

Challenges for the energy transition

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Nepp, North European Energy Perspectives Project

KSLA, Seminar Geopolitics and Energy

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A narrow alleyway between brick buildings with a waterfall in the center. The water flows over a stone ledge and down a set of steps. The buildings are made of red brick and have several windows. A metal staircase is visible on the left building.

Profu is an independent consultant and research company within the areas of energy, transport and circular economy.

Our company was founded in 1987 by researchers at Chalmers Institute of Technology, at the department of Energy System with which we still have close collaboration.

Today we are 25 employees (of whom nine are shareholders of the company).

Our main office is located in Mölndals Kvarnby outside of Göteborg, but we also have an office in an 18th century building in Målargatan in central Stockholm.



nepp

North European Energy Perspectives Project

- A coherent **multi-disciplinary research project** focusing on the development of the **energy systems in Sweden and the North European countries** with the time perspective 2030, 2040 and 2050.
- Nepp and its predecessors NEP and Nordleden has been **a central and politics-close platform for research and dialogue on the energy systems development** since the mid-90's.
- Nepp **gathers the Swedish energy sector and its actors** within the academia, research companies, authorities, energy and industry businesses.
- **Interdisciplinary synthesis work is an important part** of the research work conducted within the framework of the project.



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For more information on Nepp's current phase:
<https://energiforsk.se/program/nordeuropeiska-energiperspektiv-nepp/>

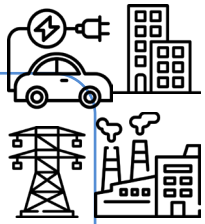
Nepp has highlighted...

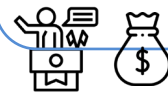
Four central factors that are of particular importance for which paths we will take and which choices we will make in the ongoing energy transition




The final report of Nepps previous phase: Insights and choices in the energy transition (2020).

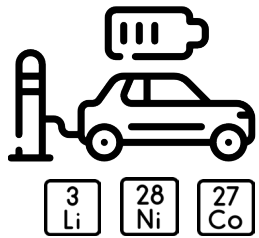
1  The degree of electrification

2  The degree of systems integration

3  The balance between market-driven and politically driven development

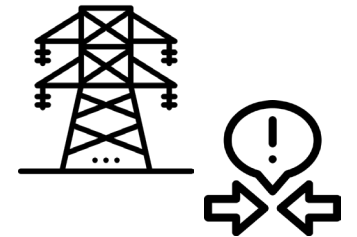
4  Changes in the perception of sustainability

Four challenges, given the urgency and speed needed for the energy transition



Need of metals
and minerals

Conflicts of interest



Permitting processes

Social acceptance



Need of metals and minerals

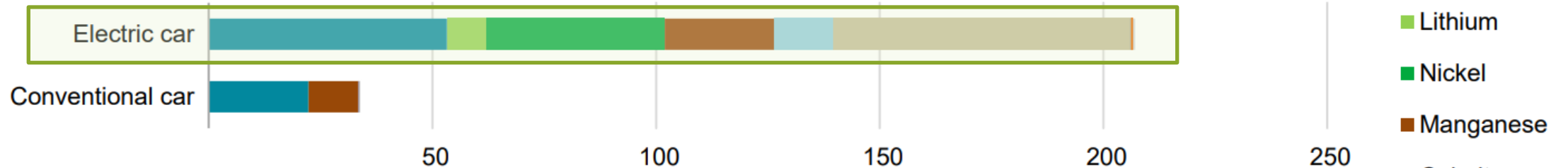
"Today, the data shows a looming mismatch between the world's strengthened climate ambitions and the availability of critical minerals that are essential to realising those ambitions."

Dr Fatih Birol
IEA Executive Director

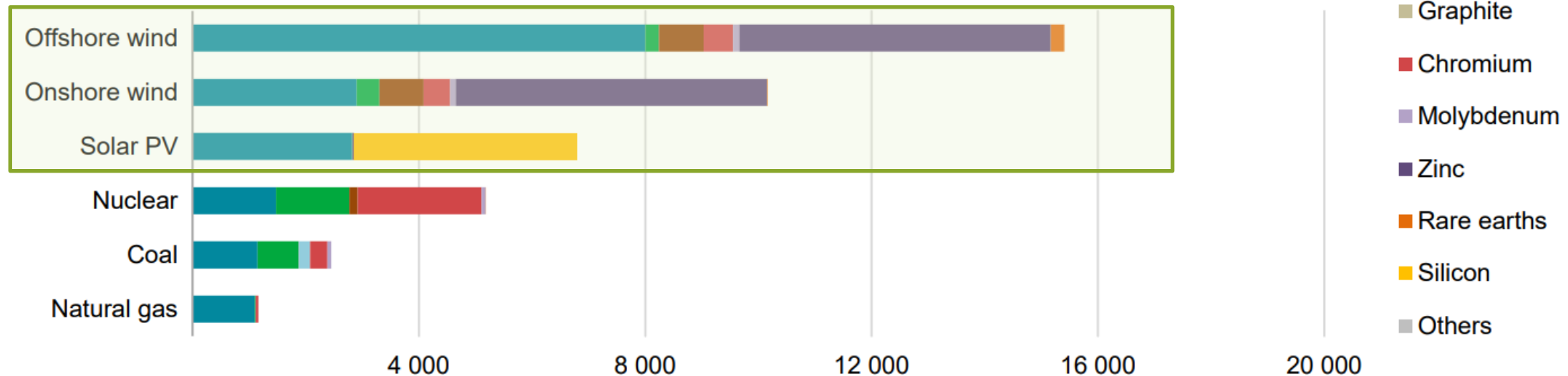
The energy system is transitioning from a fossil fuel dependency to a metal and mineral dependency

Minerals used in selected clean energy technologies

Transport (kg/vehicle)



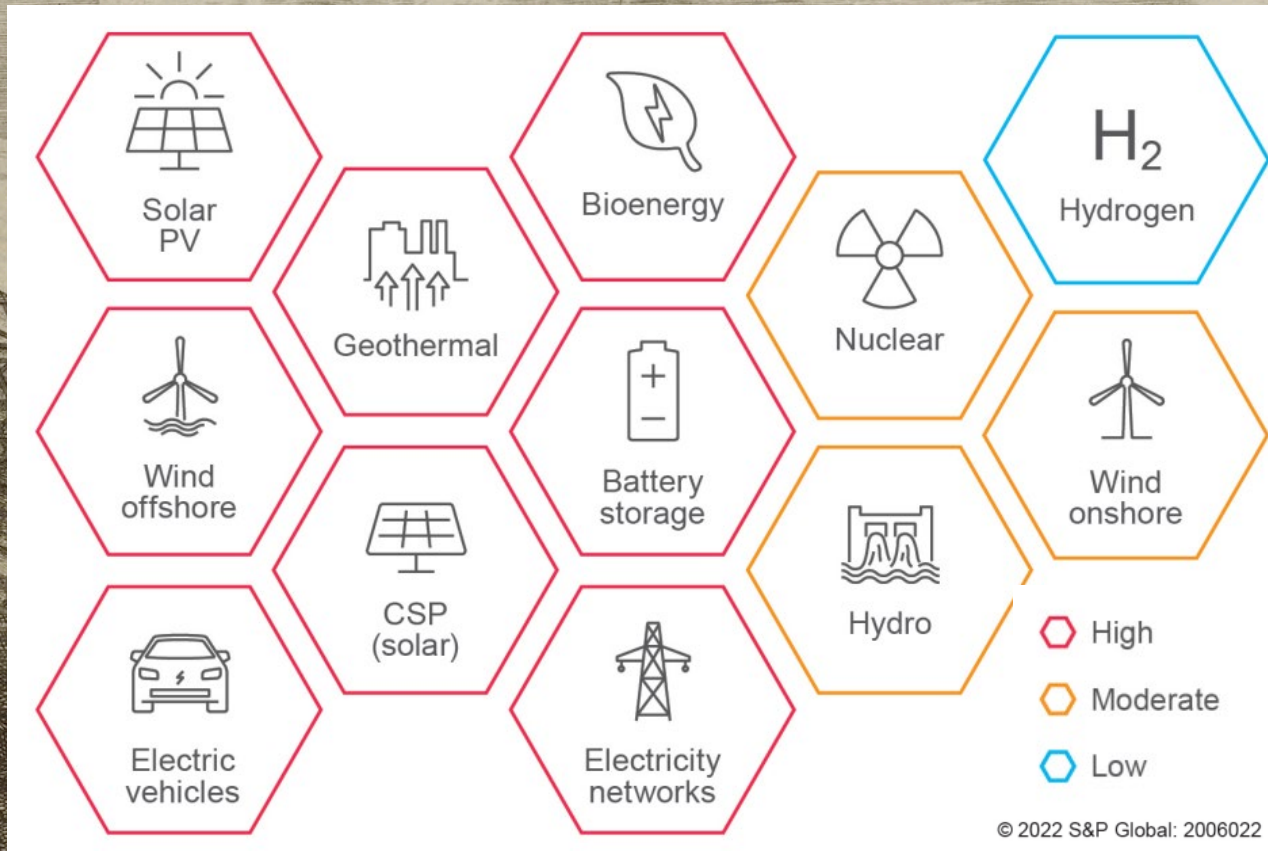
Power generation (kg/MW)



From: IEA (2021). *The Role of Critical Minerals in Clean Energy Transitions*.

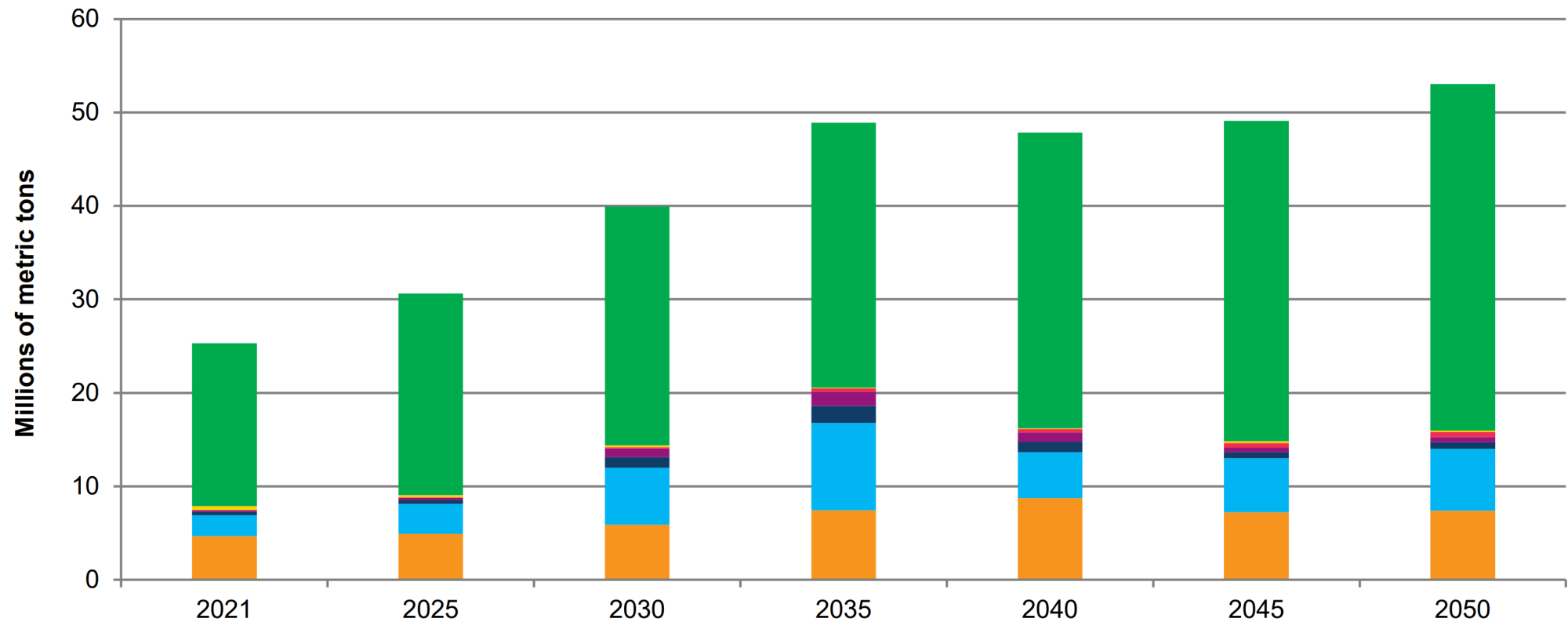
Copper – the “metal of electrification”

Presence of copper in different energy transition technologies



The copper mine in Falun. From Erik Dahlberg's Suecia antiqua et hodierna, 1701. Kungliga biblioteket.

Global refined copper usage (according to S&P Global's Multitech Mitigation scenario, 2022)



Copper needed for the energy transition

- T&D*
- Auto and charging
- Solar PV
- Wind
- Battery storage
- Other power
- Nonenergy transition demand

*Power grids

Note: Based on S&P Global's Multitech Mitigation scenario; US values are adjusted to align with Biden administration's net-zero ambitions. T&D = transmission and distribution; PV = photovoltaics; other power includes conventional generation (coal, gas, oil, and nuclear), geothermal, biomass, waste, concentrated solar power, and tidal.

Source: S&P Global analysis

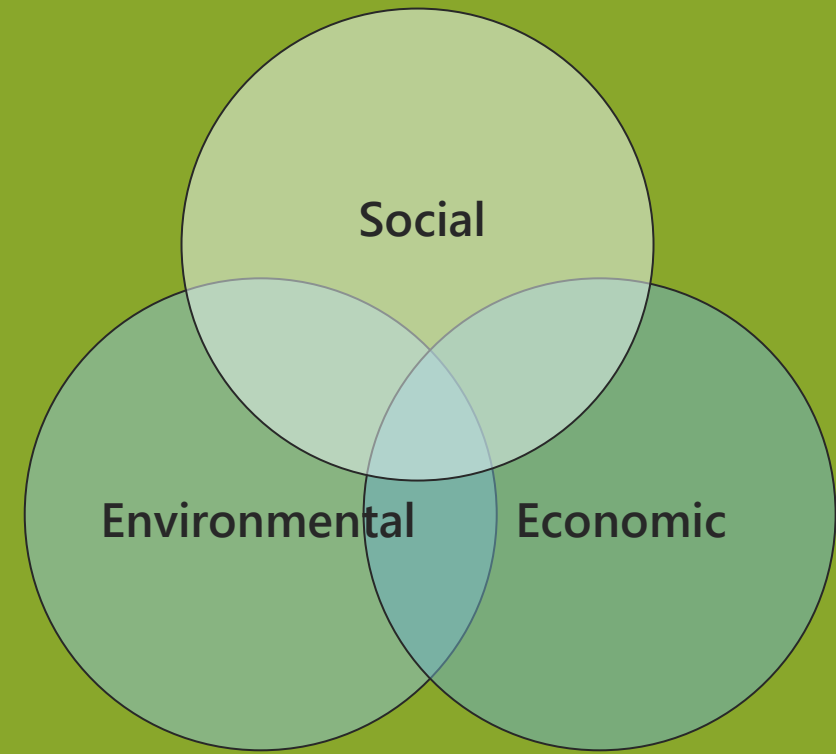
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A coming copper shortage could derail the energy transition, report finds

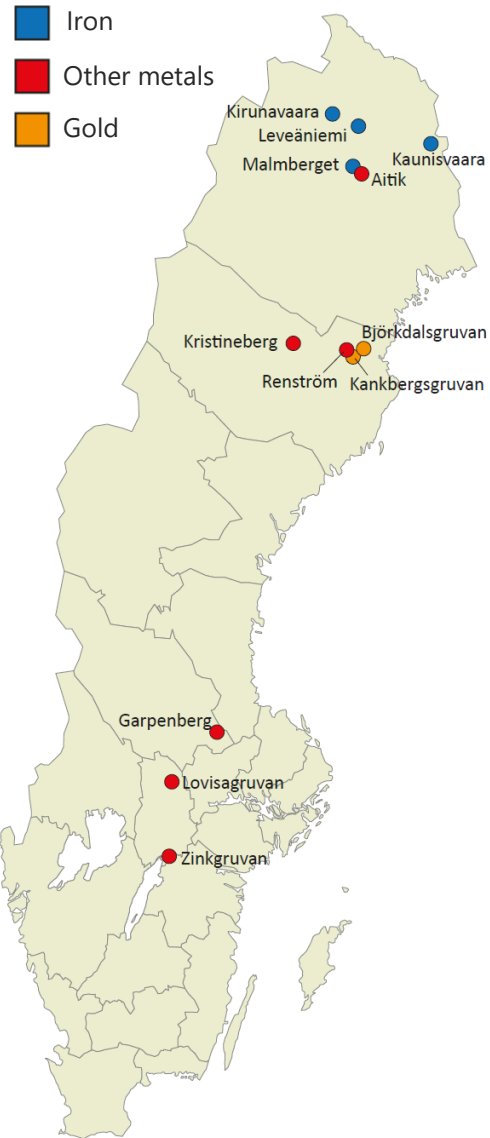
Copper demand for energy transition: The next decade is critical

“There will be a new geopolitical order around minerals like copper,” said Yergin. He noted that the copper supply chain is much more concentrated than that of other raw materials, including oil.

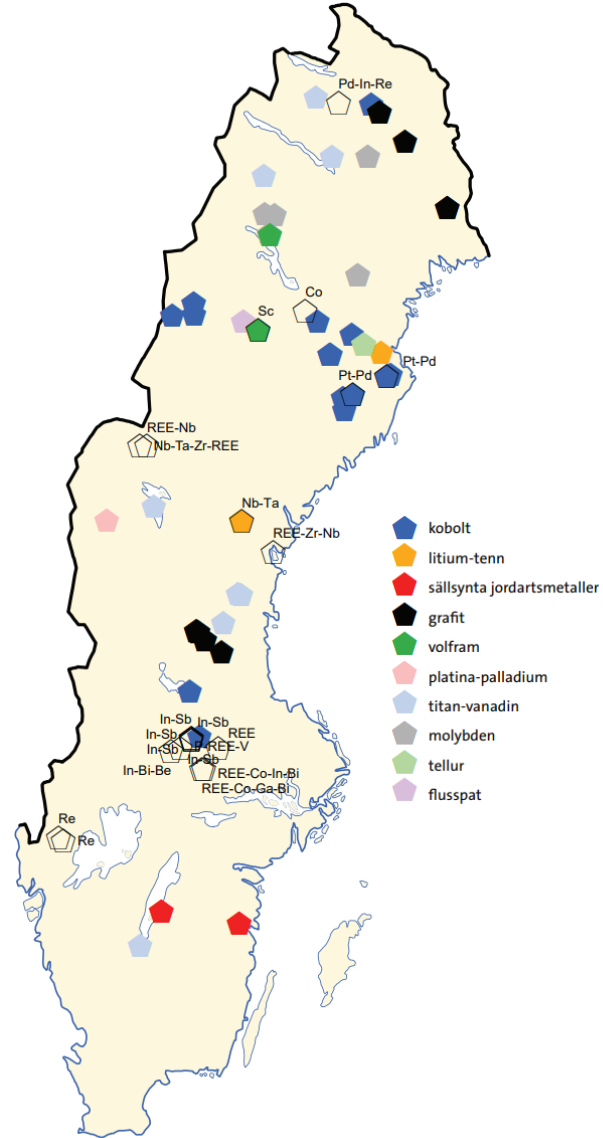
Conflicts of interest



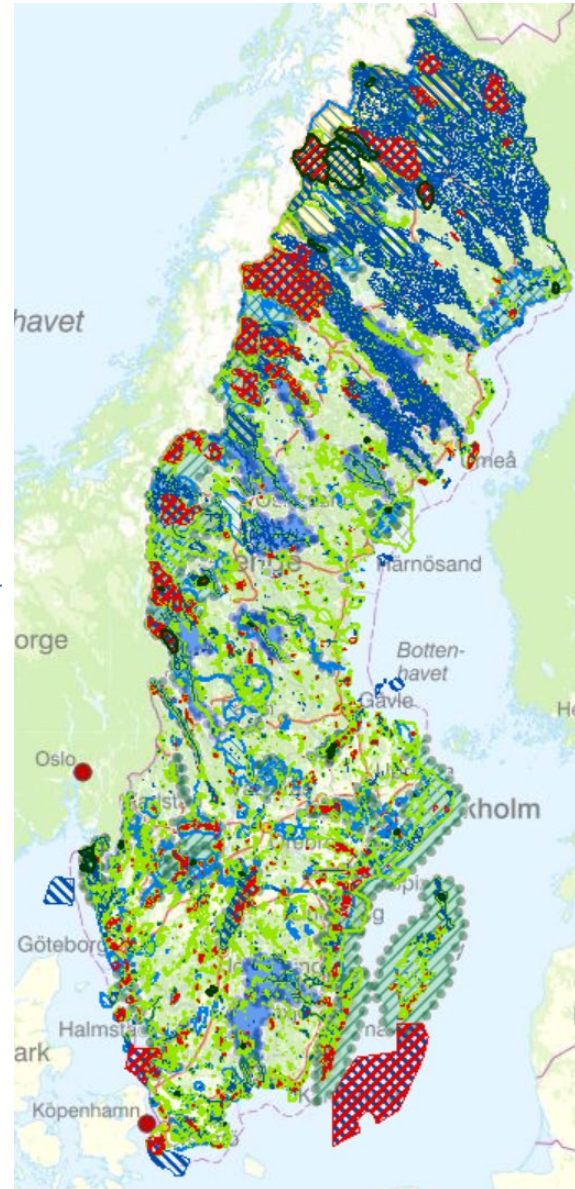
Mines in operation 2022-12-31



Mineral deposits



Protected Nature areas (Natura 2000 and National Parks)

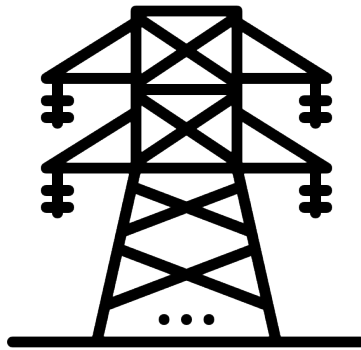


Reindeer herding districts of Sápmi



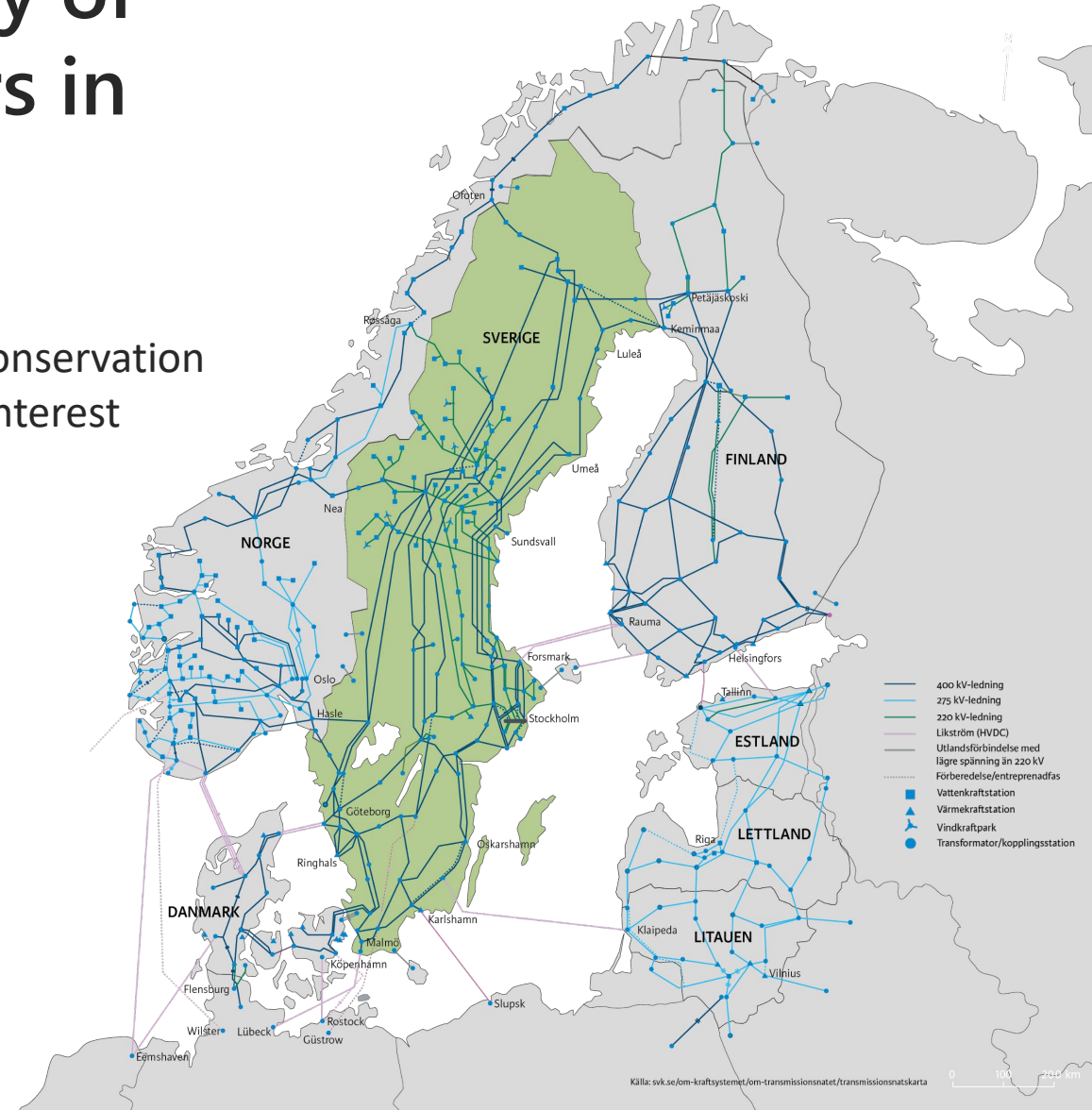
Permitting processes

Power grids are facing an array of competing interests and actors in the permit granting processes



12-14 yrs

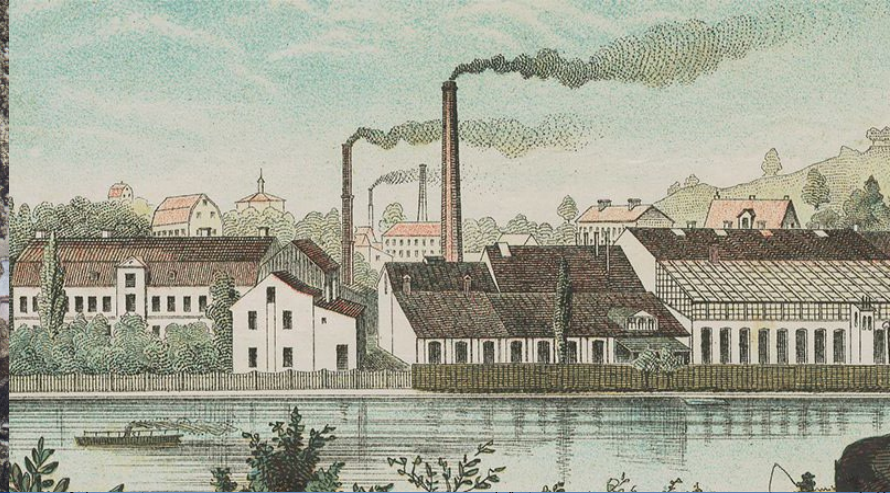
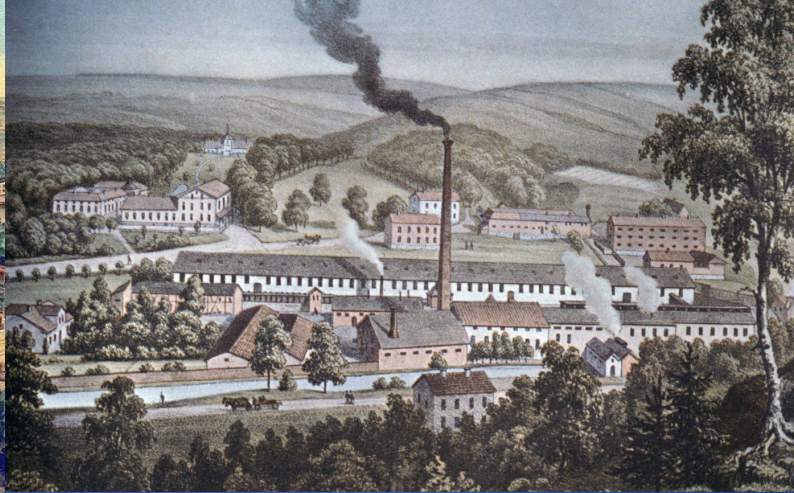
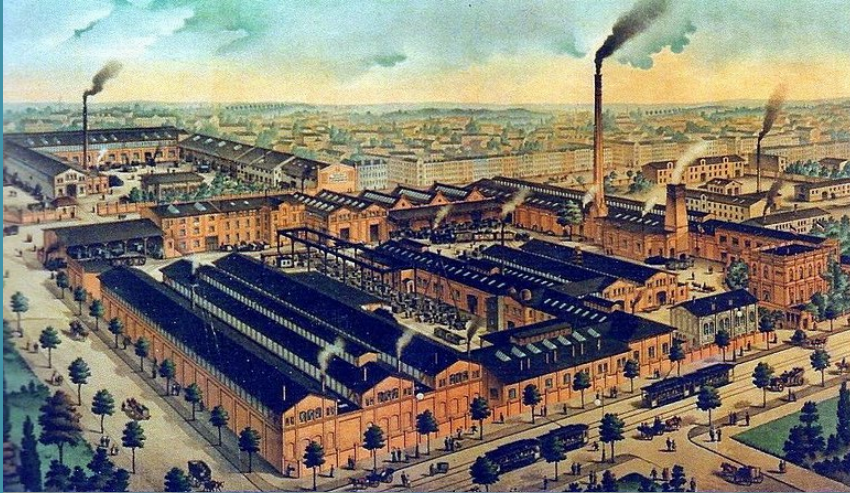
- Protected species and nature conservation
- Sites and activities of national interest
- Land and house owners
- Reindeer herding
- Railroads
- Road infrastructure
- Airports
- Defense and military
- Municipalities
- ...



Social acceptance



Our landscape is in transition due to the energy transition



Key takeaways

- We must pick up speed in the energy transition
- Electrification is a key mitigation option, but the task is immense given the time perspective
- The challenges we face are many and partly intertwined:
 - Need of metals and minerals
 - Conflicts of interests
 - Permitting processes
 - Social acceptance
- The energy transition is changing society and our landscape
- Gaining social acceptance for the energy transition will be vital

But, perhaps, we now have a “window of opportunity” for gaining a more solid acceptance for the energy transition?

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He would know. And internet infrastructure is vulnerable too




Oct 20th 2022

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Thank you for listening!

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