Energy scenarios for climate neutrality (Focus electricity)

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IRENA: Second International Forum Long-Term Energy Scenarios for the Clean Energy Transition

TYNDP 2020 Scenario Storylines

National Trends (NT)

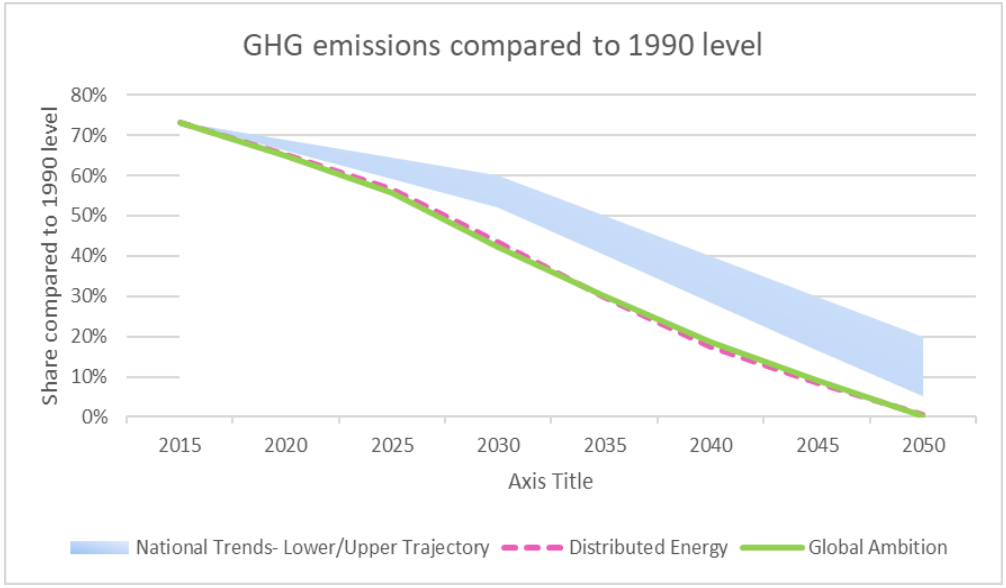
- **Policy** Scenario based on draft EU National Energy and Climate Plans EU 2030 Energy and Climate Framework (32 % RES, 32.5 % efficiency)
- EC 2050 Long-Term Strategy: 80 – 95 % CO_2 reduction

Distributed Energy (DE)

- De-centralised approach to the energy transition: active customers, small-scale solutions, circular approach.
- **COP 21**: +1.5°C target with 66.7 % probability
- Carbon neutrality by 2050

Global Ambition (GA)

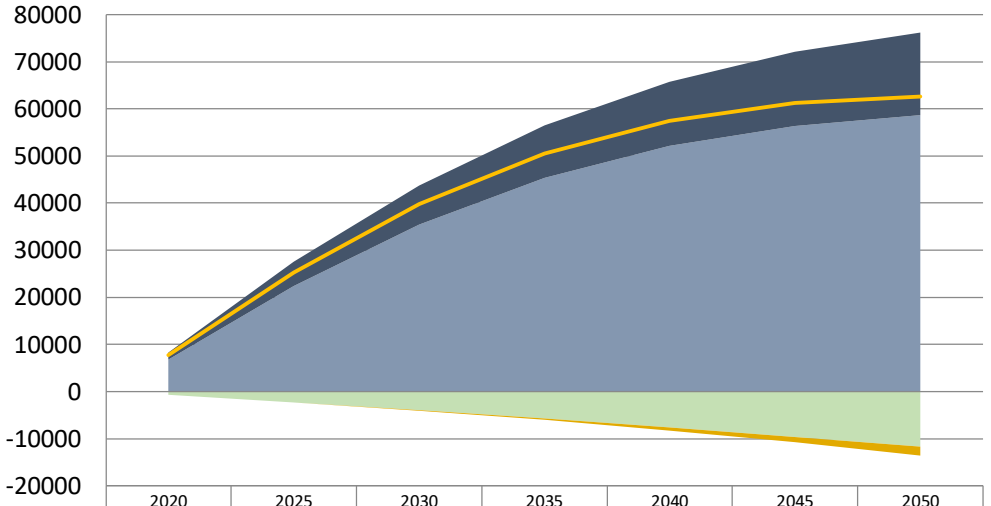
- Future is led by economic development in centralised generation, with large-scale renewables and decarbonisation.
- **COP 21**: +1.5°C target with 66.7 % probability
- Carbon neutrality by 2050



Contrasted scenarios reflecting very different pathways to reach EU targets

By 2030, National Trends will reach at least 40% - 48% CO2 reduction, where the top down scenarios see a reduction of 57% - 58% aligning with the EU green deal.
By 2050, in line with EC's LTS 1.5 scenarios, the scenarios consider around 65 $GtCO2_{eq}$ of cumulative GHG emissions.

EU28 cumulative GHG emissions - Distributed Energy



	2020	2025	2030	2035	2040	2045	2050
Cumulative non-CO2 emissions	1525	5086	8285	11123	13599	15713	17467
Cummulative CO2 emissions	6801	22441	35490	45378	52154	56391	58704
Cumulative credits from pre- and post-combustive CCS	0	0	-59	-272	-657	-1201	-1890
Cummulative credits from BECCS	0	0	0	0	0	0	0
Cummulative Credits from LULUCF	-627	-2253	-3963	-5757	-7635	-9598	-11644
Net Cumulative CO2eq emissions	7699	25274	39752	50471	57460	61306	62636

In order to meet to COP21 targets, strong development of renewables and clean gases are essentially. This must be coupled with Carbon capture technologies and LULUCFs*.
Additional measures to reach net negative emissions are necessary after 2050, to bring cumulative emissions to 47.5 GT CO_{2eq}

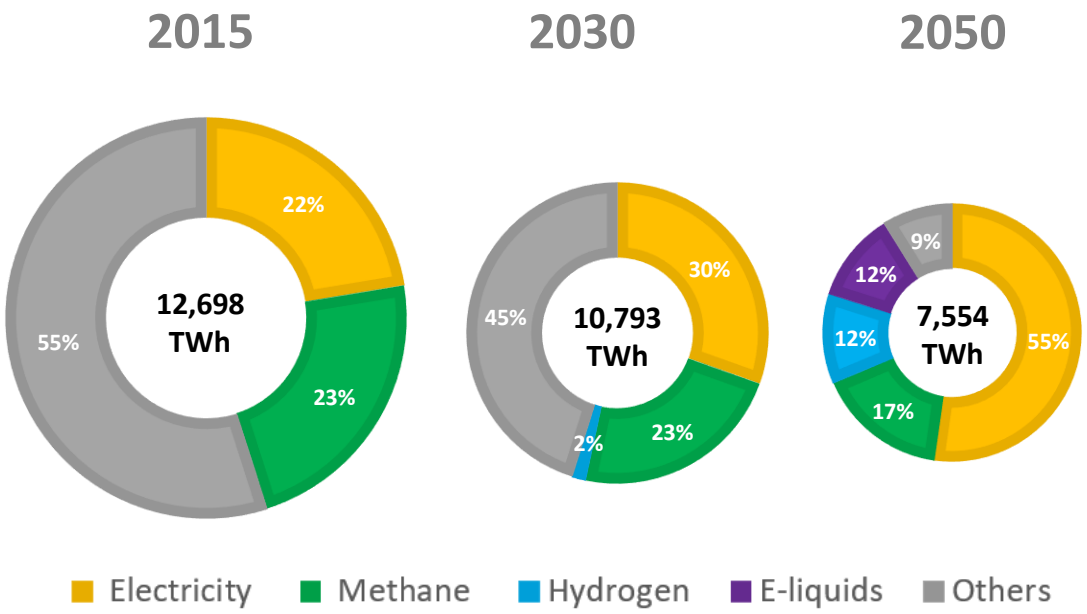
*Land use, land use change and forestry

entsog european network of transmission system operators for gas

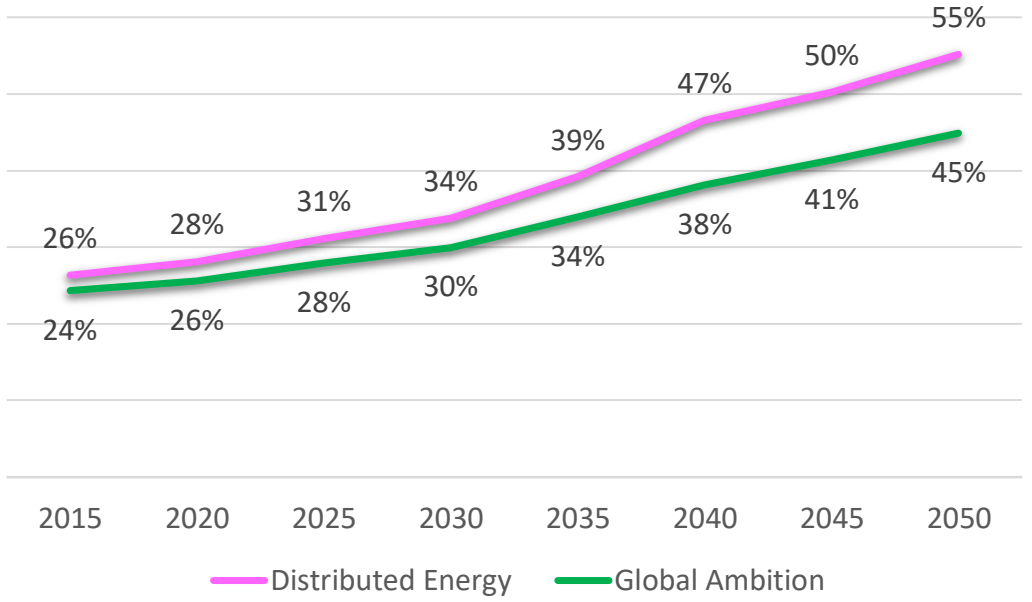
entsoe Reliable Sustainable Connected

The role of electrification

Distributed Energy

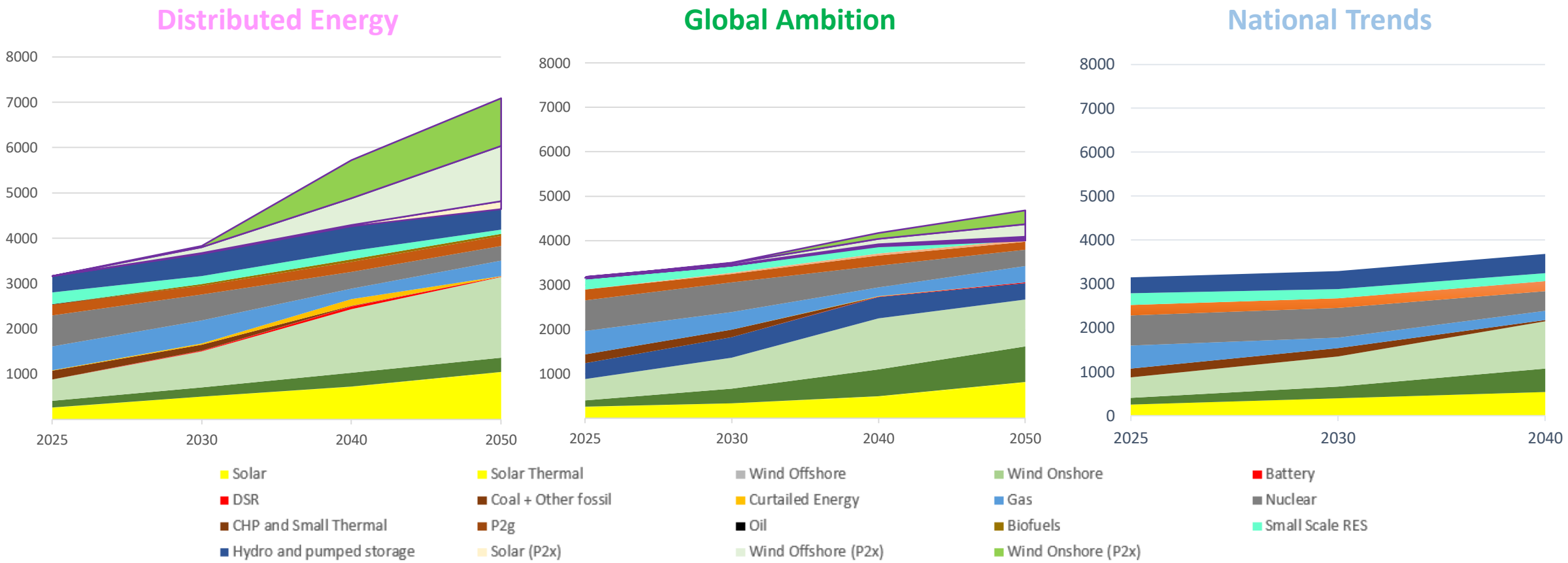


Evolution of direct demand electrification



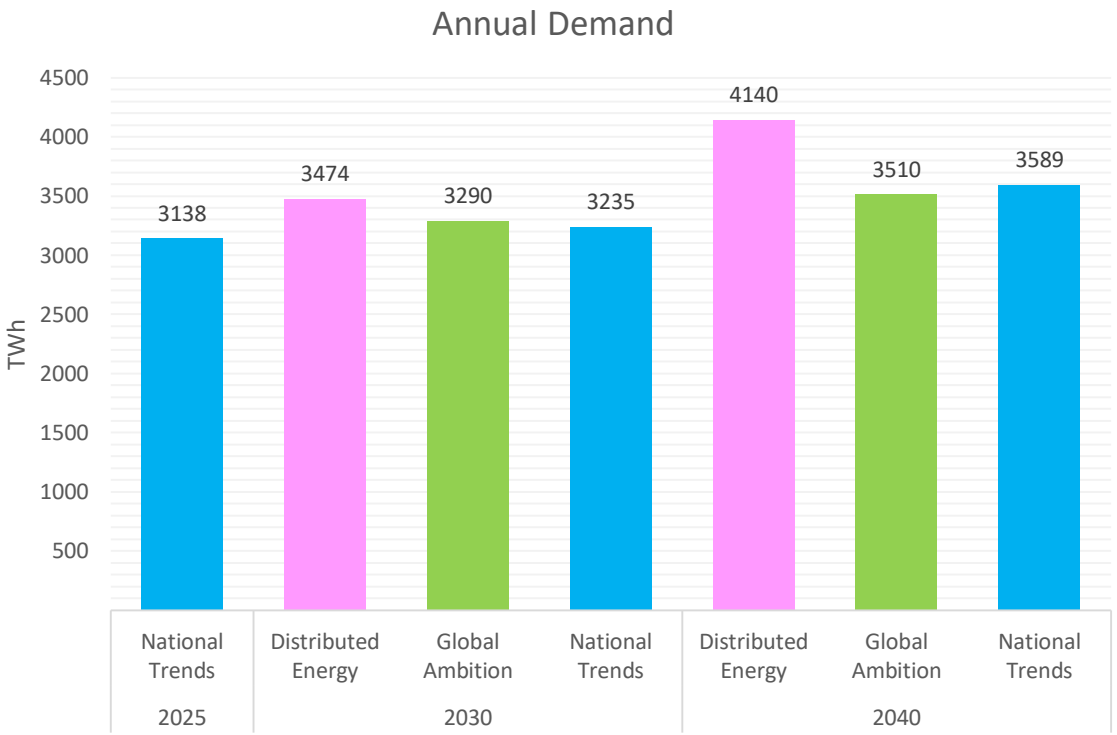
In 2030, all scenarios are in alignment with EU targets of 32% RES and 32.5% energy efficiency. Distributed Energy shows a strong need for electrification, 55% of final demand. Electricity in the charts on account for direct electricity demand, but there is a large need of P2x to support the decarbonization of the energy mix.

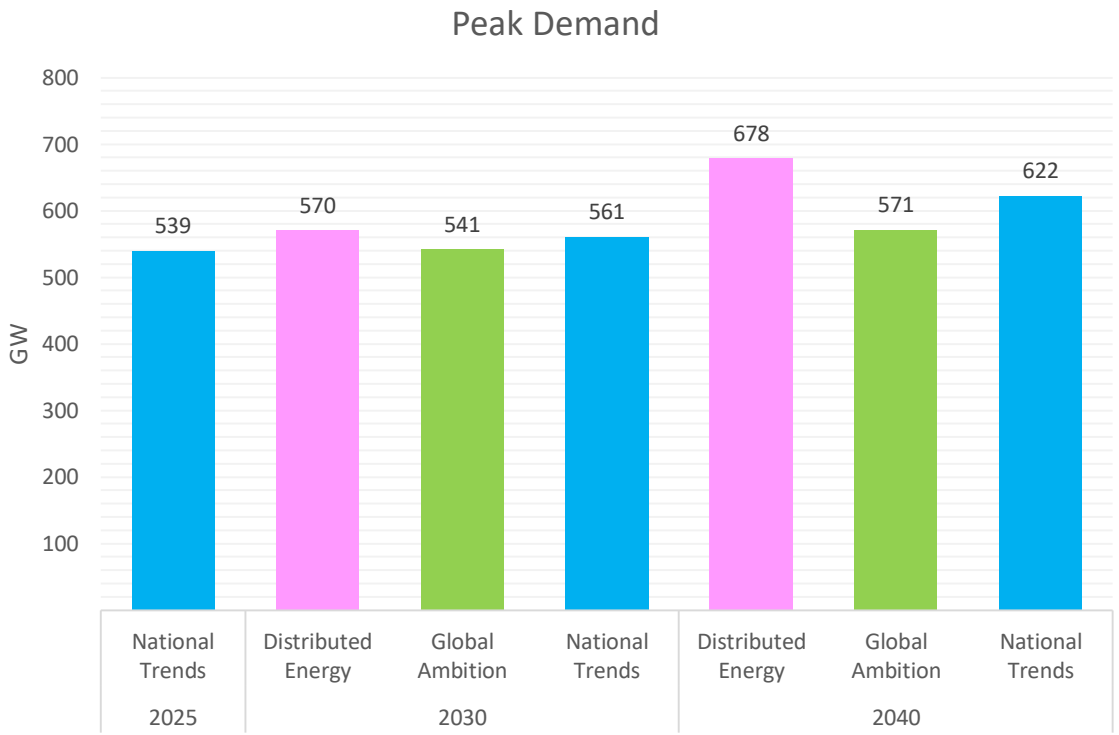
Electricity Generation (TWh)



Thermal generation declines as more renewables enter the market, Coal is phased out by 2040 in all scenarios.
On the supply side renewable and P2x technologies are critical, we see a need of up to 2,571 TWh of clean electricity for P2x.

Electricity Demand

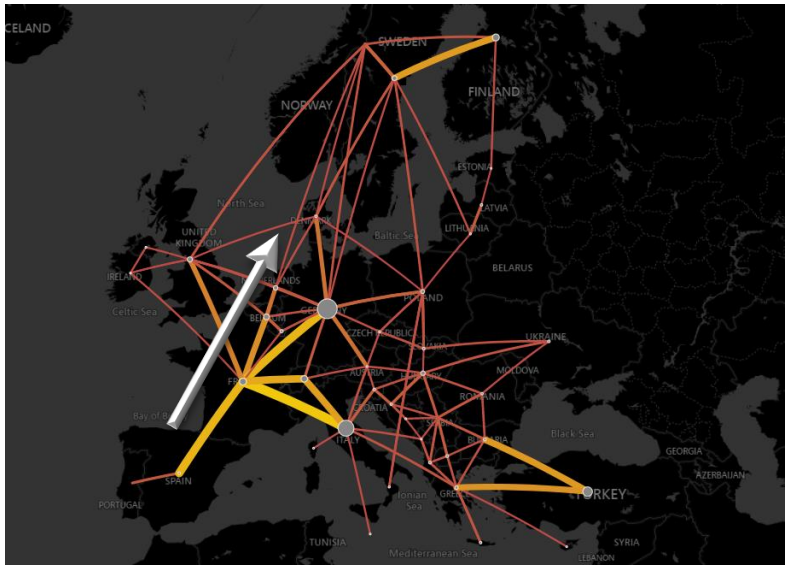




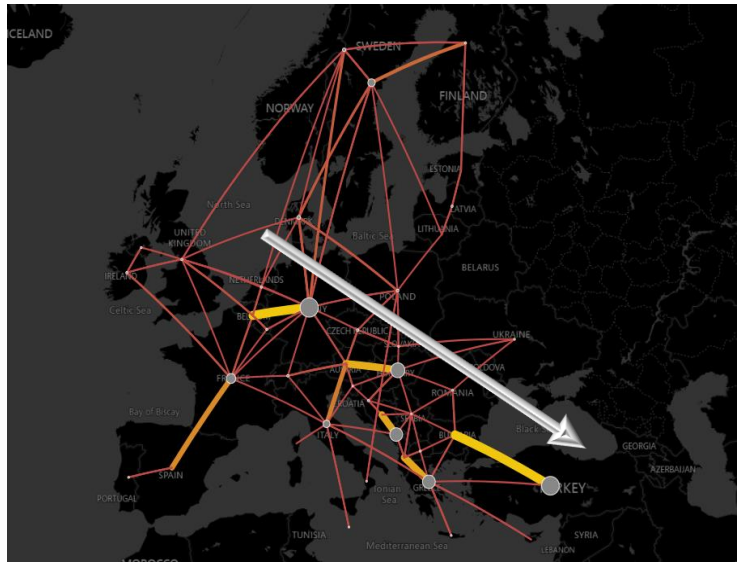
Increased direct electrification results in the increase of final electricity demand. The highest growth is seen in Distributed Energy. Whilst there is an increase in peak demand, it is subsided by demand side management e.g. batteries, DSR, smart grids, etc which are essential for the transition.

Electricity Grid Infrastructure

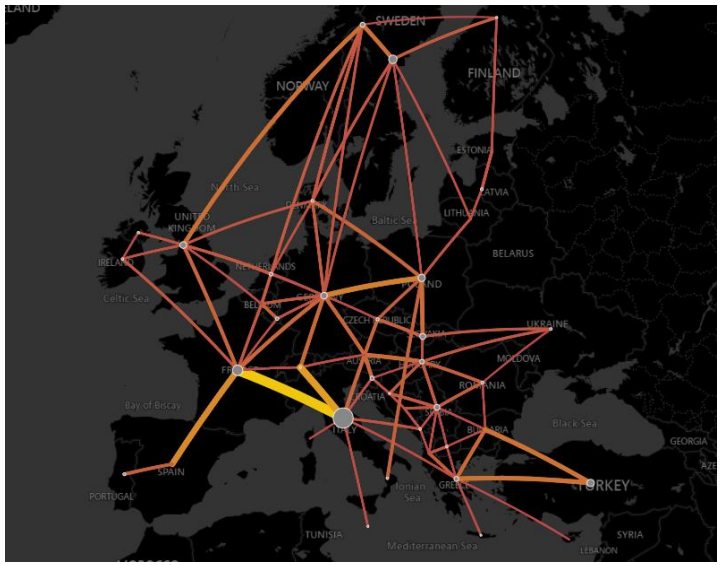
Distributed Energy



Global Ambition



National Trends



Energy flows around Europe and the need for grid infrastructure are important factors. The charts show the energy flows in Europe and the need for infrastructure based on the generation mix. Infrastructure development will be essential in ensuring we meet the energy transition in an efficient and economic way. This is assessed further in the TYNDP.