Representation of flexibility in the European grid investment planning: the Scenario Building standpoint

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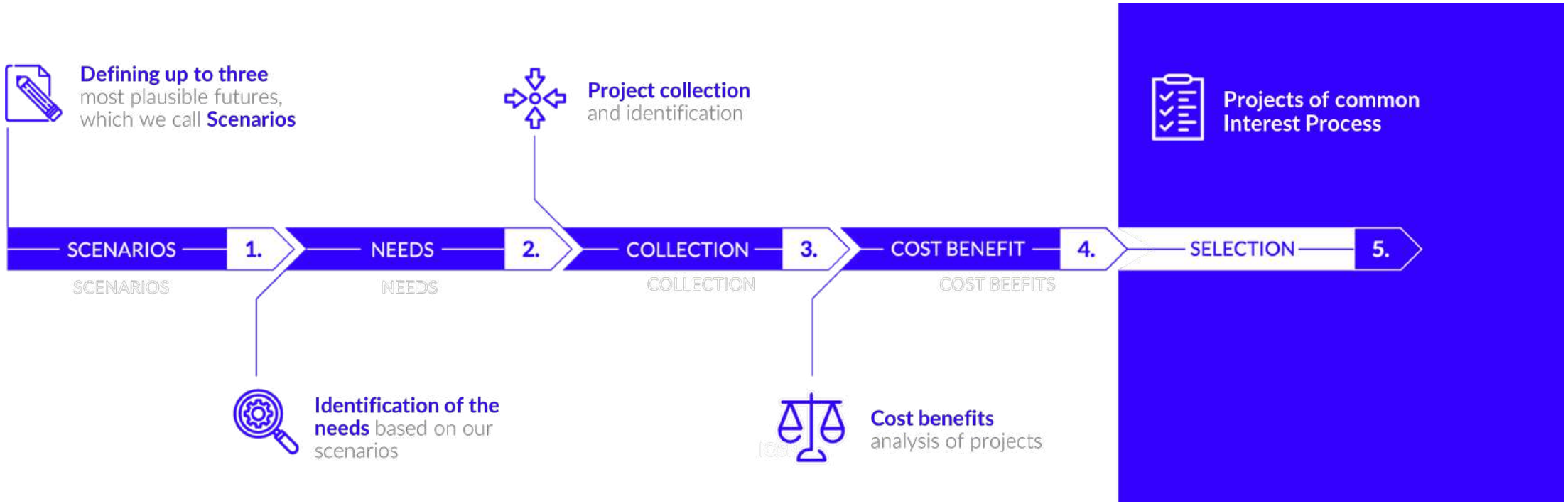
entsoe

Reliable Sustainable Connected

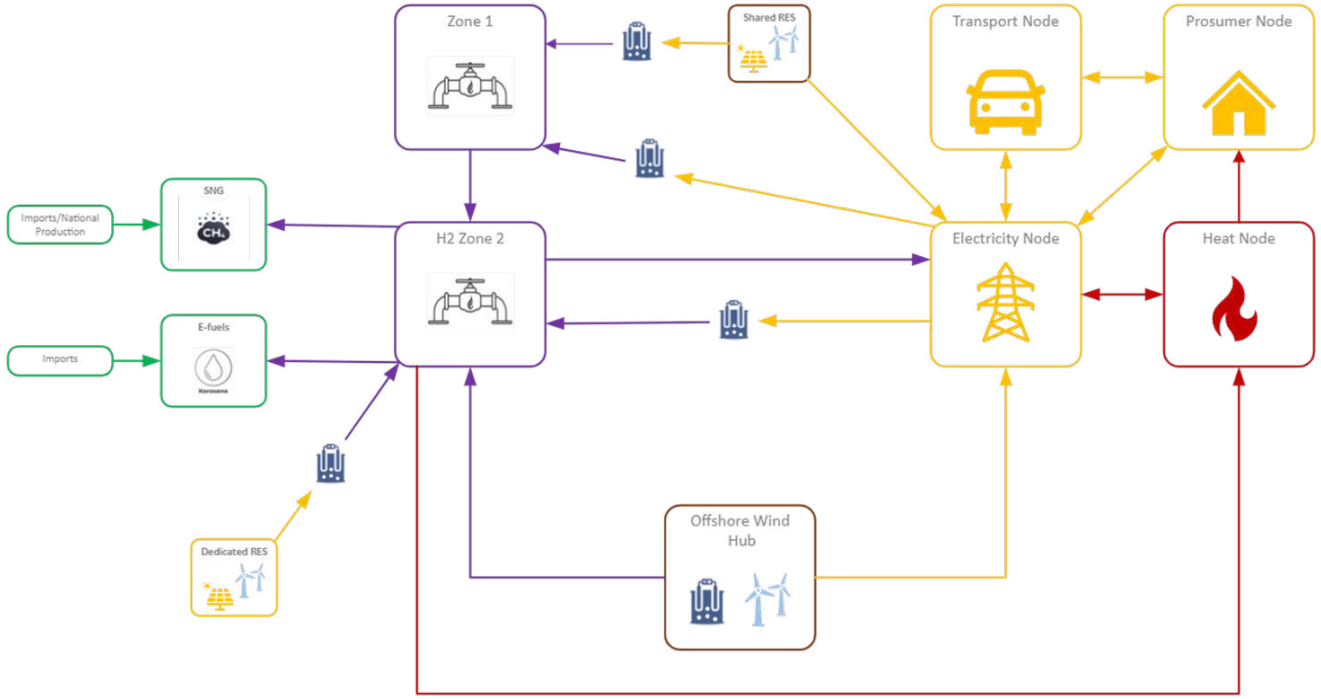
Scenarios are the first step in every TYNDP cycle, and their role is to set up the scene for all subsequent TYNDP stages. They are a joint venture of ENTSOs and are designed to capture the interactions between electricity and gas systems from a pan-EU perspective and their impact on the supply and infrastructure needs towards 2050



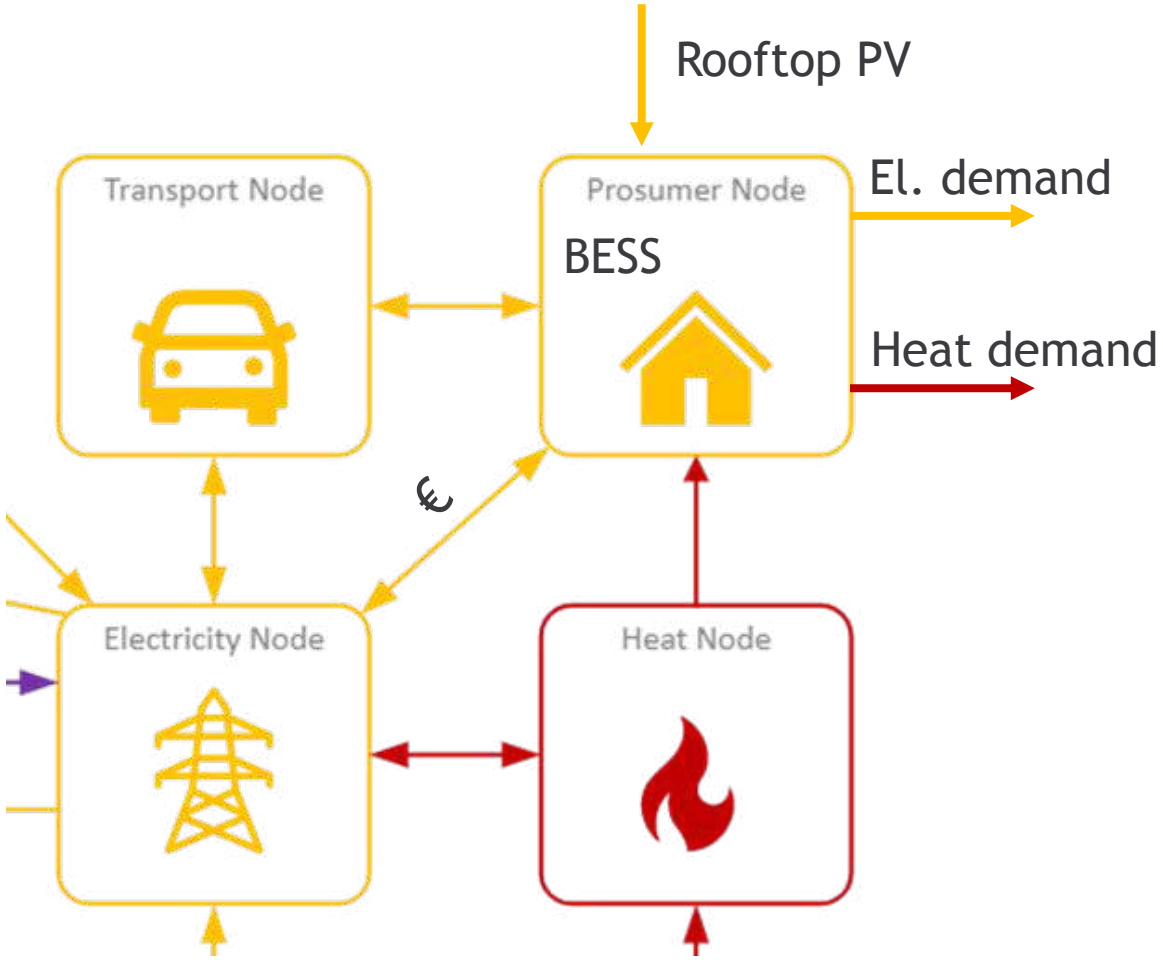
In essence, the Scenario model is a capacity expansion planning problem sizing infrastructure, supply and storage assets. The interaction between electricity, hydrogen, synfuel and heat sectors is explicitly captured in an integrated fashion.

Flexibility sources covered in the model include:

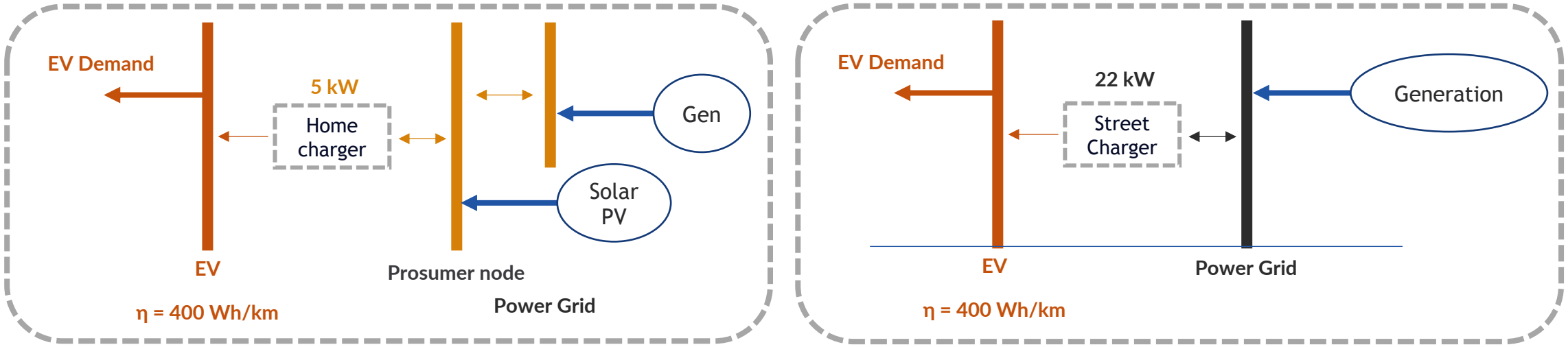
- Transmission infrastructure (el & gas)
- (Dispatchable) generation capacity
- Power-to-gas (H2 and synfuels)
- Storage (BESS - utility-scale & residential)
- Electric vehicles (passenger EVs)
- Heat sources*



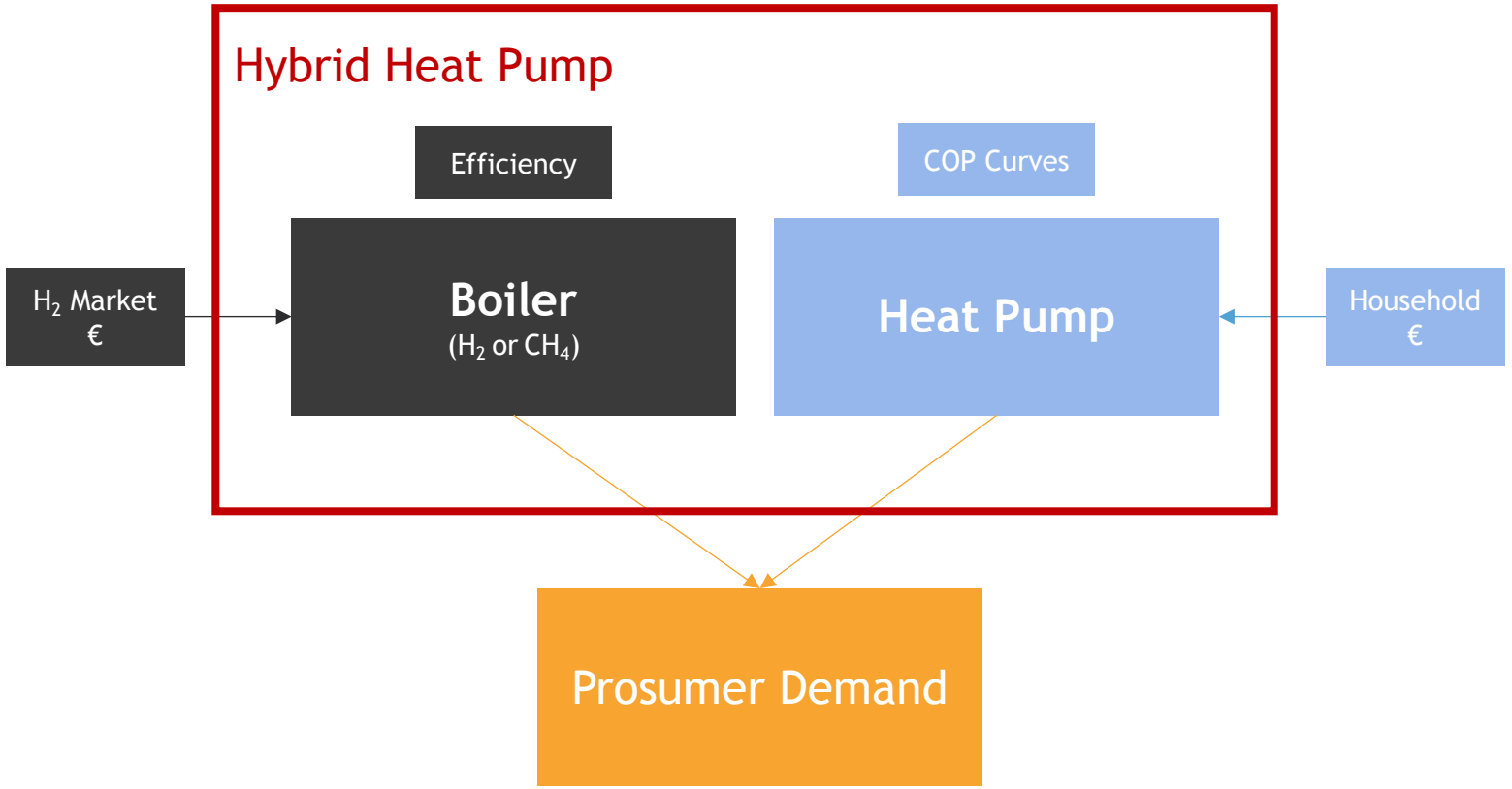
Residential BESS exist and are further deployed at prosumer nodes within upper bounds defined at country level.



In the 2024 Scenarios, one EV type and two charging station types are modelled. The "prosumer" or "home" station feeds from the "prosumer node" which, in turn, is connected to the market node. A typical Type 2 EV battery of 7.2kW/66.8kWh is assumed, while standard 5 kW charging stations are considered at any given node. Flexibility provided via deferment load share (%) and periods (hours during the day).



Heating demand of the prosumer node is supplied via hybrid heat pumps, modelled as boiler & heat pump that do not produce simultaneously. Parameters of the comprising units are determined from exogeneous sources, and no sizing takes place (boiler sized such that peak demand is met). Flexibility not fully captured – at most in conj with BESS



Wrap-up

Over the past cycles, the Scenario Building model (and the TYNDP, more generally), has taken big steps in accommodating a wide range of fleixibility sources for the power and energy systems.

While modeling capabilities suffice for mid- to long-term planning purposes, challenges revolve mostly around the availability of data enabling an accurate representation of the flexibility provided by certain assets

Flexibility sources from the built environment remains a goal for Scenario Building, yet aggregations are needed to maintain model tractability, maybe at the expense of a loss of relevant granularity

ENTSO-E Mission Statement

Who we are

ENTSO-E, the European Network of Transmission System Operators for Electricity, is the **association for the cooperation of the European transmission system operators (TSOs)**. The 42 member TSOs, representing 35 countries, are responsible for the secure and coordinated operation of Europe's electricity system, the largest interconnected electrical grid in the world. In addition to its core, historical role in technical cooperation, ENTSO-E is also the common voice of TSOs.

ENTSO-E **brings together the unique expertise of TSOs for the benefit of European citizens** by keeping the lights on, enabling the energy transition, and promoting the completion and optimal functioning of the internal electricity market, including via the fulfilment of the mandates given to ENTSO-E based on EU legislation.

Our mission

ENTSO-E and its members, as the European TSO community, fulfil a common mission: Ensuring the **security of the interconnected power system in all time frames at pan-European level and the optimal functioning and development of the European interconnected electricity markets**, while enabling the integration of electricity generated from renewable energy sources and of emerging technologies.

Our vision

ENTSO-E plays a central role in enabling Europe to become the first **climate-neutral continent by 2050** by creating a system that is secure, sustainable and affordable, and that integrates the expected amount of renewable energy, thereby offering an essential contribution to the European Green Deal. This endeavour requires sector integration and close cooperation among all actors.

Europe is moving towards a sustainable, digitalised, integrated and electrified energy system with a combination of centralised and distributed resources. ENTSO-E acts to ensure that this energy system **keeps consumers at its centre** and is operated and developed with **climate objectives** and **social welfare** in mind.

ENTSO-E is committed to use its unique expertise and system-wide view – supported by a responsibility to maintain the system's security – to deliver a comprehensive roadmap of how a climate-neutral Europe looks.

ENTSO-E Mission Statement

Our values

ENTSO-E acts in solidarity as a community of TSOs united by a shared responsibility.

As the professional association of independent and neutral regulated entities acting under a clear legal mandate, ENTSO-E serves the interests of society by optimising social welfare in its dimensions of safety, economy, environment, and performance.

ENTSO-E is committed to working with the highest technical rigour as well as developing sustainable and innovative responses to prepare for the future and overcoming the challenges of keeping the power system secure in a climate-neutral Europe. In all its activities, ENTSO-E acts with transparency and in a trustworthy dialogue with legislative and regulatory decision makers and stakeholders.

Our contibutions

ENTSO-E **supports the cooperation** among its members at European and regional levels. Over the past decades, TSOs have undertaken initiatives to increase their cooperation in network planning, operation and market integration, thereby successfully contributing to meeting EU climate and energy targets.

To carry out its **legally mandated tasks**, ENTSO-E's key responsibilities include the following:

- Development and implementation of standards, network codes, platforms and tools to ensure secure system and market operation as well as integration of renewable energy;
- Assessment of the adequacy of the system in different timeframes;
- Coordination of the planning and development of infrastructures at the European level (Ten-Year Network Development Plans, TYNDPs);
- Coordination of research, development and innovation activities of TSOs;
- Development of platforms to enable the transparent sharing of data with market participants.

ENTSO-E supports its members in **the implementation and monitoring** of the agreed common rules.

ENTSO-E is the common voice of European TSOs and provides expert contributions and a constructive view to energy debates to support policymakers in making informed decisions.

Our values define who we are, what we stand for and how we behave.
We all play a part in bringing them to life.

EXCELLENCE

We deliver to the highest standardss. We provide an environment in which people can develop to their full potential.

TRUST

We trust each other, we are transparent and we empower people. We respect diversity.

INTEGRITY

We act in the interest of ENTSO-E

TEAM

We care about people. We work transversal and we support each other. We celebrate success.

FUTURE THINKING

We are a learning organisation. We explore new paths and solutions.

We are ENTSO-E