EPINET: Integrated Assessment of Societal Impacts of Emerging Science and Technology from within Epistemic Networks

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Research line on smart electricity grids

Policy recommendations: Towards socially robust smart grids

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Objectives and aims of the case study

This report presents the policy recommendations that follow from the EPINET projects investigations into assessments of ethical, legal and societal aspects of smart electricity grids in the European Union. Its main objective has been to evaluate the state-of-the-art in assessments in this domain, especially focusing on the ways in which these may interact with or become integrated into main research and innovation networks, including the making of research and policy agendas.

These recommendations are aimed at, and relevant to, different groups and networks involved in smart electricity and governance at European and national levels. At one level of policy action there are the many advisory and expert groups involved in the design and development of smart grids. These include the EU Commission Task Force for Smart Grid. National initiatives such as the Dutch Smart Energy Collective form another target audience. Also relevant are the expert groups participating in the shaping of Horizon 2020 ICT programme (Societal Challenges and LEIT) and the European Institute of Innovation and Technology, national research councils and their advisory bodies. Our recommendations are especially relevant to so-called cross-cutting actions in Horizon 2020, especially relating to Responsible Research and Innovation and Social and Humanistic Sciences. Next, our recommendations are also directed to national and EU legislators and regulators charged with adapting to and accommodating the actions of policy makers and the smart grid and smart cities communities. Finally, our recommendations are directed to the technology assessment community, including those dedicated to Responsible Research and Innovation, integrated ELSA and impact assessments.

Background and approach taken

Within the next decades, electricity infrastructures are expected to undergo some radical changes that will turn them into 'smart grids'. Smart grids have the character of an emerging hybrid large technical system aligning technical and non-technical elements into one unified, functional whole. The European Commission expects that smart grids will serve a variety of societal, economic and environmental goals, thus suggesting it as a panacea for some important flaws of society. However unintended social impacts, controversies, risks and social robustness of this emerging technology have not yet been studied in a systematic and integrated form. To broaden the learning process and promote responsible innovation, EPINET work package 6 has developed, tested, implemented and embedded an integrated approach to technology assessment of smart energy systems with a focus on their deployment in the European Union.

The objectives of WP6 have been:

1. Provide assessments of smart grids from the perspectives of different Technology Assessment (TA) methodologies

2. Provide guidelines for good governance of smart grids in the context of EU policies

3. Provide recommendations for improved integration of TA methodologies in the field of smart grids

Overall questions addressed in the EPINET smart grid case have been:

- What visions and concepts exist regarding smart grid technology?
- What epistemic networks/ discourses/ technologies are to be observed/ identified?
- Who are the representatives of these epistemic networks involved or involved in the making of the future grid?
- Which are the key (risk/ ethical/social/ juridical/ policy) challenges and issues regarding the future of smart grids as following from each partial TA approach and how can these be integrated?

In the first phase of the EPINET project the focus has been on the development, integration and testing of a range of Technology Assessment (TA) approaches and methodologies, in order to broaden the scope of societal debates and political decision making on the future of smart grids. This will enable a more socially robust and sustainable development of smart grid technologies that is congruent with societal needs, social values and culture.

In the second phase, the focus has been on embedding the EPINET approach (integrated vision assessment) within the European epistemic networks around the smart grid innovation. A major workshop to this end was held where key players from the smart grid innovation and scholars from EPINET engaged in in depth dialogues focussed at eliciting and quality controlling the visions, narratives and values that shape the field.

The EPINET integrated approach to vision assessment starts from the notion that in its current state of emergence, smart grid is a set of promises, expectations and visions that shape innovation. These include claims about technological characteristics, societal usability and desirability. We have developed and tested a framework for the systematic critical reflection on quality, pedigree, plausibility and social robustness of these claims and promises, and this framework forms the background for the policy recommendations presented below.

Insights from visions assessment

- Discourses found are active on critical (intervening on current development), conceptual (future minded, less careful) and technical (do not include societal matters) levels
- Discrepancies between claims on technological feasibility, societal usability and desirability have been identified (box 1). These discrepancies are on the perceived definition, technological necessity, contribution to sustainability and implementation strategy of Smart Grids.
- Vision Assessment can identify latent controversies on the issue which might well hamper the further innovation trajectory.
- Governance of the smart grid innovation should be aware of and responsive to these latent controversies.

Box 1 visions regarding desirability, social usability and technological characteristics of Smart Grids

Claims about (ethical/normative) desirability of Smart Grid

Smart grids can contribute to a transition towards sustainable energies. They may enable access to affordable clean energy for all (a human right?), by increasing energy awareness (a good citizen is energy aware) and helping to reduce primary energy consumption and increase efficiency (a good citizen does not waste energy). Smart grids can help freedom and democracy in a society. When surpluses in one area can be used to solve shortages in another, it can promote or enable solidarity between regions and within communities. It can promote or enable social inclusion.

Claims about societal usability

Regarding the societal goals and needs to be served by Smart Grid: Smart Grids should be reliable and secure our energy supply. They can catalyse a transition or transformation of the energy system to sustainability. Smart grids should be affordable. They should create business opportunities. The smart grid is a mobilizing concept that can mobilize consumers to take their role as agents of (behavioral) change.

However, disagreement exists as to whether smart grids should merely support our lifestyles as they are now, or whether they should help us to transform our lifestyles towards lower energy use and reduced footprints. A transition from fossil to renewable energy could completely transform society in all its aspects or it could only substitute the present energy system and infrastructure, while delivering the same volume of end-user energy functions. In that case it might not impact the entire societal order.

Claims about technological characteristics /feasibility of smart grids

A smart grid should be flexible and efficient. Energy storage is a key ingredient. It has to match supply with demand in real time. It should match the demand for energy with (limited?) resources. A point of discussion here is: are resource limits real and do they constrain what is possible? The theoretical potential of solar and wind energy far exceeds current and future world energy demand. There is also disagreement about whether a Smart Meter is a necessary element. We need to think about whether or not it is desirable from a technical or from a societal point of view, and if it is, what functions are and are not necessary. The smart grid can take the form of super grids or micro grids.

Note: this particular sample of visions has been identified amongst the participants during the EPINET embedding workshop on Smart Grids (Van der Sluijs et al., 2014)

Current trends and the values and incentives that currently drive the smart grid innovation are partly at odds with proclaimed societal goals that Smart Grids are supposed to serve (such as sustainability and affordable energy prices).

- There is a trend of changing drivers and different interests: in Denmark CO2 reduction is now less important than job creation. Conflicts of interest exist: ancillary services that come out of "smartness" versus big operators who aim to improve their operation without giving too much power to consumers.
- Uncertainty in the legal framework discourages the investments that are needed.
- There is a huge fragmentation of too many pilots in absence of a master plan for the follow-up.
- The main focus has been so far on the technical challenges, under-addressing the consumer interface, thereby creating a high risk of failure in the implementation phase.
- ICT in the high voltage grid already works well. ICT integration in the low voltage part of the grid is the problem area. Here, there are many stakeholders who all have different needs and preferences. In Spain, there is not much in done yet in low voltage. There are some smart meter pilots, but all use different protocols. The same goes for pilots in Belgium. Between Flanders and Wallonia, different smart meter protocols are being used. In Denmark, the smart grid is already being implemented.
- Big differences exists between countries both in culture (attitude to privacy issues) and in local circumstances (abundance of wind, sun hours, hydropower). In Denmark there is agreement that everybody needs to have a smart meter and that consumers have to pay for it (about 200 euros). UK meters roll out was done by the suppliers, with no upfront costs to the consumer, though ultimately there will be costs for the consumers, for instance in case of an upgrade or replacement. UK Consumers can opt out. Privacy is a cultural matter. In Germany, the consumer reaction is not very strong. Consumer associations demand proof of energy saving in households. Public debate is about privacy problems of smart meters, but the German government still has plans to implement the meters. The German data security regulation shows that big data leads to problems. Roll out of meters shouldn't be compulsory, but adapted to each country.
- There are country specific issues. The debt issue in Spain, the privacy issue of Germany, the growth issue of Denmark: there are specific interests that may lead to different applications across Europe. How much do we want to unify the European grid?
- Another issue is standardisation while fostering diversity, diversity as an asset. Diversity should be treated as an asset, the question is how to transfer different experiences. This is more complex than convergence vs. divergence, we have to manage a multi-level approach because different problems turn up at different levels.

Insights from knowledge assessment: open-up tunnel visions, need for more pluralism and inclusiveness

From knowledge assessment of European smart grids policy documents we see that there is strong alignment between the policy proposals and the aspirations from industry; we suggest that these alignments are made totally transparent in policy documents and not masked with grand justifications of sustainability, security and the like.

Knowledge assessment of policy documents also suggests that more technical studies carried out outside the industry realm and social studies are used to support the claims made. In fact, there is a great deal of stakeholders' knowledge that is not being considered in the policy discussions or proposals.

Knowledge assessment also showed that there is poor involvement of the civil society in these discussions. As the main smart grid policies precludes an important involvement of citizens, the model should be open to more discussions.

Respond to the persistent mismatch of scales

The current governance of Smart Grids suffers from a persistent mismatch in the focus on the *how* and on the *why* at different scales of analysis. For example, the view of smart grids as a useful means facilitating the transition towards renewable energy sources is based on the consideration of the how at a low scale of analysis (domestic consumption of electricity) confused with the why at a higher scale (scarcity of fossil fuels). (Kovacic, 2015)

Respond to risk migration challenges

In the process of technological development and innovation towards a smart electricity grid, the attention is primarily focused on the proclaimed benefits. The intention is to meet societal goals and contribute to sustainable development by reduced peak demand, balancing consumer reliability and power quality needs, proactive used of energy efficiency opportunities, increased operational efficiency of the grid and integration of clean energy technologies. However, unavoidably, new technologies also have disadvantages which often manifest themselves as risks of a very different nature than the risks these innovations claim to reduce. These new risks are often unforeseen and apparent only after a new technology or consumer product has become widespread. This is referred to as 'risk migration'. (Van der Sluijs et al., 2013)

Risk migration issues identified by EPINET include:

- Privacy risks (access, storage and mining of data collected by smart meters)
- Vulnerabilities linked to increased reliance on ICT (cyber-security; malfunction/instabilities, control failures, control hijacking);
- Reduced resilience of the energy system (by not taking into account the existence of trade-offs between efficiency and resilience);
- Redistribution of political and market power as a consequence of the technological design of the smart grid rather than as the outcome of a democratic procedure.

These risk migration challenges deserve a place on the policy agenda for the governance of the smart grid innovation.

Streamline research: develop a European road map

European Smart Grid research is at present characterised by a high number of isolated pilots in Europe but with poor coordination and no prior perspective of follow up. There is a need to unite research and develop an EU roadmap, and take that as basis for national research, to streamline all research efforts. National projects should co-exist, coordinated by the EU. At present, there's a lot of overlap between existing projects: streamlining is about coordinating different research efforts, not limiting the scope of research.

There should be a focus on other aspects of the smart grid than smart meters.

There is a need to shift focus in the research to a multi-layered system. The challenge is: how to integrate the layers? Understanding of the different social and cultural layers should be more developed and should be better studied. Determinants of energy awareness are poorly understood.

There is a need for application of proper models from complexity science to the smart grid case. There is limited knowledge on unintended effects. Risk concerns should be higher on the research and policy agendas.

Energy and IT need to be merged as research fields. At present they are two separate issues in Horizon 2020. Priority is to research energy storage, energy distribution, the microgrid, standards, data management and the capacity of the system.

Redistribute responsibilities

We are in transition from public infrastructure to partly private production of energy. It is recommendable to make people responsible for their sub-system: e.g. through ownership of their own PV panel and local grid.

Create and Maintain regulatory independence

There is a need for independent regulatory bodies. Europe needs to respond to the problem of revolving doors: people that switch from politics to working for big corporations and vice versa. At present, regulation is too closely coupled to corporate interests. Regulation should also be coordinated with research.

Towards a More Inclusive and Flexible Approach to Data Protection Impact Assessments (DPIA) of Smart Grid Systems.

DPIAs have already been proposed as voluntary means for assessing risks to data protection and privacy. A template has been developed for use by assessors, data controllers and data protection authorities.

"The choice of an impact assessment as a means to evaluate societal challenges of emerging technologies seems to be an appropriate one and a tool such as a DPIA framework is a first good step. However, we would have liked to see a carefully designed, inclusive solution that systematically attempts to address – in cooperation with stakeholders – as many of these challenges as possible. Such a solution should remain easy to use and flexible, e.g. giving an option to adjust the framework to the

particular needs of a given emerging technology and to integrate with other types of impact assessments or risk management areas, if necessary." (Kloza, van Dijk & De Hert, 2015).

This general consideration leads to the following set of recommendations:

1. Focusing solely on personal data protection is a good first step, but is not enough in assessing smart grid systems. Instead a more *inclusive* solution is necessary that does justice to the wide variety of societal concerns that this technology can give rise to (Kloza, van Dijk & De Hert, 2015).
2. A "light" regulatory approach – i.e. a voluntary framework – will not solve the problem. It has been observed that "the likelihood of PIAs being conducted is related to the degree of policy compulsion to conduct them and to accountability for their completion".[1] Considering that the stakes are high - severe intrusions of fundamental rights are foreseen (surveillance of the household) - data protection impact assessments should be compulsory (Kloza, van Dijk & De Hert, 2015), (Goel et al, 2015). They should also include the following specifications.
3. An assessment of the impact of smart grid systems on the fundamental rights to data protection and privacy should not be mainly based on the risks to the data controllers, but should put central the risks to the rights of the data subject. (van Dijk, Gellert & Rommetveit, 2015), (Kloza, van Dijk & De Hert, 2015).
4. The modelling of DPIA processes on risk management methodology should be carefully re-evaluated, taking into account the following considerations relevant for assessing 'risks to rights' (van Dijk, Gellert & Rommetveit, 2015):
    a. Risk: Learning of lessons on the weaknesses of risk assessment methodologies from other relevant fields like environmental governance, especially in cases where human values are at stake. These lessons include:
        i. Acknowledging the deficiencies of the quasi-objectivist notion of risk, especially when applied in assessing normative subject matter like rights.
        ii. The data subjects that will be affected by these technologies have to be given a voice in the assessment process (public participation in DPIA)(see also Hildebrandt, 2013).
    b. Rights: Learning of lessons from the legal domains relevant for these assessments, considering that what is at stake here is the novelty of assessing the risk to the rights of people. Relevant legal expertise here pertains to:
        i. procedural obligations to: provide public access to impact assessments, take into account the views of those potentially affected, provide effective means of contestation in court (ECHR jurisprudence on environmental law) (See also Kloza, 2014).

[1] Bayley, R., & Bennett, C. (2012). Privacy impact assessments in Canada. In P. de Hert & D. Wright (Eds.), Privacy impact assessment. Springer, p. 182

ii. substantial requirements related to the legal concepts of: privacy, data protection (fundamental rights), risk (environmental law), harm (tort law), probability (evidence law).

5. DPIA methodology should explore using risk assessment in concert with a legal compliance check in a combined model (Kloza, van Dijk & De Hert, 2015), based on overall principles of due process (van Dijk, Gellert & Rommetveit, 2015).

These recommendations, clustered under the notion of "inclusive and flexible" impact assessments, pertain directly to the Data Protection Impact Assessment (DPIA) Template for Smart Grid and Smart Metering Systems. Considering the fact that the DPIA template for smart grids has just entered a two year test phase (starting in March 2015) to gather feedback in order to fine-tune and improve its efficiency and user-friendliness[2], we urge for the take-up and incorporation of these recommendations in this testing-phase process.

These recommendations however also pertain to Data Protection Impact Assessments more generally (as they are currently introduced by the GDPR) and to other sector-specific DPIA frameworks or templates.

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