

WORKING OUT A METHODOLOGY FOR BUILDING ELECTRICITY-SYSTEM SCENARIOS

Working Group

Our goal: Informing in the best possible way the issue of long-term transition for power systems

Developing viable and accepted low-carbon electricity production, distribution and consumption systems is one critical challenge of the energy transition. Meeting this challenge requires a **close examination of the pathways proposed in future studies reports** and of all their important consequences.

Many future studies are now available. By nature, their scenarios do not lie on the same perimeters, hypotheses or methods and they do not ask the same questions. The described scenarios can hardly be compared across studies because some key information is not reported at all, or not in the same way for each study. **The aspects of the transition debate which are informed by each future study are not clearly described.** This prevents decision-makers from efficiently understanding the aspects of the transition each scenario informs, or from comparing the different scenarios between them.

As a result, using these scenarios to come to fully-informed public policy decisions is quite tricky: policy-makers could make decisions on false premises. In view of the critical role of energy and the energy transition urgency, they **might choose social and economic pathways leading us far from what was expected in the first place...**

The Shift Project, a common-interest association which aims at informing the debate on energy transition, **convened and is leading a group of European experts to build a common and open methodological framework for future studies working on power systems transitions.**

WHAT IS AT STAKE: THE NEED FOR A COMMON AND OPEN METHODOLOGICAL FRAMEWORK

Climate challenges and threats on future fossil fuel supplies have impelled many French and European institutions¹ to build up scenarios. These scenarios explore how to switch to lower-carbon and more “sustainable” energy systems and assess what some of their impacts are.

Publicly-available prospective scenarios to get rid of fossil fuels are now quite various.

These scenarios make extensive use of low-carbon electric production systems. These systems may be to a greater or lesser extent controllable (such as hydropower, biomass and – partly – nuclear) or inevitable (either intermittent, such as wind and solar power, or non-intermittent, such as river hydropower and concentrated solar power). Depending on the possible tightness between supply and demand, these scenarios consider to a greater or lesser extent using storage systems (batteries, pumped hydro storage, flywheels, etc.), load management and demand response, and/or keeping on using thermal power plants with possibly some CO₂ capture and storage etc.

Possible pathways are numerous, and each of them is **complex by nature**. Understanding which aspects of the transition is informed by each scenario and which ones are not is quite challenging. Comparing scenarios with each

¹ For example, RTE, ADEME, DGEC, ANCRE, négaWatt, GrDF, RAC and CIRED for scenarios on France; ECF, EDF, European Commission, Greenpeace, Agora Energiewende/IDDRI for scenarios on the EU.

other and assessing how effective each one is as a policy-making tool is difficult. This comes from a lack of transparency, or a lack of common methodology to report about study strategy, hypotheses, results and methodology.

In order to make future studies as useful as possible to inform the energy transition and to turn the whole set of published studies into a pertinent decision making tool, a common language between them is required. This language must enable each scenario to clearly indicate which part of the energy transition debate they inform. For example, the various perimeters of scenarios (geographical, time, sector scopes) should be explicitly reported about. The fact of handling some key exogenous parameters and producing key results should be summarized. Impact analyses² which are performed should be clearly listed, as well as the supply and demand balance studies or power system safety analyses. Cost estimations should be as inclusive and systemic as possible (e.g. by taking into account connection to the grid costs, grid adaptations costs, etc.).

The scenario community shares a common goal: **informing the debate about the energy transition**. For the time being, lack of a widely-accepted methodological framework makes power system scenarios (taken together as a common effort by the scenario producers' community) poor tools for decision-makers.

Such considerations lead to the idea of formulating a set of **good practices** which should be discussed and shared by the scenario producers' community.

HOW TO DO IT: A WORKING GROUP MADE OF EUROPEAN EXPERTS AND A ROADMAP

***The Shift Project* would like to produce a common methodological framework by gathering a working group of European experts who would agree on terms needed to design electricity-system future studies which efficiently participate in a common effort to properly inform policy making.**

Made up of scenario experts and experts from various electricity-system fields, this working group will build a methodological framework for scenario design and publication. This framework will provide a list of guidelines that scenario reports should follow in order to efficiently participate in a common effort to properly inform policy decisions.



For the time being, the working group is composed of:

Christophe Bonnery, senior vice president, economics & prospective, Enedis

Patrick Criqui, senior researcher at CNRS, working on the economics of energy transition and climate policies in the Grenoble Applied Economics Laboratory

Robin Girard, PhD in applied mathematics, researcher in renewable energy and energy systems at Mines ParisTech and Sophia Antipolis

Tanguy Le Guen, senior associate, Strategy Division, ENGIE

Robert Lowe, deputy director, professor of energy & building science, University College of London Energy Institute

Jacques Percebois, professor emeritus, university of Montpellier, director of the Centre de recherche en économie et droit de l'énergie

Dimitri Pescia, senior associate, European energy cooperation, AgoraEnergiewende

Laurent Schmitt, secretary general, ENTSO-E

Vera Silva, research program director, R&D, EDF

Philippe Torrion, former innovation and strategy director at EDF

CEA (French Alternative Energies and Atomic Energy Commission) has also agreed to participate in this project.

The working group will rely on *The Shift Project* logistical resources and 'ecosystem': *The Shift Project* experts who also work on other projects and helpers who support *The Shift Project* on every study (the 'Shifters').

² These analyses estimate the effect of the power system evolution on the surrounding systems (environment, society and economy).

EXPECTED RESULTS

- **Identifying key topics scenarios should deal with.** In order to be as comprehensive as possible and to serve public decision-making in a proper way, a scenario report should be transparent on specific topics such as the questions it seeks to answer, the considered time horizon, geographical perimeter and economic sectors, the social and environmental parameters it explores, etc.
- **Identifying key variables a scenario should include and how it should present them.** The guidelines will propose good practices about variables scenarios should talk about, the transparency about their exogenous/endogenous status and for some of them how to present them efficiently.
- **Recommendations on key mechanisms binding variables together, that scenarios should consider and on how they should communicate about them.** Such topics as the estimation of social, economic or environmental impacts of the power system transition as well as the performances of the power system (supply and demand balance, safety), will be considered.
- **Recommendations on the level of transparency and data openness of scenarios.** Scenarios can be totally transparent on their hypotheses and results by publishing their data sets. They can also be transparent on the models they used by releasing their equations, or algorithms ruling them, or even by publishing the whole code. Guidelines will be proposed about the proper level of transparency scenarios should target.
- **Recommendations on the design of sensitivity analyses a scenario report should present.** Studies should include sensitivity analyses to assess results generated on the basis of other assumptions than those used by the main scenario. For example, sensitivity analyses allow testing the sensitivity of electricity cost to an increased cost of capital (discount rate), to the production or storage system cost, to the daily demand peak amount or to the socio-technical feasibility of a specific infrastructure installation. Guidelines will be proposed about the choice of sensitivity analyses a scenario should present.
- **Recommendations on the popularization of complex models and on obtained results.** Models which are used to produce the results often share a characteristic with the system they model: they are extremely complex. This may lead to a "black box" effect. The target audience might then come to *believe* a scenario rather than to *understand* it. The level of faith in a scenario depends on the actor who produced it. In that respect, it seems important for scenarios to find efficient ways for communicating complexity.
- **Building a methodological framework made of recommendations** on how electricity-system scenarios should be designed and published.
The framework will specifically focus on power systems but will also include recommendations on the interfaces between the power and the energy systems (for example in the case of energy storage).
These recommendations will be intended for stakeholders from this field, so that next published scenarios would be more easily compared and both policy-makers and observers would get a better understanding of the added value of each study regarding the already-existing corpus.
These recommendations should *ultimately* give **both policy-makers and public a better systemic understanding of the issues behind decarbonisation scenarios.**
- **Building a scenario synthesis grid which describes if the scenario report deals with the recommendations of the framework.** This grid would be filled in by scenario-producers at the end of their scenario production process. The objective of the grid is to summarize the points which are dealt with by the scenario report, following the recommendations of the framework. Once completed, the grid will be dedicated to decision-makers (and citizens) in order for them to better understand the questions scenarios answer, the subjects they handle, their key values, and the differences between scenarios.
- **Using this methodological framework to make comparative analyses** of existing scenarios. These analyses will constitute a first useful tool for policy-makers.

WORK METHODOLOGY

Our work will be composed of three different tasks:

- **Reviewing existing scenarios.** This task identifies, for each scenario, every exogenous and endogenous variable it uses, assumptions made on their trends, built-in mechanisms, derived scenarios, methods for popularizing and level of transparency. This work will constitute the basis for our recommendations as a good practices benchmark.
- **Literature review and experts' interviews.** Experts of power systems and scenario-production will be interviewed, and bibliography reviewed on the different subjects a scenario should deal with, in order to gather more precise and closer-to-the-field recommendations.
We already met the **manager of future studies at RTE** (the French TSO), an **electricity historian** (Fondation EDF), **energy systems modellers and scenario producers** (Paris Sud University, IDDRI), a **sociologist** (ADEME, the French Agency for Energy Management and Environment), managers of the production of two influential scenarios in France (ADEME), the director of MEDEAS project (Modeling the Renewable Energy Transition in Europe), a **smart grid expert** (ENEDIS), **power sector experts** (UFE, the French Union of Power system actors), **European energy union policy experts** (Delors Institute), the director of the Applied Mathematics Center (Mines ParisTech), etc.
- **Applying the methodology to some selected scenarios.** The synthesis grid will constitute a tool enabling to list the missing items that already-published scenario should bring to make it comparable with others.

All these steps are iterative (for instance, using the framework on selected scenarios can highlight some weaknesses in the methodological framework and ways for improvement) and may be carried out at the same time.

PLANNING

This ambitious project will extend over 2018 and further, leading to the publishing of the methodological framework at the beginning of year 2019. An event gathering European experts on power systems and on scenario production will be held in October 2018, in order to present the first results of the working group and to collect their feedback.

PROJECT MANAGER

Nicolas RAILLARD

Project Manager – + 33 (0)6 46 35 43 70 | nicolas.raillard@theshiftproject.org

Nicolas Raillard joined The Shift Project as a Project Engineer. A graduate in aerospace engineering from ISAE – Supaéro (France) and from the Georgia Institute of Technology (USA), he worked as an engineer in complex systems strategy for 4 years. He then passed an Advanced Master in “Environment International Management” at the Mines ParisTech school (France) and Tsinghua University (China) and now applies his skills and qualifications to the low-carbon transition at The Shift. He worked on analyzing and modeling French daily mobility to assess CO2 emissions and costs of different alternatives to car, with a group of professionals and academics. He participated in informing the French national debate preparing the Mobility Orientation Law and prepared analyses notes on an efficient future mobility and on carsharing. He now leads a working group building up a methodology for power systems future studies.

THE SHIFT PROJECT

The Shift Project, a non-profit organization, is a French think-tank dedicated to informing and influencing the debate on energy transition in Europe. The Shift Project is supported by European companies that want to make the energy transition their strategic priority & by French public funding.

Press contact : Jean-Noël Geist, Public Affairs and Communications Manager

+ 33 (0) 6 95 10 81 91 | jean-noel.geist@theshiftproject.org