Slovenian Presidency 20–21

6th Forum of the EU Strategy for the Adriatic and Ionian Region
Along the coasts of the shared sea
Izola, 11–12 May 2021

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Opportunities for using smart grids and P2G in South-East Europe for enabling decarbonisation

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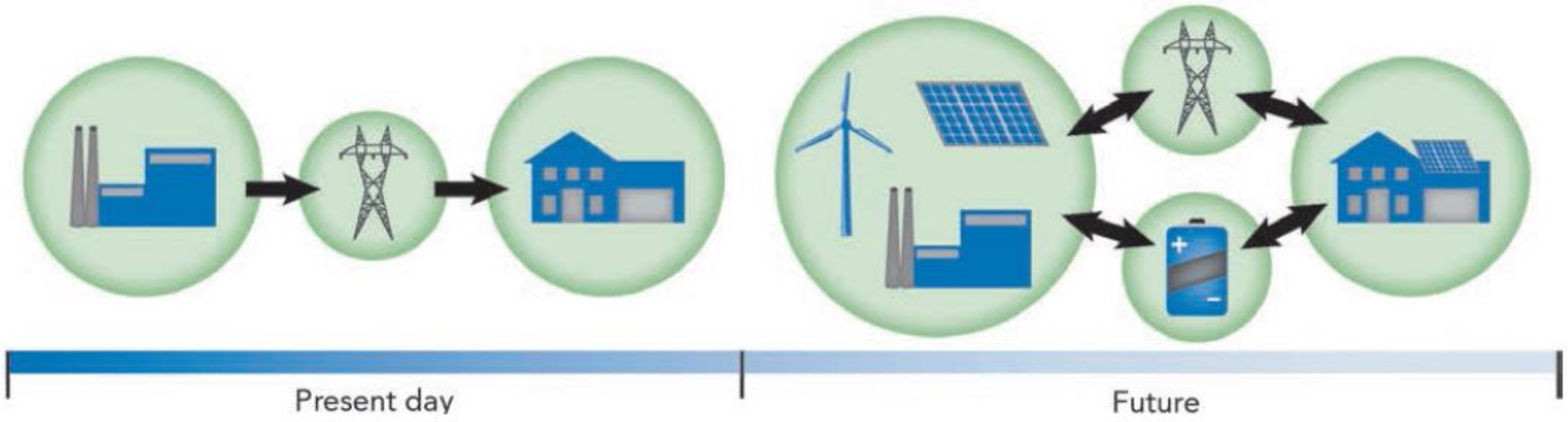
What is smart grid in general?

As defined by the International Energy Agency, "*a smart grid is an energy network that uses digital and other advanced technologies to monitor and manage the transport of energy from all generation sources to meet the varying energy demands of end-users*".

- The aim of smart grids is to maximize system reliability, resilience and stability and minimize costs and environmental impacts by coordinating the needs and resources of end-users and generation, grid and market operators.
- Since smart grids are mainly based on information sharing, the new information and communication technologies are their vital enabler.
- The first level of smartness is ensured by smart meters and standardised communication protocols



How Smart Grids Enable Renewables?

Smart grid technologies can directly address the following challenges of renewable electricity generation:

- *Variability*
- *Distributed generation*
- *Improved Consumer Information and Control*
- *Improved Transmission and Distribution System Monitoring and Control*
- *Integration of New Resources*

P2G technology

There are two main ways of **integrating wind and photovoltaic** production into the electric system:

- Integration using the power grid
- Integration using conversions

Solutions based on electrolysis to convert Power to Gas (P2G), which can be used directly as seasonal gas storage system (Hydrogen) in addition to very few hydro-power storage systems with large energy capacity and studies show that a high level of renewable penetration towards a CO2-neutral electric system can only be achieved with P2G systems. However, there are disputes on the maturity of these technologies.

P2G technology – pros

The **advantages** based on of producing synthetic gases like Hydrogen are:

- Some technologies to produce gases are extremely flexible and are therefore suitable for the electric infeed
- Synthetic gases can be used for long term storage of electricity
- Synthetic gases can be used in the transportation sector
- Synthetic gases can be used for industrial processes and heating and thus help to decarbonise other sectors
- Existing Infrastructure might be (partially) used for storage and transportation
- Production based on synthetic gases can be used to balance the system

P2G technology – cons

Some significant **disadvantages** have to be addressed and overcome:

- As of today, only small P2G plants are in operation (up to 10 MW). However, if P2G is to be used on an industrial scale, large plants in the GW region have to be available by 2030.
- Electrolysis manufacturing capacity is far from being sufficient.
- The production of synthetic gases is expensive (especially capital costs) – even though costs reductions are to be expected.
- The production of power based on synthetic gases has a fairly low efficiency rate.

P2G technology

- As a first step it seems to make sense to employ P2G if the end consumption of energy is indeed hydrogen and not electricity.
- As a second step P2G could be an option as (seasonal) storage if the remaining conventional (dispatchable) generation is not adequate to deliver the needed load during low solar/wind generation.
- Studies show that seasonal storage systems will be needed starting at the beginning of the 2030ies to support the decarbonisation of the electricity sector.
- If such systems shall have a significant effect, their rating has to be in the GW-range in the 2030ies. It is important
  - to start the upscaling process of P2G plants at least by a factor of 10 and
  - to demonstrate the grid supporting capabilities of P2G plants.

Distributed Energy (DE) scenario in TYNDP2020, ENTSOE

Distributed Energy (DE) is a full energy scenario compliant with the 1.5° C target of the Paris Agreement and presents a decentralised approach to the energy transition. On this ground, prosumers actively participate in a society driven by small scale decentralised solutions and circular approaches.

Sum of the Increase in socio-economic welfare (M€/year)	National Trends 2025	National Trends 2030	Global Ambition 2030	Distributed Energy 2030
For all projects of the TYNDP2020 portfolio	3,375	11,481	10,329	13,222
For all projects of SEE present in TYNDP2020	61	109	148	184

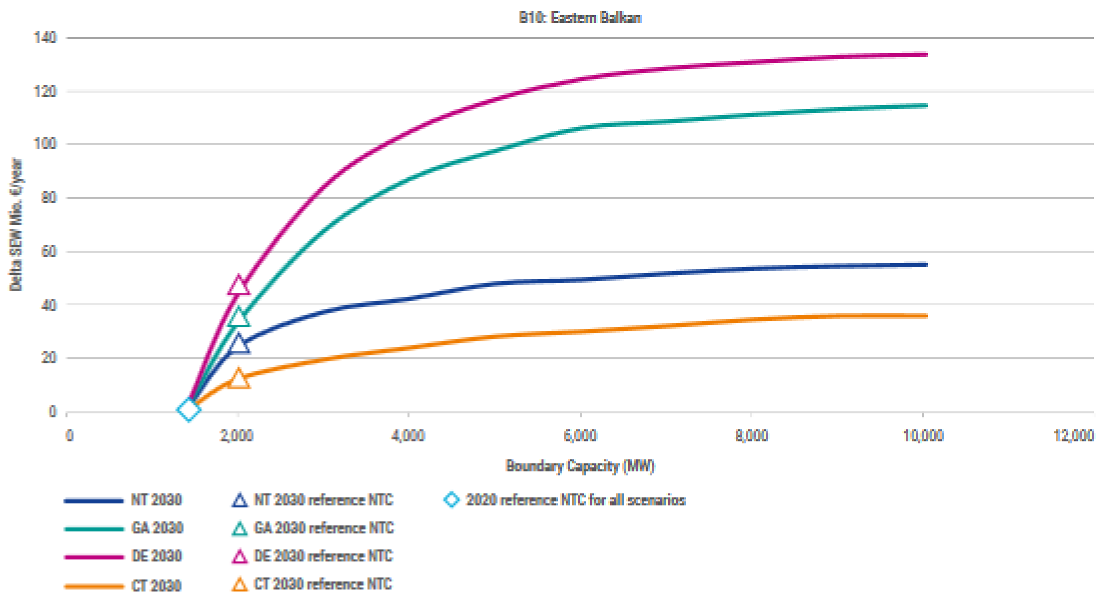
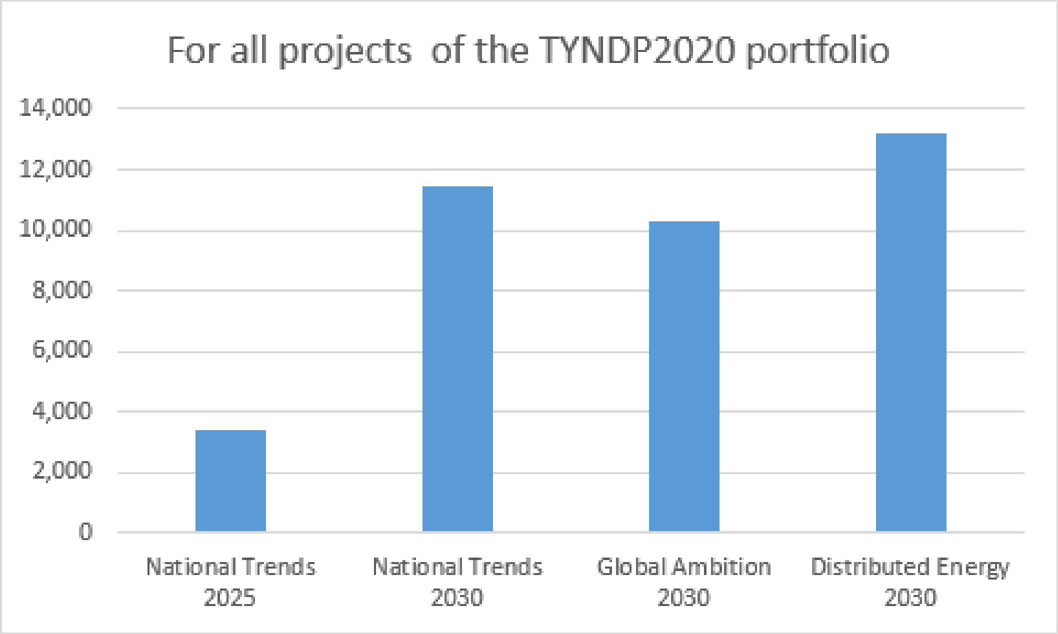
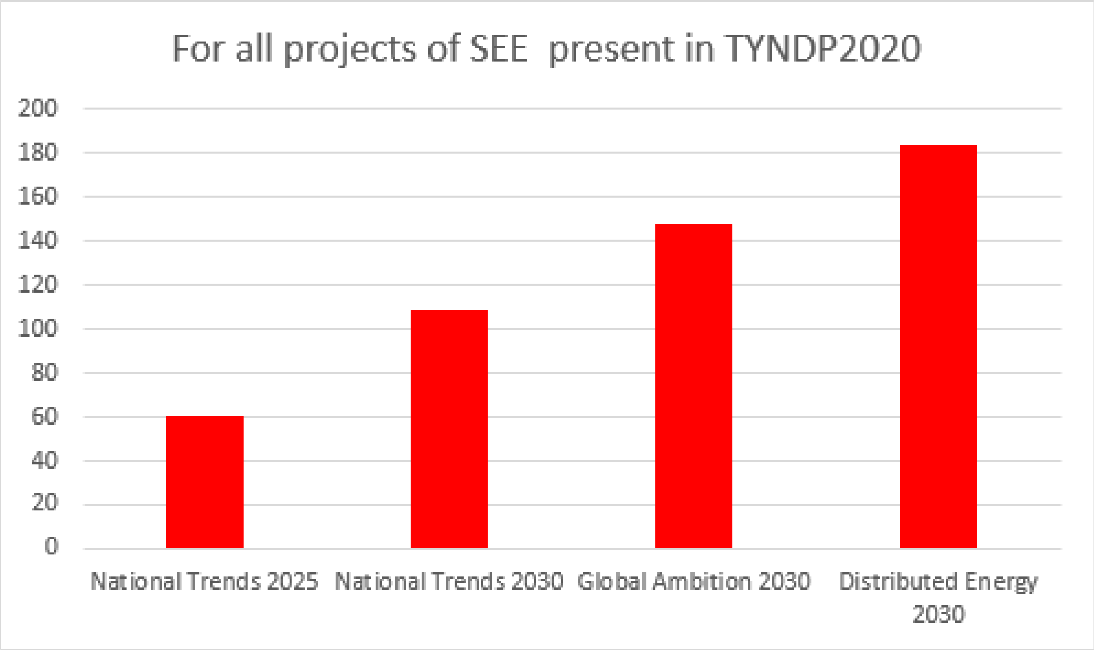


Figure 3.16 – Increase in socio-economic welfare when the transmission capacity increases from the current situation, on Boundary 10 Eastern Balkan, in all TYNDP 2020 scenarios for the 2030 horizon

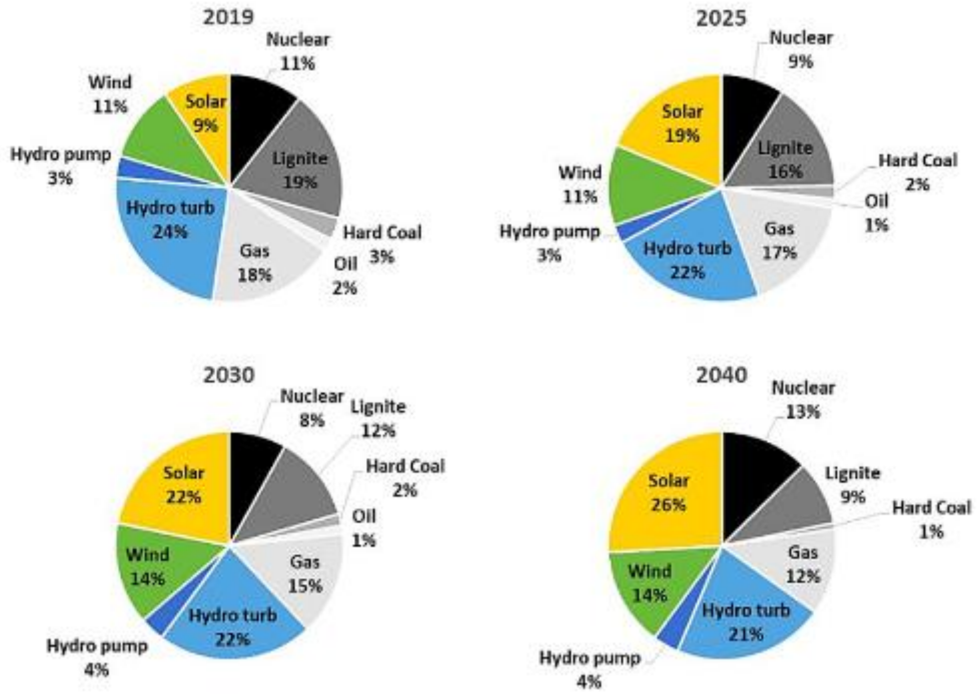
Analyses shows much higher NPV values for all CSE projects in Distributed Energy (DE) scenario than in other scenarios.

Distributed Energy (DE) scenario in TYNDP2020, ENTSOE

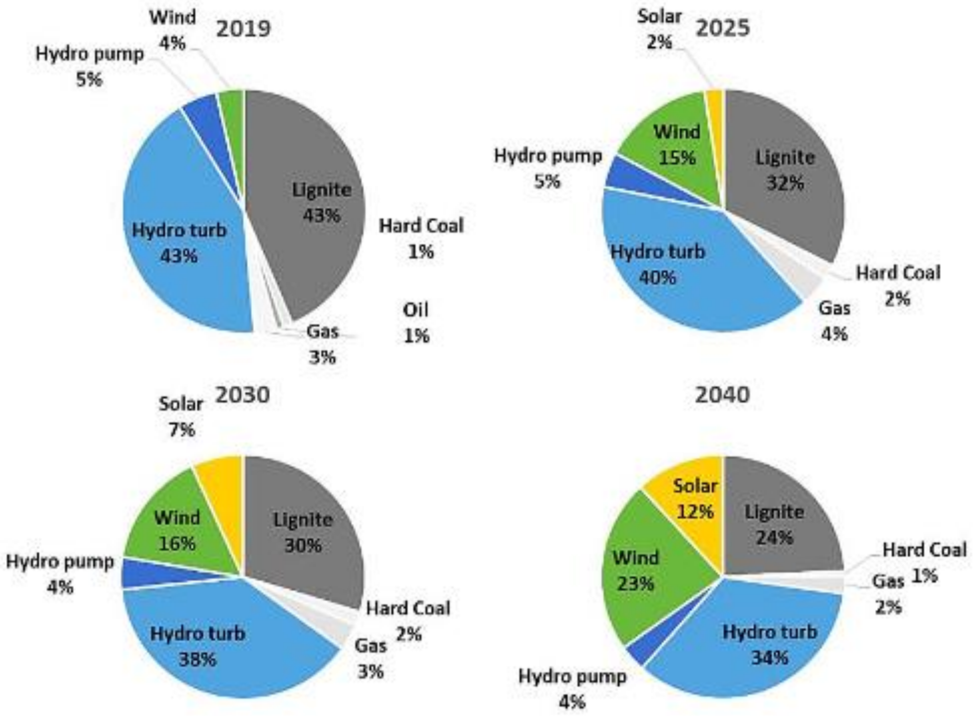




Total installed generation [%] by fuel type in countries in CSE Region, TYNDP2020 ENTSOE



EU countries



Non-EU countries

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