



Minutes of Expert Workshops on electricity market design options in 2020 and post 2020 frameworks

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List of partners in Market4RES project

- 01 SINTEF
- 02 EWEA
- 03 EEG
- 04 SOLARPOWER EUROPE
- 05 3E
- 05 TECHNOFI
- 06 IIT-COMILLAS
- 07 RTE
- 08 IBERDROLA
- 09 APX
- 10 FOSG

List of abbreviations

CHP	Combined Heat and Power
DA	Day-Ahead
DR	Demand Response
ENTSO-E	European Network of Transmission System Operators for electricity
FiT	Feed-in-Tariff
ID	Intra-Day
PV	Photovoltaic
RES	Renewable Energy Sources
RES-E	Renewable Energy Sources for electricity



1 Preliminary information

1.1 Venue

Venue: Aloft Brussels Schuman, Place Jean Rey 3, 1040 Brussels, BE

Date: 22.05.2015

1.2 Invitation to the Workshop

The workshop “Electricity market design options in 2020 and post 2020 frameworks” was jointly organized by WP4 and WP5 and the following common invitation was sent out.

1.2.1 Objectives of the workshop

The Market4RES consortium is pleased to invite EU-28 Transmission System Operators, European regulators, policy makers, and other relevant stakeholders to our one-day event where we will:

- Validate the specifications of the studies about electricity market design options within the 2015-2020 period. Our analyses run on the [OPTIMATE](#) numerical simulation platform, and focus on the effects of RES support schemes and demand flexibility.
- Discuss the market based mechanisms to integrate high levels of renewables while assuring security of supply in the post 2020 period.

1.2.2 About Market4RES

Market4RES is a collaborative Research and Demonstration project co-funded by the European Commission (DG Energy) under the 7th Framework Programme for Research and Technological Development. The project, coordinated by Sintef, aims at investigating the potential evolution of the EU Target Model in order to secure the European power system decarbonisation with large amounts of renewable energy sources (RES).

In this context, Market4RES WP4 activities aim to quantify the impacts of the studied market design options, assuming as an input the generation fleet expected for 2020. In the framework provided by the current European Target Model, the impacts of different RES support schemes as well as different demand flexibility levels will be assessed. The benefits of the studied options will be quantified and compared based on the developed methodology using the OPTIMATE prototype simulation platform, which allows for the analysis of various market design options within a model of the western European power market.

Financing the transition to a renewables based electricity mix through support mechanisms is not only unsustainable, but it also introduces severe market distortions and compromises the security of supply. An effective market design should provide sufficient investment signals to accommodate a high share of renewables while achieving the required level of security of supply. Which market design can be effective in achieving these two EU energy policy goals given a high RES energy mix and a market increasingly dominated by fixed costs? Work package 5 of the project will test current



and innovative market design options and provide a first set of recommendations for achieving the post 2020 RES-e targets.

1.2.3 Final agenda

8.45 a.m.	Registration / Welcome coffee	
9.00	An overview of the Market4RES project	Peter Ahcin (Sintef)
9.10	Introduction to the workshop	Sophie Dourlens-Quaranta (Technofi) and Peter Ahcin (Sintef)
Expert workshop: Electricity market design options in the 2020 framework		
9.40	Introduction to the OPTIMATE numerical simulation platform	Adrien Atayi (RTE)
10.20	Methodology implemented by Market4RES to quantify and compare the impacts of different market design options	Tiziana Pagano (Technofi)
10.40	<i>Coffee break</i>	
11.00	Day-Ahead market design options to be studied	Sophie Dourlens-Quaranta (Technofi)
11.20	Scenarios to compare market design options	Sophie Dourlens-Quaranta (Technofi)
11.40	Q&A session	
12.00	<i>Lunch break</i>	
Expert workshop : Electricity market design options in the post 2020 framework		
13:00	RES scenarios 2030: a transition from a variable cost to a fixed cost based electricity market.	Peter Ahcin (SINTEF)
13:15	The role of the market: Market design alternatives for a RES dominant electricity mix	Aurèle Fontaine (RTE)
14:00	Parallel group work	
14::40	<i>Coffee break</i>	
15:00	Summary of group work	
Joint WP4-WP5 session		
15:40	Q&A session and conclusions	Animated by Sophie Dourlens-Quaranta (Technofi) and Peter Ahcin (Sintef)
16.00	<i>End of workshop</i>	



2 Participants

Name	Organisation
Ahcin Peter	SINTEF Energi AS
Angelino Luca	European Geothermal Energy Council
Atayi Adrien	RTE
Burgholzer Bettina	EEG
Cecchinato Mattia	EWEA
Charalampous George	BEUC
Ciaralli Fabrizio	European Commission – DG Competition
Claeys Gaëtan	EUGINE – European Engine Power Plants Association
Dalle Vedove Mattia	Hitachi Ltd.
De Jong Gerda	Tennet TSO B.V.
Dourlens-Quaranta Sophie	Technofi
Faure Aurélie	Ifri
Fontaine Aurèle	RTE
Hall Siobhan	Platts
Hu Jing	Utrecht University
Kaim Uli Daniel	IBERDROLA
Langer Yves	APX
Larretxea Hasier	Eneco B.V.
Liesner Michael	Energcon GmbH
Navarrete Marta	FOSG
Olmos Luis	IIT-Comillas
Pagano Tiziana	Technofi
Rekinger Manoel	European Photovoltaic Industry Association
Saout Claire	ADEME - BRGM
Schumacher Hannes	EnBW Energie Baden-Württemberg AG
Thies Frauke	EPIA
Vessia Oyvind	DG Energy
Wilczek Paul	European Wind Energy Association
Wokke Sharon	European Wind Energy Association
Wolfgang Ove	SINTEF Energy Research
Wright Howard	APX Group
Zagranti Roberto	EDSO for Smart Grids
Zegnal Judit	Bruxinfo – Hungarian news agency
Zeni Diletta	European Wind Energy Association

Excused



Name	Organisation
Bial Marcel	European Solar Thermal Electricity Association (ESTELA)
Carbonnelle Mathilde	European Commission
Clarena Baron Sonia	EUTurbines
Coffineau Louise	College of Europe
D'Alberti Federico	Enel S.p.A.
Del Olmo Carlos	Abengoa
Dufour Elena	European Solar Thermal Electricity Association (ESTELA)
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Frischemeier Sven	E.ON SE
Gazzoletti Francesco	Erg spa
Harz Willi	ENBW AG
Hickel Tanja	European Energy Exchange
Huertas Hernando Daniel	ENTSO-E
Keski-Nirva Kiira	Aula Europe
Orlandi Sinead	Becquerel Institute
Rega Nicola	Confederation of European Paper Industries
Timofte Natalia	Power Engineering Institute of ASM
Villa Andrea	Enel S.p.A.
Zegnal Judit	Bruxinfo - Hungarian News Agency



3 WP4 Expert Workshop: Electricity market design options in the 2020 framework

The purpose of the workshop was the presentation of and dialogue about the specifications of the studies to quantify the impacts of market design options in the framework provided by the current European Target Model (2020 horizon).

The following main questions were raised by participants during the presentations and the dedicated Q&A session. The answers brought by the Market4RES team are also reported.

3.1 Regarding the OPTIMATE prototype simulation tool and its utilization within Market4RES

- **Question:** *Is it possible to enlarge the geographical scope of the OPTIMATE studies by including Eastern Europe?*
 - **Answer:** In theory any country can be included in the geographical scope as long as the relevant data (such as data on clusters, installed generation capacities, etc.) are provided.
- **Question:** *What is the added-value of the Market4RES WP4 studies in the light of the fact that only the Day-Ahead processes will be activated in the OPTIMATE prototype simulator? Moreover the reply to some questions addressed on demand flexibility and RES support schemes are already known*
 - **Answer:** Indeed, due to the prototype nature of the simulator, only the Day-Ahead processes will be activated for the Market4RES studies. Although this is a limitation of the studies to be taken into account when interpreting their results, their main added-value lies in the quantification of the expected impacts of the studied market design changes based on quantitative indicators relying upon the three pillars of the EU energy policy. Moreover, although absolute results may change when the other processes (i.e. Intra-Day and Real-Time) are taken into account, the studies performed within Market4RES will still give global trends on the possible impacts of a short-term electricity market design change. This aims at stimulating a rational dialogue (i.e. based on quantified results) among policy makers and key stakeholders of the electricity value-chain.
- **Question:** *Does OPTIMATE model investment decisions thereby allowing assessing their impact in the long-term?*
 - **Answer:** OPTIMATE is focused on short-term issues. It could be, however, possible to make a multiple year assessment by considering one year at a time. But the modelling of investment decisions will rather be considered in WP5 thanks to dedicated tools.
- **Question:** *Is storage taken into account?*
 - **Answer:** In the current prototype version of the OPTIMATE simulator only hydro storage is modelled. RTE is in the process of adding other types of storage in the industrial version of the tool since it is a major aspect for RES integration.
- **Question:** *What is the purpose of the learning by doing module in OPTIMATE?*
 - **Answer:** The ex-post learning module enables commercial actors to improve the quality of their price forecasts by assessing the offset between raw forecasts and realized data.



- **Question:** *Do you plan to compare the outputs of the simulations with real current values?*
 - **Answer:** Partially we do. As a matter of fact, OPTIMATE was run over the year 2013 in order to perform a “reality check” on the generation mix. However, this “reality check” cannot be performed for other variables, such as prices, since there will always be a gap between actual prices and “OPTIMATE” prices due to the modelling assumptions of the tool (for instance, the bidding strategies as modeled within OPTIMATE).
- **Question:** *Will you take into account the impact of modeling assumptions made in Optimate on the results of the studies?*
 - **Answer:** Indeed, in one of the scenarios used in Market4RES studies some key parameters will be altered for sensitivity analysis purposes. However, due to time constraints, the number of scenarios considered has to remain reasonable.
- **Question:** *When will the Intra-Day (ID) module of OPTIMATE be available?*
 - **Answer:** The ID processes are currently being refactored in the framework of the industrialization phase of the Optimate tool.

3.2 Regarding the study about RES support schemes

- **Question:** *Why modelling Feed-in-Tariffs for renewable sources, since following the recent EC communication they will be prohibited as for 2016?*
 - **Answer:** Current contracts under Feed-in-Tariffs (FiT) will continue running for several years: only the new installations will be impacted by policy changes. In addition, regarding PV generation, the EC communication foresees that FiT will still be applicable for the smallest installations (for instance in the residential sector).
- **Question:** *How will wind and PV support schemes be assessed for the 2020 horizon? In particular, how will price premium values be assessed?*
 - **Answer:** It is the purpose of the public consultation to gather advice about this assessment. It may be considered to use technology costs assessments at 2020 (which may be provided by EPIA and EWEA) and to calculate the price premium as the difference between the average market price and these costs, also considering an acceptable profit for RES generators. It can also be considered to apply the same price premium to wind and solar generation, to model the technology-neutrality of green certificates.

3.3 Regarding the study about demand flexibility

- **Question:** *Does OPTIMATE take into account demand shifting from peak to off-peak load?*
 - **Answer:** The current version of the prototype includes a simplified modelling of demand response (price elasticity) and does not take into account demand shifting. However, the industrial version will include a more realistic modelling of demand response.
- **Question:** *Modelling different levels of load flexibility (and not only a “high” level and a “low” level as foreseen) would really be useful, because the parameters of load flexibility are expected to have a high impact on the market outcomes.*
 - **Answer:** If the project constraints allow studying more options for demand flexibility than what is currently foreseen, it will be done.



3.4 Regarding the scenarios supporting the studies

- **Question:** *It is important to take into account also other types of RES in the scenarios, in particular geothermal and biogas generation units. These units will be useful flexibility providers.*
 - **Answer:** The installed capacities of CHP units, biomass and biogas are taken into account within OPTIMATE, but not on a unit by unit manner. Their flexibility can therefore not be changed. For future studies, such units may be modelled as thermal generation units (as coal, gas and oil units are modelled).
- **Question:** *Can the flexibility level of power plants be changed? For example, in the future nuclear power plants may become more flexible than they are today.*
 - **Answer:** Indeed, one scenario considered for the Market4RES studies addresses this issue by taking into account different levels of power plants' flexibility compared to the reference scenario. In this scenario, it is foreseen to model a higher flexibility for coal and gas units based on estimations provided by the literature. However, if a reliable source is found about how to configure the flexibility parameters for nuclear power plants too, it will be considered.
- **Question:** *Within the 2020 RES+ scenario, several parameters will be changed compared to the 2020 standard scenario. Will it be possible to assess the impact of the change of each parameter individually?*
 - **Answer:** In theory indeed, it would be better to have a range of scenarios between the current 2020 standard and 2020 RES+, each corresponding to the change on one single parameter. However, due to the project constraints and the time needed for each OPTIMATE study, only a limited number of scenarios can be considered.

4 WP5 Expert Workshop: Market-based mechanisms to integrate high levels of renewables while assuring security of supply in the post-2020 period

4.1 Introduction

The introductory remarks were made in the morning before the beginning of the WP4 Expert Workshop. It included an overview of the project and the agenda.

4.2 A transition from a variable cost to a fixed cost based electricity market

SINTEF explains that the objective of the workshop is to help develop the right set of scenarios to be able to assess different market design. Market designs will be assessed in terms of a number of aspects such as:

- (economic) efficiency
- effectiveness at achieving given targets
- implementability – their cost, regulatory compliance and political acceptability, etc.
- robustness.

The scenarios should be realistic and contrasted but selected in a way that will best demonstrate the market designs' qualities.



The workshop should also help select the most relevant research questions.

The rest of the presentation was used to show the considerable effect of risk and capital costs on the final cost of electricity in a future market with a rising share of renewables.

4.3 Market design alternatives for a RES dominant electricity mix

RTE explains the methodology that has been discussed within WP5. It suggests that first a cost optimal power system should be identified based on standard cost values. A set of policies would then be identified, that could bring the system from a given state as close as possible to the desired one.

RTE also mentioned that the number of investigated scenarios will be limited to 3-4. This will include a reference scenario and 2 or 3 alternative scenarios for 2030. A reference scenario for the year 2020 will be used as a starting point for the system evolution studies.

The studies will compare the effectiveness of simple mechanisms such as feed-in premiums and carbon tax or emissions quotas. They will analyze the revenues and profitability of different technologies. They will possibly include a consideration of the impact of different levels of volatility of revenues (risk) on the cost of capital.

Special focus will be put on identifying the measures to guarantee sufficient investments to achieve required levels of security of supply. This will include measures that foster demand response, storage and new transmission capacity as vehicles of security of supply.

4.4 Parallel group session

Participants were divided into two groups. The first, and considerably larger group, held a discussion on the topic of a changing mindset for the post 2020 studies. The second group was tasked with drafting parameters and qualitative scenarios for the post 2020 studies.

4.4.1 Group 1: How should we change our mindset when studying post 2020 electric power system

To the general question: "How should we change our mindset when studying post 2020?" the group responded with the following:

- Less base-load, load will be flexible
- More energy market integration Electricity<->heating<->transport;
 - Moments with cheap electricity provide energy to other sectors
- In balancing of system
 - Stakeholder impacts and local sub-optimization must be accounted for
 - There will be a number of new kinds of players and markets
 - Focus on total costs will remain in balancing in defining the system (e.g. EU)
- Cost structures will change
 - From MWh (levelized) to MW installed



- However, storages can provide energy flexibility (low electricity price is new "fuel price")
- Study: which type of market-structure will provide sufficient incentives for RES
- Discussion: will market provide sufficient capacity for flexibility and RES-E

When faced with the question "Which are the most important uncertainties?" the group produced the following inputs:

- Responsibility for balancing
- High prices for balancing energy
 - Are very high prices acceptable? (no)
 - Could this be handled by traditional risk-reducing mechanisms?
 - Or should it be handled by market-structure (e.g. capacity reserve market)

To the question: "What should still be taken as premises?" the group responded:

- Higher demand flexibility
- Focus on SOS in the future too
- Still, voluntary curtailment should be possible (incentive: e.g. reduced tariffs)

The last question: "How should we change the methodology when focusing on a distant future year?" produced the following answers:

- It is not clear whether one should think of optimal development, or not (many stakeholders and market imperfections)
- However, TSOs will probably optimize. Evolutionary development leading to near rational institutional development.
- Therefore, assumptions should be forward-looking to the needs
- It is also relevant to think of the path towards the "optimal" future system, to make it efficient/acceptable

The following issues were raised on the side:

- Is security of not obtaining high prices or sufficient SOS to be left to the market, or should we help the market to provide a reasonable outcome, also in transition?
- Critical point: secure against high price spikes
- Energy only market; how to get sufficient energy
- If it becomes the cheapest
- Also accounting CO2 price
- Over-investment in RES; CO2 does not impact, DR may solve
- How big is how each market; which is accounted for in project
- Two incentive discussions: RES, flexibility
- Motivation for RES support: risks for large investment
- The decision about which model should be used to address which questions should be based on the assessment of available models' projects and tasks



- Today not all see prices: argument for separate incentives for e.g. flexibility, or could be argument for removing barriers

4.4.2 Group 2: Scenarios and research methodology

The participants first recalled that the work-package should favour scenarios elaborated by reference organisms such as those used by ENTSO-e in the TYNDP. While being aware of the interest of using such a pre-existing set of scenarios in terms of credibility and of legibility, the facilitators explained that ENTSO-e's scenarios are meant to specifically focus on the development of the grid and therefore their two dimensions (market integration and RES development) may not be perfectly suited for the questions investigated in Market4RES. However, we will make our scenarios as coherent as possible with those of ENTSO-e and re-use a number of hypotheses.

The group then established the list of parameters that would vary across the scenarios. As compared to the initial proposal, demand response was split between industrial and distributed (the latter item including distributed generation and on-site storage), CO2 price was removed to be considered as an instrument of public policy and the cost of capital for renewable was added. Economic growth was questioned but finally kept as it has impacts on demand and, therefore possibly on the mix from a dynamic point of view and also because it determines the relative abundance of risk-prone capital.




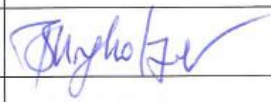
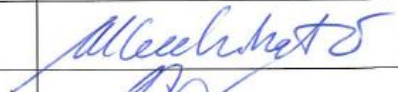







Finally, on top of a reference scenario, three alternatives were sketched up:

- Higher share of renewables (than the current objectives corresponding to the reference scenario) driven by a very high price of fuels;
- Higher share of renewables driven by a technological breakthrough (namely distributed storage becoming much cheaper than it is today);
- Lower share of renewables, due to a economic stagnation inducing a very high cost of capital for investors in renewable and a relatively low price of fuels dooming renewables to remain a very expensive option.

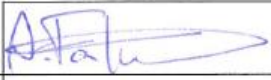
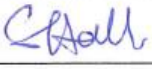
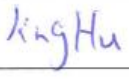


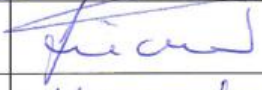

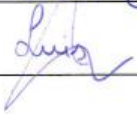


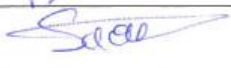
Part of the group discussion was dedicated to the issue raised by Iberdrola on the importance of capital costs in the existing and future electricity mix. Iberdrola also showed a document displaying the effect of auctions for power purchase agreements on the cost of energy for solar installations.



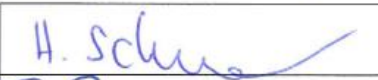







5 Scan of original list of participants


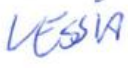




Last Name	First Name	Company / Organisation	Signature
Ahcin	Peter	SINTEF Energy Research	
Angelino	Luca	European Geothermal Energy Council	
Atayi	Adrien	RTE	
Bial	Marcel	European Solar Thermal Electricity Association (ESTELA)	
Burgholzer	Bettina	EEG	
Carbonnelle	Mathilde	European Commission	
Cecchinato	Mattia	EWEA	
Charalampous	George	BEUC	
Ciaralli	Fabrizio	European Commission - DG Competition	
Claeys	Gaëtan	EUGINE - European Engine Power Plants Association	
Clarena Baron	Sonia	EUTurbines	
Coffineau	Louise	College of Europe	
D'alberti	Federico	Enel S.p.A.	
Dalle Vedove	Mattia	Hitachi Ltd	
de Jong	Gerda	TenneT TSO B.V.	
del Olmo	Carlos	Abengoa	
Dourlens-Quaranta	Sophie	Technofi	
Dufour	Elena	European Solar Thermal Electricity Association (ESTELA)	
Faure	Aurélie	ifri	



Fontaine	Aurèle	RTE	
Franken	Marcus	E.ON SE	
Frischemeier	Sven	E.ON SE	
Gazzoletti	Francesco	Erg spa	
Hall	Siobhan	Platts	
Harz	Willi	EnBW AG	
Hickel	Tanja	European Energy Exchange	
Hu	Jing	Utrecht University	
Huertas Hernandez	Daniel	ENTSO-E	
Kaim	Uli Daniel	IBERDROLA	
Keski-Nirva	Kiira	Aula Europe	
Langer	Yves	APX	
Liesner	Michael	Enercon GmbH	
Navarrete	Marta	fosg	
Olmos	Luis	IIT-Comillas	
Orlandi	Sinead	Becquerel Institute	
Pagano	Tiziana	Technofi	
Rega	Nicola	Confederation of European Paper industries	
Rekinger	Manoel	European Photovoltaic Industry Association	
Saout	Claire	ADEME - BRGM	



Schumacher	Hannes	EnBW Energie Baden-Württemberg AG	
Thies	Frauke	EPIA	
Timofte	Natalia	Power Engineering Institute of ASM	
Villa	Andrea	Enel S.p.A.	
Wilczek	Paul	European Wind Energy Association	
Wokke	Sharon	European Wind Energy Association	
Wolfgang	Ove	SINTEF Energy Research	
Wright	Howard	APX Group	
Zangrandi	Roberto	EDSO FOR SMART GRIDS	
Zegnal	Judit	Bruxinfo - Hungarian news agency	
Zeni	Diletta	EWEA	

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