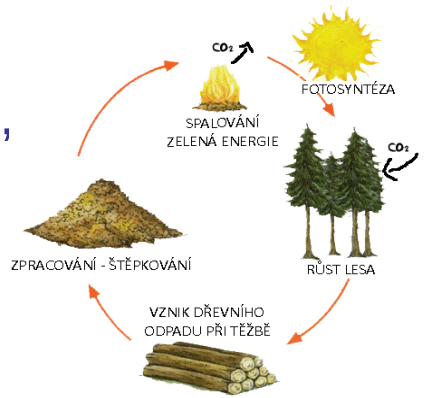
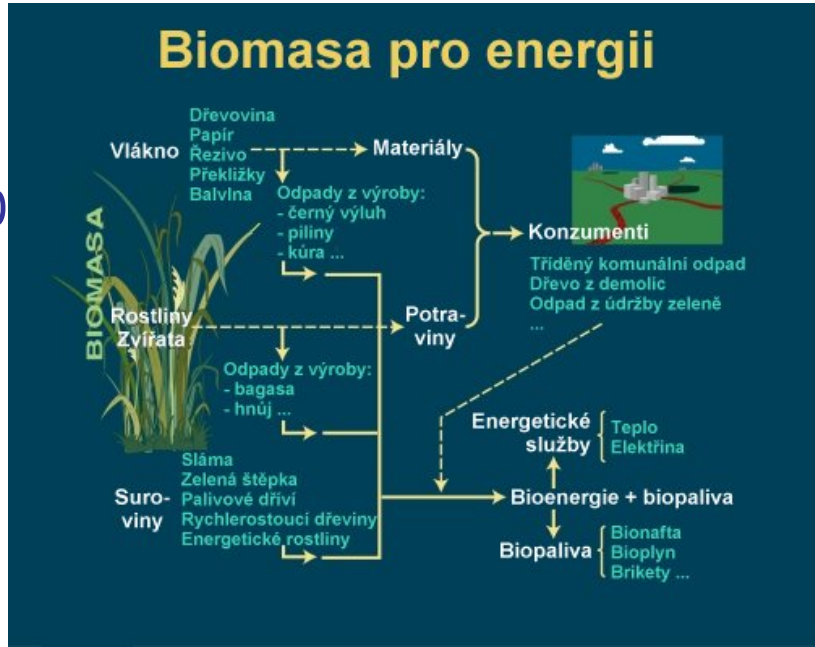


Fuel costs

displaced fuel costs, which does not need to be spent thanks to use of the RES can be estimated in circa CZK 2 bln /year (2010

- the fuel costs incurred on biomass contributes to local development



Consequences of RES utilization

Employment

- employment diversified in many fields and qualification levels

US green economy has 10 times more jobs than the fossil fuel industry

ENVIRONMENT 15 October 2019

By Adam Vaughan

A wind farm worker in California
Billy Hustace/Getty

The green economy has grown so much in the US that it employs around 10 times as many people as the fossil fuel industry – despite the past decade's oil and gas boom.

The fossil fuel sector, from coal mines to gas power plants, employed around 900,000 people in the US in 2015-16, government figures show. But Lucien Georgeson and Mark Maslin at University College London found that over the same period this was vastly outweighed by the green economy, which

Consequences of RES utilization

Employment

- employment diversified in many fields and qualification levels

Security of supply

- RES = diversified, local resources contribute to security and independence supply E

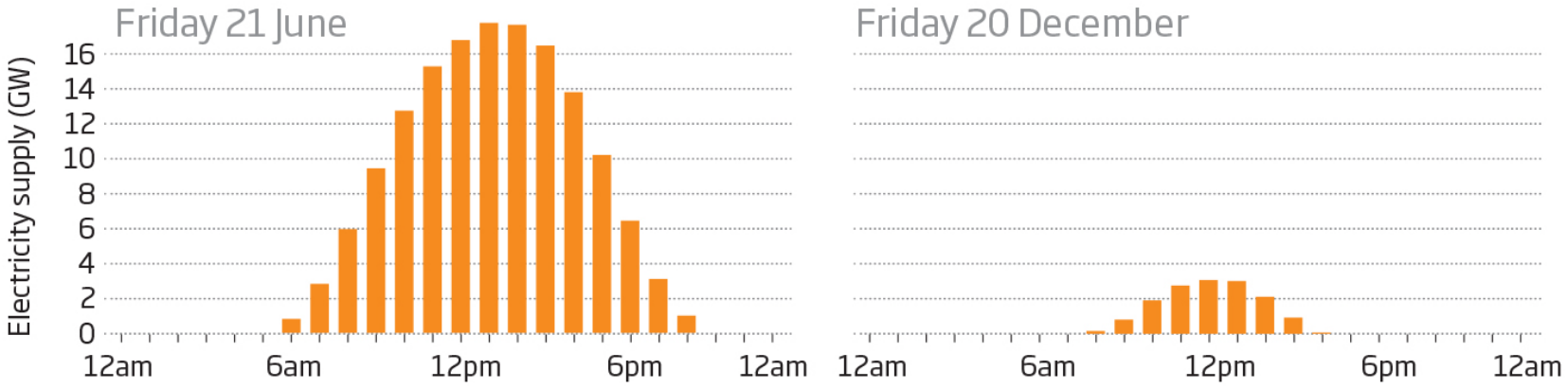
security + partial independence today has increasing meaning (political instability, terrorism, natural disasters…)

Consequences of RES utilization

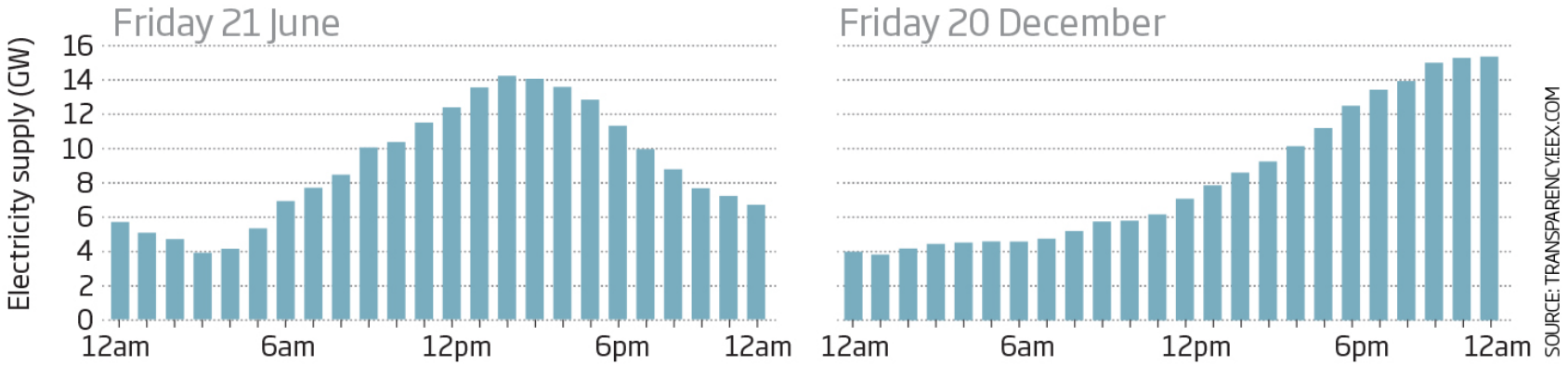
- non-reliable E source

Solar and wind power are both highly variable sources of energy, as 2013 data from Germany shows

Weaker sunlight and shorter daylight hours suppress winter **solar** production...



...while the **wind** blows unpredictably from hour to hour and day to day

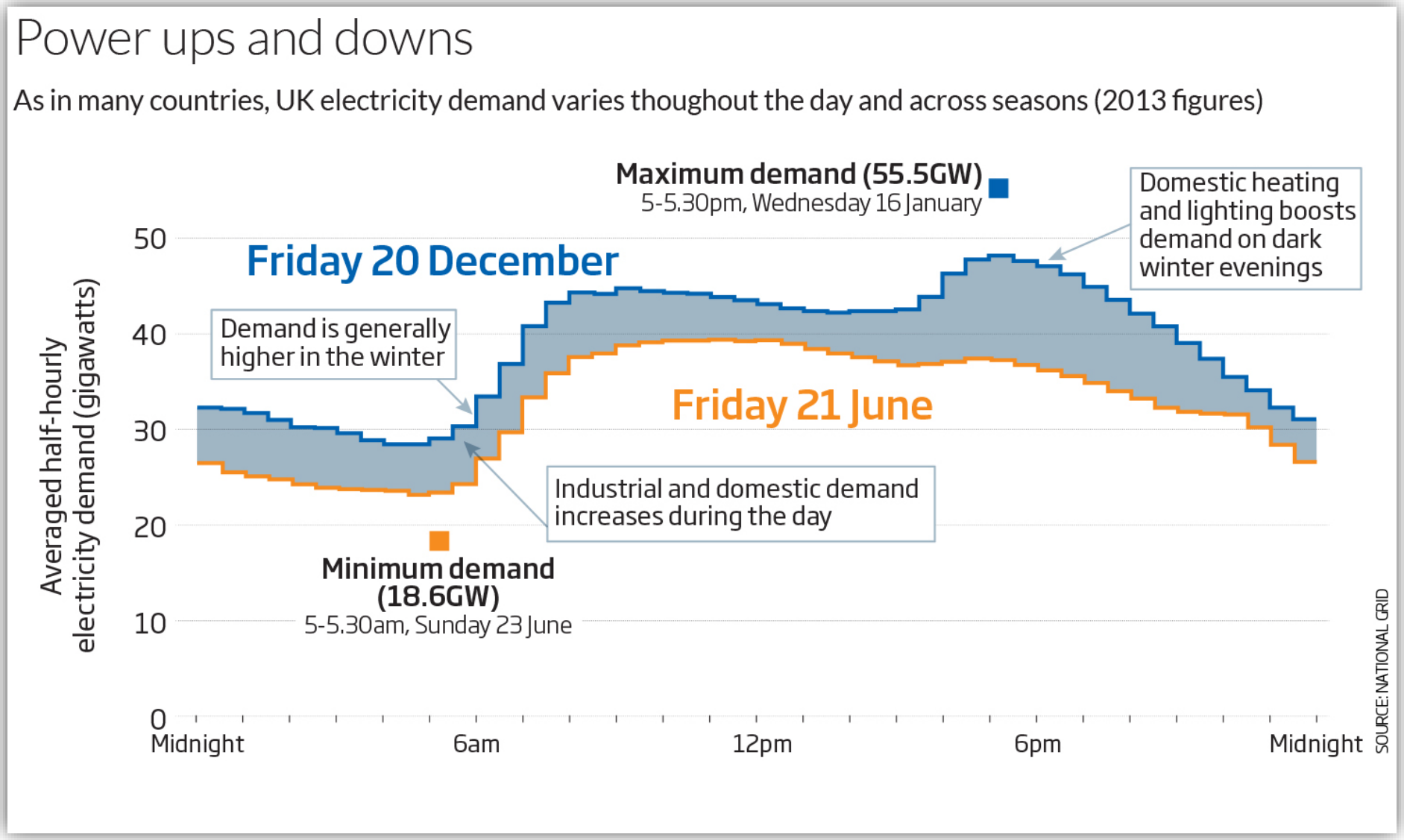


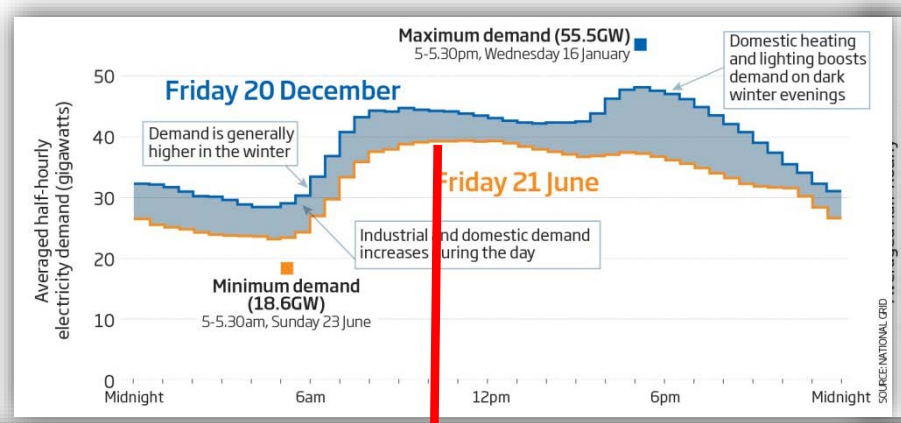
At what time is the peak of the highest E consumption in Europe in winter?

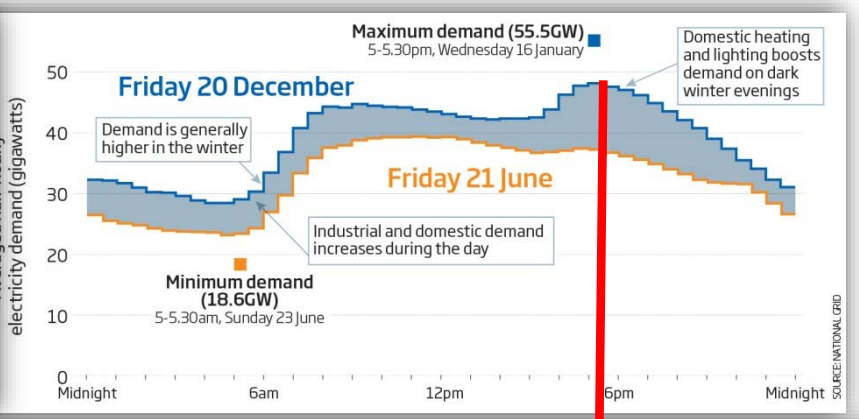
Nobody has responded yet.

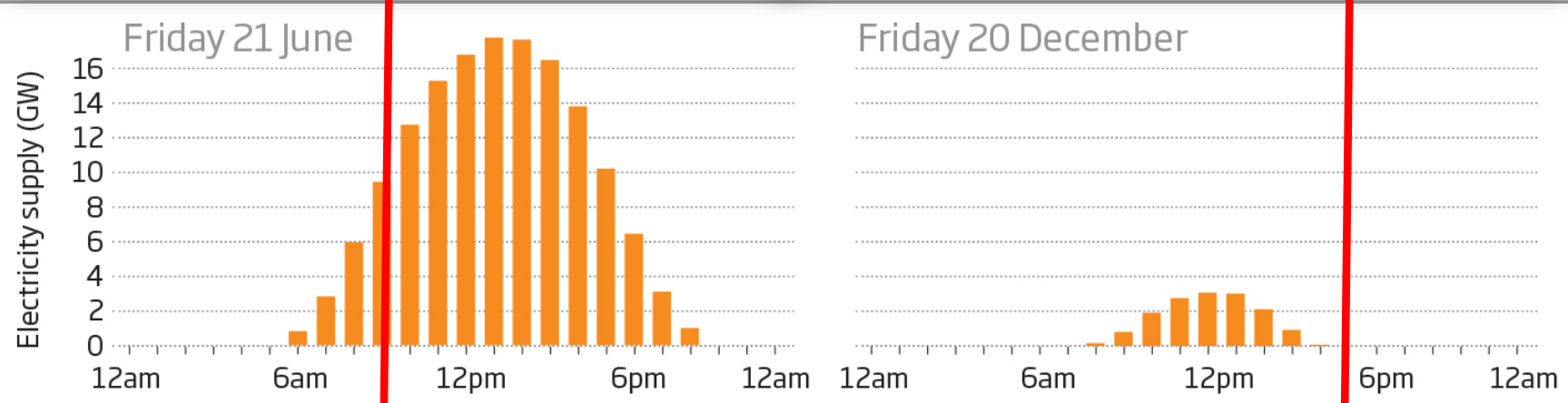
Hang tight! Responses are coming in.

Do we have RES when we need it?

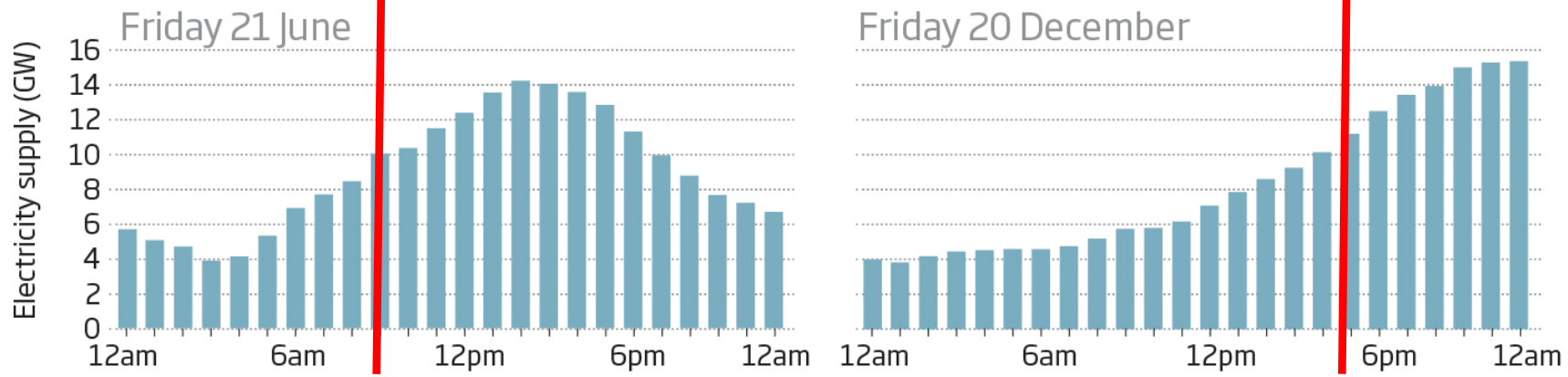






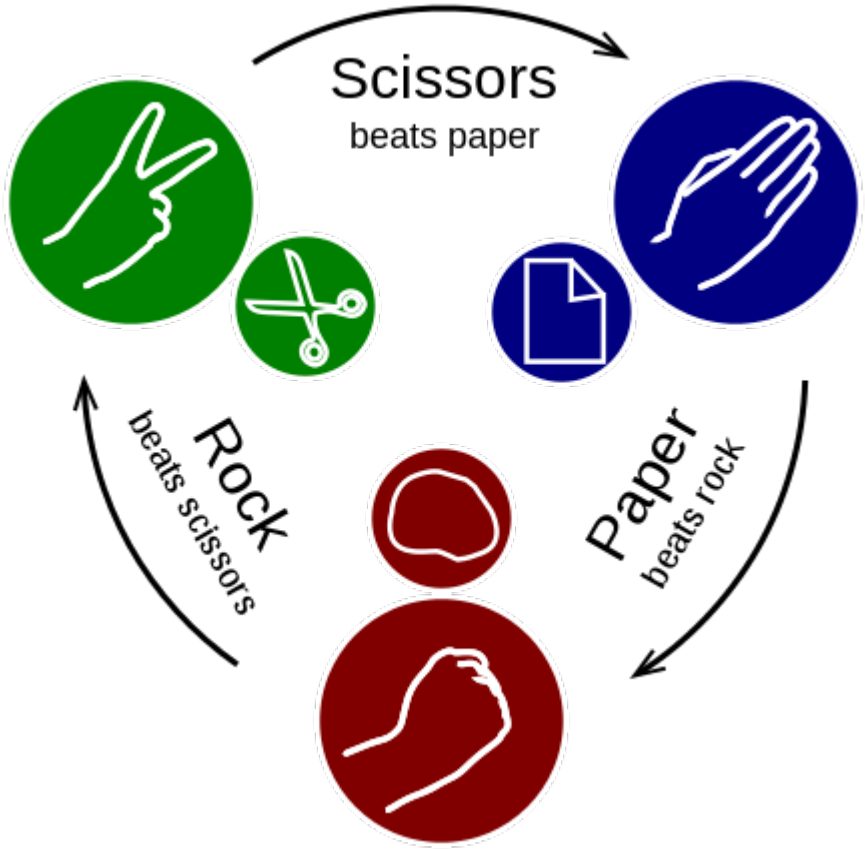


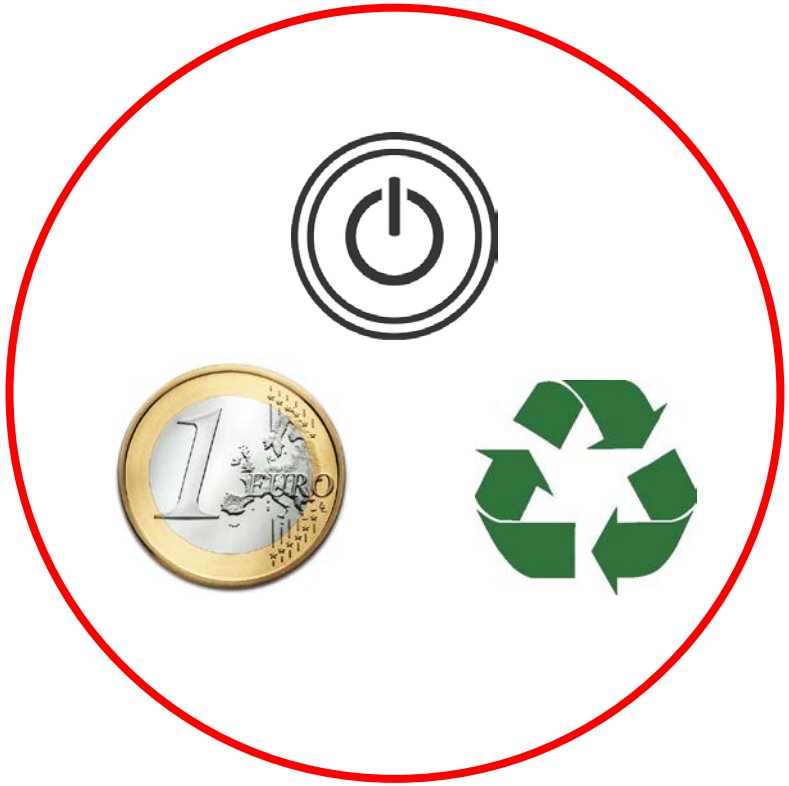
...while the **wind** blows unpredictably from hour to hour and day to day



E trilemma

Does win-win-win strategy exist ?





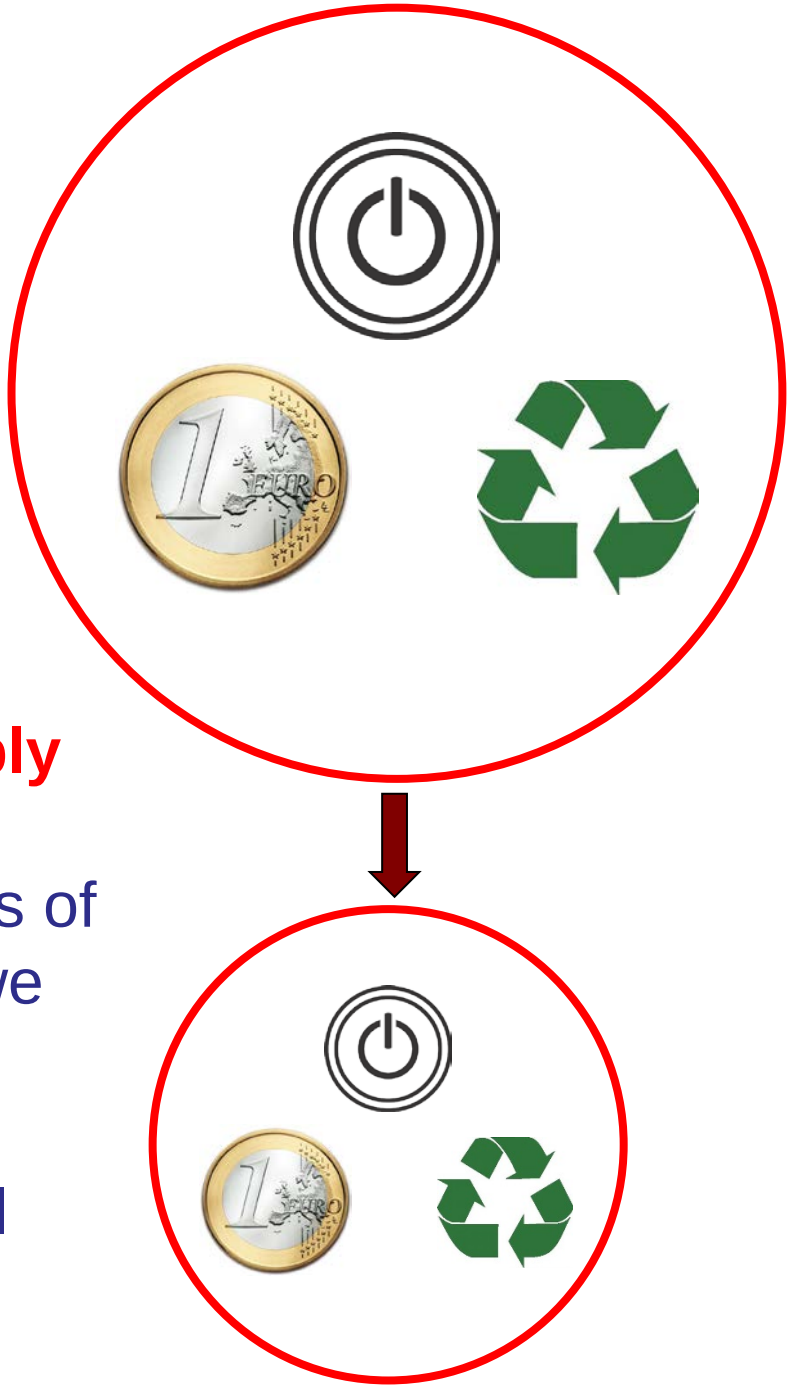
Does the Win-Win-Win solution exist?

Nobody has responded yet.

Hang tight! Responses are coming in.

E trilemma

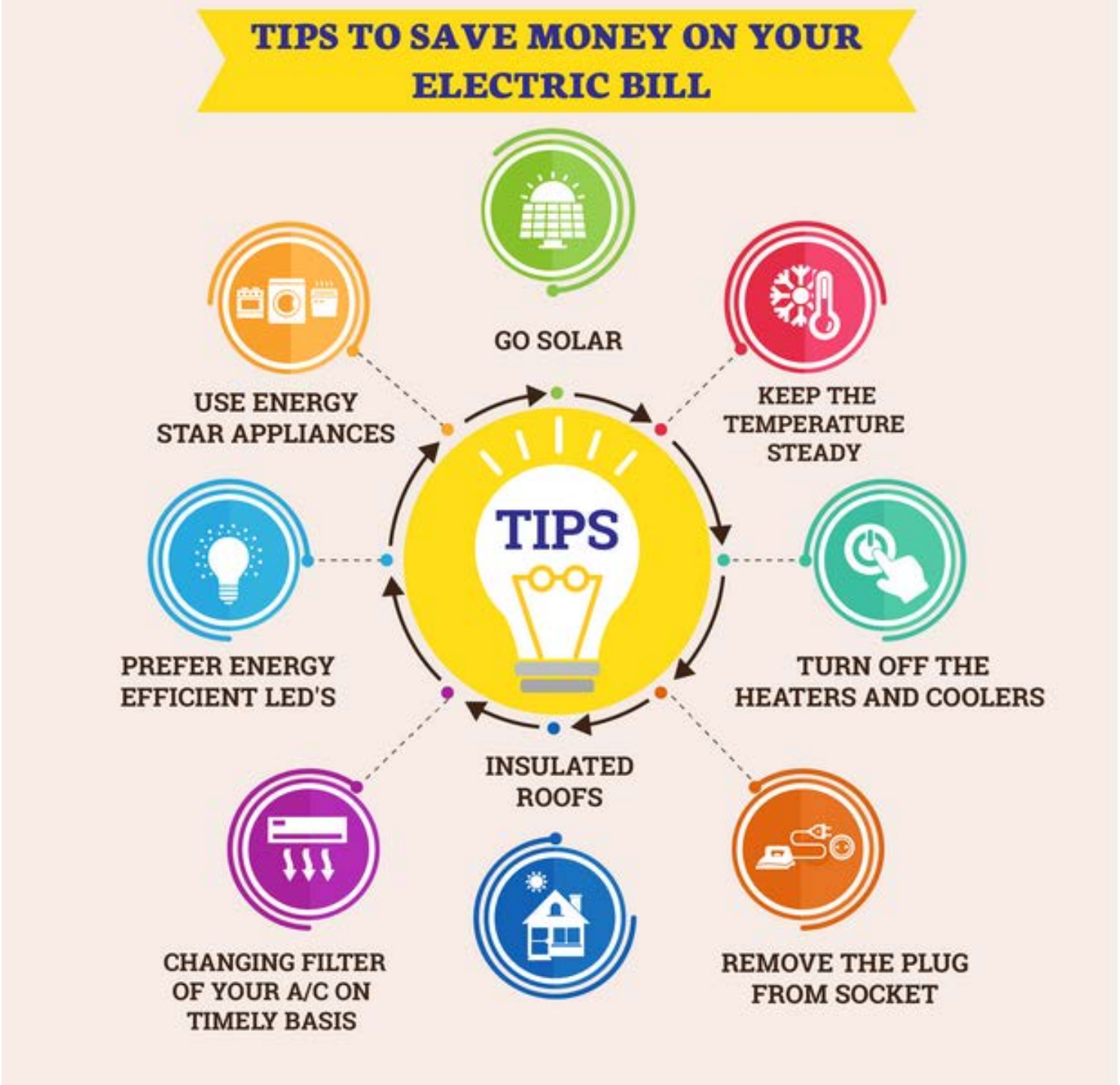
Does win-win-win strategy exist ?



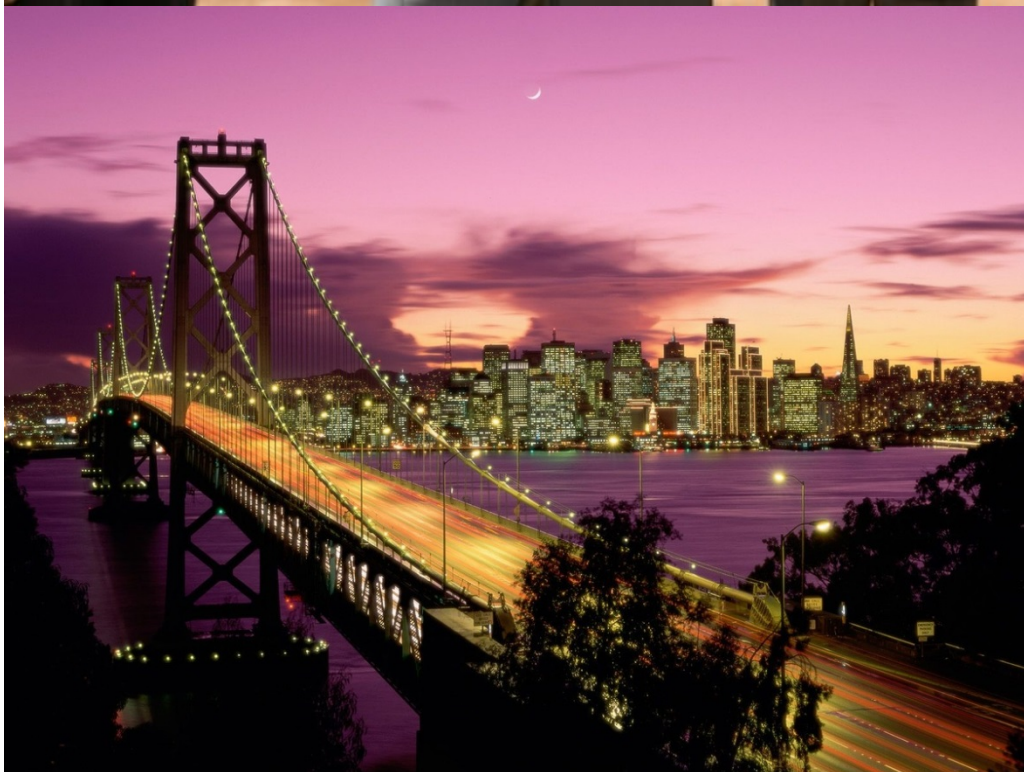
Economically efficient E savings while maintaining „reliable“ supply

- CO_2 emmisions decreases, peaks of consumption will also drop and we will save even more

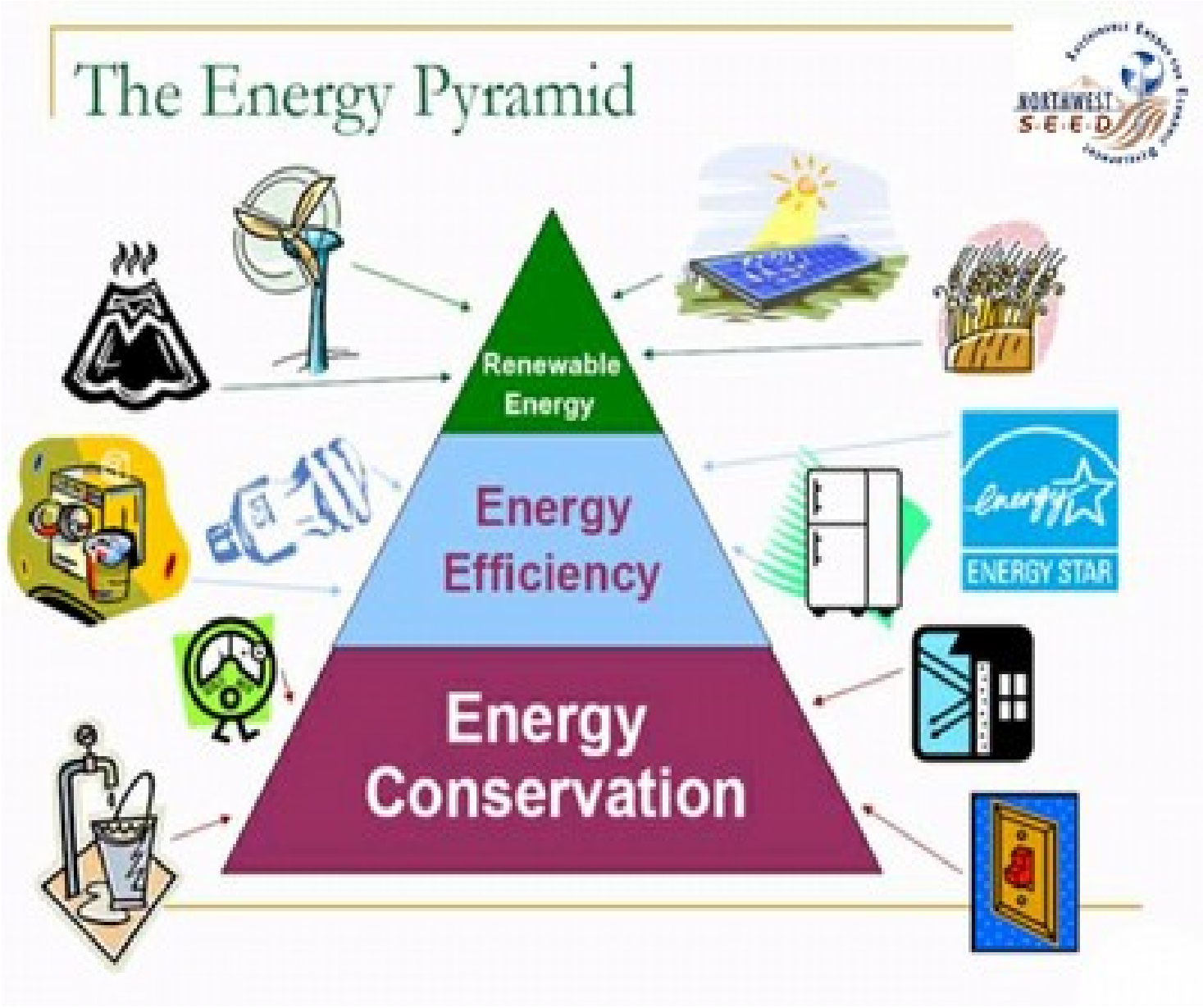
- it is not so "sexy", E-producers will reduce profits, but it works!


TIPS TO SAVE MONEY ON YOUR ELECTRIC BILL
GO SOLAR
USE ENERGY STAR APPLIANCES
KEEP THE TEMPERATURE STEADY
TIPS
PREFER ENERGY EFFICIENT LED'S
TURN OFF THE HEATERS AND COOLERS
INSULATED ROOFS
CHANGING FILTER OF YOUR A/C ON TIMELY BASIS
REMOVE THE PLUG FROM SOCKET

„*California is 40% more energy efficient than the rest of the US. If the US were as energy efficient as California, 75% of all coal-fired power plants could be shut down in the US*. ”A. Schwarzenegger, 2013

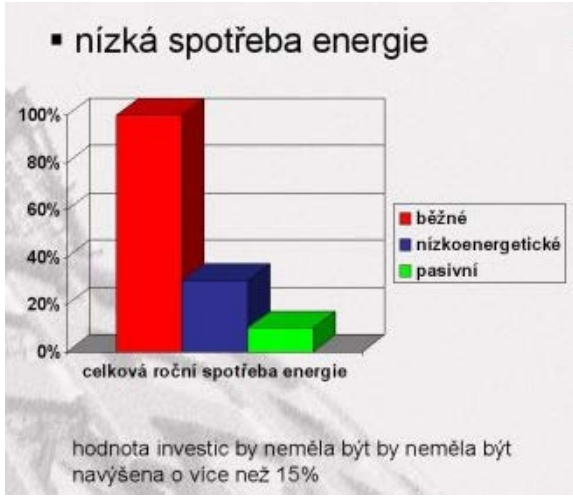


E-conservation + E-efficiency + RES

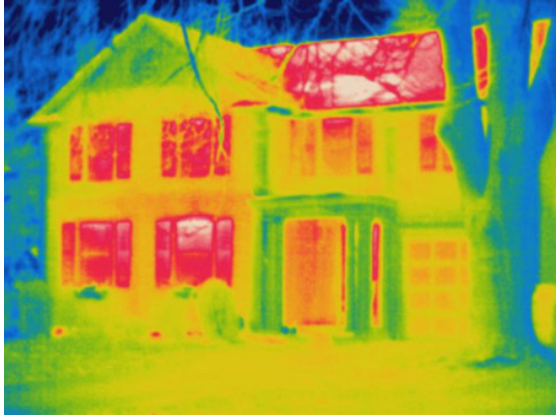


Energetically efficient houses

domy běžné ve 70.-80. letech	současná novostavba	nízkoenergetický dům	pasivní dům	nulový dům, dům s přebytkem tepla
charakteristika				
zastaralá otopné soustava, zdroj tepla je velkým zdrojem emisí; větrá se pouhým otevřením oken, nezateplené, špatně izolující konstrukce, přetápí se	klasické vytápění pomocí plynového kotle o vysokém výkonu, větrání otevřením okna, konstrukce na úrovni požadavků normy	otopná soustava o nižším výkonu, využití obnovitelných zdrojů, dobře zateplené konstrukce, řízené větrání	pouze teplovzdušné vytápění s rekuperací tepla, vynikající parametry tepelné izolace, velmi těsné konstrukce	parametry min. na úrovni pasivního domu, velká plocha fotavoltaických panelů
potřeba tepla na vytápění [kWh/(m^{2}a)]				
většinou nad 200	80 - 140	méně než 50	méně než 15	méně než 5



Passive house



Heat exchanger for the ventilation air
Fresh air is heated by the used air.

Exhaust air

Fresh air

Solar panels for hot water are recommended.

Summer sun

Sun screening
In order to have a good indoor climate all year round, it is important to shade the sunlight during summer.

50 cm

The roof
The insulation in the roof is at least 50 cm.

The surfaces in the passive house are warm.

Waste heat from household equipment, home electronics and body heat is the main heating source.

Winter sun

Exhaust air from kitchen and bathroom.

Fresh air to living room and bedrooms.

The wall is well insulated with a U-value of about 0.1. It is important to make sure that the construction is frost and damp sealed.

40 cm

TV

The windows have a low heat loss value
$U \leqslant 0{,}9 W/m^2K$. Condensation and even frost can emerge on the outside of the windows, but only for a few days each year.

Grounding
The insulation in the ground is at least 30 centimeters.

30 cm

How we can transform our energy system to achieve net-zero emissions

Killing fossil fuels to halt global warming is the greatest challenge we face. We now have a masterplan of what we must do when – and there's no time to delay

ENVIRONMENT 4 August 2021

By **Michael Le Page**

Marcin Wolski

Milestones to net zero

Now to 2025

(According to International Energy Agency report *Net Zero By 2050: A roadmap for the global energy sector*)

- No new coal plants without emissions capture approved for development from 2021
- No new oil and gas fields approved for development, and no new coal mines or mine extensions
- No new sales of oil or coal boilers by 2025

Milestones to net zero

Now to 2025

(According to International Energy Agency report *Net Zero By 2050: A roadmap for the global energy sector*)

- No new coal plant
- No new oil and ga
- No new sales of oi

Milestones to net zero

By 2030

- Universal energy access extended to all lower-income countries
- The use of coal without emissions capture phased out in advanced economies
- 60 per cent of global car sales are of electric vehicles
- All new buildings zero-carbon ready
- Most new clean technologies required to decarbonise heavy industry demonstrated at scale

Milestones to net zero

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- No new coal plant
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Milestones to net zero

By 2030

- Universal energy acces
- The use of coal withou
- 60 per cent of global ca
- All new buildings zero-
- Most new clean techno

Milestones to net zero

By 2035

- Electricity supply in advanced economies is net-zero emission
- No new cars with internal combustion engines sold
- 50 per cent of heavy truck sales are electric

Milestones to net zero

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Milestones to net zero

By 2040

- Net-zero emissions from electricity generation globally
- Phase-out of all coal and oil plants without emissions capture
- 50 per cent of aviation fuel low emission
- 50 per cent of existing buildings retrofitted to be zero-carbon ready

Milestones to net zero

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Milestones to net zero

By 2040

- Net-zero emissions from electricity generation globally

Milestones to net zero

By 2050

- Almost 70 per cent of electricity generation globally from solar photovoltaic and wind
- More than 85 per cent of buildings zero-carbon ready
- More than 90 per cent of heavy industrial production low-emission