



Finnish energy system today and in the long term

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Content

- Finnish energy system – success story
- Low carbon Finland 2050 – scenario study to support Finland's 2050 low carbon road map
- Specific study for new nuclear by 2030 to support governmental decision making
- Role of VTT to support the implementation of national energy and climate strategy





Finnish Energy System Today– Success Story

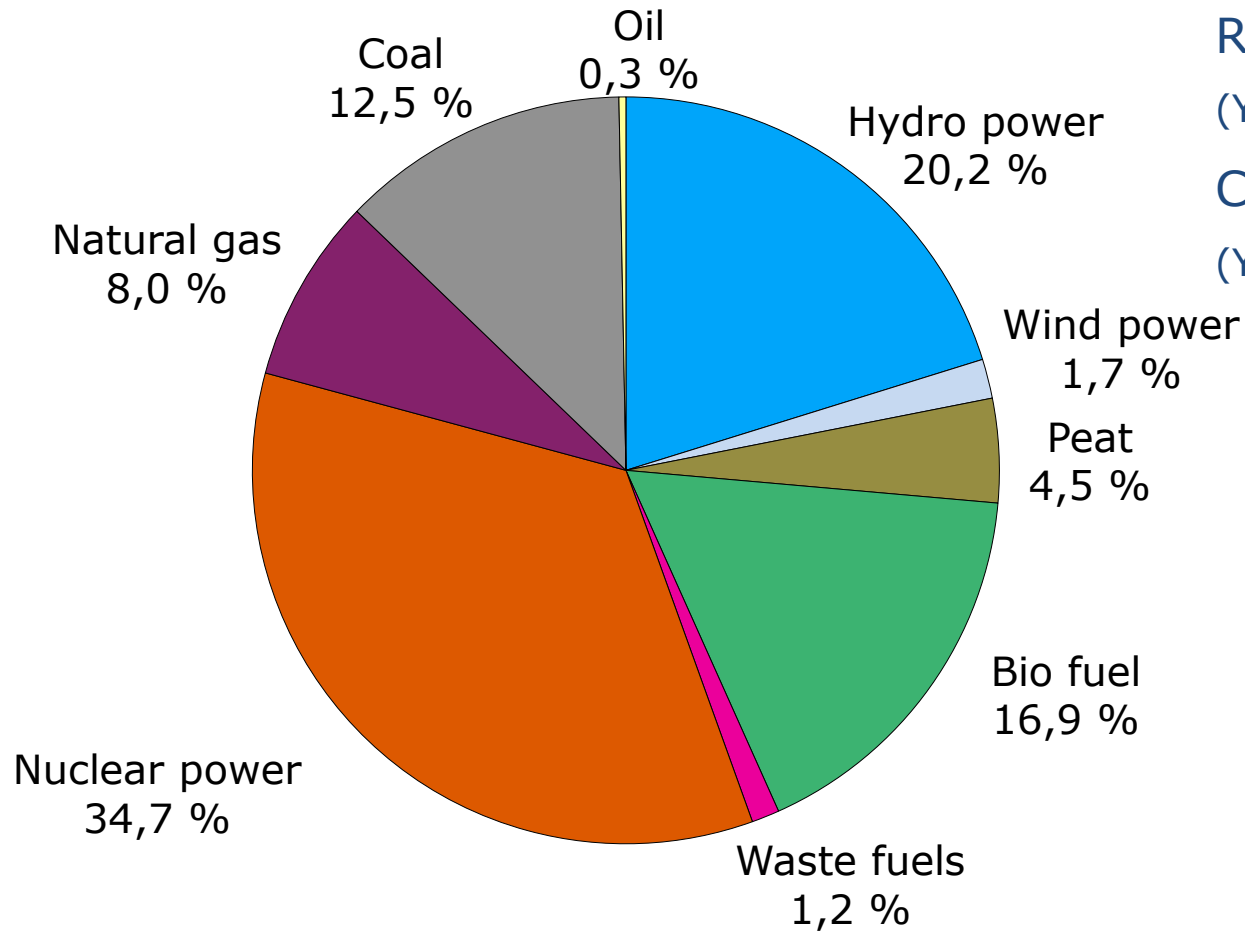
Specific Features of Finnish Energy System

- Finland, Norway, Sweden and Denmark form a common Nordic electricity market with effective transmission grid
- Finland is very dependent on the import of fuels (natural gas, coal, oil, nuclear)
- The Finnish electricity system has several characteristic features:
 - Highly diversified production structure
 - High share of bioenergy from electricity supply (around 17 %)
 - Very high overall efficiency due to extensive use of combined heat and power (CHP) plants in residential and industrial energy supply.
 - Large share of industry in the total electricity consumption (around 50 %)
- The need for competitive price of electricity is crucial to the Finnish energy-intensive industry.
 - At the moment, Electricity price is rather low level – one of the lowest in EU Member States
 - This continues to be a major incentive to expand the use of nuclear energy, competitive CHP-based electricity and well-functioning electricity market.

Electricity Production by Energy Sources



2014 (65.4 TWh)



Renewable 39 %

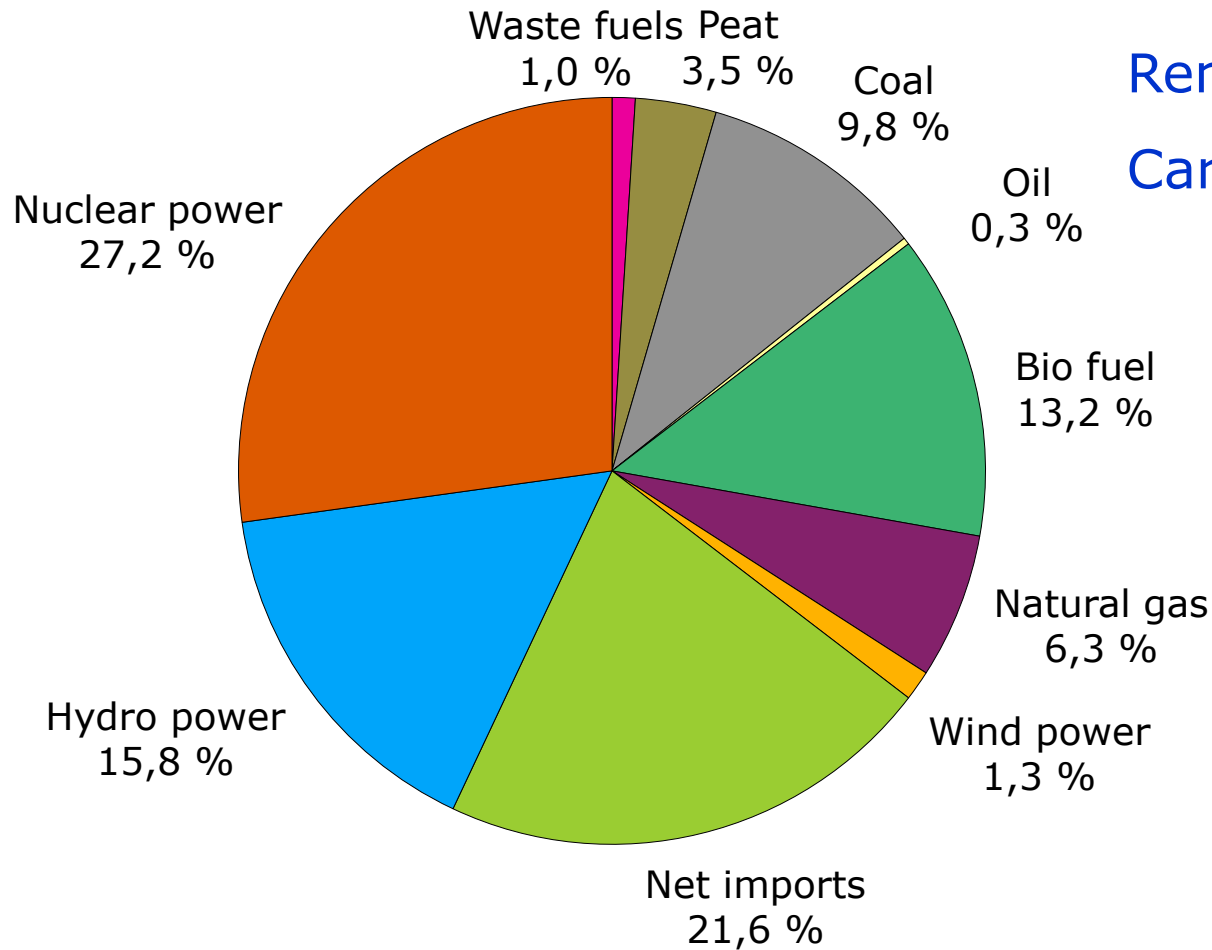
(Year 2013: 36 %)

Carbon dioxide free 74 %

(Year 2013: 70 %)

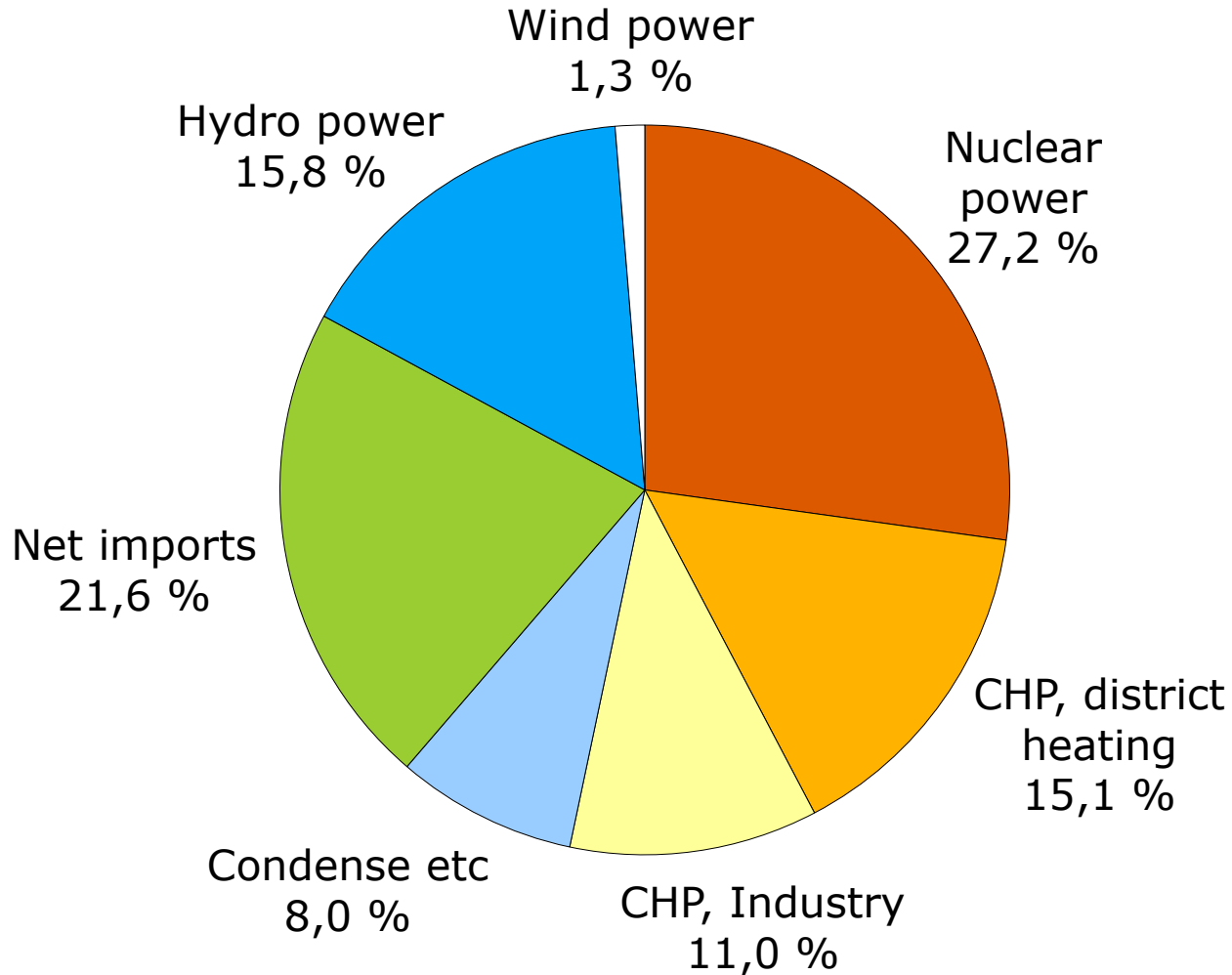
Electricity Supply by Energy Source 2014

(83.3 TWh)



Renewables around 30 %
Carbon dioxide free 69 %

Net Supplies of Electricity 2014 (83.3TWh)



Source: Finnish Energy Industries



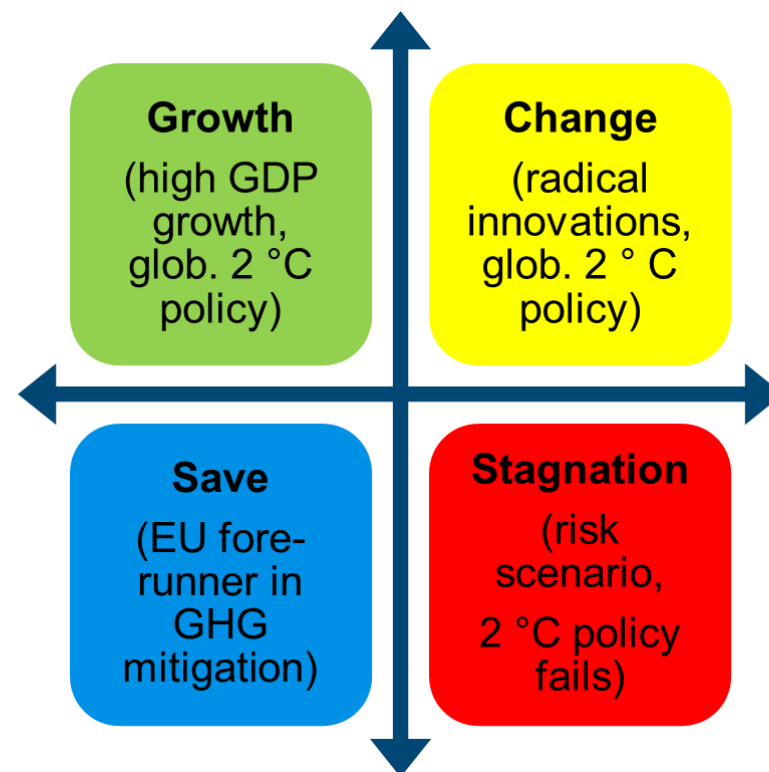
Low carbon Finland 2050 Platform – Background scenario study for the
Government of Finland (2014)

Objectives and scope

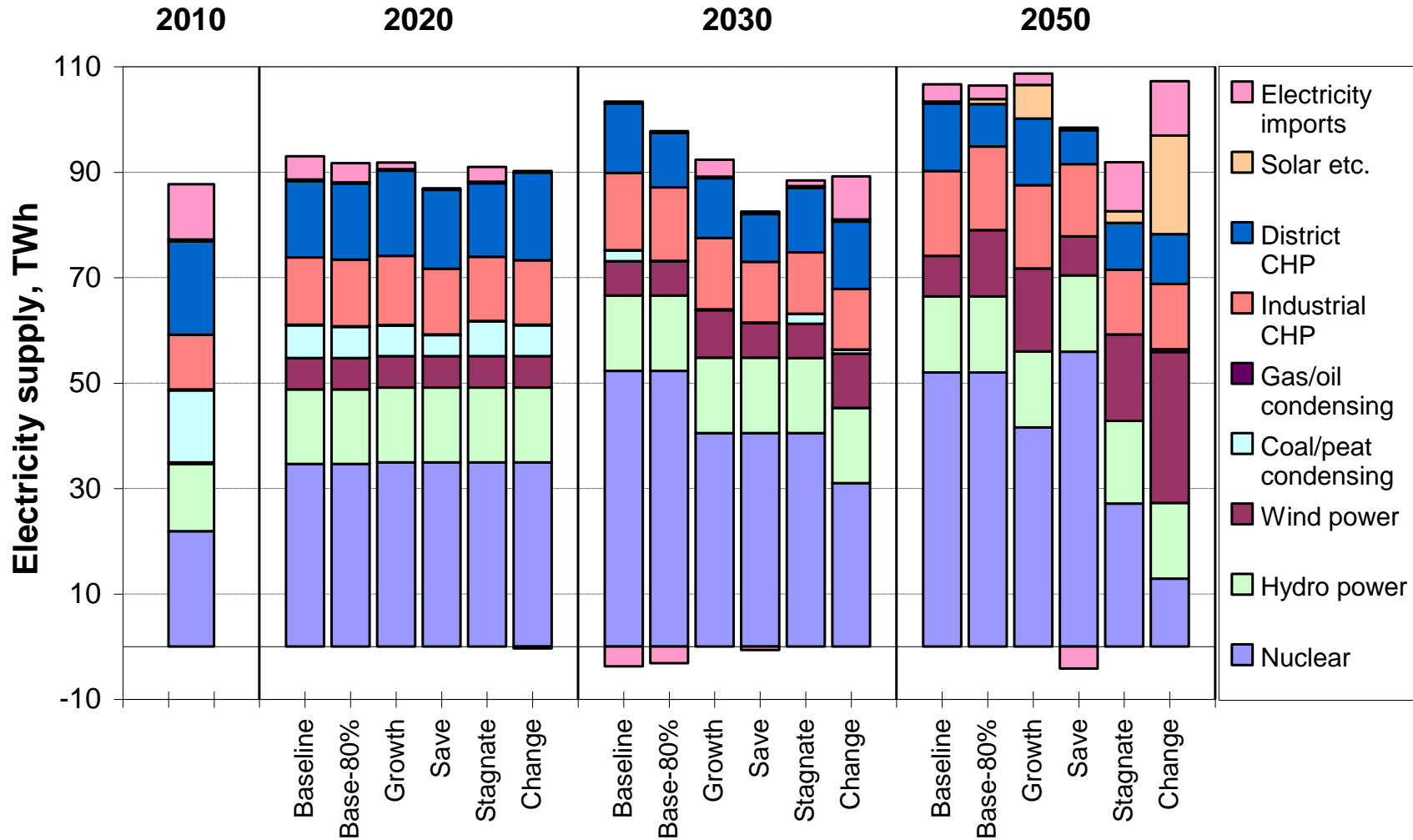
- The **objective of project was to create research based analysis** for the
 - Parliamentary Committee on Energy and Climate Issues, who prepared the Energy and Climate Roadmap 2050 for Finland (Report published on 16th October 2014)
 - Finnish CleanTech companies, investors, research institutes. etc.
- Platform: **Formulation and analysis of alternative low carbon pathways for Finland**
 - Collaboration between large number of experts
 - Low carbon visions and scenarios were formulated in a series of workshops
 - Quantitative impact analysis for Finnish economy, energy systems, sustainable use of natural resources (VTT, VATT, Metla ja GTK)
 - Large consumer survey (1000 respondents)
 - Values, barriers, consumer choices for climate change mitigation

Description of the Low Carbon Finland 2050 scenarios

- **80% GHG mitigation target** by 2050 is achieved in all the scenarios both in Finland in the EU (except in the Baseline)
- **Global climate agreement** is implemented in all the scenarios, except in Stagnation
- **New technology development and implementation** rapid (Growth and Change) or conservative (Save and Stagnate)
- **The industrial structure in Finland** comparable with today's structure (Base-80%, Save), strongly renewing (Growth, Change), reducing production (Stagnate)
- **Community structure** no urban sprawl (Growth), high urban sprawl (Change) or small urban sprawl (other scenarios)

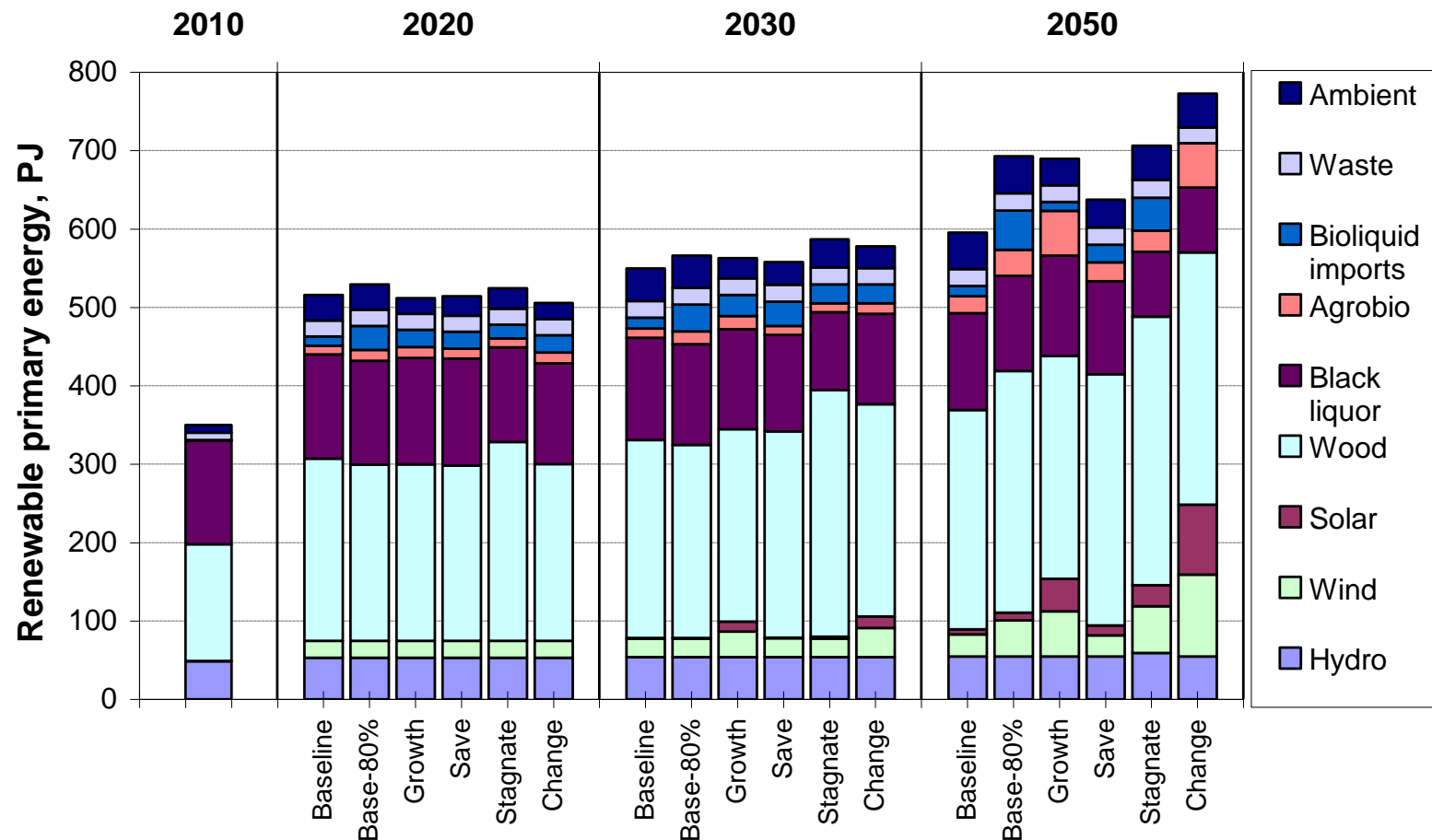


Electrification of the electricity system will increase electricity demand



The share of renewables increases in low carbon scenarios to 40 - 60% from primary energy and to 55 - 65% from final energy

Wood based biomass is the major renewable energy source but also the shares of wind and solar increase considerably



Main results from scenarios



- It is possible to achieve **80% reductions of GHG**, with optimistic cleantech RD&D even 90%.
- **The highest reductions** in GHG emissions are needed in **energy and industrial sectors**
- The share of **renewable energy increases** clearly compared to current level
- In the building sector the **energy demand is decreasing 17 - 30% by the year 2050**.
- The **energy consumption of the transport sector may be halved by 2050** if new technologies and transport services are fully implemented.



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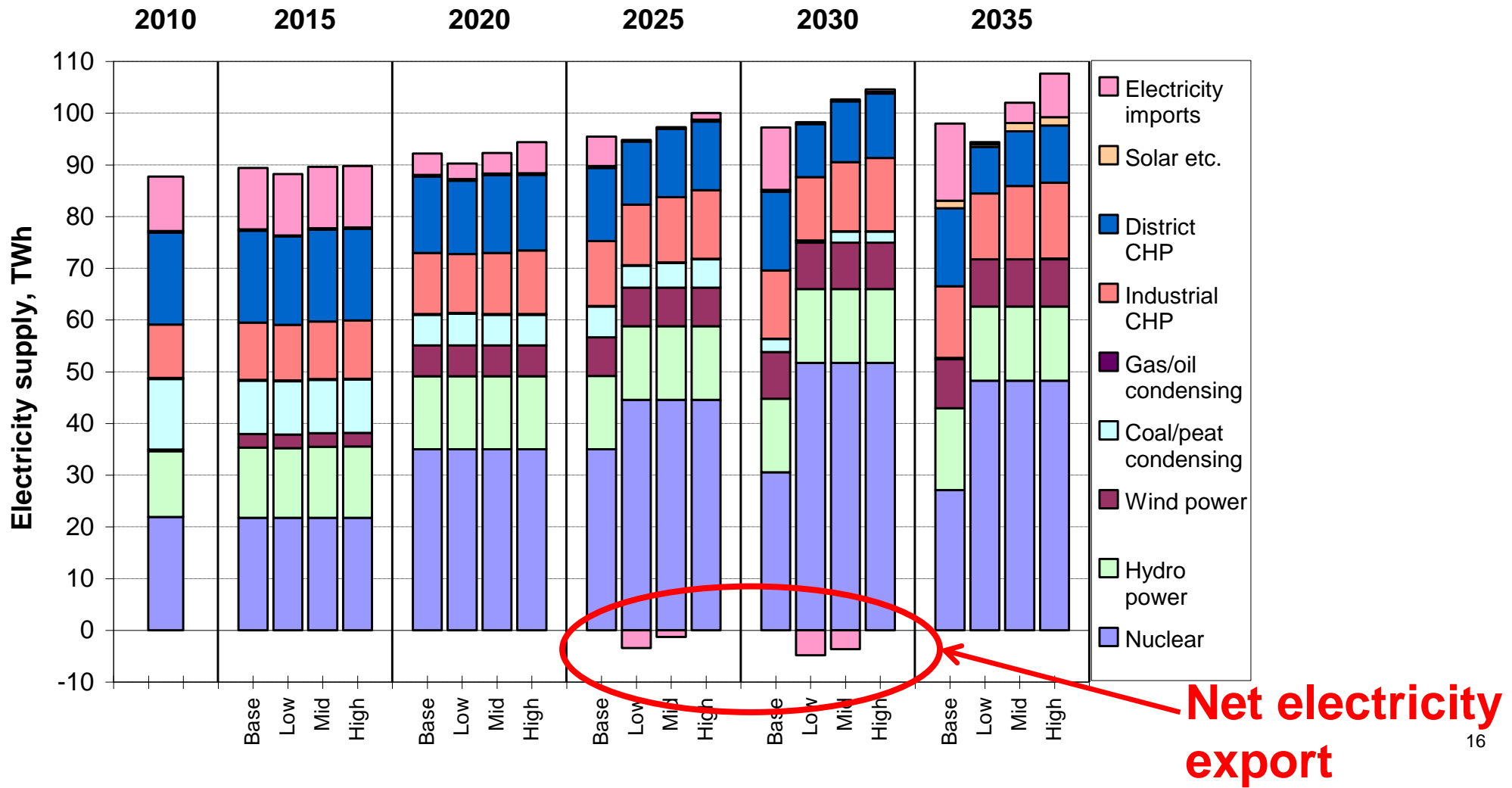


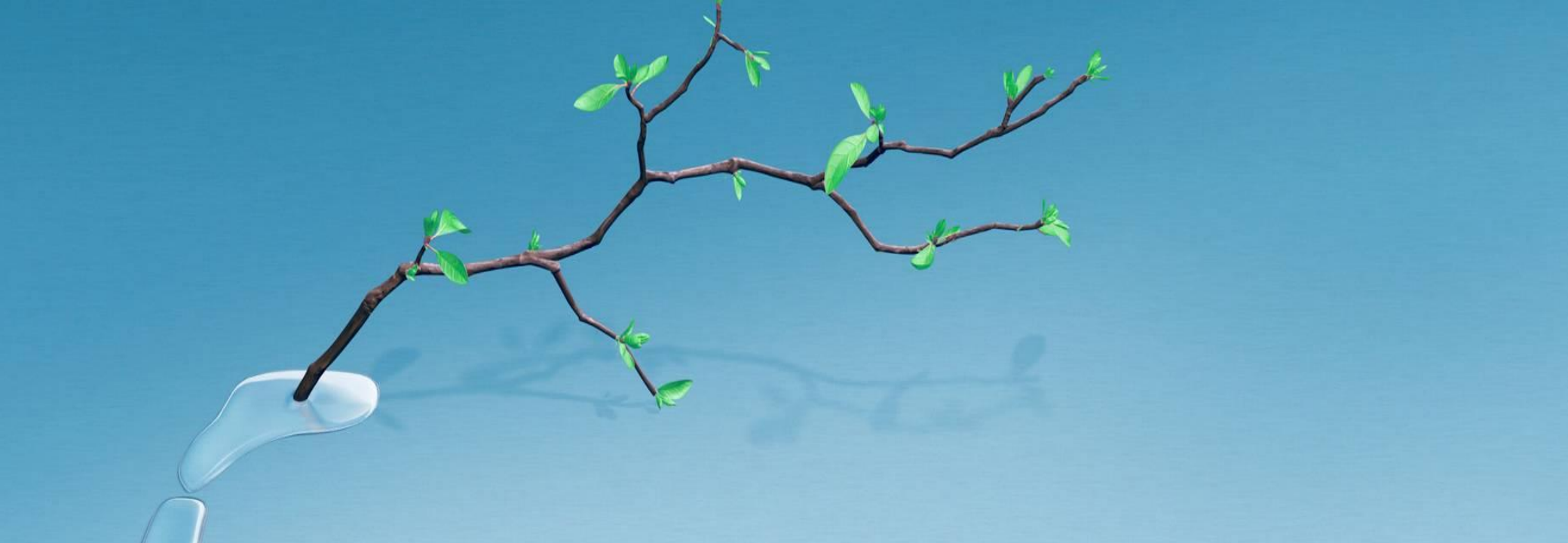
Impacts of the new nuclear decisions on Finland's energy economy

Impact of new nuclear builds on energy ja national economy

- Impacts were evaluated under the contract of Ministry of Employment and Economy (MEE) together with National Research Centre of Economy (VATT)
- Study was based on the Baseline scenario of energy and climate strategy from the year 2013 with an update considering also the EU climate and energy targets by 2030
- Analysis on electricity demand was based on three scenarios “Low”, “Mid” ja “High” with the variation of electricity demand in forest and mining industries and service sector.
- Nuclear new build options were
 - Base: Both new investments (Fennovoima 1 and OL4) will not be realised
 - “Low”, “Mid” ja “High”: both investments will be realised

Investments on new nuclear will impact Finland's electricity import/export balance





VTT's role in the Finnish energy system

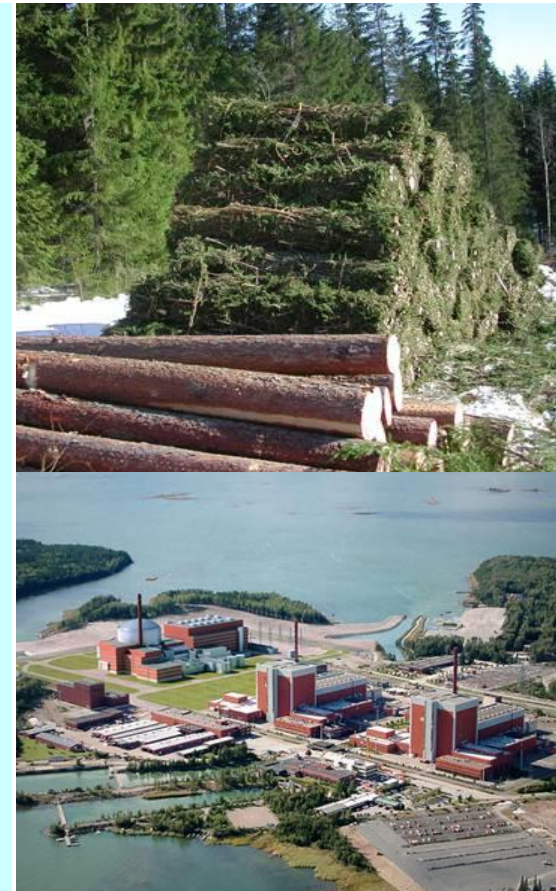


VTT - Diverse and sustainable energy research



VTT operates as an innovation and technology partner for companies and supports decision-making in the public sector, and provides research, development, demonstration and analysis services to clients in overall business value chain.

- **Provides 400 energy experts**
- **R&D service portfolio**
 - Efficient and smart energy system
 - Renewable energy
 - Advanced fossil technologies
 - Nuclear energy
- **Provides modern experimental facilities, pilot plants and calculation tools**
- **Synergy with other VTT competencies**
- **Involved in key international energy networks**
 - EC working groups
 - European Technology Platforms
 - IEA, International Energy Agency
 - OECD/NEA, Nuclear Energy Agency
 - IAEA, International Atomic Energy Agency



VTT visions, road maps and foresights





TECHNOLOGY «FOR» BUSINESS

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