



30.10.2024

Tuomas Rauhala

Electrical systems as critical infrastructure

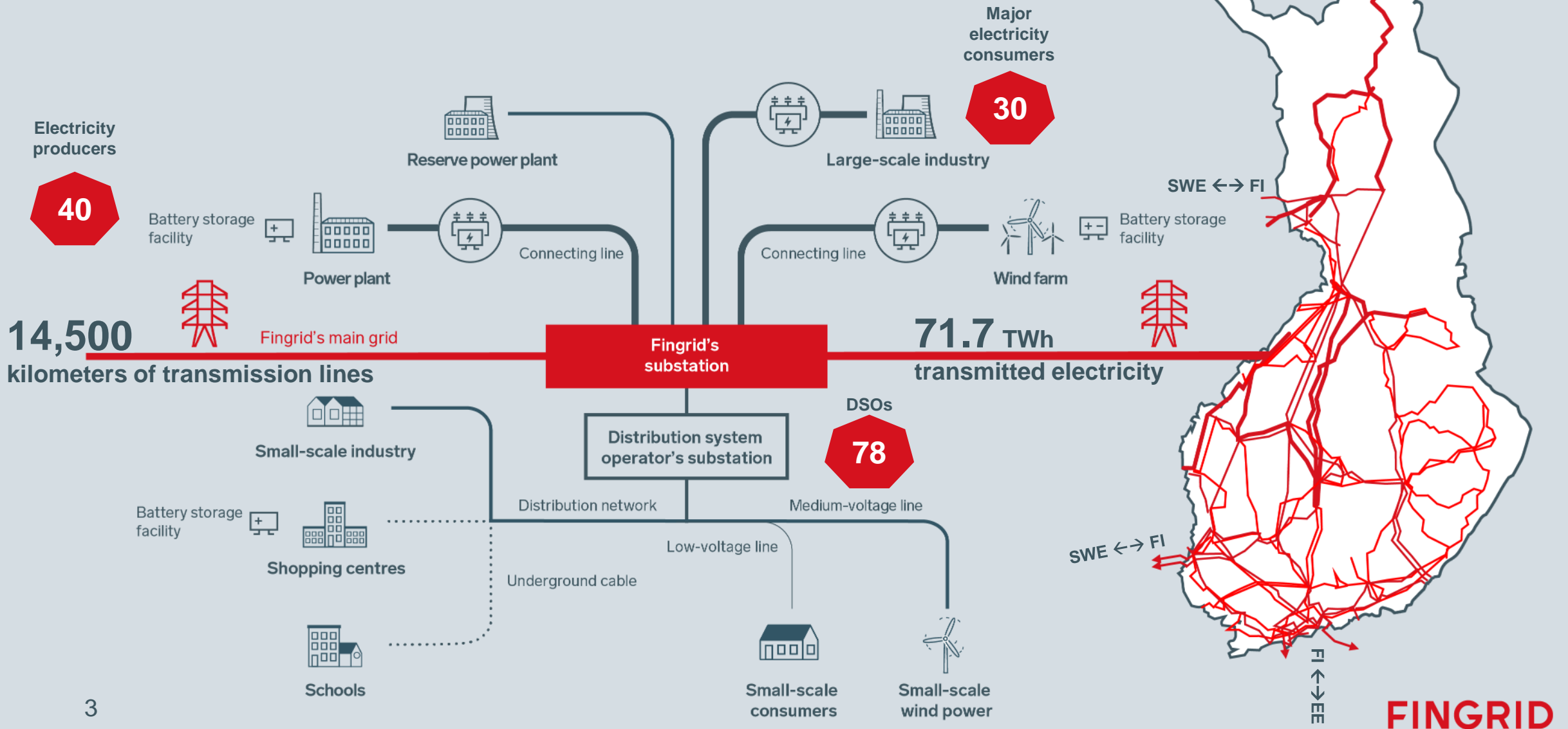
How geopolitics and green transition impact the
landscape

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An aerial night view of a city, likely Helsinki, Finland. The image shows a dense urban landscape with various buildings, including a prominent Ferris wheel in the upper right. The city lights are visible, and the overall scene is illuminated by a soft blue and white glow. The text "Electrical power system as critical infrastructure is more than power lines" is overlaid in the center in a large, white, sans-serif font. In the bottom right corner, the logo "FINGRID" is visible in red. In the top right corner, the date "5.11.2022" and the number "4" are displayed in white.

**Electrical power system as
critical infrastructure is
more than power lines**

Power system of Finland



400 kV transmission lines





400 kv Electrical substation (under construction)

Four sectors of critical electrical infrastructure



Electrical power system



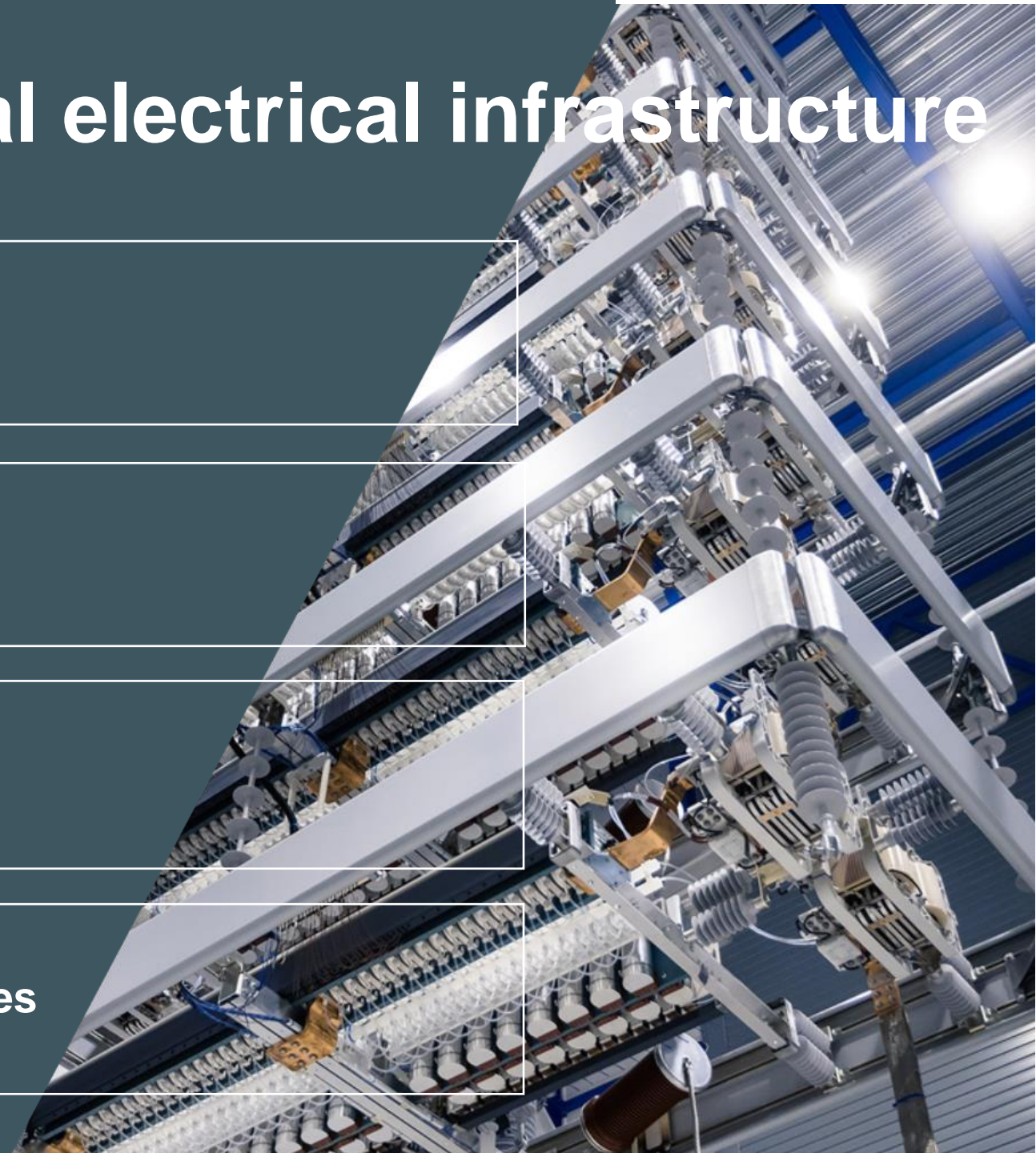
Electricity markets



Cybersecurity



Human resources and working spaces



Systematic efforts to ensure high level of preparedness have been needed...

12.10.2023 10:24

CURRENT NEWS,
POWER SYSTEM,
PRESS RELEASES

Damage to the gas pipeline and data link between Finland and Estonia has no impact on the operation of the electricity system

23.11.2023 20:04

CURRENT NEWS,
PRESS RELEASES,
ELECTRICITY MARKET

Electricity trading error results in exceptionally low prices and no price steer for production and consumption for Friday

04.01.2024 16:41

Fingrid increases readiness due to tightening electricity power balance situation

Fingrid will increase its readiness until further notice as of Thursday afternoon, 4 January 2024. The situation is exceptional; the prolonged cold front has lasted several days and has driven...


And despite all the challenges...

25.01.2024 11:00

CURRENT NEWS,
PRESS RELEASES,
POWER SYSTEM

Main grid transmission reliability rate reached the highest recorded level in 2023

In 2023, the main grid managed by Fingrid recorded the best transmission reliability rate since measurements began. Several other key figures describing the main grid also reached record highs. The...



Transition towards the CO2 neutral system

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Finland's prospects in energy transition are very promising

Megatrends drive electricity consumption – climate neutrality, electrification, data & AI

- EU electricity demand projected to grow by ~100% to ~5,000 TWh by 2040*

Fingrid has received ~400 GW of grid connection inquiries for new electricity production

- ~50% onshore wind – among the most competitive resources in Europe**
- ~25% offshore wind
- ~25% solar PV

Fingrid has received over 35 GW of demand-side connection inquiries

- Including data centers, hydrogen & derivatives, industrial facilities and electric boilers

* Source: ENTSO TYNDP2024 scenarios. Projected EU demand, including electrolysis is 4,700-5,400 TWh in 2040 compared to 2,500 in 2022. <https://2024.entsos-tyndp-scenarios.eu/>

** Source: BloombergNEF <https://about.bnef.com/blog/wind-and-solar-corporate-ppa-prices-rise-up-to-16-7-across-europe/>

Electrical energy related recent European records owned by Finland

Fastest rate of increase in wind based electricity generation
(between 2015-22)

+370% and increasing
(from share of 3% up to 16%)

Fastest rate of decrease in fossile fuel based electricity generation
(between 2015-22)

-49% and decreasing
(from share of 21% down to 11%)

Additionally, single largest generation unit
(>10% as compared with national peak load)

1650 MW
(1300 MW step-wise change in power balance in case if plant disturbance)

Transition brings both opportunities and challenges

2nd cheapest average electricity price in 2023 in Europe

57 €/MWh

One of cleanest electricity energy supplies in 2023

39 gCO₂/kWh

One of the most volatile electricity prices in Europe since 2023

From globalization to geopolitics



Focus on resilience

Preparedness and continuity

Co-operation

Flexibility

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In times like these there is increased need for resiliency

and it needs to go along with

Large scale investments in generation

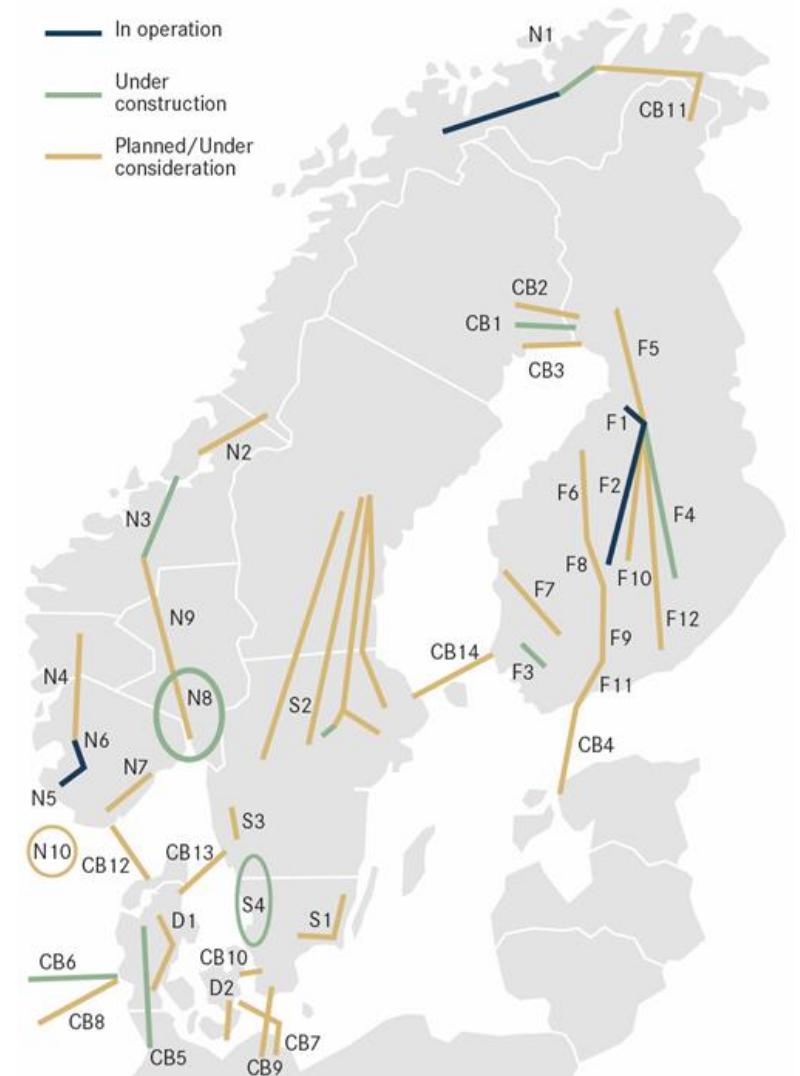
Electrification of use of energy

Major changes in the electricity markets

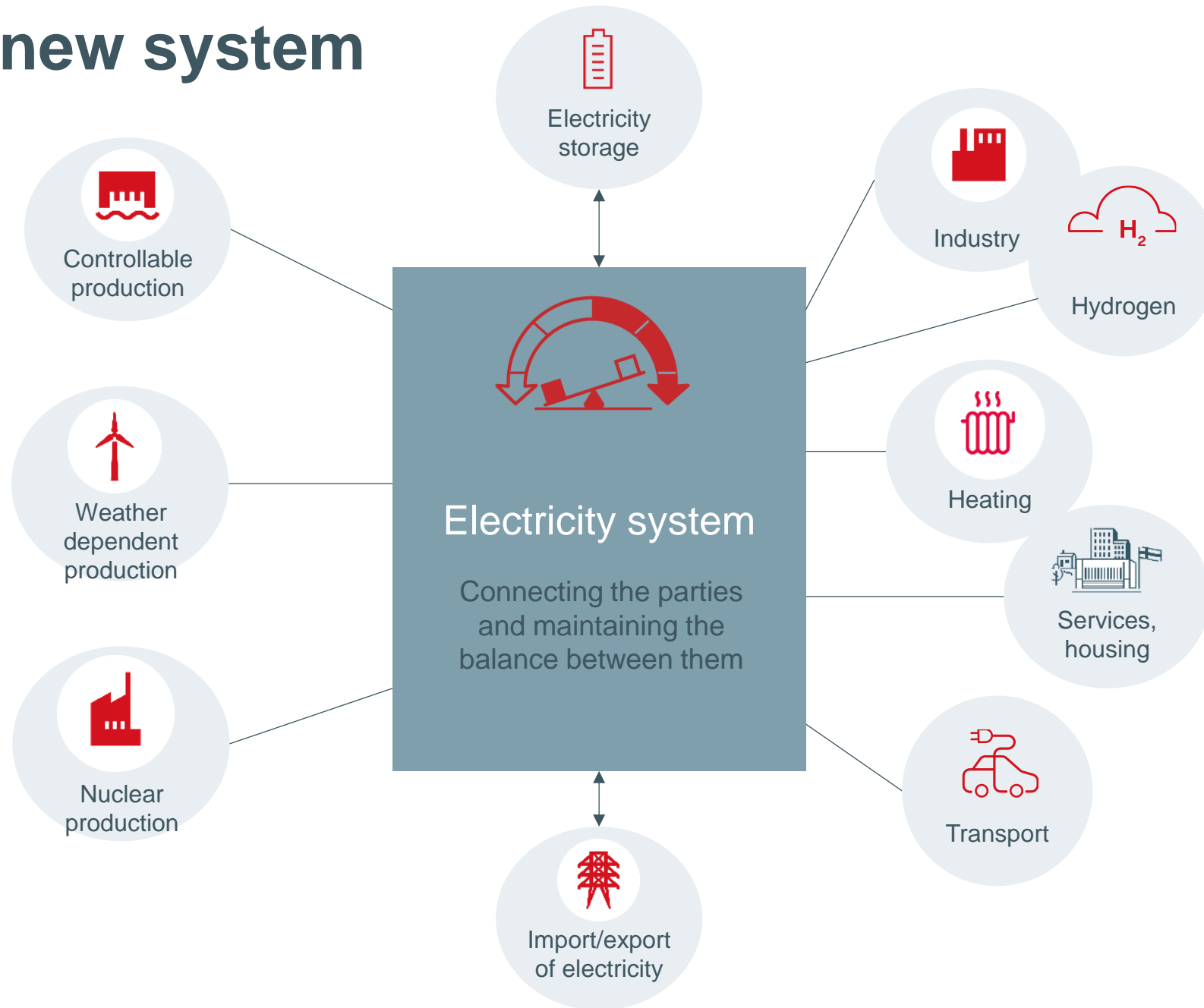
The transition in progress with different paces in different areas

Finding synergies between all the key stakeholders is getting more and more important than ever

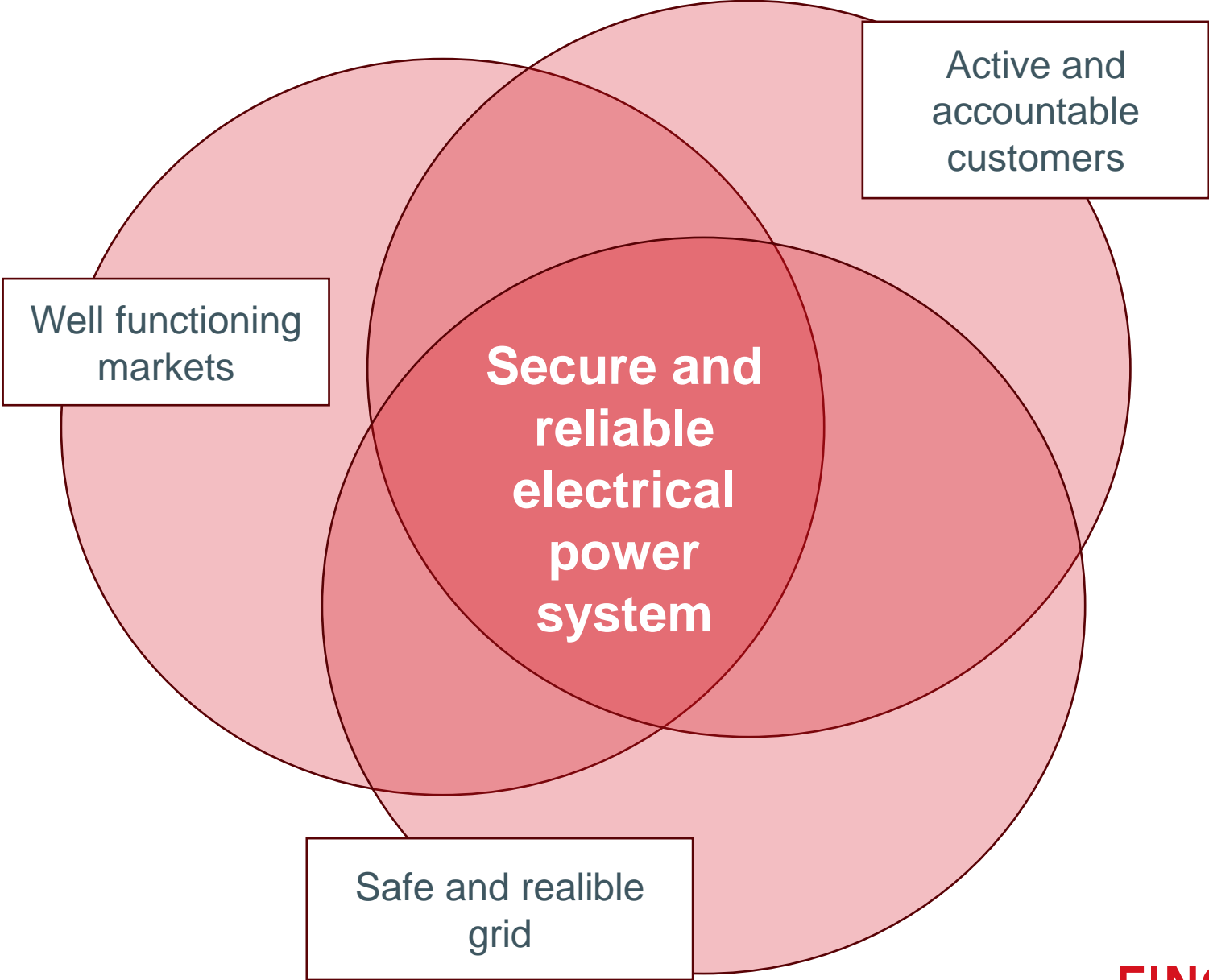
Major grid investments in Nordics



The new system



The three main elements of secure and reliable electrical power system



An aerial night view of a city, likely Helsinki, Finland. The scene is illuminated by city lights, with a prominent Ferris wheel in the upper right. In the foreground, there are several buildings, including a large, ornate one with a blue sign that reads "nvida". The text "Questions and comments?" is overlaid in the center in a large, white, sans-serif font.

Questions and comments?

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