Reaction on the ERGEG Position Paper on Smart Grids of 10 December 2009

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The Intelligent Energy Europe program funded the IMPROGRES project *(Improvement of the Social Optimal Outcome of Market Integration of DG in European Electricity Markets),*[2] which has analyzed the impact of large-scale deployment of distributed generation and demand response (or distributed energy resources, DER) for the whole electricity supply system. Within IMPROGRES a number of findings were obtained which are relevant for the ERGEG position paper (numbers refer to the questions on page 15-16 of the Position Paper. Responses are limited to those questions which are also treated in the IMPROGRES project. For more information visit the IMPROGRES website: http://www.improgres.org/ where the project reports can be downloaded)

1. New challenges for electricity network companies

As a consequence of the success of renewable energy and distributed generation support schemes the impact of increasing amounts of distributed energy resources on distribution grids is becoming more and more important. Network costs are likely to increase due to the need to integrate increasing shares of intermittent renewable energy sources such as wind and solar energy. A scenario analysis with the GreenNet model combined with Primes 2007 estimates for combined heat and power (CHP) concluded that the installed capacity of distributed generation (DG) in the EU-25 will grow from 201 GW in 2008 to about 317 GW in 2020, which corresponds to an increase of around 116 GW in 12 years. Increased amounts of electricity generation in distribution grids are starting to affect the business of distribution network companies (DSOs). IMPROGRES analysis showed that relatively small amounts of distributed generation as percentage of the electricity demand do not increase the network cost significantly. On the contrary, it can sometimes even lead to a small reduction in distribution network costs. Relatively small amounts of local generation, closer to the point of use than in case of large-scale generation, can lead to slightly smaller grid capacity requirements, and to somewhat lower electric losses. However, with larger shares of DG compared to the load, extra network investments are usually required. These cost increases will be the main challenge for both transmission and distribution companies: how to cope with the growing costs of integrating large amounts of low-carbon technologies in the networks. What will be the role of increased smartness in electricity networks to mitigate the growing network costs?

Extrapolating a number of IMPROGRES case study findings focusing on regional distribution network costs in different countries, the expected doubling of DG capacity in Europe between 2005 and 2020 will lead to a substantial increases in distribution network costs. An IMPROGRES project finding from the network simulations is that the cost of integrating distributed generation in distribution networks is in the order of 200 € per kW of extra distributed generation capacity. With this figure, the total cost for the EU-25 of network expansions to accommodate the growth in DG until 2020 is estimated to be around 25 billion €. However, with exception of offshore wind, these additional network costs will still be relatively small compared to the overall costs of increasing the level of renewable electricity generation.

[1] This reaction on the ERGEG Position Paper on Smart Grids represents the opinion of the author only and not of ECN or any of the other IMPROGRES project partners

2 The IMPROGRES project is supported by the EU in the Altener programme of Intelligent Energy Europe, and was conducted between September 2007 and March 2010. The Energy research Centre of the Netherlands is coordinator of the project, involving the following partners: Liander, (previous name: Continuon) The Netherlands, Fraunhofer Institute for Wind Energy and Energy System Technology IWES (previous name: ISET), Germany, MVV Energie, Germany, Risø National Laboratory for Sustainable Energy, Technical University of Denmark, (Risø DTU), Denmark, Union Fenosa Distribucion, Spain, Universidad Pontificia Comillas, Spain, and Vienna University of Technology, Austria

3. Energy savings and decoupling DSO profits from the volume of energy supplied
Charges for the services of DSOs should ideally reflect the cost of providing these services. These costs are not necessarily directly related to the volume of energy supplied. The charges by the DSO for network use (Use of System (UoS) charges) can be either full capacity- (kW) or energy-based (kWh) or a mix of both. On the one hand, in case UoS charges are fully capacity-based (kW) this accounts for the fact that the required network capacity for network users is mainly capacity based; DSOs have to guarantee the connection and transport of the energy consumed and produced at full capacity, taking into account existing complementarities between production patterns as well as the interaction between production and consumption patterns. On the other hand, in case UoS charges are fully energy-based (kWh), this accounts for the fact that network costs are not only related to investments in additional network capacity, but also to O&M costs like energy losses which are related to the actual amount of energy transported through the network. However, with fully energy-based UoS charges energy sources with low load factors do have to pay only a part of the network costs they induce to the system which means that network costs are redistributed upon energy sources with high load factors. At least from a cost-causality point of view this is not preferable.[3] Consequently, the IMPROGRES project finding is that *UoS charges should preferably be dependent on both kW production capacity and kWh energy produced. Further research is needed to establish the optimal mix in kW and kWh charges.*

6. Role of energy suppliers and energy service companies in deploying smart grids solutions
High shares of intermittent renewable sources such as wind power are likely to result in larger electricity price variations over time, which constitute an important driver for further market integration of distributed generation and for developing demand response solutions. Energy suppliers and energy service companies are expected to take the lead in this process by looking for cost-effective solutions in linking their customers' potential flexibility in consumption and generation of electricity to the needs of the markets. This will require bidirectional information exchange and possibly some form of control of equipment 'behind the meter'. Whenever developed, this infrastructure can also contribute to supporting the local network for example by peak shaving. Integrating the interests of users, network companies and suppliers will be crucial to prevent that the network cost will rise unnecessarily.

11 Output regulation
The regulator doesn't have the means to judge the efficiency of operation of DSOs in the complex smart grids environment when based on inputs. Output is therefore a more relevant criterion.

12. Benefits and performance indicators of smart grids (table 4.1)
The main benefit of smartness in electricity is providing adequate network capacity to connect increasing shares of distributed generation and flexible loads. Energy curtailment of renewable sources due to congestion would be a suitable performance indicator. However, to prevent that future grids would become too costly, some amount of congestion due to excess generation of renewable sources has to be accepted. Minimum levels of congestion is not optimal from the viewpoint of society. An acceptable optimal level should be defined based on a trade off between the capacity cost of low-carbon technologies and the costs of additional network capacity.

[3] Whether or not redistribution of network costs through UoS charges is favourable is subject to political decisions.

13 Performance criteria for output regulation

Output is now often determined based on the volume of electricity delivered to loads, adjusted with a parameter reflecting the quality of service. In the smart grids situation with larger shares of distributed generation it becomes desirable to include also the volume of electricity from distributed generation in the quantification of output. This should be further enhanced by including carbon effects both the direct effect related to electric losses as well as the indirect effect of facilitating an increasing share of low-carbon electricity generation.

18. Regulatory priorities for meeting the 2020 targets

A major contribution to the EU objectives towards achieving improved sustainability, security of supply and competitiveness in the energy sector will come from harnessing the potential flexibility in electricity demand and in distributed generation. Regulated network companies have a role in facilitating this process by developing sufficient network capacity, and by establishing advanced metering and communication infrastructure at every network connection. A major challenge for regulators is the fact that a major part of the benefits of smarter grids will be outside the regulated domain, affecting the relation between customers and energy suppliers and energy services companies. Financing of smart grid projects and regulation of the network companies should take into account this complexity. Unbundling should not be used as an excuse to limit regulation to network aspects only. As a consequence, network regulation should give a prominent place to 'external effects', cost and benefits outside the network. Developing the infrastructure for smart metering and control of distributed generation and demand response may not be a financially viable 'smart grids project' when only viewed from a network cost perspective.