Discussing an inclusive transmission grid planning process

Learning Group Dimensions of the Grid

This paper was developed based on contributions from over 15 professionals from academia, NGOs and TSOs that were part of RGI's Learning Group on the Dimensions of the Grid[1]. The RGI secretariat[2] coordinated this process and contributions in drafting this paper.

The RGI secretariat would like to thank the Learning Group participants for sharing their views and providing feedback to the paper. The responsibility of the contents of this paper rests with the RGI secretariat as the contributing Learning Group participants (including RGI's members) have not necessarily committed or taken responsibility for the paper's content. More information on the Learning Group and its list of participants can be found in the Annex.

Section 1 details the aim and scope of this working paper; Section 2 explains the key terms used throughout this document; Section 3 deals with grid planning processes in Europe, current issues and policy considerations; Section 4 discusses stakeholder engagement and scenario development approaches; Section 5 provides generic suggestions for structuring the stakeholder participation within each grid planning phase; and Section 6 provides suggestions specific to ENTSO-E's TYNDP process.

[1] For more information, please visit: http://renewables-grid.eu/activities/learning-groups/dimensions-of-the-grid.html

[2] For more information, please contact: Andreas Reinhardt at andreas@renewables-grid.eu

[2] For more information, please contact: Andreas Reinhardt at andreas@renewables-grid.eu

Summary

Following the unbundling of the power sector, the need definition for new transmission grid infrastructure in Europe has been determined on the national level by the respective TSO's grid planning process, typically with a 10-year timeframe. Only recently grid planning has been implemented at the EU level, where through ENTSO-E's TYNDP a longer-term horizon (20 years) is being considered.

The process and outcomes of these established grid planning processes are often debated amongst civil society, academia, governments, regulators and industry; stakeholders primarily call for more transparent and participatory processes, while TSOs are faced with the challenge of developing scenarios 20 years ahead in an environment of diverging interests and uncertainties. However, developing scenarios for grid planning through multiple narratives, and essentially agreeing on a set of influencing factors and their interactions amongst a broad stakeholder group, provides benefits to the grid planning process through:

- increased transparency on how and which key developments are taken into account in scenario development
- better identification of robust future grid developments

Designing an inclusive grid planning process, aiming at proactive decision-making and consensus building, is vital for a timely and cost-effective grid development, needed for the transition to a renewables-based power sector in Europe. ENTSO-E's Ten Year Network Development Plan (TYNDP) is making steps in this direction as it is continuously improving through each iteration of the planning process by addressing stakeholders' concerns.

This paper discusses elements and principles of such inclusive grid planning processes and provides suggestions for realizing them. Drawing from these elements and principles, the table below was developed detailing observed[3] current key concerns and challenges of the TYNDP 2014 process and providing suggestions for overcoming them. The table below does not imply that all concerns mentioned are shared by every NGO, grid planner, etc, but they are rather indicative.

Stakeholder concerns	TYNDP 2014	Suggestions
Limited stakeholder participation	Participation mainly from Brussels-based industry and associations	To assign representatives for each stakeholder interest group and formalize their role recognizing their participation as an integral part of the grid planning process To ensure[4] adequate financial support is provided by an EU instrument for NGOs and academia (or other resource

[3] Observed via bilateral discussions with stakeholders and participation in relevant workshops related to the TYNDP 2104

[4] This suggestion is not relevant for ENTSO-E to adopt but it is mentioned as it can provide benefits to the grid planning process

		constrained organizations) travelling and/or operational expenses
Scenarios do not fully reflect key stakeholders' views of the power sector's evolution	Comments from industry and NGOs	To define scenarios, their assumptions and input parameter data collaboratively with selected relevant stakeholders from the outset of the scenario development process To consult with stakeholders and agree on publishable relevant data available online illustrating the values selected with their respective justifications
Data quality and transparency	Concern among stakeholders about the quality of the assumptions and methods used in producing the grid planning outcomes	
Lack of transparency on the decision making process and intermediate steps	Stakeholders not confident they could contribute effectively in the process / Lack of communication between grid planners and stakeholders on their role and responsibilities	To consult with stakeholders from the outset on a draft plan of the process, the format of participation, what type of input is required and how it will be considered To publish online a workplan of the grid planning process detailing its different elements and the respective stakeholder interaction points
Ineffective stakeholder participation		

1. Aim and Scope

Through RGI's European Grid Declarations[5] on:

i) Electricity Network Development and Nature Conservation in Europe [1]
ii) Transparency and Public Participation [2],

RGI members and other signatory parties agreed on a set of priorities, principles and initiatives related to grid development, amongst them:

- Developing credible scenarios and grid planning in line with long-term EU commitments and relevant energy and climate targets
- Planning and development of transmission systems need to anticipate the integration of increasing shares of variable renewable energy sources
- The need for new infrastructure development should be determined through consistent, coherent and transparent planning processes and methodologies
- Stakeholders should have access to all relevant information that they need to form and express their views through dialogue and participation as well as formal consultation processes at a point in time when their input can still be taken into account

Both the stakeholder engagement process and scenario development methods are key in delivering the above principles, and thus contribute to define the need for new grid infrastructure. Thus, this paper aims at providing suggestions for stakeholder engagement in all phases of a grid planning process, with a focus on scenario development, in order to contribute to the question of how a grid planning process could be structured to deliver more robust results about grid infrastructure requirements whilst enjoying broad stakeholder support. The recommendations are targeted for the EU level while remaining generic enough to be considered in national grid planning processes.

2. Terminology

Throughout this document the following terms and acronyms are used:

Terms

Influencing factors: elements that can impact grid planning outcomes (e.g. level of renewable electricity penetration, energy efficiency improvements)

Assumptions: they are the basis upon which the influencing factors are quantified (e.g. 70% renewable electricity generation, 10% energy efficiency improvements)

Input parameters: (usually) exogenous (not a model result) parameters that are used in grid modelling with regards to generation, demand and grids. They are derived from the influencing factors of scenarios and their assumptions quantifying them

[5] The European Grid Declaration outlines principles for a renewables grid for Europe that is built in a participatory and transparent manner in line with nature conservation objectives. It was signed by a number of NGOs, TSOs, non-profits and associations, across Europe

Narrative: a story motivating the assumptions defined for each influencing factor (e.g. 70% for renewable electricity generation is selected because it represents an expectation of high penetration). A narrative provides the reasoning with causal attributions and also dictates how particular developments could be incentivized/implemented

Scenario: a coherent set of individual influencing factors and their defining assumptions that are used as an input to a quantitative market/grid modelling exercise. Each scenario has a small number of drivers around which the narratives are build (e.g. high renewables and European focus)

Market model: software tool that determines the utilization of electricity generation units dependent upon the demand of the region under analysis

Grid model: software tool that replicates the electricity grid of the region of analysis (various types of models exist that each serve different purposes, i.e. provide different output variables and rely on different input parameters). Its solution is the new grid infrastructure required to meet the generation and demand levels

Output variables: endogenous results delivered by the model, i.e. its solution. Their value is usually derived either by optimization or simulation procedures. The resulting value depends on the input parameters as well as structural assumption on how the model is formulated

Stakeholders: where not specified, representatives from civil society, academia, industry and any other stakeholder group that has an interest in participating in a grid planning process

Planning Phases

Grid planning process: national, regional or European process through which the grid development plan over the next 10-20 years is determined (long-term focus)

Preparation phase: During this phase the design and planning of the process takes place

Scenario definition/framework phase: During this phase the influencing factors and their assumptions that are used in defining the scenarios, in parallel with data collection, are determined

Market/Grid modelling phase: During this phase, the scenarios, influencing factors and their assumptions are translated into input parameters and data to be used for market/grid modelling. Following the results of the modelling exercises, a cost-benefit analysis is conducted on the new transmission lines

Results phase: During this phase, the grid planning outcomes are available and any last changes are being implemented

Strategic Environmental Assessment (SEA)/Spatial planning phase: During this phase, the grid planning outcomes are subject to SEAs and spatial planning

Acronyms

ENTSO-E: the European Network of Transmission System Operators for Electricity represents all TSOs in the EU and others connected to their networks and deals with their technical and market issues

TSO: Transmission System Operator

TYNDP: Ten Year Network Development Plan published by ENTSO-E

3. Grid planning in Europe

Generic grid planning process

Current national grid planning processes in Europe can generally be grouped under 3 phases; i) scenario definition/framework, ii) market/grid modelling, iii) results. A Strategic Environmental Assessment (SEA) phase could take place in parallel with the grid planning process.

Figure 1 below provides a generic exemplified graphical view of the technical and governance elements of a generic grid planning process and their interactions:

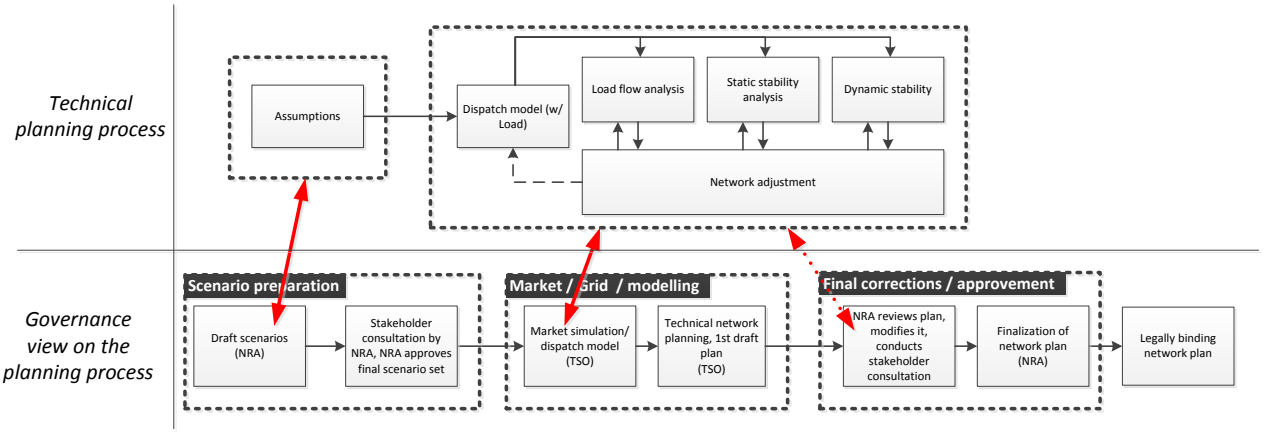

Figure 1: Generic and exemplified technical planning elements and governance view of the planning process (available in the Annex II in higher resolution) [3]

Stakeholders are typically consulted during or right after the drafting of scenarios (scenario definition phase), after the first modelling results are available (market/grid modelling phase) and before the finalization of the grid plan (results phase). The level and frequency of stakeholder participation can vary between the various national and European grid planning processes. Likewise, depending on the specific characteristics of each grid planning process, building blocks can be partially different. For the example of scenario preparation, TSOs can also be responsible for drafting scenarios with or without the support of external grid experts and/or the regulatory authority.

Challenges and stakeholder concerns[6]

TSOs are faced with the difficulty of planning in an environment where generation investments are decoupled by network investments. The need of new transmission lines is often less evident, which often could lead to diminished stakeholder support from industry and civil society. Hence, the need

[6] The challenges described here are indicative and do not imply that every grid planning process faces all of them

definition process and outcomes of the newly established grid planning processes are often debated by civil society, academia and industry. Stakeholder concerns are often related to how they participate in the planning process, in particular:

Insufficient stakeholder participation from various interest groups

Participation in public consultations could be either limited or not broad enough to reflect the expertise required to provide meaningful input. In the case of NGOs and academic experts, this could be mainly attributed to the limited staff and financial capacity to respond to such participation requests.

Lack of transparency and awareness of the decision making process and intermediate steps

Stakeholders are sometimes not well informed of the decision making process of each phase and the intermediate steps between the points of stakeholder involvement.

Ineffective stakeholder participation

Stakeholders may consider their participation ineffective in cases where there are:

- Limited opportunities for stakeholder involvement or lack of awareness
- Insufficient information and data exchange prior to the stakeholder involvement point
- Lack of clarity on the purpose of the consultation
- Limited (or unknown) impact/influence that stakeholder input can have in shaping grid planning outcomes
- Stakeholders are not involved at appropriate stages of the process

Scenarios do not reflect key stakeholders' interests

TSOs are often legally required to follow certain provisions when developing scenarios that will be considered in the modelling exercises. This scenario framework sometimes does not capture a range of power system evolution paths that are shared by the various stakeholder groups, resulting in criticism of their assumptions and methods in developing scenarios.

Disconnect between energy policy and grid planning

The long-term nature of grid planning often appears separated from energy policy and regulations; they are often more short-term focused and/or contain an element of uncertainty. Adding to this separation are the often conflicting and diverging interests of stakeholders from industry, civil society and governments.

Data quality and transparency concerns

Stakeholders are concerned with the quality of the assumptions surrounding key future data, as TSOs may not have the best available source of information and knowledge to estimate them. These concerns are further intensified due to the perceived lack of transparency on some of these figures that further creates doubts about the quality of the outcomes.

4. Discussing stakeholder engagement & scenario development

Stakeholder engagement

When designing multi-stakeholder participatory exercises, as in the case of engaging stakeholders in grid planning processes, key starting considerations typically revolve around the questions of:

- What is the purpose of the stakeholder involvement?
- What should be the format of the stakeholder involvement?
- Who (stakeholders) should be included in the process?
- What (e.g. scenarios, data) should be consulted in the process?
- By which means and rules should stakeholders provide their input?
- How are conflicting stakeholder opinions/interests dealt with?

A number of key principles should be adhered to by the grid planners and regulator when designing such participatory exercises, including [4]:

Stakeholders

- Identify and involve representatives of all relevant key stakeholder groups
- Stakeholders should contribute to the areas they feel competent

Establishing a framework

- Generate a common understanding about the problem, its potential solutions and consequences from the outset of the process
- Develop a clear framework of an engagement process
- Establish dialogue with the different stakeholder groups on:
    - how stakeholders could influence the process
    - what the decision making procedure is and what the expected outcomes of each stage of the process

Decision-making

- Conduct a transparent forum for decision-making that provides equal and fair opportunities to all parties to voice their opinion and preferences and empower them to participate actively and constructively
- Address all arguments
- Collect recent evidence
- Include practical knowledge and expertise

Such a transparent and inclusive collaborative multi-stakeholder approach has been developed recently in California's state-wide Renewable Energy Transmission Initiative (RETI). In RETI, every participating stakeholder had to commit to the procedure by agreeing not to act against the process and support the final decision of the process in public. RETI was conducted to identify future transmission projects, contribute to corridor selection, and ultimately support energy policy. The initiative included initially all renewables generation zones and ranked them in order to identify the required grid projects. The benefits

of such an open, transparent and inclusive process were mainly illustrated through the effective identification of grid priorities and the build-up of stakeholder support for them, which led to certainty for investing in the identified grid projects [5].

Stakeholder groups

The quality of the grid planning process and its assumptions can benefit from the systematic inclusion and participation of expert stakeholders from academia/technical consultancies[7], civil society, governmental organizations and industry as each ones' expertise and role could contribute to the grid planning process in a complementary fashion.

Stakeholder group	Role	
	In the societal context	In a grid planning process
Academia, representing the interests of their respective field	To accumulate knowledge and research, and provide new insights and viewpoints on their respective field	To provide scientific expertise on their respective topic
Industry[8], representing the interests of their respective products and services	To produce a for-profit product or service within an economy	To ensure that model-based calculations and theoretical argumentations reflect market and technological expectations
Civil society, representing the interests of citizens	To express their opinions and arguments based on ethical, cultural, environmental, political, scientific, religious or philanthropic considerations	To ensure that the process is inclusive of environmental and other considerations, and respects the public's interests in a transparent and participatory manner
Governmental organizations[9], representing the interests of the government	To establish the regulatory framework of markets and controlling/intervening when necessary	To ensure that grid planning approaches are in line with policy objectives and respective regulations

Scenario development

Often due to the short-term nature of political decision-making, grid planners are faced with many uncertainties while lacking knowledge that they used to have pre-liberalization (e.g. on temporal and spatial generation and demand patterns). This makes the necessity of developing robust scenarios aiming at proactive decision-making and consensus building [6] a key prerequisite for a timely and cost-effective grid development needed for the transition to a renewables-based power sector in Europe.

[7] In a grid planning context, technical consultancies are assumed to serve a similar expert role as academic grid experts
[8] Including associations, utilities, manufacturers, project developers, investors
[9] Including regulators

Scenarios analyze the evolution of energy systems and offering a contextual description of how the present could evolve and identify a set of possible long-term futures. They are often identified in literature as descriptive or normative scenarios [7]. Descriptive scenarios use quantitative models to explore the likely evolution from current trends without a predetermined outcome (i.e. simulation approaches such as forecasts), while normative scenarios are elaborations of desirable futures including how to reach them (optimization approaches such as visions, back-casting, roadmaps that have inherent outcomes in their scenarios).

Descriptive scenarios can be used to identify the implications of certain policy choices but as the timeframe of the scenario increases (>20 years) the quality of the outcomes becomes more debatable. On the other hand, normative approaches are not predictions and are more suited for longer-term horizons where there is an agreement of different options of how the future should look like. The combination of offering more than one future is materialized through multiple narratives, which explain the reasoning behind future developments recognizing that the power sector and its grid infrastructure will eventually be determined through a combination of influencing factors affected by social, techno-economic, environmental and policy developments. Developing scenarios through multiple narratives, and essentially agreeing on a set of influencing factors and their interactions, can provide benefits to the grid planning process through:

- increased transparency on how and which key developments are taken into account in scenario development
- better identification of robust future grid developments reduced dependence on specific policy developments

It is preferable to keep these influencing factors to a relatively low number so that the complexity and time requirements of the entire process remain manageable. In order to select those factors that are thought to be the most influential in future developments, the scenario development process should investigate their importance and certainty, in relation to their interactions with one another.

Current grid studies

Over the past decade, a number of grid studies are attempting to provide insights with regards to the future grid infrastructure in Europe, in view of the unbundling of the power sector, increasing needs for cross-border connectivity and increasing penetration of renewable generation. These studies typically identify and describe a number of influencing factors that are used in generating scenarios and their respective grid infrastructures. In the case of TSO studies, the objectives of grid planning[10] need to be met while dealing with the aforementioned complexities and uncertainties. Typically grid studies' time horizons, including national grid planning processes, are 10 to 20 years. Today, the number and type of scenarios varies, ranging up to ±10, and they typically consist of either a single varying influencing factor or a combination of factors in line with the scenario's narrative. In some national grid planning cases, most influencing factors are assigned by TSOs to fix input parameters' values based on a few likely evolutions of each scenario's key driver (i.e. "baseline", "low"/"high" value of key scenario driver).

[10] Traditionally, the objective of grid planning has been the identification of new transmission lines required to cope with future generation and demand needs while maintaining reliability requirements in the most cost-efficient manner possible

Influencing factors

The table below lists key influencing factors that could be considered when developing scenarios and their related grid/market modelling input/output variables. Depending on the political and technical environment these factors can be differentiated and adapted according to the EU, regional or Member State level.

Each influencing factor could be assessed and classified according to their importance and certainty:

- Important and likely development → consider influencing factor as a fixed assumption depending on each scenario narrative
- Important and unlikely development → consider influencing factor as a variable assumption depending on each scenario narrative
- Unimportant and likely development → consider using influencing factor at a later stage

Uncertain developments could be further classified according to:

- Developments that can be influenced by power sector stakeholders if they choose to do so (i.e. controllable)
- Developments that are beyond the control of any power sector stakeholder (i.e. uncontrollable)

Key influencing factors	Input/Output parameters for market/grid modelling
Fuel costs	Operating expenses
CO_2 prices	
Fuel independency	Electricity imports
Technology maturity & upscalability	Capital expenses of generation, storage, grid, demand side management technologies
R&D development	
Electrification of heat and transport sector	Temporal and spatial demand level
Demographic change	
GDP growth	
Energy efficiency	
Demand response (including EV and heat pump use)	
Centralized/Decentralized renewables and storage development	Generation technologies temporal and spatial penetration levels, smart grid operation
Backup/flexible generation sources development	
ICT/Smart grids development	

Nuclear development	
Coal/Gas development	
Acceptability towards generation technologies and grids	Timing and likelihood of successful development of new technologies
Consumer behaviour	
Economic framework / Financial capabilities / Market design	
Permitting framework	

Constructing scenarios

Scenario narratives could be defined through an extensive analysis of all possible combinations of the classified influencing factors and their interactions, in order to result to a manageable number of scenarios with their respective key drivers. Alternatively, key drivers could be defined from the outset through structured quadrants (or more dimensions), as for example:

- variable renewables vs baseload generation
- national vs European focus
- market vs regulated environment
- centralized vs decentralized generation

Such an exercise of scenario definition could be considered at the EU level collaboratively with stakeholders to ensure at first a jointly developed approach and to avoid the development of a large number of diverse sets of scenarios across Europe. Subsequent adaptations at the regional level can ensure the consideration of regional/national heterogeneities.

Recent examples

Quadrant structures have been utilized in ENTSO-E's TYNDP, the EU project SUSPlan [8] and in some national planning processes. Alternatively, in the e-Highway2050 [9] project and in a recent study by the Agora Energiewende [10] a more exhaustive analysis of the influencing factors was conducted where all their combinations were taken into consideration investigating the influence factors have on one another, prior to identifying a small number of scenarios.

5. Suggestions for improvement

Within the context of involving stakeholders throughout a grid planning process, the aforementioned considerations can be condensed to a number of suggestions that should be addressed. It is assumed that the TSO and/or the relevant regulatory and governmental authority is in charge of the grid planning process and tasked with addressing its challenges.

5.1 Governance

1. The TSO, in collaboration with the relevant regulator and ministry, to create a small stakeholder group (e.g. ±20, in the form of a Stakeholders/Citizens Council). Such a stakeholder group could consist of representatives from industry and consumer associations, experts from academia/technical consultancies, and civil society organizations in order to ensure that all interests are represented. Representatives would be tasked to coordinate with stakeholders of similar interests and represent them in the group (e.g. wind association on behalf of all wind industry stakeholders). Regulators and relevant governmental authorities can monitor and participate from an observatory role ensuring that energy policy objectives and regulations are adequately taken into account. Such a group's core mandate should be to participate in the preparation of scenarios and co-develop with the grid planner their narratives and respective influencing factors through a series of mini-workshops.

5.2 Participation/Consultation

1. Seek external expertise in designing energy planning participatory processes for:
   - designing and moderating the various points of stakeholder involvement, in particular where decisions are taken collaboratively
   - monitoring the overall stakeholder engagement process in order to assure that any lessons learned from its implementation are incorporated in the planning process
2. Identification, with the support of the aforementioned stakeholder group (5.1.1), and preparation of comprehensive mailing list of stakeholders from industry, environmental NGOs and civil society, external grid experts, regulators, relevant ministries at the beginning of the planning process and keeping them informed and invited throughout the different stages of the planning process.
3. Participation processes should be based on open, highly transparent dialogue and with a clearly defined goal (e.g. to inform, to consult, to generate joint decisions).
4. Ensuring that both external stakeholders and TSOs learn and benefit from each stakeholder interaction by performing consultations with a sufficient level of time flexibility to react and implement suggestions.
5. Ensuring that the relevant stakeholders have the capacity and expertise to participate in each planning phase (e.g. through financial support from EU institutions)[11].
6. Ensuring that the teams drafting the scenarios and those conducting the stakeholder participation are in close cooperation and communication to assure that input given by stakeholders is useful and being used in the drafting of scenarios in a fair and objective manner.

5.3 Information/Data

1. Prior to the beginning of a grid planning process, there are a number of materials that can contribute to the better understanding and transparency of the process. Stakeholders can become more actively involved when provided with documentation detailing:
   - how the stakeholders' input will be taken into consideration in the process, its limits, what it could result to, and explanations when not implemented
   - the overall decision making processes and governance

[11] This suggestion would not be addressed by the grid planner but it is mentioned here as it can provide benefits to the grid planning process

- the intermediate steps of the process
- descriptions of the models and their capabilities

2. Accompanying consultations with relevant sufficient information/data and clear guidance to participants on how answers could be structured (e.g. by giving examples).
3. Provide access to sufficient relevant scenario input data to allow for external stakeholders to model and reproduce grid planning outcomes.

5.4 Environmental considerations

1. Conducting Strategic Environmental Assessments (SEAs) on all grid planning scenarios in a timely fashion and with close cooperation with the TSO in order to allow for addressing and including its findings on spatial considerations within grid planning outcomes.

5.5 Communication

1. The public should be kept informed of the goals, participants and developments of each participation process.
2. Disseminating results with the support of communication specialists (e.g. develop material for non-experts, enhance website section with information on scenarios, methods, intermediate steps, results).

The aforementioned suggestions are detailed in the next page's table for each grid planning phase with respect to the purpose of each stakeholder interaction, the desired stakeholder participation and their role, mode of engagement, and required material that should be available prior to involving of the stakeholders. Ensuing on the following page, a graphical representation of the process is depicted.

Planning Phase	Desired stakeholder participation	Engagement content & mode	Purpose	Information material provided / Stakeholder input required
Preparation	Any interested stakeholder from industry, civil society, academia, governments	Introductory workshop on grid/market modelling	To improve the stakeholders' understanding of modelling requirements, capabilities and limits	Description of the tools that will be used in market/grid modelling
		Consultation on the stakeholders' and TSOs' wishlists detailing expectations of the process	To improve the understanding of both the TSOs and stakeholders needs and challenges	Pre-formulated questionnaires on the various elements of the grid planning process and methods, individual suggestions/expectations/ requirements
		Consultation on transparency measures	To improve the transparency of the grid planning process by implementing the stakeholders' suggestions	Report on transparency measures currently implemented and request for feedback
		Workshop on reviewing the implementation of the previous grid planning process and consulting the planning of the next one	To provide insights on how the process could be improved and present the results of the implementation phase	- Monitoring/Review report - Draft workplan of the grid planning process detailing its different elements and their respective stakeholder interaction points
Scenario Definition	Representatives from industry, civil society, regulators, relevant governmental authorities (e.g. in the form of a Stakeholders/Citizens Council)	Workshop and consultation to: - identify, evaluate, select and classify a set of influencing factors according to their importance and certainty - define scenario narratives and the assumptions of each selected influencing factor	To develop scenarios that are accepted by a broad stakeholder group	Extensive set of data on influencing factors and of their interactions available through an online portal
		Workshop and consultation on input parameters' value selection	To ensure data used in grid planning are of high quality representing the best current available	Dataset of preliminary input parameter values with reference to their source

			knowledge	
	Any interested stakeholder from industry, civil society, academia, governments	Final workshop on scenarios	To finalize the scenarios and data to be used in market/grid modelling	Description of scenario narratives, influencing factors and assumptions including justifications on what was not considered, information on who has contributed to the process
Market/Grid Modelling	Grid experts from academia and technical consultancies	Workshop and consultation on translating scenarios and assumptions into input parameters and methods for grid/market modelling	To consolidate and agree upon the modelling approaches, providing assurance on methods used and improving the credibility of results	Description and questionnaire on methods and data used (e.g. on optimizing interconnector capacities, demand/renewable distributions, technology cost projections)
	Representatives from industry, civil society, regulators, relevant governmental authorities (e.g. in the form of a Stakeholders/Citizens Council)	Workshop and consultation on preliminary market modelling results	To provide preliminary results and seek the stakeholder's feedback	Preliminary data set of market modelling results relevant for decision makers and modelling experts
		Workshop and consultation on preliminary grid modelling results and on the Strategic Environmental Assessment (SEA)	To provide feedback on preliminary grid modelling results, and to provide environmental expertise on the SEA's scope and outcomes	- Preliminary data set of grid modelling results - Documented environmental impact of each analysed scenario's grid outcome and suggested alternatives, if necessary
Final Grid Development Plan	Any interested stakeholder from industry, civil society, academia, governments	Final workshop	To present the final draft outcomes of the grid planning process	Draft technical and policy-relevant report, information on who has contributed to the process
	Any interested regional and local stakeholder	Regional workshops	To present grid planning and SEA outcomes for each region, explain their importance and discuss potential compensation methods, if necessary	Technical and policy-relevant report, SEA regional reports

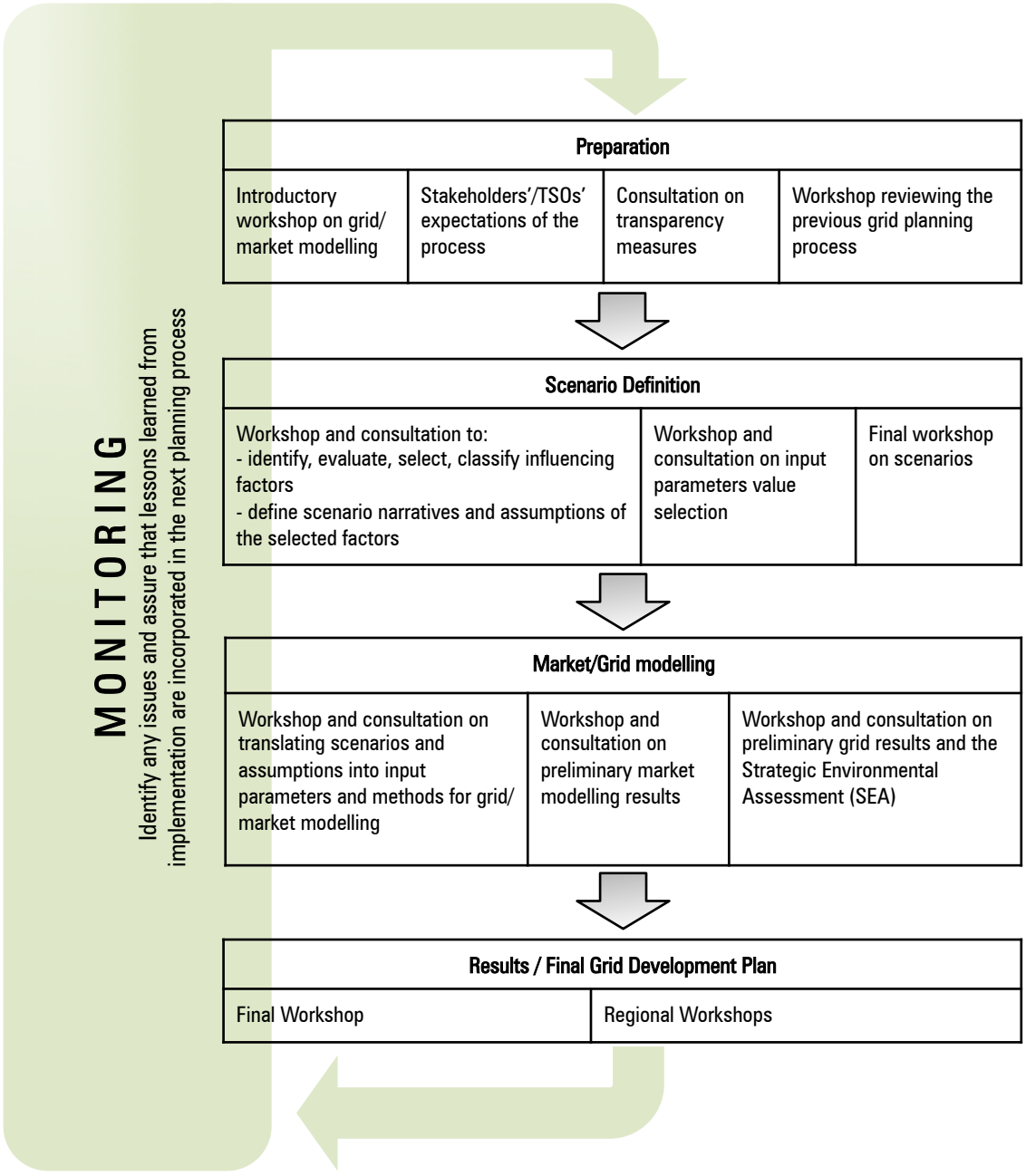

Figure 2: Stakeholder engagement opportunities for each grid planning phase

6. Suggestions specific to EU level planning

ENTSO-E is already engaged on a number of consultations and interactions with stakeholders during the 2-year TYNDP period, which are directly or indirectly related to grid planning outcomes. Besides a consultation on the final draft of the TYNDP 2014 package, there were 3 consultation opportunities accompanied by 4 public workshops and relevant presentations on the methods and assumptions with regards to the 2030 Visions that form the basis for the development and modelling of the TYNDP scenarios.

Key stakeholder concerns, observed via bilateral discussions with stakeholders and participation in relevant meetings related to TYNDP 2104, included:

- Limited stakeholder participation, coming primarily from Brussels-based industry and NGOs
- Scenarios do not fully reflect key stakeholders' view of the power sector's evolution
- Doubts among stakeholders about data quality and transparency with regards to the assumptions and methods used in producing the grid planning outcomes
- Stakeholders not confident they could contribute effectively in the process

The table below compares the current ENTSO-E TYNDP stakeholder engagement practice and provides suggestions for improving them, in comparison with the suggestions provided in the previous section.

Planning phase	Engagement content & mode	TYNDP 2014 status quo	Suggestions
Preparation	Introductory workshop on grid/market modelling Consultation on the stakeholders' and TSOs' wish-lists detailing expectations of the process	No explicit activity was planned	To organize a consultation on the "wish-lists" and a 1-day workshop addressing the consultation's responses and the capabilities of the grid/market models
	Consultation on transparency measures	No explicit activity was planned – Stakeholders could voice their suggestions in one of the TYNDP stakeholder workshops	To organize a consultation on transparency measures To organize a 1-day workshop to: - address the transparency consultation's responses and the lessons learned from the implementation of the previous planning process - consult with stakeholders from the outset on a draft plan of the process, what type of input is required and how it will be considered
	Workshop on reviewing the implementation of the previous grid planning process and consulting the planning of the next one	No explicit activity was planned that involved and informed the stakeholders	
Scenario Definition	Workshop and consultation to: - identify, evaluate, select and classify a set of influencing factors according to their importance and certainty - define scenario narratives and the assumptions of the selected influencing factors for each of them	Stakeholders were not explicitly involved in the scenario definition phase and could provide their input only at a later stage when the possibility to influence scenarios was considered limited	- To assign representatives for each stakeholder interest group and formalize their role recognizing their participation as an integral part of the grid planning process - To define scenarios, their assumptions and input parameter data collaboratively with selected relevant stakeholders from the outset of the scenario development process
	Workshop and consultation on input parameters' value selection	Questionnaire on setting the boundary conditions with respect to key input parameters (e.g. generation capacities, demand level), accompanied with a public workshop	To consult with stakeholders on publishable relevant data, available online illustrating values selected with their respective justifications
	Final workshop on scenarios	Workshops were conducted throughout the process of presenting the scenarios, assumptions and data considered	To organize a workshop to present the scenario narratives, influencing factors and assumptions including justifications on what was not considered, and information on who has contributed to the process
Market/Grid Modelling	Workshop and consultation on translating scenarios and	Questionnaire to refine modelling methods (e.g.	To ensure that grid experts from academia, technical consultancies,

	assumptions into input parameters and methods for market/grid modelling	optimizing interconnector capacities, optimizing hydro/fossil generation, adequacy calculation methods), accompanied by a public workshop	industry participate to the consultation
	Workshop and consultation on the preliminary market modelling results	Web-based consultation requesting comments on the first market modelling results and accompanying scenario data	-
	Workshop and consultation on the preliminary grid modelling results and the Strategic Environmental Assessment (SEA)	There is no SEA for the TYNDP and grid modelling results are presented at the end of the process	To consider on a trial basis to conduct regional SEAs within each Regional Group, also allowing stakeholders to provide feedback on preliminary grid modelling results
Final Grid Development Plan	Final workshop	Workshop on the final TYNDP draft	-
	Regional workshops	Regional workshops conducted towards the end of the TYNDP process	To ensure that relevant regional stakeholders are invited and informed in advance

References

[1] "European Grid Declaration on Electricity Network Development and Nature Conservation in Europe", Renewables-Grid-Initiative (RGI), 2011

[2] "European Grid Declaration on Transparency and Public Participation", Renewables-Grid-Initiative (RGI), 2012

[3] "Long-term Power System Planning in the Context of Changing Policy Objectives – Conceptual Issues and Selected Evidence from Europe", Weber, A., Beckers, T., Behr, P., Bieschke, N., Fehner, S., von Hirschhausen, C., WIP TU Berlin, 2013

[4] "Inclusive Risk Governance: Concepts and Application to Environmental Policy Making", Renn, O., Schweizer, P., Environmental Policy and Governance, Institute of Social Sciences, University of Stuttgart, 2009

[5] Renewable Energy Transmission Initiative (RETI), US California

[6] "The structure of uncertainty in future low carbon pathways", Hughes, N., Strachan, N., Gross, R., Energy Policy, 2012

[7] "Forecasts, scenarios, visions, back-casts and roadmaps to the hydrogen economy: A review of the hydrogen futures literature", McDowall, W., Eames, M., Energy Policy 34, 2006

[8] "Development of regional and pan-European guidelines for more efficient integration of renewable energy into future infrastructure", SUSPlan, 2009

[9] "The selection of energy scenarios for the e-Highway2050 project", e-Highway2050, 2013

[10] "Ein robustes Stromnetz für die Zukunft: Methodenvorschlag zur Planung – Kurzfassung einer Studie von Bet Aachen", Agora Energiewende, 2013

Annex I: Learning Group participants

In 2013, RGI has initiated a new format, called "Learning Groups". Learning Groups consist of both RGI's TSO and NGO participants, and handpicked external stakeholders from different backgrounds (civil society, industry, academia, governmental). The Learning Groups serve the triple purpose of:

- Identifying open questions that require attention
- Learning from each other and sharing experiences, thus helping in disseminating best practices
- Developing new approaches and solutions that can be applied to concrete grid development projects

The Learning Group "Dimensions of the Grid" aims to address and contribute to finding solutions through participatory and transparent approaches for challenges that accompany grid planning processes. The RGI secretariat would like to thank the following Learning Group participants for providing their input by responding to the questionnaires and/or providing feedback to the paper:

Alexander Weber, Workgroup for Infrastructure Policy (WIP), Technische Universität Berlin

Anser A Shakoor, Pöyry Management Consulting (UK)

Björn Bakken, Sintef

Björn Fleischer, Jan-Hendrik Kamlage, European Institute for Public Participation (EIPP)

Daniel Fraile Montoro, Climate Action Network-Europe (CAN-Europe)

Eva Schmid, Potsdam Institute for Climate Impact Research (PIK)

Fabian Georges, Elia

Gianluigi Migliavacca, Ricerca Sistema Energetico (RSE)

Ivan Scrase, Royal Society for the Protection of Birds (RSPB)

Jeroen Bremmer, Natuur&Milieu

Lars Waldman, Agora Energiewende

Marius Strecker, TenneT GER

Phil Baker, University of Exeter

Reinhard Stornowski, 50Hertz

Sara Lumbreras, Institute for Research and Technology, Universidad Pontificia Comillas

Yannick Jacquemart, Reseau de Transport d'Electricite (RTE)

Annex II: Building blocks of a generic grid planning process