# Plan, prepare, perform: Best practices for operating the system with high shares of renewables

Berlin, 7 November 2018, 10am – 5pm

Workshop summary

On 7 November 2018, the Renewables Grid Initiative and its Members 50Hertz and Germanwatch held the workshop "Plan, Prepare, Perform - Best practices for operating the system with high shares of renewables" in Berlin. More than 70 experts from European Transmission System Operators (TSOs), regulatory authorities, associations, academia and the energy industry came together to exchange good practices and experiences from different European countries. Participants explored ways of achieving a very high share of renewables in the electricity system and a structured phase out of coal-fired power generation while ensuring the stability of the system today. They discussed both technical as well as regulatory challenges and solutions.

## 1. Welcome

*Antonella Battaglini | CEO Renewables Grid Initiative (RGI), Olivier Feix | Head of Nature Protection and Permitting 50Hertz, Christoph Bals | Policy Director Germanwatch*

In their welcoming speech, Olivier Feix (50Hertz), Christoph Bals (Germanwatch) and Antonella Battaglini (RGI) stressed the fact that all actors need to work together for the energy transition and find solutions that are acceptable for society. For a TSO, Olivier Feix emphasised, targets are an important factor for them to plan their operation on a long-term basis. Currently, the two main issues to discuss are system security and security of supply, while it is important to lead this discussion in an international context.

Christoph Bals made clear that the next ten years will be crucial on the decision whether we will be able to fully transform all sectors needed to combat climate. The

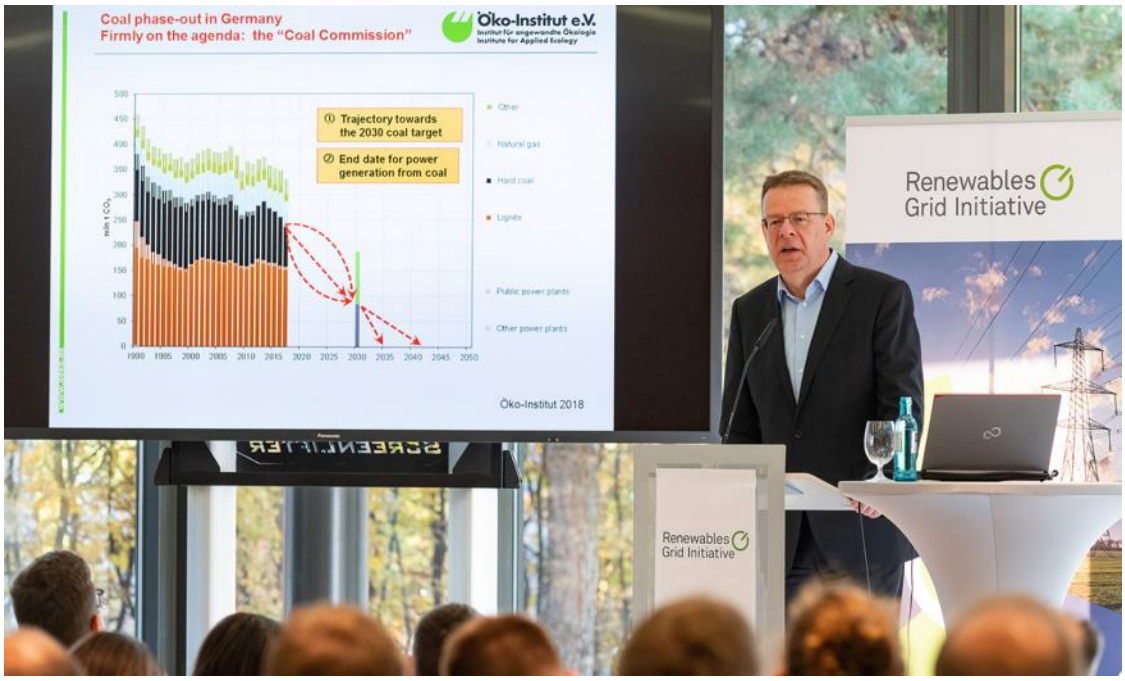
electricity grid plays a big role in the transformation of the power sector and Germanwatch is supporting the development of a better grid fit for the future.

In response to Antonella's question about expectations for the workshop, Oliver Feix explained that, ideally, it would deliver three concrete questions that 50Hertz to be better prepared for the future and give some concrete hints of how to move forward, which could then enrich 50Hertz' modelling and inform their questions on the future.

Christoph replied that he wanted to understand the challenges, including technical and socio-political aspects, and what they mean for regulators, political decision makers and other actors. He wanted to hear clear steps on how to move forward.

## 2. Opening address

*Dr. Felix Matthes | German Commission for Growth, Structural Change, Employment; Research Coordinator for Energy & Climate Policy Öko-Institut*




While Felix Matthes is a member of the German "coal commission", which is currently negotiating the best path for a German coal phase out, he clarified at the beginning of his speech that he would not be able to share details due to the commission's agreed confidentiality.

He explained to the audience the developments of the German power sector over the past 70 years, stressing the fact that the shares of generation from nuclear, gas and coal are all down, while renewables went up. However, this happened parallel to the growth of demand to more than two times higher numbers. His thesis is that decarbonisation will happen, but he was not fully sure about whether it would come quickly enough.

He made clear that the changes that need to happen in order to meet the targets set out in the Paris agreement, will rather be a transformation than a transition. Moreover, German targets could not be met by German action alone since power

generation is an interconnected market and EU wide change is needed to increase renewables. He pointed out four strategic issues that needed to be solved now:

1. Innovation and openness to new ideas.
2. Designing the exit game – not only thinking about how to increase renewables, but also plan for the phase out of coal.
3. Triggering infrastructure adjustments (with sufficient lead times).
4. Innovation in time to meet objectives. And correct selection of ideas by market.

### Q&A session:

Is the reduction of non-renewables generation affected by interconnection?

- Yes. For example, the UK has benefited from interconnection in achieving better renewables performance because it takes nuclear from France and wind from Germany.
- Interconnection helps all countries achieve better renewables performance but can also mask problems in countries who are not taking sufficient action.

Will the Öko-Institut open sources to its models, data, and code?

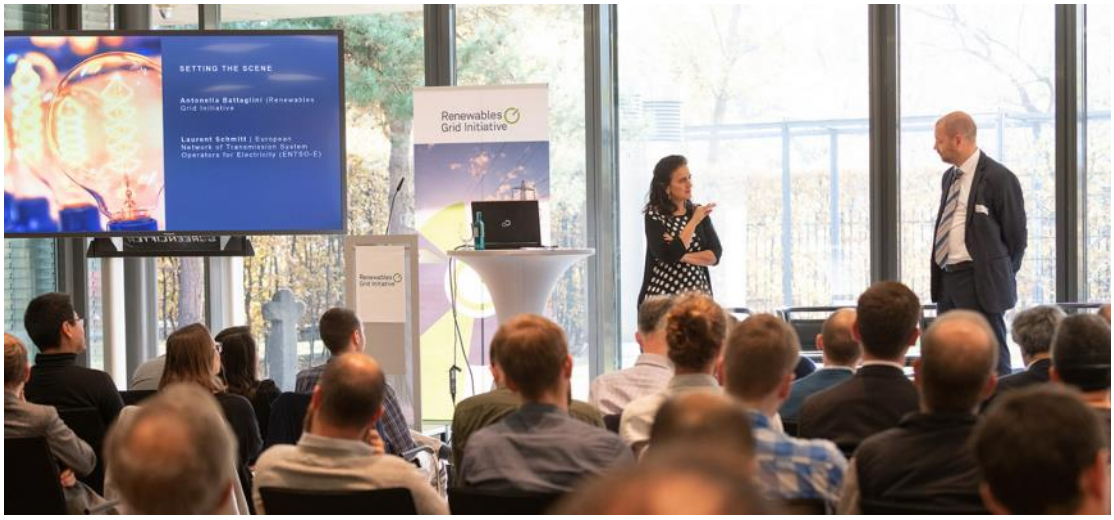
- There are no plans for full openness. However, they do already share all results and are trying to provide more information on the assumptions and inputs to their models.
- All data to the Öko-Institut comes from the energy community and is not cross checked by environmental and societal agencies, which is a weakness in the modelling system.

How much will the transformation cost? Who should pay?

- Decarbonisation costs will be high in the short term but less expensive in the long term. The system needs to pay for itself via the consumer. Distortion by Government intervention over the longer term will not help to create the transformation.

## 3. Setting the scene

*Conversation between Antonella Battaglini (RGI) and Laurent Schmitt, Secretary-General of ENTSO-E (European Network of Transmission System Operators for Electricity)*




The conversation started with a question about Europe's role in the energy transformation. Laurent Schmitt highlighted ENTSO-E's efforts on network codes and their importance for the integration of the internal market in the short-term. He explained that these codes are the rule book agreed upon on a European level. They help to balance the system ('balancing codes') and guide operators at system operation, e.g. when looking at loop flows and congestion.

Afterwards, the discussion continued looking at distributed resources and what ENTSO-E can do to optimise their utilisation. Laurent pointed out that ENTSO-E considers distributed resources in their calculations as much as possible. Their innovation team, in particular, is thinking about the future and how the market design should evolve until 2050 to better integrate renewables. Questions that they address include: What type of pricing do we need to better utilise renewables? How are we going to manage inertia? How do we manage grid with more electronics? What role will digitalisation play? What is the level of transparency which needs to be given?

Antonella and Laurent concluded with an outlook for the day. Laurent wanted to get a better understanding on what society is willing to accept in terms of infrastructure, price signals, etc. Moreover, he expected to find new opportunities for ENTSO-E to engage in the current discussions.

Laurent hinted the audience to a paper that ENTSO-E will publish in March next year about different models for more flexibility in the system.

## 4. Pecha Kucha talks

*Slides of all presentations are available on RGI's website*


*Dr. Erik Riedel | Head of Scenario Development Amprion*

Dr. Riedel pointed out that power systems must be robust and able to withstand disturbances of demand. However, the current planning against possible disturbances is still based on the old pre-renewables world structure of power. Therefore, he thinks that high share of renewables and the coal phase out are possible, but only if a set of coordinated actions happen. Building blocks that are essential for today's and the future energy system include: System stability, grid codes, innovation, network expansion, highly utilised transmission.

*Kathrin Guttman | Campaign Director "Beyond Coal"*

"Beyond coal" is a Europe-wide organisation with the objective of a complete phase out of coal by 2030. Today, there are 278 coal plants remaining in Europe, 66 coal plants are planned for construction. However, many governments agree that a coal phase out is required and have made public commitments to it in the medium-term. Moreover, there is a large amount of public action against coal due to health, environmental, and cost concerns. The UK, for example, has demonstrated that a swift and significant change to renewables is possible. There is an opportunity to learn from these examples and also to look into new technologies, such as battery storage.

*Dr Contstanze Adolf | Project Coordinator Lumenion Energy*

Lumenion Energy offers a new energy storage solution, so-called “High Temperature Energy Storage”. Currently, the EU spends €350bn importing energy. Lumenion will take energy at renewables peaks and store this for sale at moments of scarcity. It stores the energy as heat and can either sell that heat or transfer it to and sell it as electricity. Dr. Adolf concluded that a much bigger systemic view is needed in terms of decarbonisation and storage should be considered better in this view.

*Jan Zacharias | Manager Regulatory Affairs Entelios*

Jan Zacharias called for more interconnection to Norway, where potential for exporting hydro energy was at 16TWh. Moreover, he pointed out that Germany needs a flexibility market including: opportunities for small and medium-sized suppliers, cooperation between TSOs and Distribution System Operators (DSOs), large amounts of electricity at short notice, demand side management.

## 5. Innovative technical approaches from Europe: TSO roundtable

*Panellists: Ian Connaughton | DS3 Programme Manager EirGrid: Juan Peiró | Control Centre for Renewables Red Eléctrica de España; Dr. Niels Ehlers | Head of Concept and System Strategy 50Hertz*
*TSOs challenged by: Dr. Eva Schmid | Senior Advisor – Power Grids and Low-Carbon Policy Germanwatch*
*Moderation: Antina Sander | Deputy CEO RGI*

According to the TSO representatives, having very high shares of renewables is technically feasible but we still need to ensure they can be implemented in an economic way. The main challenge on the path to 100% renewables comes with the last 20%: although it is technically possible, each percentage will become more and more expensive based on available technology and knowledge.

Regarding the issue of inertia in the system, panellists mentioned the fact that is important but not insurmountable since wind energy is capable of delivering what is needed.

The Irish TSO is setting up “nodal” points with DSOs which gives the TSO better visibility and control of wind on the DSO grid. Moreover, Ireland is getting batteries that will deliver frequency stabilisation and other services. These kinds of developments, together with the deployment of smarter renewables that are able to provide system services are key for further steps to increase shares of renewables.

TSOs pointed out that we need to design markets that make it economic for renewables to provide system services. 50Hertz added that while system services may not be the real challenge, congestion is driving the desperate need for more capacity on the lines.

Further urgent points that were mentioned and need to be taken care of in the near future included: better DSO-TSO collaboration, developing demand flexibility, more interconnections and more storage.

## 6. Political and regulatory frameworks around Europe: roundtable discussion on experiences and lessons learned

*Panellists: Riccardo Vailati | Italian Regulatory Authority for Electricity, Gas and Water; Dr. Christine Materazzi-Wagner | E-Control Austria; Dr. Ilan Momber | Vlerick Research Fellow/ Consultant energy sector; José Medeiros Pinto | Secretary General Portuguese Renewable Energy Association (APREN)*
*Panellists challenged by: Dr. Stephanie Ropenus | Senior Associate Grids and Digitalisation Agora Energiewende*
*Moderation: Theresa Schneider | Senior Manager Communication RGI*


European countries are highly different when it comes to the share of renewables in their systems. These differences relate not only to current contributions of renewables, but also to renewable energy targets until 2030 and domestic

geographical distribution of renewables installations. Such setting leads to various challenges related to interconnections between and among countries, like controlling, coordination, redispatching demands or pricing.

While the attempts to coordinate challenges are taking place at the European level, we are still somewhere in the middle of this process. This results from the fact that solutions proposed at the EU do not entirely reflect the diverse realities in different countries and they need domestic adjustments. Moreover, solutions are very complex, which can be seen at the currently negotiated Winter Package, for example. Additionally, what is happening at regional and local levels (e.g. wind power curtailments, structural congestions, attempts to develop solar power capacity), is leading to changes in the system before a legislation is proposed, which requires faster responses from network operators.

Regulators encourage TSOs to introduce and implement pilot projects that could offer innovative technological solutions. Such projects ensure the development and exchange of knowledge. However, there is no guarantee that a proposed technological solution will be scaled up afterwards. Additionally, regulators expect that solutions TSOs deliver will not be created only to receive more money, but to improve the overall TSO's performance (not input-based, but output-based regulation).

While thinking about the future European electricity system, it is not important to consider what will be generated and where because, in any case, we will need a mix of different kinds of renewables. It is possible to pursue a regionalised and localised optimisation together with a European perspective, but we need a very clear general direction. In order to achieve European targets (if we have them) and to have a well-functioning system, good cooperation between TSOs and DSOs will be fundamental. Even though their roles will change, and they can offer different services to the system, they should not compete between each other.

Having acknowledged a changing role of actors participating in and creating the electricity system, efforts aiming at closer collaboration between TSOs and DSOs are undertaken, although there is a lot of room for further improvement. This can be achieved by joint actions launched by both actors, as well as by changing the regulation, that would make such collaboration easier. The role of innovation in this process remains unclear because

(i) innovation is not written into law *per se*,
(ii) innovation very often "just happens" and cannot be planned in advance,
(iii) technological innovation can work very well in pilot projects, but not necessarily in the market,
(iv) innovation is faster than regulations,
(v) innovation should go "hand in hand" with the acceleration of ongoing (and future) power line projects.

## 7. World café


During the world café, groups had the task to discuss one concrete solution they have heard during the day and answer the question "Who needs to do what and when to implement the solution you find particularly promising?". Solutions that were discussed include:

- Early involvement of stakeholders for regulation of networks (regulators, stakeholders and public as main actors)
- Storage (regulators, TSOs and DSOs as main actors)
- Dynamic line rating
- New power lines
- Market design
- Smart consumption
- Control power from distributed resources (regulators, legislators, TSOs as main actors)
- Standards and procedures for exchange of information (TSOs, DSOs, regulators as main actors)

All participants in the discussions agreed that actions need to take place immediately.

## 8. Conclusions

Comprehensive conclusions can be found in the document "Key findings" on RGI's website.