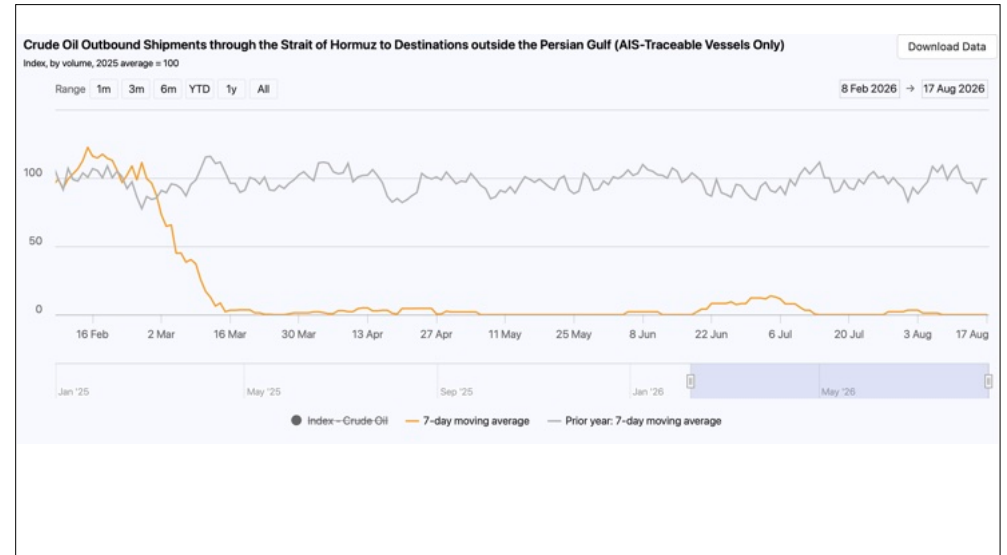


Sveriges energimöjligheter

Stenungsund
2026-08-17

Tomas Kåberger

professor Chalmers tekniska högskola
Ledamot IVA och Sveriges EnergiEkonoms Förening



DAGENS NYHETER. Nyheter Sverige Världen Ekonomi Kultur Sport Klimatet Ledare DN Debatt

DN Debatt. "Fullt möjligt att stoppa EU:s import av rysk gas"

Uppdaterad 2023-03-10 Publicerad 2023-03-09



DN DEBATT 10/3.

Tomas Kåberger och Anders Wijkman: Intäkterna från olje- och gasexporten är kärnan i Rysslands ekonomi, och själva förutsättningen för Putins krig i Ukraina. Västvärdens sanktioner har ändå i stort undvikit energisektorn. Men EU-länderna skulle i det korta perspektivet klara även ett importstopp. Och kriget rasar nu.

Detta är en opinionsartikel i Dagens Nyheter. Skribentens åsikter för skillnad i artikelns.

Spara Dela

Vladimir Putins regim är starkt ekonomiskt beroende av export av energi och gammal energiteknik. Halva ryska statsbudgeten kommer från export av fossila bränslen. Ryssland, tillsammans med Kazakstan och Uzbekistan, står där till för mer än hälften av världens uranvinning. Alla kärnkreaktorer som börjat byggas utanför Kina efter 2019 har en rysk leverantör.

Council of the EU | Press release | 3 December 2025 01:43

Council and Parliament strike a deal on rules to phase out Russian gas imports for an energy secure and independent Europe

This press release was updated on 10 December to add the text of the provisional agreement

Today, the Council presidency and the European Parliament's representatives reached a provisional agreement on the regulation to **phase out imports of Russian natural gas**. The regulation constitutes a central element of the EU's **REPowerEU** roadmap to end dependency on Russian energy following Russia's weaponisation of gas supplies with significant effects on the European energy market.

The regulation introduces a legally binding, **stepwise prohibition on both liquefied natural gas (LNG) and pipeline gas imports from Russia**, with a **full ban from the end of 2026 and autumn 2027** respectively. It will contribute to the overarching goal of achieving a resilient and independent EU energy market, while preserving the EU's security of supply.

SvD Näringsliv
Nyheter Näringsliv Kultur Ledare Debatt Livet eSvD
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Fraktskepp rader upp sig för att försöka ta sig igenom Hormuzsundet, som idag är en krigszon. Foto: Altal Qadiri / AP

Ryssland tjänar 150 miljoner dollar om dagen på nya oljeexporter, när nu kriget i Mellanöstern driver upp priserna i hela världen.

Teresa Küchler
Publicerad 2026-03-16

Följ skribent

CREA
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March 2026 — Monthly analysis of Russian fossil fuel exports and sanctions

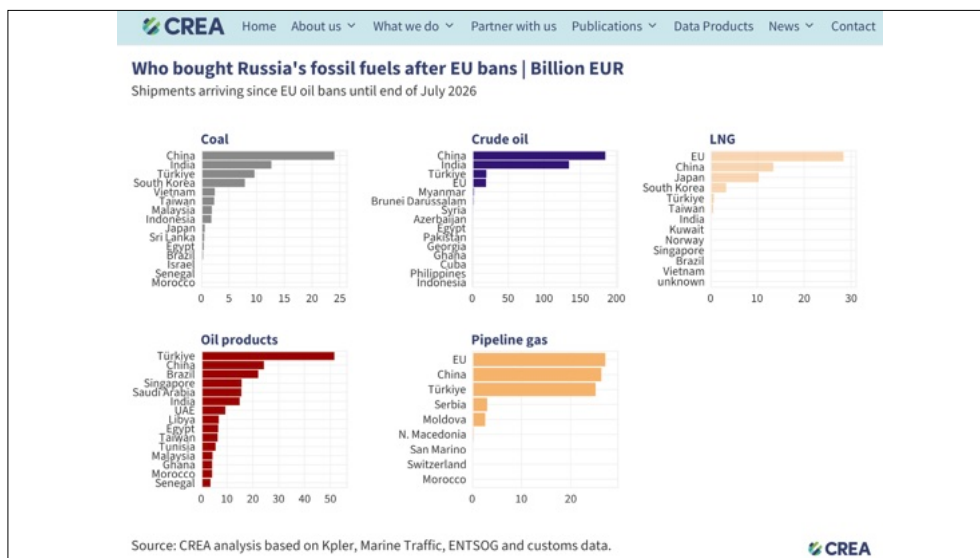
13 April 2026 by [Luke Wickenden](#)

Authors: Luke Wickenden and Isaac Levi; **Data scientist:** Panda Rushwood

Russia's fossil fuel export earnings reach the highest level in two years, with tax revenues from crude projected to double in March.

Key findings

- In March 2026, Russia's monthly fossil fuel export revenues saw a 52% month-on-month increase to EUR 713 mn per day — the highest in two years — while volumes grew by a more modest 16%.
- Russia's increase in monthly fossil fuel export earnings was driven by a massive 115% month-on-month rise in seaborne crude export revenues.



1 of 27 | Russia is attacking Ukraine's energy sector with renewed intensity and alarming accuracy, signaling to Ukrainian officials that Russia is armed with better intelligence and fresh tactics. [Read More](#)

Ukraine says 30% of its power plants destroyed in last eight days

Nato secretary general says new counter-drone defences to be delivered to Ukraine within days

● **Russia-Ukraine war - latest updates**

Dan Sabbagh in Kyiv and Patrick Wintour
Tue 18 Oct 2022 19:00 CEST

[Share](#)



Members of emergency services respond to a fire after a Russian attack targeted energy infrastructure in Kyiv, Ukraine. Photograph: Anadolu Agency/Getty Images

...better intelligence and fresh tactics. [Read More](#)

IEEE Spectrum Transformer Stockpiles—and Gr...



Workers dismantle an autotransformer completely destroyed after the Ukrenergo high voltage power substation was hit by a Russian missile strike. ED SAR/GETTY IMAGES

IEEE Spectrum Transformer Stockpiles—and Gr...

Багень

News Stories Lifehacks Podc



Workers dismantle an autotransformer completely destroyed after the Ukr power substation was hit by a Russian missile strike. ED SAR/GETTY IMAGES



This is a transformer at one of the large substations in western Ukraine. At the time of its impact, **approximately 400,000 people were left without electricity**. There are now dozens of such transformers.

IEEE Spectrum Transformer Stockpiles—and Gr...

Russian attack damages three transformer substations in Kyiv

ECONOMICHA PRAVDA — MONDAY, 8 JULY 2024, 12:57

[f](#) [t](#) [r](#)

624



DESTROYED TRANSFORMER SUBSTATIONS. COLLAGE: UKRAINSKA PRAVDA

Three transformer substations belonging to DTEK, Ukraine's largest private energy firm, have been destroyed or damaged as a result of the Russian attack on Kyiv.



substations in western Ukraine. At the time people were left without electricity. There are

Chernobyl shelter repairs: 'Difficult choices' lie ahead

By Alex Hunt
World Nuclear News, in Vienna
Thursday, 18 September 2025

The arch-shaped New Safe Confinement structure built over the remains of Chernobyl's destroyed unit 4 suffered such extensive damage in a drone strike in February that it may not be possible to restore it to its full original design purposes and life-span of 100 years, a side event at the International Atomic Energy Agency General Conference heard.

The planned repairs

Protsenko said that inspections and assessments had been taking place with the aim of drawing up estimates for a repair plan, but this would take time and so there was therefore a need to go ahead with temporary repairs to protect the structure from further weather-related damage.

Steven White, from the European Bank for Reconstruction and Development, said that its long-running support and work at Chernobyl was now focused on the urgent need for repairs to the New Safe Confinement. He said repair costs were estimated to exceed EUR100 million (USD118 million).

IAEA says drone damaged equipment at Zaporizhzhia nuclear plant in Ukraine

By Reuters
May 5, 2026 2:40 AM GMT+2 · Updated May 5, 2026

IAEA concern after drone strike close to Barakah nuclear power plant

Monday, 18 May 2026

The International Atomic Energy Agency says it has been informed by the UAE that radiation levels at the Barakah Nuclear Power Plant remain normal and no injuries reported "after a drone strike ... caused a fire in an electrical generator located outside the inner site perimeter of the NPP".

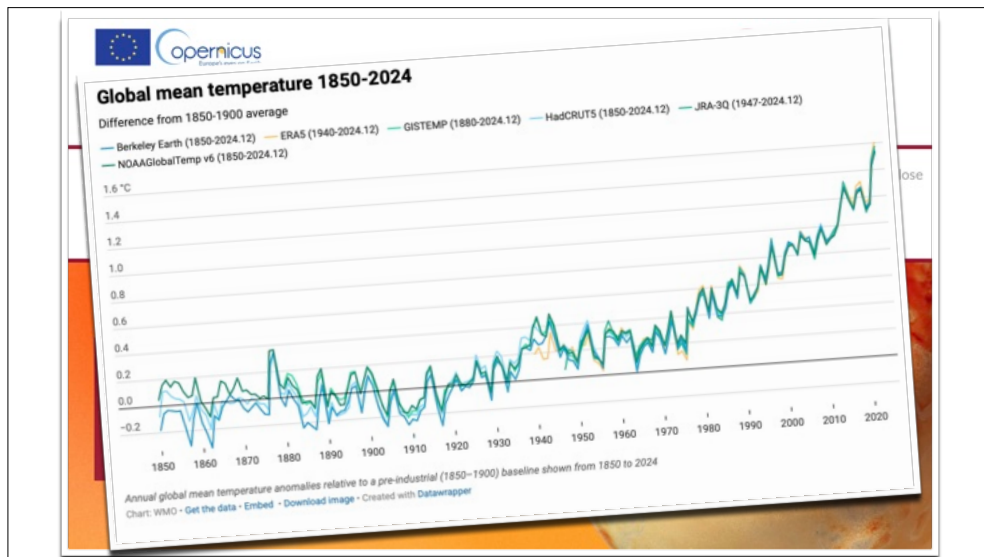
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What we do

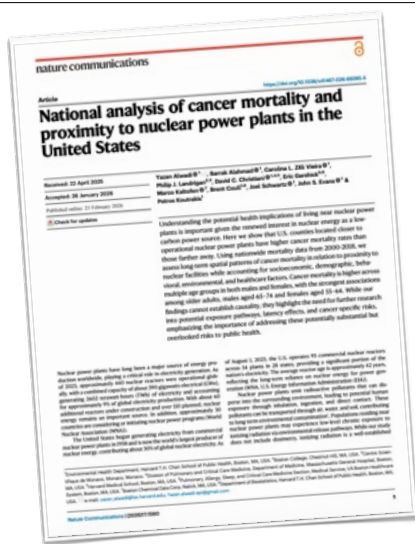
Data

GLOBAL CLIMATE HIGHLIGHTS 2025

Copernicus: 2025 was the third hottest year on record



Ionizing Radiation Health Effects



Ionizing Radiation Health Effects



Ionizing Radiation Health Effects



REPOWEREU TO CUT OUR DEPENDENCE ON RUSSIAN GAS

More rooftop solar panels, heat pumps and energy savings to reduce our dependence on fossil fuels, making our homes and buildings more energy efficient.

Speeding up renewables permitting to minimise the time for roll-out of renewable projects and grid infrastructure improvements.

Diversifying gas supplies and working with international partners to move away from Russian gas, and investing in the necessary infrastructure.

A Hydrogen Accelerator to develop infrastructure, storage facilities and ports, and replace demand for Russian gas with additional 10 mt of imported renewable hydrogen from diverse sources and additional 5 mt of domestic renewable hydrogen.

Decarbonising Industry by accelerating the switch to electrification and renewable hydrogen and enhancing our low-carbon manufacturing capabilities.

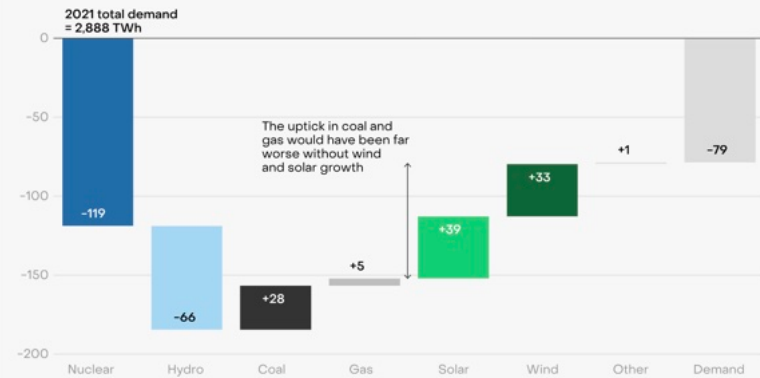
Doubling the EU ambition for biomethane to produce 35 bcm per year by 2030, in particular from agricultural waste and residues.

2030

2030

The EU's coal generation rose due to a sizeable nuclear and hydro deficit

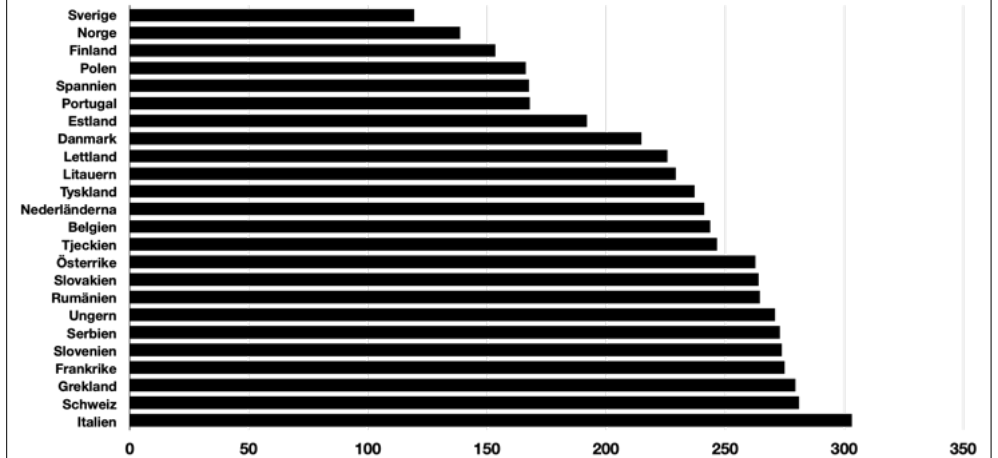
Year-on-year change in EU-27 generation for 2022 (terawatt hours)



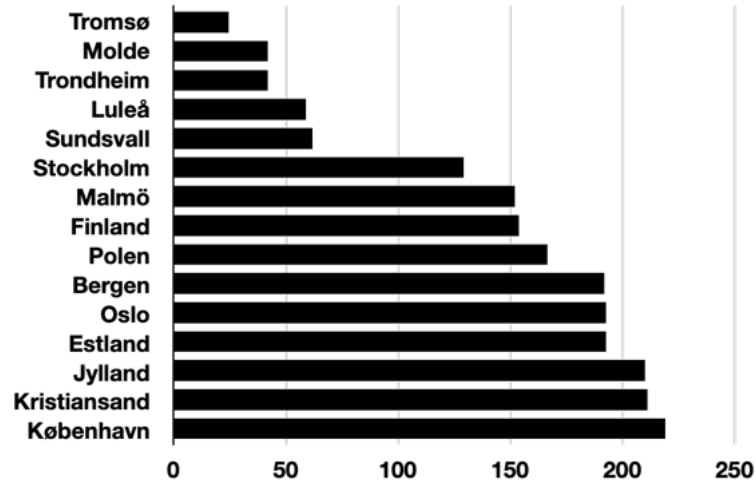
Source: Monthly electricity data, Ember
 'Other' includes bioenergy, other renewables, other fossil fuels and net imports

EMBER

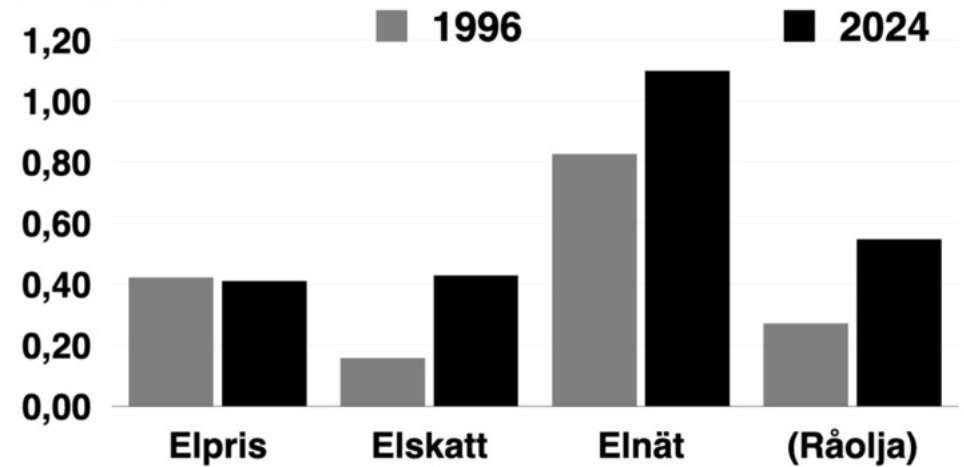
Elpris Europas länder 2022, €/MWh



Elpris Europas billigaste elområden 2022, €/MWh

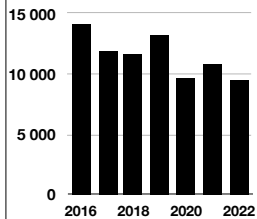


SEK/kWh



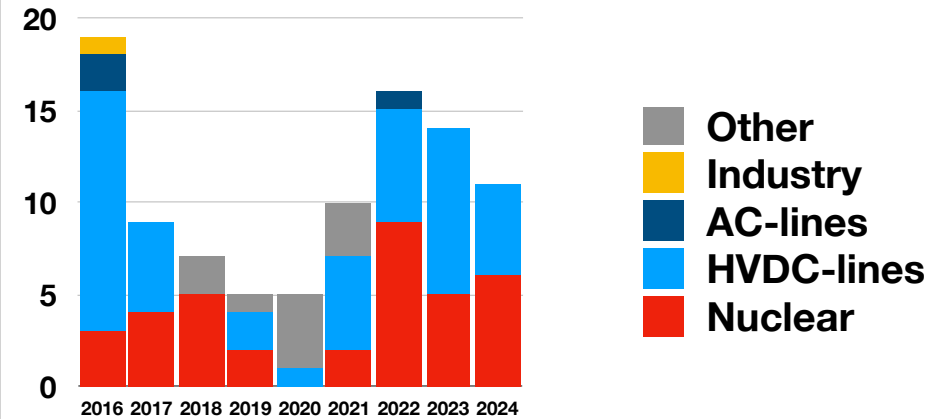
Frekvensstabilitet

Frekvensen i nätet är ett mått för att se om det är balans mellan produktion och konsumtion av el. Frekvensen är normalt 50 Hz. Om frekvensen sjunker är elanvändningen högre än produktionen, och tvärtom ifall frekvensen ökar. Elsystemet är dimensionerat så att frekvensen ska hållas inom intervallet 50 +/- 0,1 Hz. Frekvensen är en indikator både på förmågan till god leveranssäkerhet och kraftsystemets elkvalitet. Under 2022 låg frekvensen utanför detta intervall under 9 394 (10 608) minuter, vilket är en klar förbättring i jämförelse med föregående år. Målet på under 10 000 minuter utanför normalintervallet uppnåddes, och resultatet är den bästa frekvenskvaliteten Svenska kraftnät haft sedan 2009.



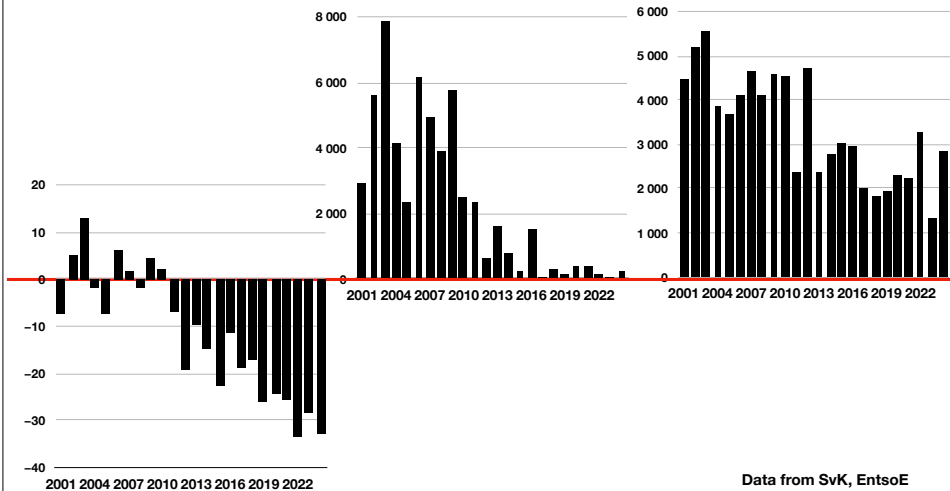
Svenska kraftnät – Årsredovisning 2022, sid 86-87

Frekvensstörningar större än 300 mHz i det nordiska synkrona systemet 2016-2024



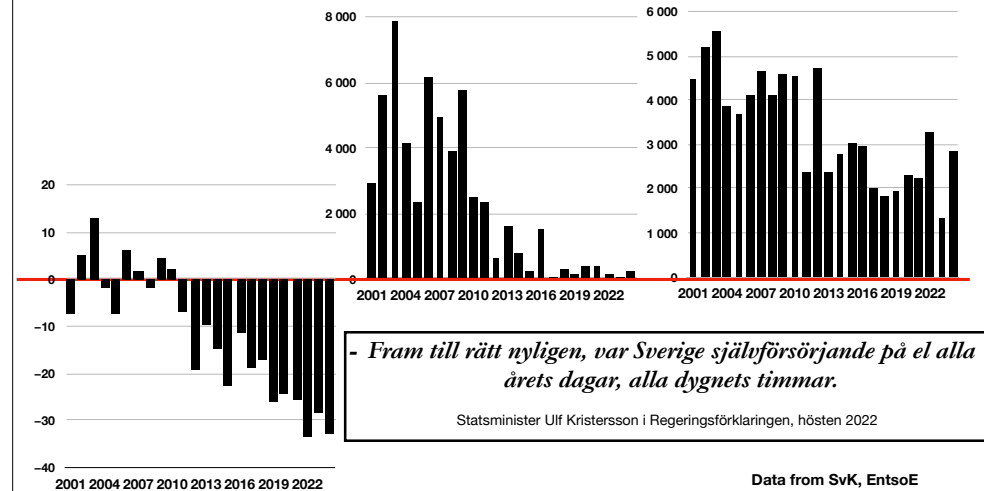
<https://www.fingrid.fi/en/grid/power-transmission/maintenance-of-power-balance/>

Årlig nettoimport, TWh | Antal timmar med nettoimport | Maximal nettoimport, MW



Data from SvK, EntsoE

Årlig nettoimport, TWh | Antal timmar med nettoimport | Maximal nettoimport, MW

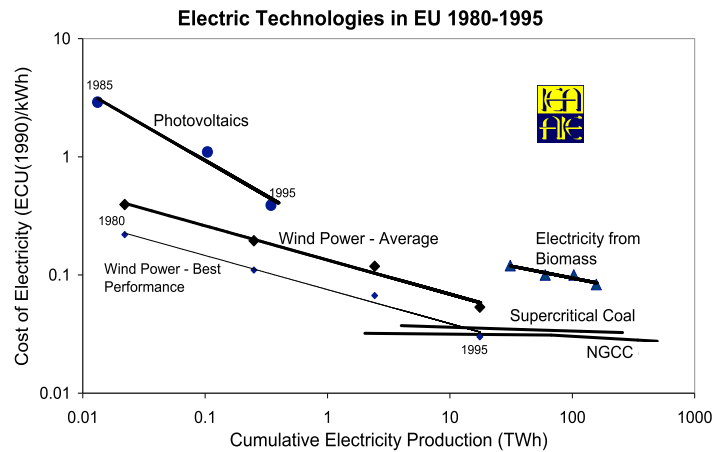


Data from SvK, EntsoE

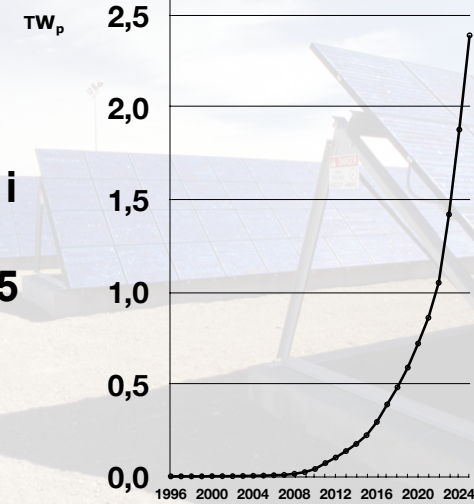
Industrial learning by experience



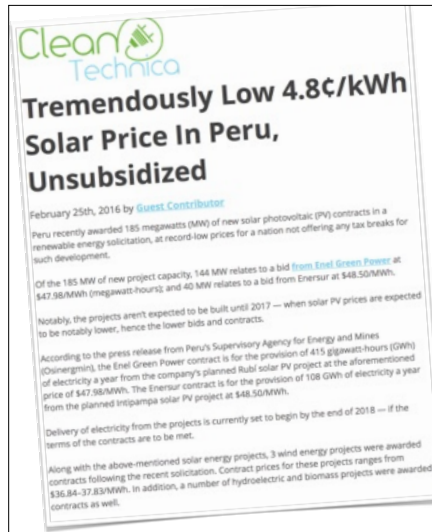
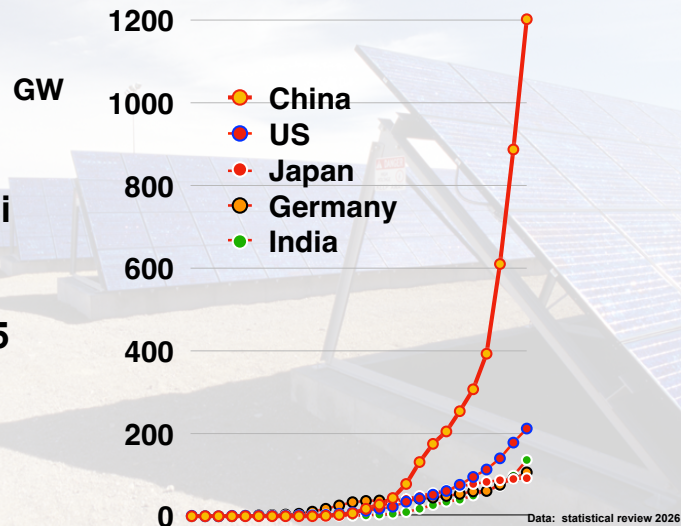
Professor Clas-Otto Wene,
Chalmers Univ. of Technology, 2000

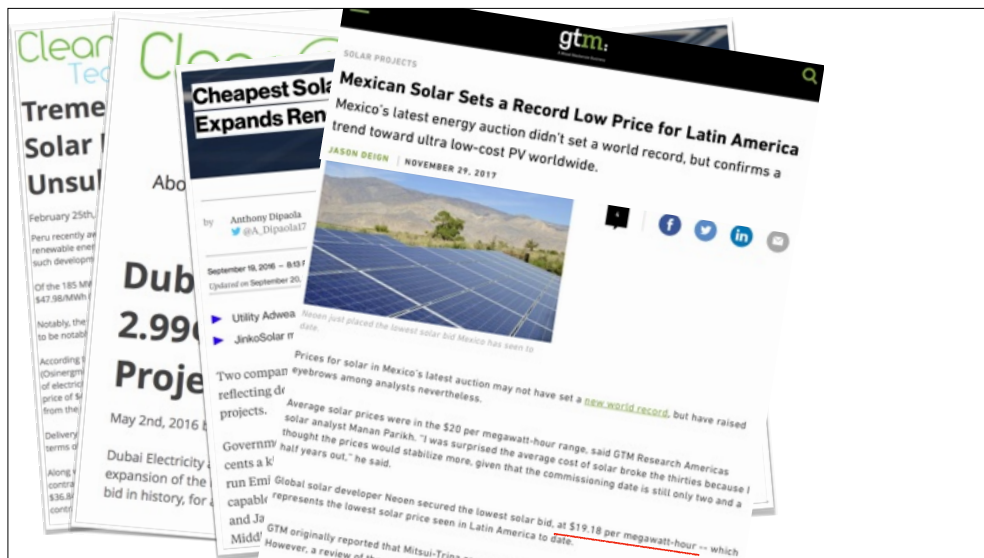
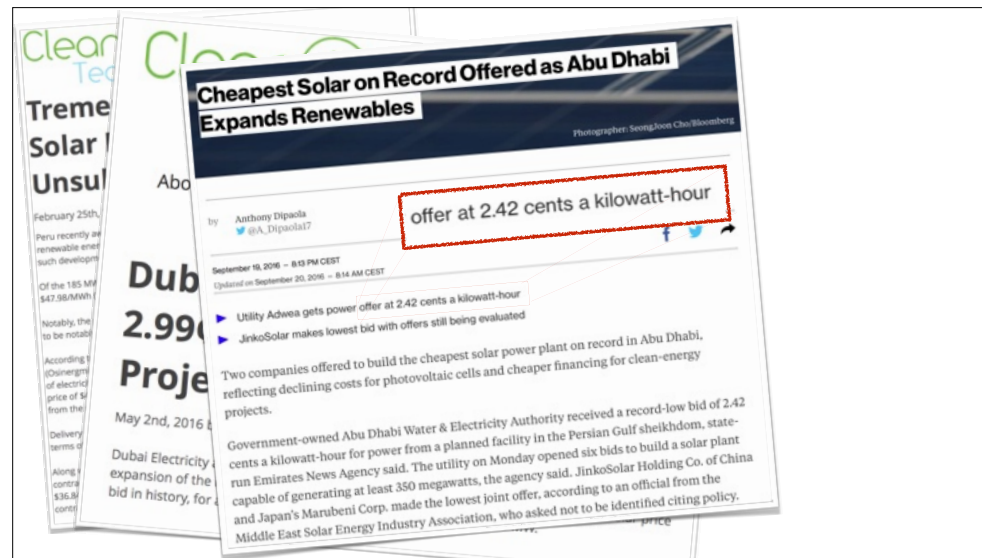


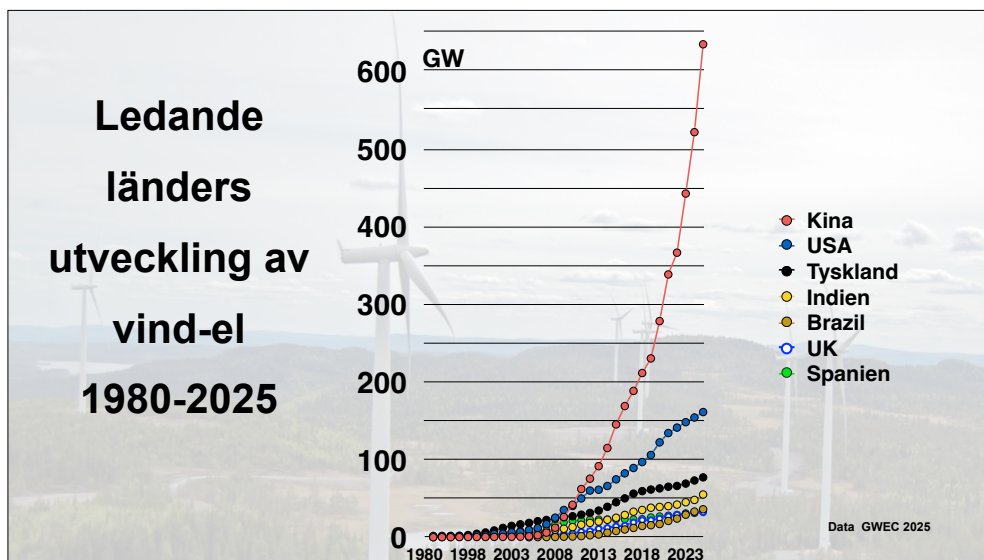
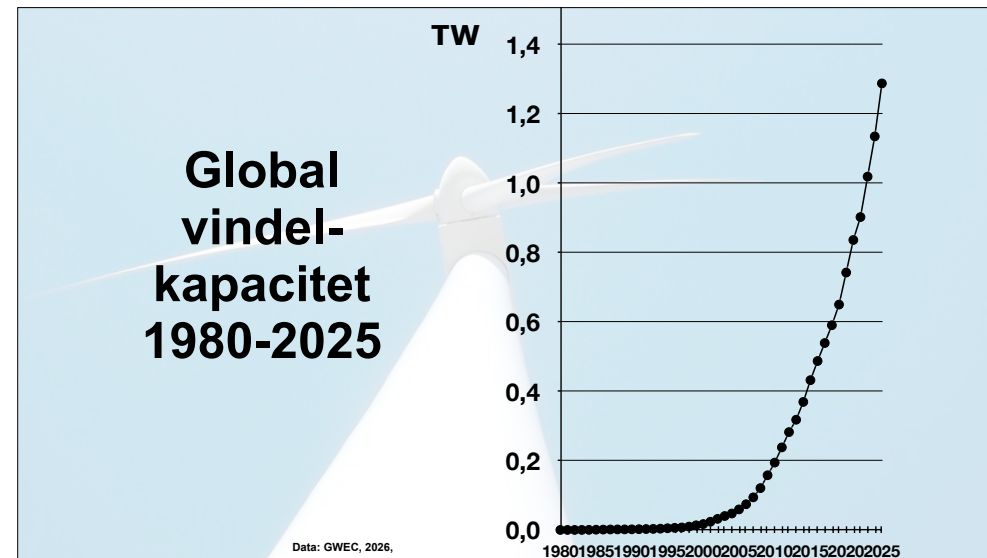
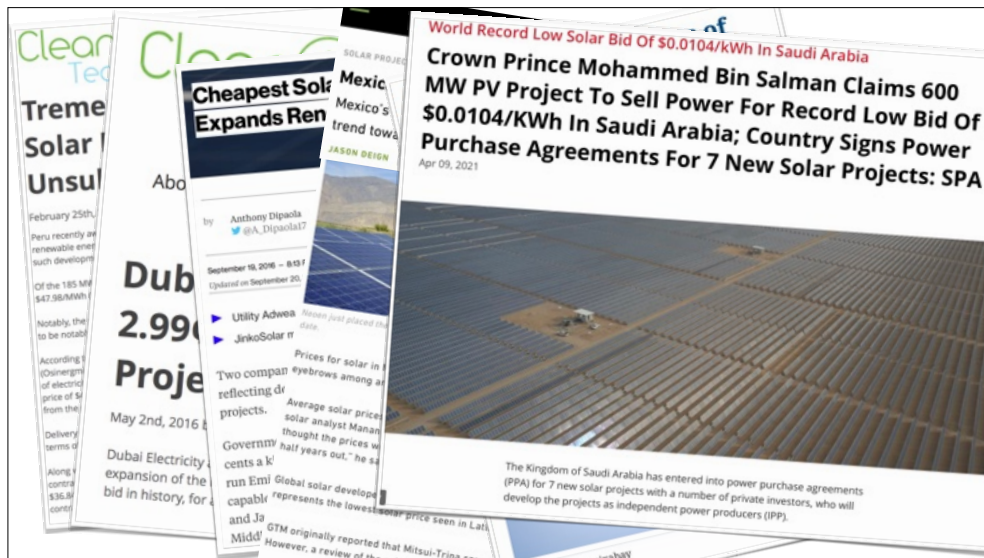
Solceller i världen 1996-2025



Solel-kapacitet i ledande länder 1996-2025







New low for wind energy cost - Morocco tender average

By Giles Parkinson on 17 Jan

The north African country is securing average bids of just scale wind energy projects.

The pricing – revealed by its Energy summit in Abu Dhabi – boosted by the remarkable win concessionary finance.

Abderrahim El Hafidi, vice minister and "amazing" and said it pointed the US have been in and around production tax credit.

Enel sets a new world wind record in Mexico, below \$18/MWh

November 29, 2017 Paul Dvorak : 0 Comments

This Flash Note from Make Consulting examines the results of Mexico's third long-term power auction held in November 2017. The note evaluates the event and its bidding within the context of previous auction rounds in Mexico as well as within the Latin American region. It analyses the dynamics that contributed to Enel's record low bidding and posits dynamics that favor low bidding in the Mexican market.

Key points:

- Mexico hosted a long-term power auction in November 2017 which awarded offtake agreements to wind power and PV projects totaling 5.5 TWh of annual production
- Enel submitted four successful bids for wind power sites with the lowest reaching \$17.70/MWh
- In total, the auction awarded PPAs to 2 GW of new project sites, including 689 MW of new wind power sites which are due online in 2020



24

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Enel sets a new world

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Saudi Arabia Sets New World Record in Producing Low-cost Electricity From Wind Energy

TOKYO — Minister of Energy Prince Abdulaziz bin Salman announced that Saudi Arabia has achieved new world records in reducing the cost of producing electricity from wind energy, thanks to the Al-Ghat and Wa'ad Alshamal projects. "This great step would support the Kingdom's plans to raise the share of renewable energy to 50 percent of the electricity mix by 2030," he said during the signing of energy agreements on the sidelines of the Saudi-Japan Vision 2030 Business Forum in Tokyo on Tuesday.

Prince Abdulaziz thanked Custodian of the Two Holy Mosques King Salman and the Crown Prince and Prime Minister Mohammed bin Salman, who is also chairman of the Supreme Committee for Energy Mix Affairs for Electricity Production and Enabling Renewable Energy Sector, for all the encouragement, support, and follow up that the Ministry of Energy and its ecosystem receive from the country's leadership, to enable achieving the Vision 2030 targets in the energy sector. "It is my pleasure to announce that Al-Ghat project achieved a new world record low levelized cost of electricity production from wind power at 1.56558 cents/kWh [5.87094 halalas/kWh] Levelized Cost of Electricity (LCOE), and Wa'ad Alshamal project has also achieved a second world record low for wind power at 1.70187 cents/kWh [6.38201 halalas/kWh] LCOE," he said.

Offshore wind costs hit record low

1k Shares

Published on 06/07/2016, 10:57am

Two 350MW arrays in the Netherlands will supply power at €87/MWh, beating the next cheapest project by miles

By Megan Darby

Dong Energy has set a record low price for offshore wind power in a winning bid to build two arrays off the coast of the Netherlands.

The Danish company committed to supply electricity at €72.70/MWh (US\$80.40), not including transmission costs. The cables will add about €14/MWh, experts say.

That beats an industry goal of bringing costs below €100/MWh by 2020. The closest any rival had previously come was €103/MWh by Vattenfall in Denmark last year.

"It was a result that was well beyond anyone's expectations," said Oliver Joy, spokesperson for the European Wind Energy Association.

25

Offshore wind record low

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New record for cheapest offshore wind farm

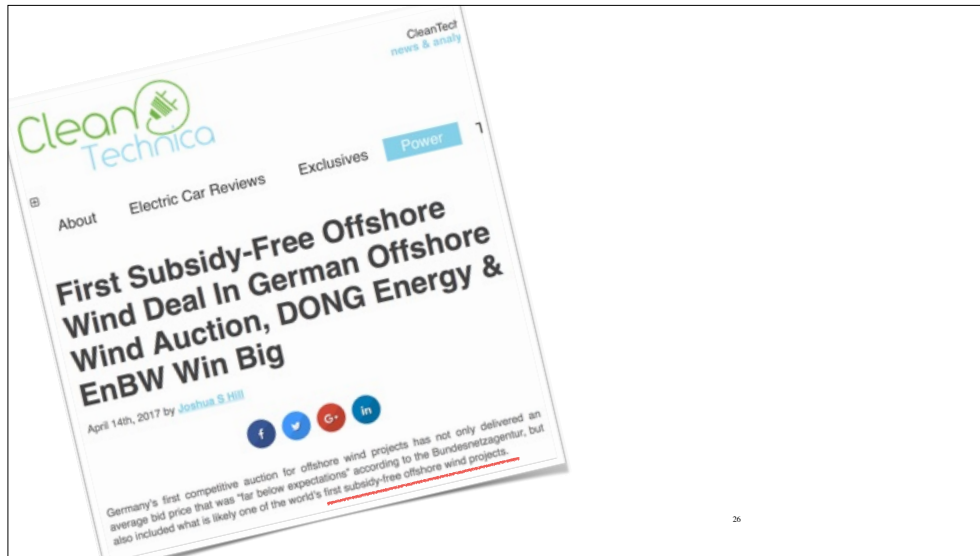
By Emily Gosden, ENERGY EDITOR

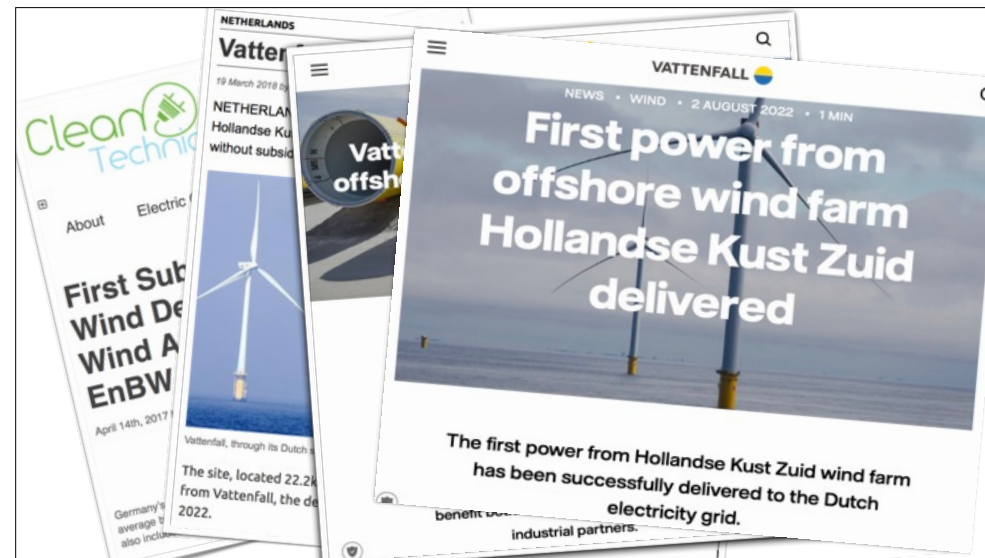
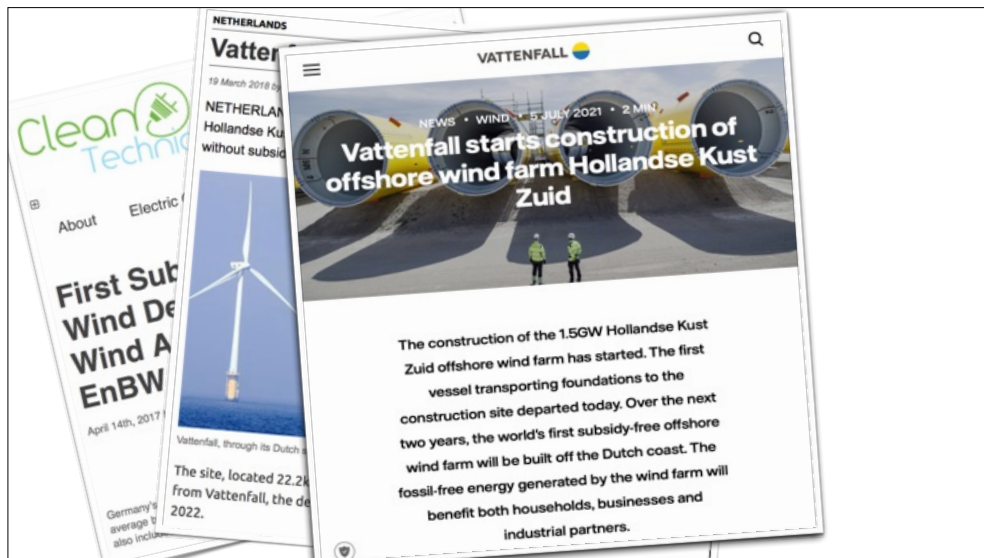
14 SEPTEMBER 2016 · 7:35AM

The cost of building offshore wind farms has fallen to a new low, with Sweden's Vattenfall winning contracts to build two projects in Danish waters for just over €60 (£51) per megawatt-hour (MWh).

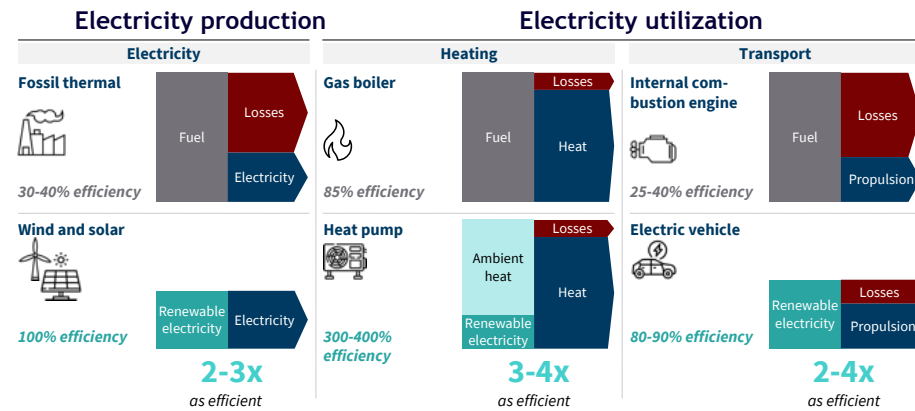


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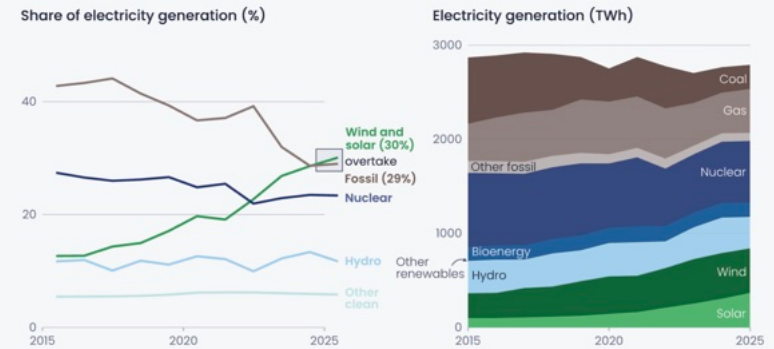
Renewable electricity more efficient than fuels



Source: IEA, IIAASA, RMI analysis, Adapted from Prof. Tomas Kaberger. Note: Solar & wind's 100% efficiency represents the fact that there are no conversion losses from primary to secondary energy.

21

Wind and solar overtake fossil power in the EU for the first time in 2025

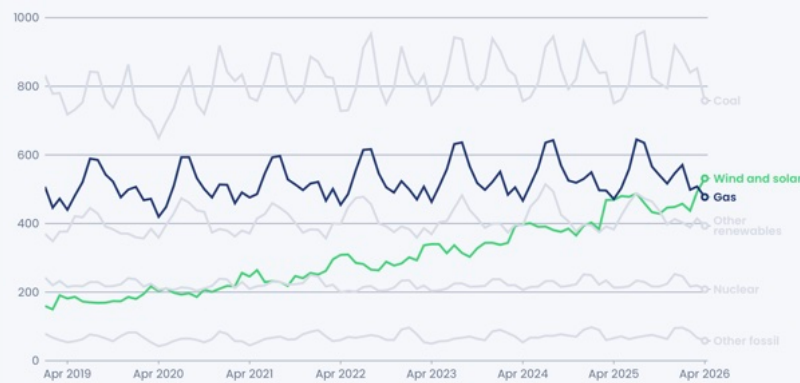


Source: Yearly electricity data, Ember. Other clean includes bioenergy and other renewables. Fossil includes coal, gas and other fossil.

EMBER

In April 2026, wind and solar generated more electricity than gas globally for the first time

Global electricity generation by source (TWh)



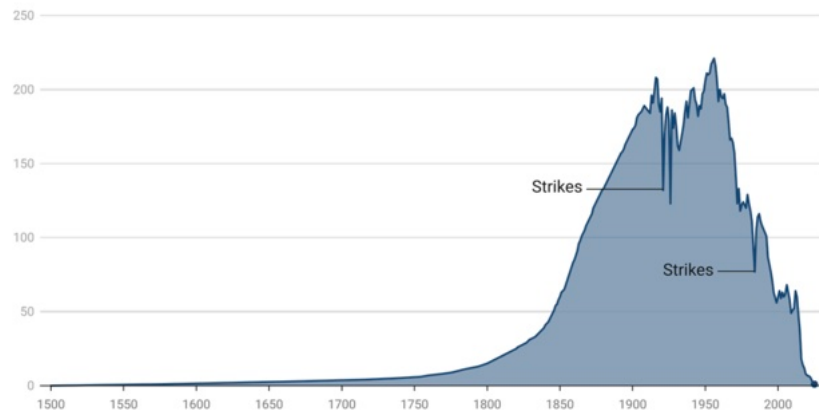
Source: Monthly electricity data, Ember. Other renewables includes hydro, bioenergy and smaller generators such as geothermal; Other fossil includes oil and other fossil generators

EMBER

The image shows the CarbonBrief website header and a main article image. The header includes the CarbonBrief logo and navigation links: SCIENCE, ENERGY, POLICY, NATURE, IN FOCUS, DAILY BRIEFING, and a SUBSCRIBE button. The main article image shows two workers in a coal mine, with a large excavator in the background. The article title is "Analysis: Coal power drops in China and India for first time in 52 years after clean-energy records". The article is dated 13 January 2026 and has a 0:01 duration. Social media sharing icons for Facebook, Twitter, LinkedIn, Email, and WhatsApp are visible.

UK coal demand in 2025 fell to lowest level since 1600

Annual demand for coal, million tonnes



Source: Fouquet, DESNZ and Carbon Brief analysis

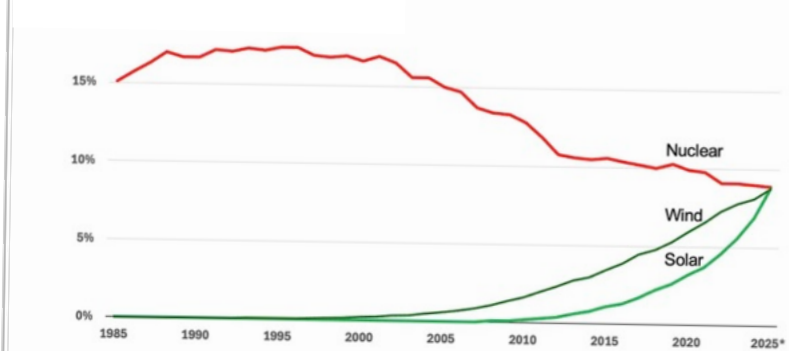
CarbonBrief

26/33

Fossilfri elproduktion 1985 – 2025

% av global elproduktion

Liebreich Associates



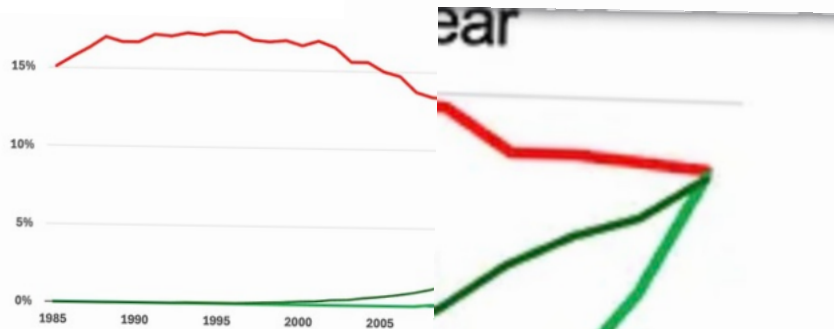
* Full year estimate based on January - November

Source: Ember/Energy Institute Statistical Review; Liebreich Associates

Fossilfri elproduktion 1985 – 2025

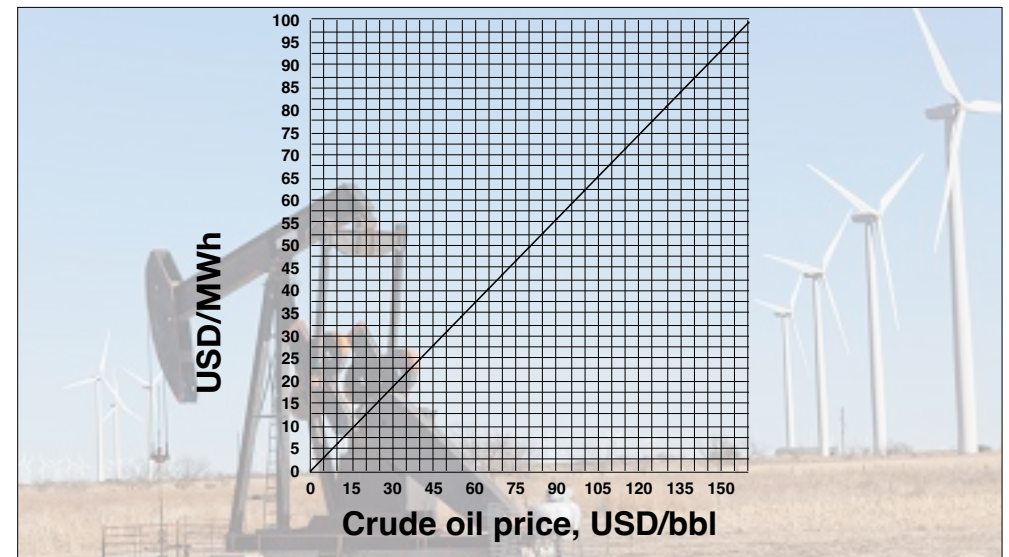
% av global elproduktion

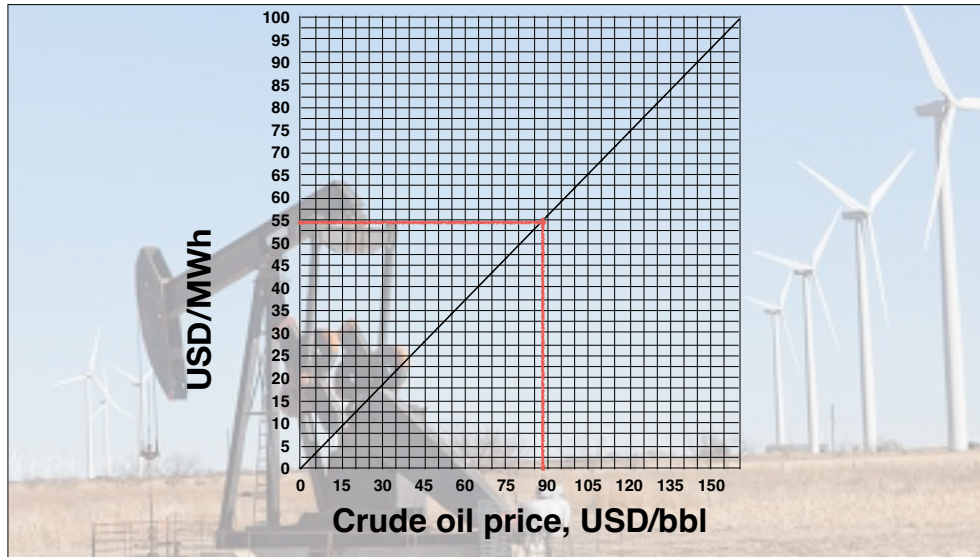
Liebreich Associates



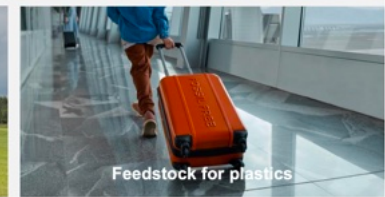
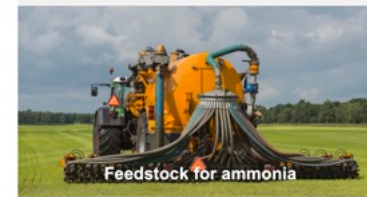
* Full year estimate based on January - November

Source: Ember/Energy Institute Statistical Review; Liebreich Associates





First fossil free electricity. Then:



Confidentiality: C1 - Public

VATTENFALL

OVAKO

World's first fossil-free hydrogen plant revolutionizes steel

The hydrogen plant will be used to heat steel with hydrogen before rolling, making Ovako the first producer in the world to use this technology.

Hydrogen plant makes Ovako unique in the world

On September 5, 2023, the world's first plant for fossil-free hydrogen for heating steel before rolling was inaugurated. The new plant in Hofors starts a new chapter in Swedish steel history with the potential for major emission reductions.

The plant is now in operation, producing fossil-free hydrogen to fuel our steel heating furnaces and reduce the emissions from our rolling mill to almost zero. As well as being the first electrolysis plant in the world at a steelworks, it's also Sweden's largest electrolysis plant, being rated at 20 MW and able to generate 3,880 cubic meters of hydrogen per hour.

HYBRIT

A joint venture between SSAB, LKAB and Vattenfall

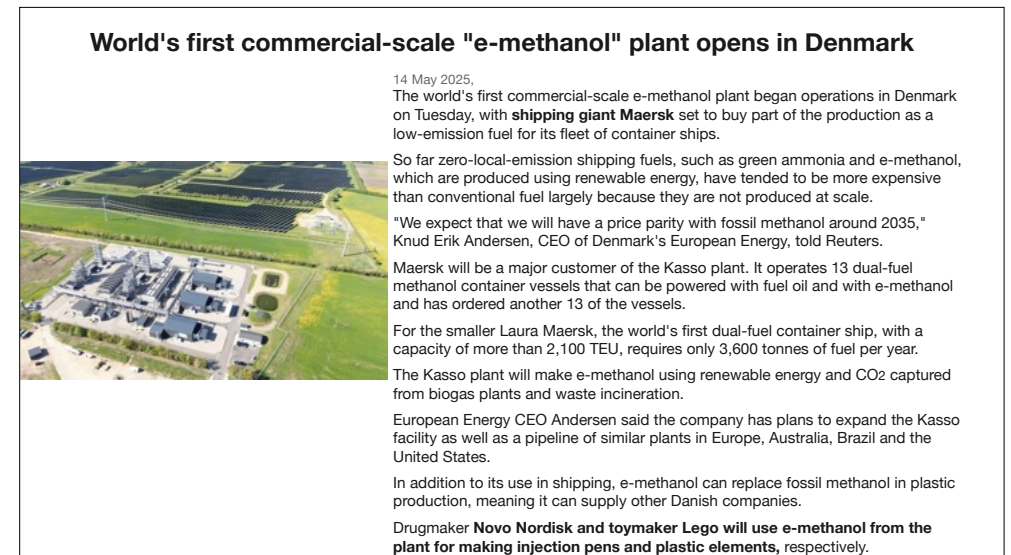
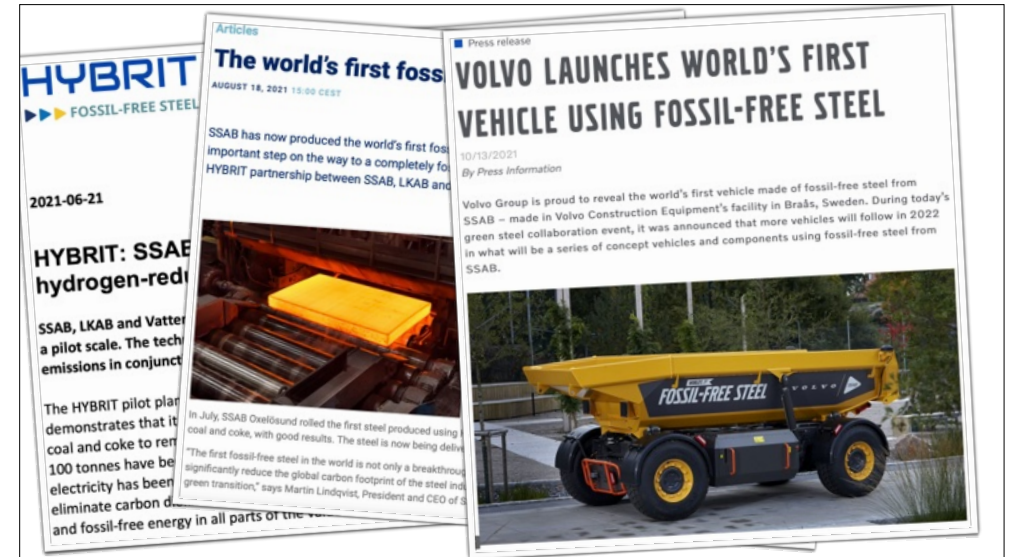
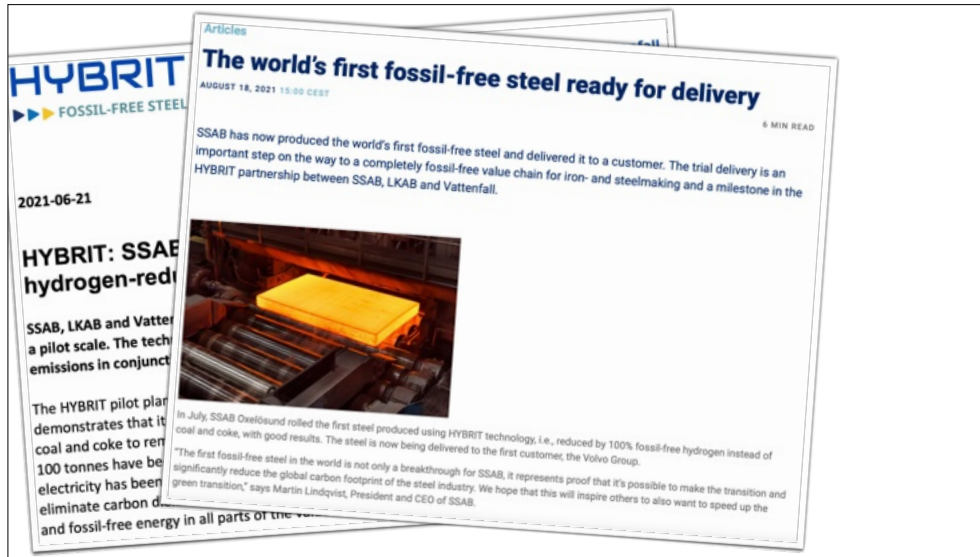
FOSSIL-FREE STEEL

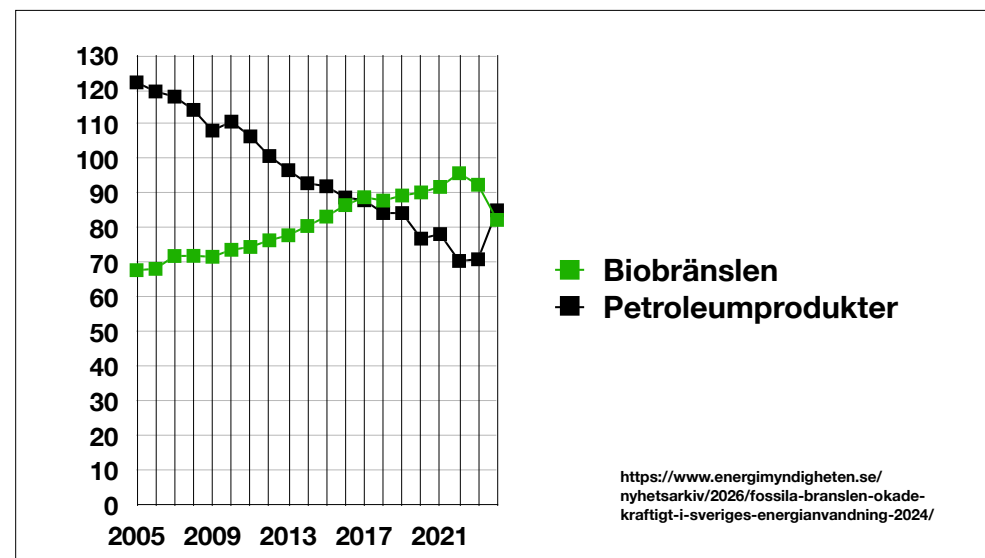
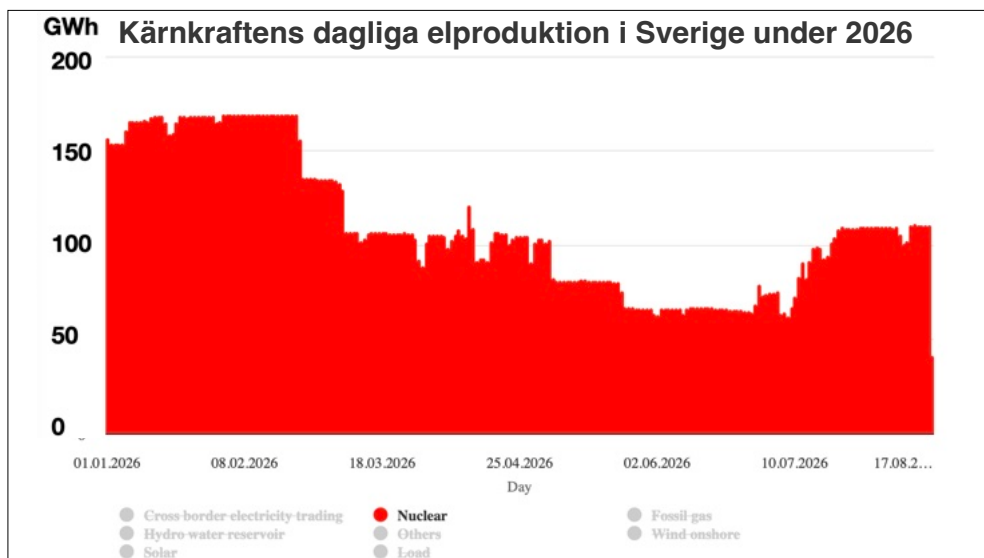
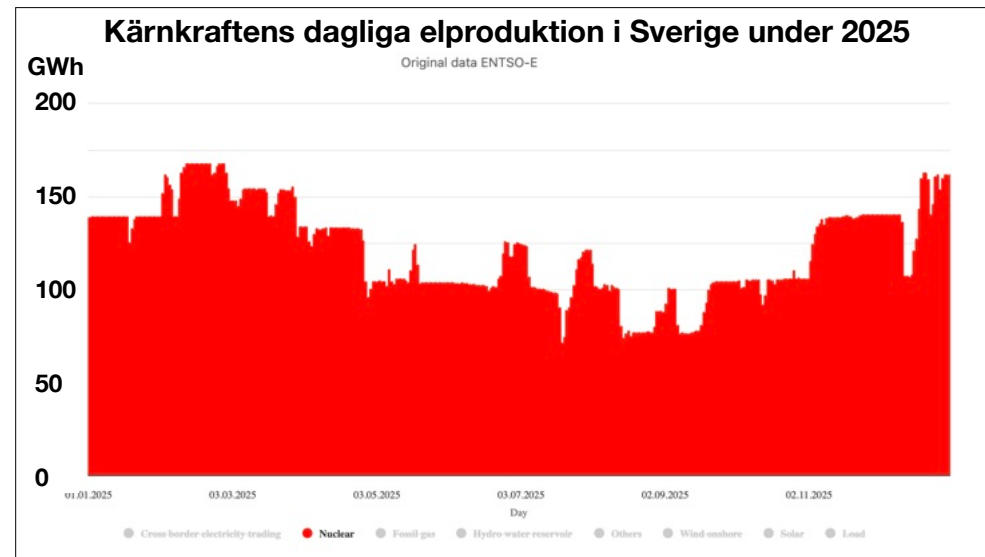
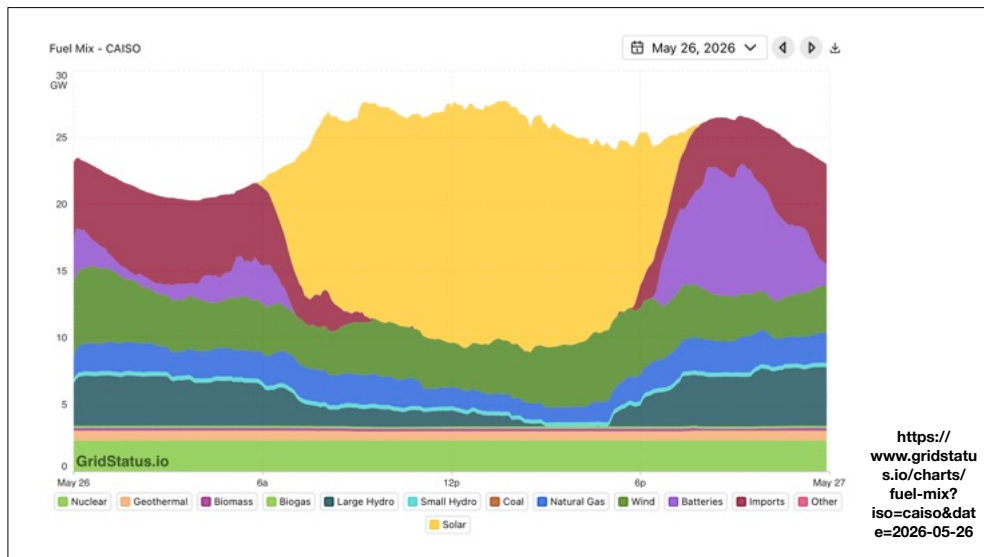
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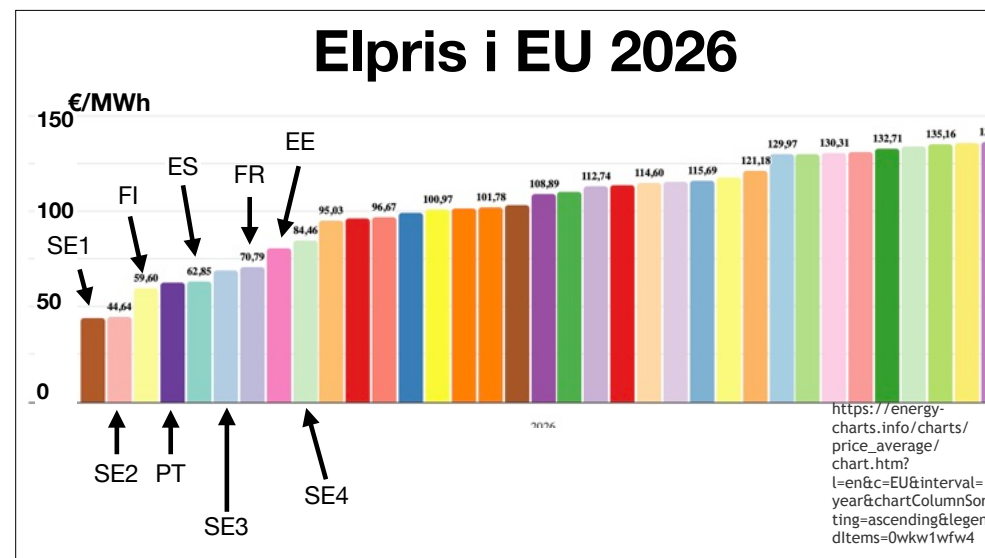
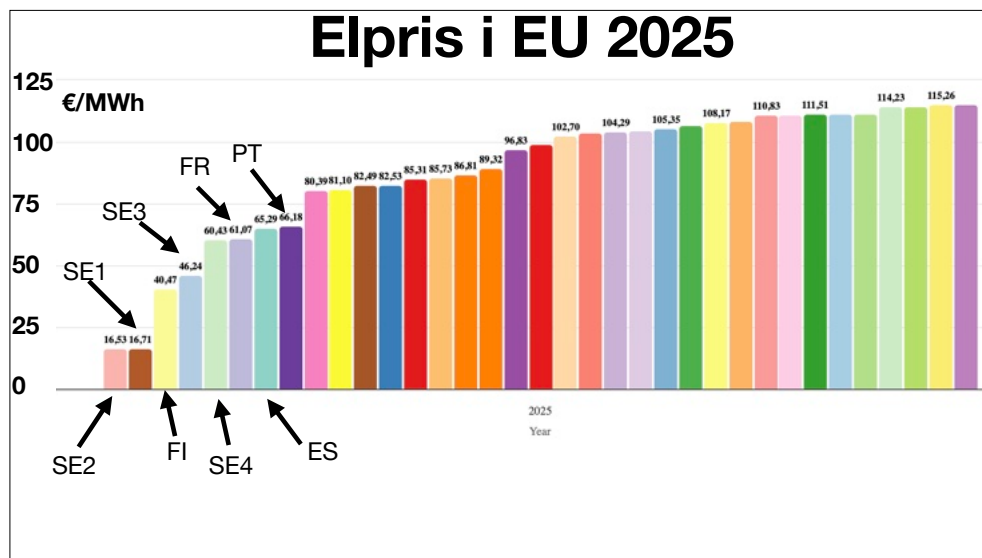
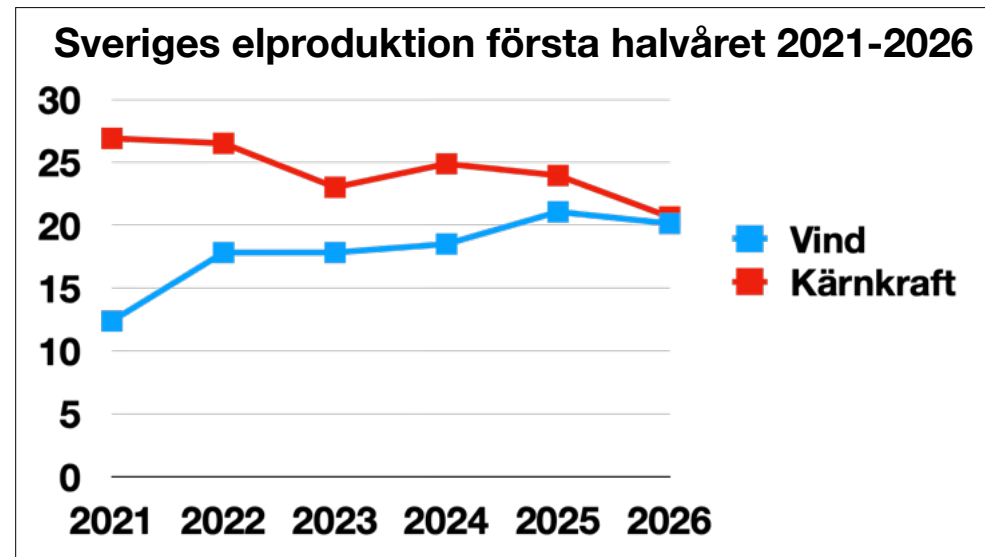
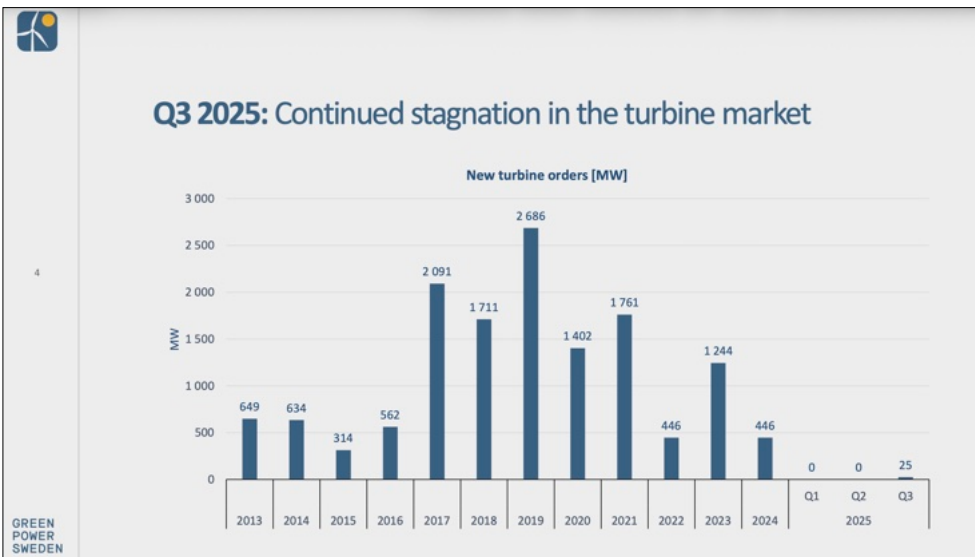
HYBRIT: SSAB, LKAB and Vattenfall first in the world with hydrogen-reduced sponge iron

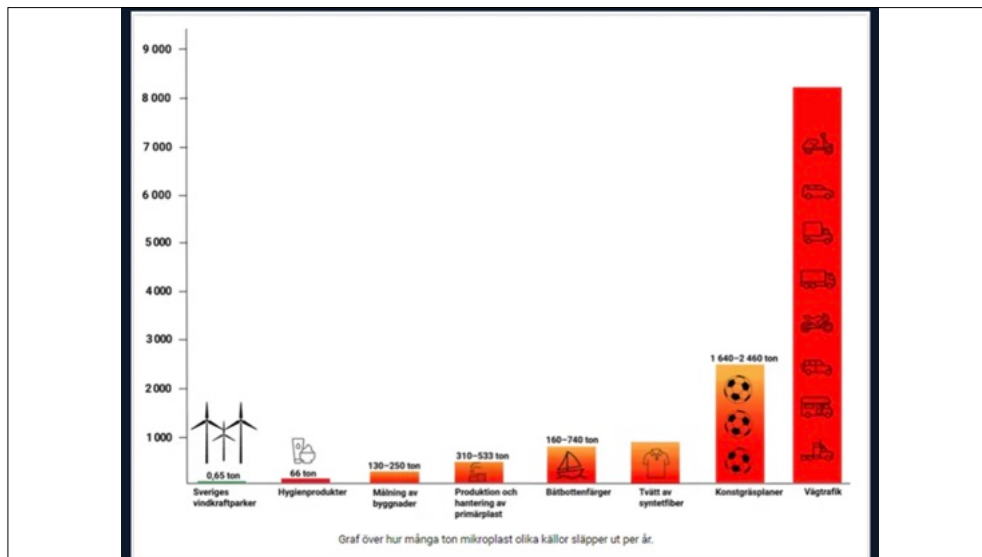
SSAB, LKAB and Vattenfall have now produced the world's first hydrogen-reduced sponge iron at a pilot scale. The technological breakthrough in the HYBRIT initiative captures around 90% of emissions in conjunction with steelmaking and is a decisive step on the road to fossil-free steel.

The HYBRIT pilot plant in Luleå, Sweden has completed test production of sponge iron and demonstrates that it is possible to use fossil-free hydrogen gas to reduce iron ore instead of using coal and coke to remove the oxygen. Production has been continuous and of good quality. Around 100 tonnes have been made so far. This is the first time ever that hydrogen made with fossil-free electricity has been used in the direct reduction of iron ore at a pilot scale. The goal in principle is to eliminate carbon dioxide emissions from the steelmaking process by using only fossil-free feedstock and fossil-free energy in all parts of the value chain.









World Nuclear Industry Status Report 2025+

NUCLEAR WORLD 2025 IN NUMBERS

Number of Operating Reactors Drops – Taiwan Completes Nuclear Phaseout

As of 1 January 2026, 404 nuclear power reactors were operating in the world—five units less than one year earlier—maintaining however a stable combined operating capacity. Construction of new nuclear plants was underway in 11 countries, five fewer host nations than just two years earlier.

WNISR, January 2026

SvD Näringsliv Nyheter Näringsliv Kultur Ledare Debatt Livet eSvD

Rolls-Royce SMR kommer att vara igång med sina byggen i Storbritannien och Tjeckien innan bygget vid Ringhals startar, enligt Anna Borg.



– Däremot kommer reaktorerna inte att vara klara där i början av konstruktionen av de svenska reaktorerna, säger hon till SvD.

Men det kommer att gå att dra lärdomar redan i den första fasen och många av delarna kommer att vara testade innan Videberg kraft ska börja bygga, enligt Anna Borg.

Anna Borg, vd Vattenfall. Foto: Ari Luostarinen

SvD Näringsliv Nyheter Näringsliv Kultur Ledare Debatt Livet eSvD

Rolls-Royce SMR kommer att vara igång med sina byggen i Storbritannien och Tjeckien innan bygget vid Ringhals startar, enligt Anna Borg.



In November, the government announced that Wylfa on the island of Anglesey, North Wales, will host three Rolls-Royce small modular reactors. It said the site - where a Magnox plant is being decommissioned - could potentially host up to eight SMRs.

On 1 April, GBE-N announced it had signed a GBP300 million contract with an Amentum/Cavendish Nuclear joint venture to serve as the Owner's Engineer to support the deployment of Rolls-Royce SMR's reactors at Wylfa. The joint venture - Litmus Nuclear - will deliver "independent assurance and expert technical guidance across critical areas, including design, safety, engineering, construction, and commissioning". The agreement has a maximum duration of 14 years and aims to ensure the programme meets all regulatory requirements and help GBE-N to secure a final investment decision for the UK's first SMRs. A final investment decision is expected to be taken in 2029.

Anna Borg, vd Vattenfall. Foto: Ari Luostarinen

SvD Näringsliv Nyheter Näringsliv Kultur Ledare Debatt Livet eSvD

Rolls-Royce SMR kommer att vara igång med sina byggen i Storbritannien och Tjeckien innan bygget vid Ringhals startar, enligt Anna Borg.



CEZ, Rolls Royce SMR sign early works contract on first Czech small nuclear reactor

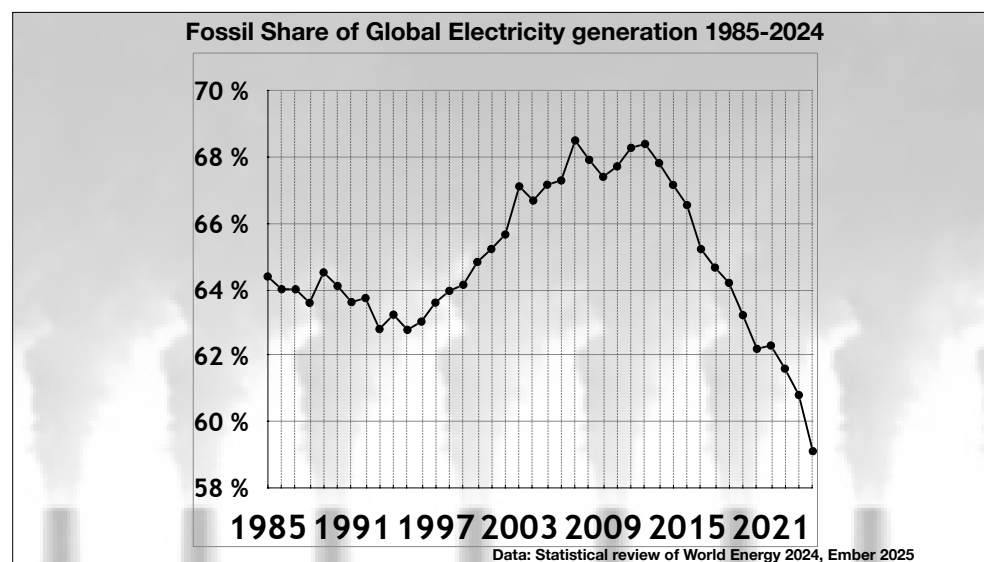
Published by Global Banking & Finance Review
Posted on April 24, 2026 · 1 min read · Last updated: April 24, 2026

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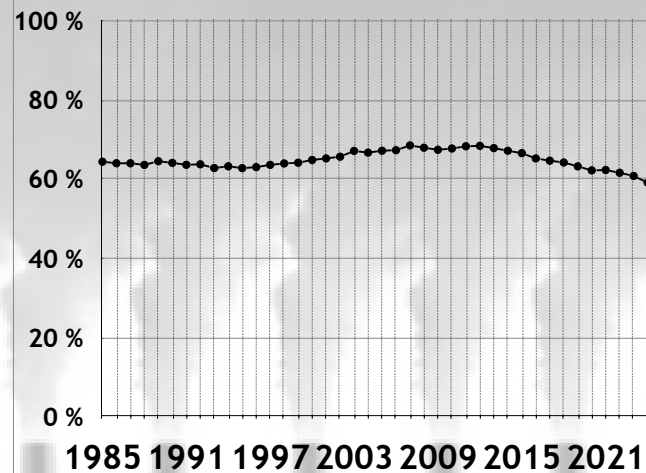
Finance Energy Nuclear Czech Republic

Quick Summary
Czech utility ČEZ and UK-based Rolls-Royce SMR signed an Early Works Agreement on April 24, 2026 to prepare the first small modular reactor (SMR) at Temelin, now expected in the latter half of the 2030s—slightly later than prior mid-2030s projections.

Anna Borg, vd Vattenfall. Foto: Ari Luostarinen



Fossil Share of Global Electricity generation 1985-2024



Data: Statistical review of World Energy 2024, Ember 2025



Sveriges energimöjligheter

Stenungsund

2026-08-17

Tomas Kåberger

professor Chalmers tekniska högskola
Ledamot IVA och Sveriges EnergiEkonomers Förening

Dependence on metals instead of fuels?

- Fuels resources for energy are consumed
- Continuous need for mining new resources.
- Metals refined to build new industrial structure
- Resource value increased when put into use. Recycling, together with efficiency improvements, will reduce (or even remove) the need for mines.



A single journey by 1 large container ship of solar PV modules can provide the means to generate as much electricity as the gas on over 50 large LNG tankers or the coal on over 100 large ships

Solar PV



LNG



Coal



iea

<https://www.iea.org/reports/energy-technology-perspectives-2024>

Import dependence

- If fuel imports stop: No power, cars stop
- If solar pv or battery imports stop:
 - Continued power production, electric cars can operate.
- Just no expanded capacity