European Network of
Transmission System Operators
for Electricity

ENTSO-E POSITION PAPER ON A FRAMEWORK REGARDING ELECTRICITY HIGHWAYS

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FINAL

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ENTSO-E Position Paper on a framework regarding Electricity Highways

1. Introduction

Looking at the discussion on Electricity Highways implementation in Europe, ENTSO-E welcomes the Communication from the European Commission (EC) to the Council, the European Parliament, the European Economic and Social Committee, and the Committee of the Regions on the "Energy Infrastructure Priorities for 2020 and 2030 – A Blueprint for an integrated European energy network" as well as the publication of the corresponding legislative package on the 19th of October as an important step towards the attainment of European Energy Policy objectives.

Looking back, in the context of the conclusions of the Bucharest Energy Efficiency Forum 2009 and following the 1st European Electricity Grid Reliability Conference (European Parliament on 8 January 2009), ENTSO-E established a Working Group on 2050 Electricity Highways in 2009. The main task of this WG is to set up and coordinate comprehensive and sustainable Electricity Highways concepts and to perform consultations with the EC and other stakeholders. In line with the blueprint on Energy Infrastructure Package as published in 11/2010, the tool advocated by ENTSO-E`s transmission system operators (TSO) to assess how a pan-European Electricity Highways System will be built over a time horizon to 2050, is a study roadmap with work packages towards a Modular Development Plan on a pan-European Electricity Highways System 2050. Based on this study, the modular development plan shall now be developed by a study consortium consisting of ENTSO-E and its members, relevant associations, institutes, universities etc. within the **"e-Highway2050"** study project (start early 2012).

ENTSO-E's roadmap to the 2050 electricity grid, as well as the TSOs' active involvement in the SET-Plan European Electricity Grid Initiative shall be the stepping stones for elaborating and implementing the modular development plan that the Communication calls for; however, the timing for the appearance of this plan as well as the commissioning of the first parts of the "Electricity Highways" should be carefully chosen in order to ensure the streamlined delivery of all ENTSO-E tasks.

Some background aspects are included in the **Annex** of this paper. This includes the role of TSOs within the realization of the EC's long-term priorities, the framework for long-term investments and tools.

2. Objective

The aim of this ENTSO-E position paper is to identify the main tools enabling TSOs to keep up with the objective of the European Commission to accelerate designing, planning and building the Electricity Highways System. The time horizon of the framework covers the period after the TYNDP (i.e. post 2020).

ENTSO-E is looking forward to feed the forthcoming debate with concrete proposals that should translate into immediate benefits. In this respect ENTSO-E addresses the setting up of a **Master Plan for Electricity Highways Implementation** as a community tool enabling to meet the EC objectives.

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3. Pan-European Electricity Highways System for achieving the EU's energy policy targets. Consistency of the EU's and ENTSO-E's strategic needs and visions

In November 2010 EC highlighted numerous initiatives at regional level in the blueprint on Energy Infrastructure Package which prove the need for new EU scale integrated energy grids. Further, the successful pursuit of the core EU Energy Policy objectives of competitiveness, sustainability and security of supply calls for the development of a pan-European electricity grid able to cope with the future bulk power transmission needs but calls also for a steady TSO leadership in supporting Demand Side Management initiatives and more specifically Demand Response architectures capable of supplying System Services to the Networks, Transmission System included. In this regard, *time of use* tariffs and the strict *user pays* principle will promote more direct end-user involvement.

Reliable, sustainable and cost-efficient energy supply systems that accommodate power flows resulting from the shift to an almost carbon-free EU energy system and respond to the need to combat climate change shall facilitate important objectives provided under the Lisbon Treaty.
In the long-term perspective, these aspects shall be covered by EC's comprehensive concept in the Energy Roadmap 2050, Roadmap towards low carbon economy by 2050, and the White Paper on the Future Transport. The TSOs under the umbrella of ENTSO-E align the EC's mid-term actions and orientation on pathways to 2050 with the vision and mission expressed in ENTSO-E's Strategic Plan for the period 2010-2015. In this context, ENTSO-E members give their support to the integration of renewable energy sources and the completion of an Internal Energy Market while maintaining secure and reliable supply of electricity.

4. Necessity of the convergence of the planning approaches towards an efficient and sustainable pan-European concept regarding an Electricity Highways System

In the 2050-perspective the EU energy system will undergo a fundamental transformation. This is brought about by the production of large and intermittent wind volumes predominantly in the Northern Seas and large scale solar in Southern Europe and possibly in Northern Africa and the Middle East along with the developments in storing and consuming electricity and in decentralized models of electricity generation. Acknowledging this, ENTSO-E members stress the need for consistent long-term transmission planning supported by novel planning approaches based on dedicated R&D efforts. The development of the transmission grids is highly dependent on the development of electricity generation, hence TSOs will use best estimates of future generation (including locations). The EC's top-down centralized approach needs to be aligned with the bottom-up methodology of TSOs and other stakeholders. This convergence shall allow for the credible assessment of the elements of the infrastructure (existing and planned) necessary to realise the EC's vision of an Electricity Highways System.

The **"e-Highway2050"** study project including the Modular Development Plan on a pan-European Electricity Highways System 2050 will cover the time period beyond **ENTSO-E's Ten Year Network Development Plan (TYNDP)**. It will consider two important starting points: The TYNDP, and also the possible **North Seas offshore grid concept for 2020/30** following the MoU for North Seas Countries' Offshore Grid Initiative (NSCOGI). It must be underlined that the **"e-Highway2050"** study project will aim at:

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- developing **future-oriented novel planning approaches** allowing a comprehensive but efficient Electricity Highways discussion,
- analyzing and justifying **bulk power transmission needs** taking into account **future generation** and its spread throughout the whole transcontinental region**,**
- proposing **concrete implementation, operation and governance principles**[1] for needed grid investments throughout Europe and to neighboring areas,
- in the interest of security, efficiency, feasibility and sustainability, consider the **whole energy supply chain** including relevant technical/technological, economical/financial, ecological, political/sociopolitical and geopolitical/security issues,
- following a **modular approach**: 2030, 2035, 2040, 2045 and 2050,
- and finally, proposing **general strategic Electricity Highways architectures** including technology options.

5. EC Master Plan for Electricity Highways Implementation

European TSOs and ENTSO-E are the most suitable entities to undertake a leadership role into defining the future electricity grid. The Electricity Highways System shall serve and link regions in Europe. The utmost challenge for the implementation will be to reach societal consensus at EU and involved countries' (EU and non-EU) level, together with consensus among different groups of stakeholders: generators, grid operators, consumers, NGOs and decision-making entities at different level. This is especially true for financing, the authorization procedures, environmental priorities, local acceptance issues, which are aspects under the responsibility of the TSOs in charge of the project, and the regulatory gaps within the different national schemes. These have been identified as the main barriers in completing high-priority electricity infrastructure projects across Europe. Looking beyond the latest proposal for Energy Infrastructure Package (comprising of two Regulations, namely the "Guidelines for the Implementation of European Energy Infrastructure Priorities" and the "Connecting Europe Facilities", ENTSO-E therefore suggests setting up an **EC Master Plan for Electricity Highways Implementation** as a tool to keep up with the ambition of the EC to accelerate designing, planning and building the Electricity Highways system. As a next step after the finalization of the **"e-Highway2050"** project incl. elaboration of first Modular Development Plan on a pan-European Electricity Highways System 2050, this Master Plan should:

- further **prioritize the needed Electricity Highways corridors,** as identified in the modular development plan and - for the medium-term horizon - also in the TYNDP,
- further **define special permission**[2] **rules to** assure timely Electricity Highways implementation,

[1] Despite the aim that the identified lines should be designed as point to point (meaning specific region to specific region) with proposed technical transmission principles, no concrete geographical routing can be done within this three-years "e-HIGHWAY2050" study project, this task is outside of the study project scope and will be given to the respective ENTSO-E members (Regional Groups and bilaterally at TSO level).

[2] Long and uncertain permitting procedures are addressed in the blueprint on Energy Infrastructure Package. The industry as well as TSOs and regulators, see this issue as one of the main reasons for delays in the implementation of infrastructure projects, notably in electricity. The time between the start of planning and final commissioning of a power line is frequently more than 10 years. In electricity, the resulting delays are assumed to prevent about 50% of commercially viable projects from being realised by 2020. The Commission proposes a new method which includes supporting the implementation of projects of European interest through new tools, such as improved regional cooperation, permitting procedures, better methods and information for decision makers and citizens and innovative financial instruments. However, the "e-HIGHWAY2050" project will study possible evolutions of those priorities and ways to adapt EIP mechanisms to the future pan-European Electricity Highways system.

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- further **clarify the ground for financial incentives** for needed adequate re-financing of EH projects which will be based on breakthrough technologies and will bring new technical, regulatory or coordination challenges, and therefore show higher risks than classical transmission projects,
- further **support ACER to overcome the existing regulatory gaps** and clearly **take advantage of the key expertise of ENTSO-E and its members** in terms of EH planning, implementation, operation and ownership,
- **promote and incentivize further elaboration of concrete routing options** by ENTSO-E and its members,
- **reserve the needed corridors for future energy infrastructure purpose,**
- **ensure operational security** of the whole grid **and system/generation adequacy** on the transcontinental and regional scales,
- and finally, **anchor regular updates on the modular development plan under the responsibility of ENTSO-E**.

The EC Master Plan shall also cover implications for non – EU member states, both in and outside Europe.

6. Conclusions

The consistency of the EU's and ENTSO-E's strategic needs and visions is extremely important in order to address the needs arising according to all projections for the penetration of carbon-neutral technologies in the future energy mix, with production often located in very distant areas from consumption and storage areas. European TSOs and ENTSO-E are the most suitable entities to undertake a leadership role into defining the future electricity grid.

There is a need of convergence of planning approaches towards an efficient and sustainable pan-European concept on an Electricity Highways System. ENTSO-E's roadmap towards the **Modular Development Plan on a pan-European Electricity Highways System 2050**, the **study project "e-Highway2050"** as well as the TSOs' active involvement in the SET-Plan European Electricity Grid Initiative shall be the stepping stones for elaborating the **modular development plan** that the EC`s Communication of November 2010 calls for.

ENTSO-E is looking forward to contribute with concrete proposals and translating them into immediate benefits. In this respect ENTSO-E proposes the setting up of a **Master Plan for Electricity Highways Implementation** as a community tool enabling us to keep up with the objectives of the EC related to the establishment of the Electricity Highways system and to achieve the EU's energy policy targets.

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ANNEX - Background Aspects

1. Role of TSOs within the realization of the EC's long-term priorities

Keeping in mind the role of the Electricity Highway System (EHS) as the transportation and integration of Renewable Energy Sources and finally the delivery of energy to the consumers, ENTSO-E members as the entities responsible for the overall stability of electrical power systems perceive the EHS as the identified pan-European System for bulk power transmission flows. These new transmission needs shall be accommodated by the defined new infrastructure corridors of European interest altogether with the upgraded parts of the existing grid.

The role of TSOs shall be defined as ensuring seamless operation, planning and congestion-management of the EHS including the existing transmission grids. This has to be done in compliance of the security of supply and also in a cost-effective manner so that EHS failures do not lead to emergency situations and cascading outages, voltage collapse and blackouts in the whole system. In the context of expected high fluctuation of loads the critical issue will be to ensure flexibility in system balancing based on sharing generation reserves and storage and load flexibility capacities on market terms. In the process, hydro storage potentials in Scandinavia and the Alpine region will play a crucial role possibly together with back-up generation capacities needed to cope with longer-time imbalances during unfavorable weather conditions.

2. Framework for long- term investments

The cross-border nature of projects of European interest and the involvement of several TSOs with the aim to build, operate and maintain a future EHS requires aligning more closely the policy goals with the incentives which reflect the investment risks in order to enhance investors' confidence (e.g. stability, transparency and predictability of the regulatory regime).

With regards to access to capital for TSOs, ENTSO-E supports the principle of the existing "user pays" regulatory regime, and the risk-mitigating effect European funding may have in certain cases. It is however essential that this regulatory regime be adjusted, not only to support cost allocation mechanisms for projects for which the cost-benefit distribution is not proportional to involved parties, but also in a more general manner concerning grid *expansion*. Not to be neglected is the fact that the TSOs must be enabled, through properly designed tariff schemes, to maintain their assets in the future.

In ENTSO-E the TSOs work under different market designs and regulatory regimes, which makes the application of the one financing toolkit unlikely to prove effective. Thus ENTSO-E members support both market based and non-market based instruments.
In considering the future development of Europe's electricity transmission networks, it will be important to ensure that there is motivation among financiers to fund investment and that a stable regulatory framework incentivizes parties to undertake the required investments and provides appropriate risk/reward trade-offs.

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3. Tools

The Modular Development Plan on a pan-European Electricity Highway System 2050 as a feasible strategic plan over a time horizon to 2050 and the dedicated study project **"e-HIGHWAY2050"** shall cover all relevant technical and technological, economic and financial, political, ecological and sociopolitical aspects. It will also address concrete implementation (planning, financing, construction, extension and integration), operation and governance measures undertaken by the TSOs.

ENTSO-E TSOs acknowledge the necessity to follow the rules of coherence referring to different planning time horizons (2020, 2030 and 2050), character (top-down vs. bottom-up) and modularity of the approach embedded in the progressive adjustments along with the learning curve during the realization of the modular development plan. The implementation of the projects submitted by TSOs into TYNDP shall be the prerequisite for the development of the pan-European Electricity Highways System towards 2050. Thus, as part of **"e-HIGHWAY2050"** dissemination process, respective progress reports along the three-year study project will be included as outlook in the TYNDP 2012 and 2014 as the starting point for sketching intermediary steps reflecting the increase of decarbonization of the electricity systems.

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