European Network of
Transmission System Operators
for Electricity

entsoe

ENTSO-E response to TYNDP 2014-2030 Visions consultation answers

PEMS-ET/Working Group System Adequacy and Market Modelling

December 2013

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1. Disclaimer

This document lists ENTSO-E's assessment of comments provided in the formal web-based consultation on the TYNDP 2014-2030 Visions in the period of 17 June – 17 September 2013.

ENTSO-E's assessment of comments is given in two levels. First, the main general comments are summarized and addressed. This is followed by a list of detailed answers. This distinction is based on ENTSO-E's judgment, irrespective of the organization(s) providing the comment nor the number of times it was provided.

From the public consultation ENTSO-E received up to 60 comments and several public communications; In order to provide a clear oversight of comments and responses, the issues mentioned in this document may have been summarized with respect to the original comments provided. For a full overview of all comments provided in the web-based consultation, in their original formulation, please refer to https://www.entsoe.eu/consultations/

This document is not legally binding. It only aims at clarifying the content of the TYNDP Scenarios, based on feedback provided during the formal consultation period.

ENTSO-E acknowledges and thanks stakeholders for the effort that they have invested in providing feedback for the consultation on the 2030 Visions; this feedback is a major contributor to bringing improvements and transparency to the TYNDP process.

2. General responses to reactions on the consultations

Comments on the general approach

The main goal of creating Visions was to evaluate grid development projects for different extreme scenarios, and not to provide a "Best Estimate" scenario, especially in a long term time horizon, where the number and the variability of the unknowns elements is too high to be managed by only one scenario. The 2030 Visions Scenarios are expected to cover a realistic range of possible developments, and are therefore by definition different from the Best Estimate pathway.

The purpose of the consultation is not to provide data to simulate operation and market of electric system (that is an item in charge of TSOs), but to share with the stakeholders the general principles on the base of the scenario building process, in order to improve it in the next years. The possibility to review the level of details available during the consultation can be reviewed in the next editions, according to the current regulations and confidentiality agreements. In addition an increased perimeter of the analysis could be considered in the next years according to the regulation and the availability of the data from the interested country.

Demand growth is too much for Vision 4 and energy efficiency is not well reflected:

The main criticism is that in a scenario where there is a combination of high RES, high demand and high amount of inflexible generation, the system would not be cost-effective. While this argument might be right it should be taken into consideration the fact that Vision 4 is supposed an extreme scenario where there are favorable financial conditions.

Energy efficiency has been taken into account while constructing the basic load curve which shows a default of -0.5% of growth rate annually. However, due to the high default penetration of EV (15%) and heat-pump (9%), which was determined based on stakeholders' inputs; the total demand shows an increase

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of 1.2% CAGR (Compound Annual Growth Rate). Moreover, indeed even IEA WEO 2012[1] justifies the increase in demand through electrification which enables savings in other sectors:

More detailed analysis shows the "High RES" scenario for Roadmap 2050 demonstrates a 0.84% CAGR (scaled up annual demand from EU27 of 3998 TWh) while our Vision 4 has 1.2% CAGR (4249 TWh). This discrepancy can be explained by several factors (GDP, population, perimeter of the analysis…) and certainly by a lower assumption on the impact on efficiency gain coming from technological breakthrough and paradigm shift. Deeper analysis on this point will be led for the next TYNDP.

CO2 price unrealistically high

Some criticized that the IEA 450 ppm scenario is outdated and that the CO2 price which ENTSO-E used is too high. ENTSO-E is not directly involved in such kind of item, therefore it has been considered IEA WEO as the most relevant international reference. ENTSO-E checked with the latest version of the IEA WEO version 2012 (values for 2035 from WEO 2011 were taken) and the assumed CO2 prices (31 EUR/ton and 93 EUR/ton) are still compatible with what their forecast.

Nuclear almost the same for all visions

This point is related to the demand growth as well. The criticism is that there is too much inflexible generation in the high RES scenarios. However, from the last IEA WEO the expected nuclear contribution to the generation mix is high in the 450 ppm scenario:

It is not explicitly explained why there is so much nuclear in the report. Nuclear generation, besides RES (48% for EU27 for the 450ppm scenario), may be a necessary and viable option for the required CO2 emission reduction. Because of this, the assumption of having a relatively high amount (almost the same for all visions) of installed nuclear capacity in Vision 4 is no considered unreasonable. One must also take into account that the contribution from nuclear in the generation mix from market simulations decreases in high RES scenarios (about 5% decrease in Vision 3 and Vision 4 compared with Vision 1 and Vision 2).

3. Specific answers to the responses received

Topic	Comment/Proposal	
Load Management projections in 2030 Visions	It isn't understandable why some countries have extremely high load management potentials (e.g. ES, IT, FR) and other countries (e.g. DE, GB, AT) have no potentials even if load management has already been introduced in the latter countries. The source of the given potentials should be given and justified. This comment is also related to Vision 2, 3 and 4.	ENTSO-E collected the demand and load managements figures according to specific guidelines provided to the TSOs for the bottom-up visions (V1 and V3). Based on the ENTSO-E stakeholder's workshop held April 2012, the default peak shaving in V3 is 2.5% of reduction of the V1 seasonal peak load. The values provided for V2 are considered the same as V3 if no other value is provided by TSO. In the same manner the default value for V4 is 5%, unless a specific value was provided by the TSO.

[1] International Energy Agency World Energy Outlook 2012

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Hydro and Pumping projections in 2030 Visions	Hydro and pumping assumptions for EU2020 and consequently for all Visions are far too optimistic (if not unrealistically high). For example in Austria as of today 13,350 MW of hydro & pumping capacities are in operation (source: E-Control) - EU2020 assumes 25,350 MW for 2020 and Vision 1-4 up to 31,800 MW(!). Also not only the numbers for Switzerland but many other countries are far too high - especially for pumping. We would therefore strongly recommend reassessing hydro & pumping potentials for all countries.	Deduced from the values provided in the comment, apparently the ENTSO-E datasets have been misinterpreted. Considering Austria - the chosen example - the correct interpretation of the hydro dataset e.g. for EU2020 is 17170 MW for the total hydro generation (incl. generation capacity of pumped storage power plants) and 8180 MW pumping capacity (not generation). The values brought in with the comment (25,350MW in EU2020 and 31,800 MW in Vision 4) are apparently derived by totalizing the total pumping and the total generation capacities (incl. gen. from pump storages) and therefore leading to wrong results.
Photovoltaic projections in 2030 Visions	Vision 1 looks too pessimistic to us in terms of solar development. It assumes a European annual market of 3-4 GW in the period 2013-2030, against an annual market of 17 GW in 2012 and 22 GW in 2011. While we foresee that the PV market may not grow as fast as in the past 2-3 years, it is very unlikely that only 3-4 GW per year will be installed in the future. It must be taken into account that PV is partly developed by small, medium and large consumers that simply aim to decrease their electricity bills by producing their own electricity. As PV prices decline, in markets with high electricity prices it is more and more economically attractive to install PV to cover up part of the own electricity consumption. We propose to set as the lowest value for PV penetration 350 GW, which would correspond to around 10% of Europe's electricity consumption according to ENTSO-E 2011 hourly load values projected into 2030 in line with the European Commission Energy Trends 2030.	According to the feedback received from stakeholders in the ENTSO-E workshop in July 2013, the PV installed capacity projection in V4 was adapted to reach 340GW for Vision 4. Vision 1 was constructed under the assumption that policy objectives for year 2020 and the Roadmap 2050 are not met.
ENTSO-E TYNDP scenarios assumptions	In the introductory document to the 2030 scenario development it remains unclear to us what exactly 'on track for energy roadmap 2050' means. The energy roadmap displays different pathways to decarbonise the energy sector by 2050 and does not only cover electricity. We recommend clarifying what elements of the roadmap ENTSO-E compares its visions with. Anyways, We still do not understand why	ENTSO-E described in the storyline of the Visions for 2030 the assumption that some of the objectives for year 2020 and for the Roadmap 2050 are not met in visions V1 and V2. ENTSO-E used the indicators of CO2 emission reduction and RES penetration to check if the scenarios are on track with the

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	ENTSO-E has formulated new visions and has not used the pathways contained in the energy roadmap 2050, which are the most authoritative scenario document for the energy sector in Europe.	Roadmap 2050 objectives.
Demand growth projections in 2030 Visions	We have noticed that electricity demand grows quite impressively in scenarios 3 and 4. This seems to show that, according to ENTSO-E, it is not possible to decouple the decarbonisation of the energy sector from the increase in electricity use. In other words, electricity efficiency measures would by far not be able to outweigh electricity demand increase due to increased use of EVs and of electricity for heating/cooling. We disagree with this approach and believe that in scenarios whereby Europe commits to climate protection, ambitious efforts should be envisaged for electricity efficiency.	Answer included in the general responses.
Photovoltaic projections in 2030 Visions	Assumptions for solar penetration in vision 4 (around 340 GW) are too pessimistic in our view. We believe that PV could realistically cover 15% of Europe's demand by 2030 (demand assumptions taken from ENTSO-E 2011 hourly load values projected into 2030 in line with the European Commission Energy Trends 2030). If PV installations were spread across Europe starting from areas where the consumption is the highest, to cover 15% of Europe's electricity demand by 2030 around 520 GW PV would be installed. Going beyond 15% is not challenging from a transmission grid perspective but rather from a financial (support and system integration measures) and a system operation (e.g. copying with steep ramps) points of view (see Energynautics paper attached). The question around reaching penetration levels of around 25% is when and not if. We acknowledge the difficulty in forecasting the spatial distribution of PV systems and would be happy to discuss with ENTSO-E and its members this matter.	ENTSO-E recognises that the total PV installed capacity of 340GW is already very optimistic according to some other stakeholders and far beyond the NREAPs expectations. In the framework of the Long Term Network Development Stakeholders Group, ENTSO-E will continue the communication with stakeholders on the way to improve the PV distribution in the TYNDP 2016 scenarios.
Photovoltaic projections in 2030 Visions	Vision 2 looks too pessimistic to us in terms of solar development. It assumes a European annual market of 3-4 GW in the period 2013-2030, against an annual market of 17 GW in 2012 and 22 GW in 2011. While we foresee that the PV market may not grow as fast as in the past 2-3 years, it is very unlikely that only 3-4 GW per year will be installed in the future. It must be taken into account that PV is partly	ENTSO-E adapted the projection of 340GW installed capacity for Vision 4 according to the feedback received from stakeholders in the ENTSO-E workshop on 2 July 2013. Vision 2 dataset was constructed under the assumption that policy objectives for year 2020 and the Roadmap 2050 are

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	developed by small, medium and large consumers that simply aim to decrease their electricity bills by producing their own electricity. As PV prices decline, in markets with high electricity prices it is more and more economically attractive to install PV to cover up part of the own electricity consumption. We propose to set as the lowest value for PV penetration 350 GW, which would correspond to around 10% of Europe's electricity consumption according to ENTSO-E 2011 hourly load values projected into 2030 in line with the European Commission Energy Trends 2030.	not met.
Photovoltaic projections in 2030 Visions	Assumptions for solar penetration in vision 3 (around 230 GW) are too pessimistic in our view. We believe that PV could realistically cover 15% of Europe's demand by 2030 (demand assumptions taken from ENTSO-E 2011 hourly load values projected into 2030 in line with the European Commission Energy Trends 2030). If PV installations were spread across Europe starting from areas where the consumption is the highest, to cover 15% of Europe's electricity demand by 2030 around 520 GW PV would be installed. Going beyond 15% is not challenging from a transmission grid perspective but rather from a financial (support and system integration measures) and a system operation (e.g. copying with steep ramps) points of view (see Energynautics paper attached). The question around reaching penetration levels of around 25% is when and not if. We acknowledge the difficulty in forecasting the spatial distribution of PV systems and would be happy to discuss with ENTSO-E and its members this matter.	ENTSO-E Vision 3 is a bottom-up "green" scenario, based on national views. The values provided are compatible with the National Renewable Energy Action Plans coming from Member States. The final RES penetration in the Vision 3 scenario is 49%, consistent with the 450ppm scenario from IEA WEO 2012 (48%).
ENTSO-E TYNDP scenarios assumptions	Scenarios, specially the 4th, do not, in our understanding, reflect reality. 93 euro CO2-price, strong green development and 106,26 TWh/a Consumption in Finland are clearly not any realistic combination. Simultaneous vast investments to production, especially at fossil condensing are just no-go for this scenario (also for the other scenarios) In accordance with our understanding; the scenario calculation has not succeeded. False outcome - misleads further work - weakens ENTSO-E/TSOs' credibility and	ENTSO-E acknowledges that the assumed CO2 price is very high. However it is still consistent with the IEA projections in the last WEO (2012). Vision 4 is a scenario to explore the extreme futures. The assumption of high CO2 price was the basis to enable a swap in the merit order curve between gas and hard coal. ENTSO-E Vision 4 Scenario demand is higher because of the additional increase of Electric Vehicles and heat pump penetration.

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	- can too easily be misunderstood/misused	ENTSO-E scenario construction methodology required each country to be self-sufficient in terms of peak capacity in Scenarios 1 and 3, which is the reason behind the increase of the condensing capacity. Such a future would likely require some form of capacity compensation in place. Scenarios 2 and 4 were derived from Scenarios 1 and 3, respectively, according to pre-set criteria consulted in the different 2030 Visions workshops. ENTSO-E recognizes that improving the methodology to 1) separate scenarios further apart from each other and 2) enhance internal consistency of the scenarios are areas of further development.
CCS harmonization projections in 2030 Visions	About CCS it is surprising that Germany does not have any data, being the largest producer of coal and an important producer of gas. Spain is testimonial and UK proposes significant amounts. It would be desirable to unify the methodology in all countries.	ENTSO-E agrees on the need to improve the methodology harmonisation of the four Visions for as many aspects as possible. In this regard ENTSO-E is looking forward to improve in the scenario building process with stakeholders in the Long Term Network Development Stakeholders Group framework. For TYNDP 2014, the data on generation capacities was based on the TSOs contribution, the CCS installation for Vision 4 was harmonised by adding CCS to the new hard coal and lignite units. The rest of the values provided were kept in Visions 1, 2, and 3, which explain the different views for different countries.
ENTSO-E TYNDP scenarios coherency checks	It should be explained if a coherence analysis of each vision has been developed. For example, is there enough flexibility to meet the intermittent energy?	Before market analyses are conducted for all visions, ENTSO-E performs range checks of the data provided, taking into consideration ramp rates, minimum stable generation, hydro energy constraints and pump storages. The market simulation results show that there could be dump energy in some countries for the high RES penetration scenarios.
Demand growth projections in	Spain proposes the highest growth in demand (vs. UK and Germany). According to current	For Vision 1 the data is provided by the Spanish TSO, compliant with

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2030 Visions	situation, these data seem excessive even in the pessimistic scenario.	scenario consistency checks
Demand growth projections in 2030 Visions	Spain proposes the highest growth in demand (vs. UK and Germany). According to current situation, these data seem excessive even in the pessimistic scenario.	Vision 2 is derived starting from the Vision 1 data, which in turn is provided by the TSOs. The amount of load management, EV and heat-pump penetration is added based on default values for all countries unless they are specified otherwise by the TSO.
Demand growth projections in 2030 Visions	Spain proposes the highest growth in demand (vs. UK and Germany). According to current situation, these data seem excessive even in the pessimistic scenario.	For Vision 3 the data is provided by the Spanish TSO, compliant with scenario consistency checks
Demand growth projections in 2030 Visions	Spain proposes the highest growth in demand (vs. UK and Germany). According to current situation, these data seem excessive even in the pessimistic scenario.	The ENTSO-E Vision 4 scenario is derived starting from the Vision 3 dataset, which is provided by the TSOs. The amount of load management, EV and heat-pump penetration is added based on default values for all countries unless they are specified otherwise by the specific TSO.
Photovoltaic projections in 2030 Visions	Solar growth of Spain is very high.	ENTSO-E recognises that the total PV installed capacity of 340GW is already very optimistic. The ENTSO-E Vision 4 is an extreme scenario with very high RES penetration. According to this assumption, the PV installed capacity for Vision 4 was increased following the stakeholders feedback received during the ENTSO-E workshop on 2 July 2013. The PV increase is distributed according to the capacity factor of the RES technology in each country.
Hydro projections in 2030 Visions	Hydraulic growth of Spain is very high.	The high increase in pump storage for Spain is calculated according to the ENTSO-E guidelines taking into account the storyline for Vision 4, i.e. increase in centralized storage

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Thermal capacities in Finland	The capacity figures for Finland in the vision scenarios seem somewhat unreliable and differ from our view for some parts: - Finnish coal-fired capacity is currently taking into account implemented and announced closures, approximately 2300 MW. A conservative estimate is that at least an additional 50% of this capacity is likely to exit by 2030, probably even more in the green scenarios. This is based on plant life times and available alternatives. 2500 MW and 2000 MW are very high figures. - The future of natural gas is more uncertain. However, gas will highly unlikely be base load in Finland, unless CHP for district heating and its power generation is considered base load. Using gas for balancing is also considered unlikely. The assumptions for increasing gas-fired power to 1700 MW in the "Green Transition" and "Green Revolution" are therefore over-estimating the role of gas. - Finland has wind power targets in place, a generation target translating to 2500 MW for 2020 and 3700 MW by 2025. Staying below 3000 MW in 2030 as estimated in visions 1 & 2 would therefore mean giving up current targets. On the other hand, the current decisions are already on track towards 4900 MW capacity presented in the green scenarios. A "Revolution" could assumedly ramp up wind power even higher above the current track.	Vision 1 and Vision 2 scenarios were constructed under the assumption that policy objectives for year 2020 and the Roadmap 2050 are not met. For the running hours of hard coal, it could also be a problem for some other countries; thus it would require some form of capacity mechanism in place. For the Vision 3 and Vision 4 scenarios, gas is supposed to get in front of hard coal in the merit order curve. Therefore gas is naturally replacing part of the base load. A simplified estimation of thermal power plants profitability was performed in the construction process of the two top-down scenarios, i.e. Vision 2 and Vision 4. Based on these estimations, the installed capacity of the non-profitable plants was reduced in a conservative manner in order to avoid system adequacy problems. Stakeholders' suggestions on potential methodology improvements are welcome for the next round of scenarios building (TYNDP 2016).
ENTSO-E TYNDP scenarios assumptions	Spanish data of EUR2020 scenario are very outdated due to RES forecasts have been reduced. These data should be updated.	The NREAP for Spain has not been updated. This is why the Spanish data have not been changed in the scenario EU2020
ENTSO-E TYNDP scenarios assumptions	Regarding ENTSO-Es TYNDP 2014-2030 scenario development the Danish Energy Association would like to emphasize some of the points put forward by ACER in the letter to ENTSO-E on this very subject dated 18 July 2013 One of ACERs key points is that Scenario "A" should be used to identify generation needs when looking into the difference between the Remaining Capacity and the Adequacy Reference Margin. In our view, scenario "B" is optimistic and we	ENTSO-E Visions goal is to evaluate grid development projects for different extreme scenarios. Predicting the long term future is difficult, so the objective of the visions for 2030 is to construct divergent scenarios that differ from each other, to capture a realistic range of possible futures. These different futures will result in different challenges for the grid. In this way, it allows the identification

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	support ACER's suggestion to shift to scenario "A" in the adequacy assessment. Furthermore, The Danish Energy Association has carried out analyses that show negative generation adequacy for a significant number of countries when using scenario "A". Since scenario "A" is considered more realistic and the result of using scenario "A" shows a very challenged generation adequacy for several countries, we urge both ENTSO-E and ACER to pay due consideration to this negative generation adequacy.	infrastructure needs, which should be flexible to cope with the different requirements. The Visions developed are deemed appropriate for this aim. This is reflected in the market simulation results, which take into account interconnections.
ENTSO-E TYNDP scenarios assumptions	The next TYNDP will be the first pan-European document of its kind, using "top-down" European scenarios for long-term grid development: it shows a promising evolution towards a European approach to infrastructure planning and development. The next TYNDP will be key in identifying and selecting the grid infrastructure projects necessary to deliver the EU's sustainability, affordability and security objectives and building a truly European electricity market. However, we believe the scenario building, modelling and data collection methodologies present certain limitations. Above all, all four scenarios are far from illustrating the completion of the European internal energy market. Even the top-down "Green Revolution" scenario (Vision 4) does not value the benefits of building an integrated European network, or assume renewables penetration and energy savings in line with the European Commission's energy and decarbonisation scenarios. We believe ENTSO-E and its regional groups best placed to demonstrate the value of strengthened institutional capacity and regional collaboration. Enhanced regional cooperation will be essential in effectively delivering on the EU's energy policy objectives. We encourage ENTSO-E and its regional groups to lead in developing ways to value resource sharing, at regional or European level, assess flexibility and core infrastructure needs. If not rectifiable, the shortcomings of the TYNDP 2014 must be clearly identified and laid out in the final publications in order for	Predicting the long term future is difficult, so the objective of the visions for 2030 is to construct divergent scenarios that differ from each other, to capture a realistic range of possible futures. These different futures will result in different challenges for the grid. In this way, it allows the identification infrastructure needs, which should be flexible to cope with the different necessities. The paths to 2030 are designed along two axes. The first defines the scope for reaching the EU commitment to achieve the 2050 Energy Roadmap. The aim is not to question the commitment, but to demonstrate the impact on the grid of a delay in this achievement. Two extremes result in different visions: in the first (Slow Progress), Europe faces a delay in the realisation of its 2020 goals and likely delays on the way to 2050. In the second (Money Rules), Europe is assumed not being on track to realise the 2050 objectives; The second axis defines the degree of European integration in achieving the EU objective. This can be within a strong European framework with a high degree of integration or a framework in which

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	decision-makers acting on the basis of this study do so knowingly, and to encourage further improvement of the methodology for the subsequent editions. Several oversights were caused by a lack of recognised data sources or models, but one can imagine this problem to be solvable by the time work starts on TYNDP 2016.	national policies lack a common European vision. The (Green Revolution) assumes a fully functioning Internal Energy Market, where market competition ensures efficient energy dispatch at the lowest possible cost at a European level. The (Green Transition) has less market integration and poor cross-border competition. Therefore, the assumptions for Vision 1 and Vision 2 are that some of the Roadmap 2050 targets won't be met. For Vision 3 and Vision 4 they are on track with the decarbonisation scenarios regarding indicators such as CO2 emission and RES penetration
ENTSO-E TYNDP scenarios assumptions	ENTSO-E does not put the proposed scenarios in perspective using a benchmark with alternative relevant scenarios. Providing a benchmark and comparing ENTSO-E's assumptions with other conventional ranges of reference scenarios, before defining the scope of possible scenarios, is essential for all involved parties in order: o to highlight the relevant singularities and potential inconsistencies of each scenario: o to assess the completeness of plausible futures delimited by the proposed scenarios. Furthermore, each scenario relies on some assumptions for key parameters (e.g. fuel prices) that should be clearly justified. Otherwise the different key parameters appear to result from a cherry-picking in different reference scenarios. Transparency and controllability regarding scenarios are indeed critical issues to ensure that all involved parties in the end share ENTSO-E's visions and the resulting decisions. Resulting from the first comment, the scenarios proposed by ENTSO-E would make future analyses rely on a limited vision of plausible futures. o ENTSO-E visions cover a restricted range of values for key parameters As an example, we consider that the ENTSO-E vision regarding the French consumption is limited to a reduced and low range of plausible futures (468 to 516 TWh in 2030) compared to a	The 2030 Visions were created based on the storyline to create 4 extreme scenarios, instead of starting off with a reference scenario. Predicting the long term future is difficult, so the objective of the visions for 2030 is to construct divergent scenarios that differ from each other, to capture a realistic range of possible futures. These different futures will result in different challenges for the grid. In this way, it allows the identification infrastructure needs, which should be flexible to cope with the different necessities. The paths to 2030 are designed along two axes. The first defines the scope for reaching the EU commitment to achieve the 2050 Energy Roadmap. The aim is not to question the commitment, but to demonstrate the impact on the grid of a delay in this achievement. Two extremes result in different visions: in the first (Slow Progress), Europe faces a delay in the realisation of its 2020 goals and likely delays on the way to 2050. In the second (Money Rules), Europe is assumed not being on track to

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national vision (source: RTE - Bilan provisionnel) considering a different range (468 to 590 TWh in 2030). On the contrary, for example, the UK consumption appears rather overestimated.
It is essential that ENTSO-E connects its scenarios to available national visions resulting from similar prospective analyses.
ENTSO-E visions cover a restricted and questionable combination of different key parameters
We consider in the first place that the four scenarios proposed by ENTSO-E do not provide a large enough vision of plausible futures. Furthermore, the different key parameters should have been crossed-over more completely. As an example, ENTSO-E considers a direct relationship between "(less favourable) economic and financial conditions" and "(low) CO2 prices and (high) primary energy prices", which appears questionable. In the same vein, the progress towards the 2050 objectives is always combined to healthy economic conditions.
Furthermore, many assumptions lack economic rationality. Indeed, it appears difficult to explain why, with a CO2 price at â‚¬ 93/t and gas at more than $ 10/But, visions 3 & 4 do not feature any new nuclear build.
Conversely, the assumption that commercial development of CCS starts when the CO2 price reaches â‚¬ 31 (visions 1 & 2) is hard to justify.
Besides, ENTSO-E has partly developed its visions with reference to "IAE 450ppm" vision, which IAE has since considered as out of scope.

We underline the importance of providing economic analyses, justifying the development of infrastructure under each scenario
The development of some specific technologies (e.g. combined gas turbines) cannot only be justified considering their technical ability to provide additional flexibility in relation to the development of RES. Generators, as any market participant, would not have any interest to invest and develop such projects if not profitable in the market. Consequently, ENTSOE's scenarios (especially relying on a strong market-oriented European integration) should be elaborated taking into account economic signals that will drive future investments.

realise the 2050 objectives;
The second axis defines the degree of European integration in achieving the EU objective.
This can be within a strong European framework with a high degree of integration or a framework in which national policies lack a common European vision.
The (Green Revolution) assumes a fully functioning Internal Energy Market, where market competition ensures efficient energy dispatch at the lowest possible cost at a European level.
The (Green Transition) has less market integration and poor cross-border competition.

ENTSO-E acknowledges the fact that the current methodology has room for improvement and strives in more actively involving stakeholders in defining the critical parameters.
The final values of these scenarios might not correspond to the best estimates from the national TSOs, because the important assumptions at ENTSO-E level might differ from those at the national level.

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Cost Benefit Analysis	We fully support the development of scenarios, but is particularly interested in the economic and financial aspects of this issue: how much will grid development cost and who will pay for it? We therefore insist these aspects are dealt with in the final development plan to be presented in June 2014.	ENTSO-E is taken into account this concern in the CBA for TYNDP
ENTSO-E TYNDP scenarios assumptions	CO2-prices in all scenarios are extremely high. Shouldn't there be a scenario with a lower CO2-price?	In the latest version of the IEA WEO the lowest CO2 price they assume for 2030 is 40 USD/ton. In comparison to our 31 EUR/ton this assumption on CO2 prices does not seem extremely high.
ENTSO-E TYNDP scenarios assumptions	We suggest adding a scenario 'business as usual' in order to have a reference for results of the present scenarios in the final TYNDP (costs, risks, ...).	The 2030 Visions were built based on a storyline so that 4 extreme scenarios can be used for transmission projects evaluation. ENTSO-E will take the suggestion into consideration during the planning phase of the next TYNDP

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