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Changing Power: Innovating Electricity Legislation Upon Regulated Governance Experimentation for Smart Grids

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Abstract

Smart grids are a promising innovation in the energy sector, however, the current legal framework is tailored for the conventional electricity system and does not facilitate the deployment of smart grids. In order to find new governance forms which alleviate this problem, recent efforts in the Netherlands allow for derogations from the standard legal framework (regulated governance experimentation). But do the governance structures of the Dutch experiments provide new governance models for developing a legal framework which enables smart grids on larger scale? This question is answered by taking an interdisciplinary approach between governance and legal research. The findings indicate that whereas derogation from specific legal rules allows for collective generation, P2P supply, dynamic electricity tariffs and involvement of consumers, it does not facilitate the emergence of new actors that could very well play a relevant role with regard to smart grid operation. Only associations are allowed to carry out all the tasks in the electricity supply chain. Therefore, the paper concludes that the results from the experiments can only to a limited extent provide new governance models for developing a legal framework that facilitates the implementation of smart grid technology on a larger scale.

Contents

List of Abbreviations

ACM	Autoriteit Consument & Markt (Authority for Consumers & Markets)
DG	Distributed Generation
DSM	Demand Side Management
DSO	Distribution System Operator
EU	European Union
ETS	Emission Trading Scheme
GHG	Green House Gases
ICT	Information and Communication Technology
IPIN	Innovatie Program voor Intelligente Netten (Innovation Program for Smart Grids)
MEA	Ministry of Economic Affairs
NRA	National Regulatory Authority
P2P	Peer-to-Peer
RES	Renewable Energy Sources
TSO	Transmission System Operator

1. Introduction

Reaping the benefits of technical innovations requires their effective deployment by actors. Smart grids are a promising innovation in the energy sector for achieving the policy goals of a secure, affordable, and sustainable energy system.[1] Still, the actual deployment of smart grids is not existent yet on a large scale. One of the main obstacles of the successful deployment of smart grids is the current legal framework of the electricity sector which divides tasks between incumbent actors and assigns rights for consumer protection, thereby affirming governance that is tailored for the conventional electricity system. In order to find new governance forms which enable the deployment of smart grids, recent efforts in the Netherlands allow for derogations from the standard legal framework (regulated governance experimentation).

The derogations from the standard legal framework are granted by the Ministry of Economic Affairs (MEA) on project basis and expected to deliver insights on governance forms which are relevant for smart grid implementation. In that sense, the projects are supposed to serve as experiments, providing information on emerging governance structures that enable technical innovations. This information can serve for developing legislation which enables smart grid implementation. This approach hereby integrates the two fields of governance and law and acknowledges that both depend on each other.

By combining legal and governance research, this paper approaches the matter of innovating electricity legislation upon regulated governance experimentation for the case of smart grids in the Netherlands. The underlying problem is that governance as established by the current legal framework of the electricity sector does not facilitate smart grid deployment.[2] Regulated governance experimentation creates space outside the regular setting for developing governance forms that facilitate smart grids. Creating such space that is exempting from the regular setting implies the risk that experimentally acquired results might be difficult to implement in the current setting. By looking closer at the governance structure of the projects the goal of this paper is twofold: firstly, identifying the specific differences between emerging governance settings and those established by the current legal framework. Secondly, building on those findings, reflecting upon the experiments in general with regard to the questions how to come from experiments to common practice, and whether the experimental setting indeed provides useful information for developing a legal framework which applies to the whole electricity sector. This paper poses the following research questions: *Do the governance structures of the Dutch experiments provide new governance models for developing a legal framework which enables smart grids on larger scale?*

Answering those questions requires an interdisciplinary approach between governance and legal research. Whereas governance research provides findings on changing structures in the

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[1] Even though smart grids are also relevant for the gas sector, this paper focuses on the electricity sector. Therefore, the remainder of this paper mainly applies the term ‘electricity’ instead of ‘energy’.

[2] On EU level this was established by research of the EU. See Joint Research Centre – Institute for Energy and Transport, ‘Smart Grids Projects 2014 Outlook’ (Publications Office of the European Union, 2014) 11. Accessed 19.1.2016 from http://ses.jrc.ec.europa.eu/sites/ses.jrc.ec.europa.eu/files/u24/2014/report/ld-na-26609-en-n_smart_grid_projects_outlook_2014_-_online.pdf

For a specific legal assessment of Dutch law with regard to smart grids see for example Sanne Akerboom, Gerrit Buist, Annelies Huygen, Annetje Ottow, and Simone Pront-van Bommel,(2011) ‘Smart Grid Pilots: Handvatten voor Toepassing van Wet- en Regelgeving. Deel 2 - Naslag: Achtergrond en Verdieping. Amsterdam, Delft, Utrecht.

electricity sector, legal science can evaluate those findings for the further development of a legal framework which enables smart grids. The overall guiding conception is that smart grids are a technical necessity for maintaining a secure, affordable, and sustainable electricity system and require new forms of governance. Law has the potential to steer this development, however, this depends on knowledge of governance structures that are indeed enabling smart grids. Reversely, for governance research to become effective, findings need to be translated into legal frameworks, so that smart grids are not only a phenomenon enabled in the experimental setting, but are integrated in the legal framework of the electricity sector.

This paper is structured as follows: after this introduction section 2 introduces the idea of smart grids as a technical necessity in the current electricity system and the need to develop novel regulation which enables smart grids. Section 3 introduces the approach of regulated governance experimentation chosen in the Netherlands aiming to find relevant information for novel legislation. Section 4 provides a closer analysis of the regulated governance experimentation by identifying the main differences of governance structures emerging in the projects and the current legal framework. Section 5 reflects upon the findings by addressing the question whether the governance structures of the experiments provide governance models for developing a legal framework which enables smart grids on larger scale. Section 6 concludes on the matter of innovating electricity regulation upon regulated governance experimentation.

2. Smart Grids and the Quest for Novel Regulation

2.1 Smart Grids – Enabling Sustainable and Efficient Grids

Smart grids are said to be a technical necessity in order to further ensure the EU energy policy objectives of developing a secure, affordable, and sustainable energy system.[3] Mainly, the technical necessity is caused by increasing amounts of distributed generation (DG) of intermittent energy sources that need to be accommodated by the energy system in conjunction with the aim to maintain this system efficiently and affordably. Understanding this claim requires contrasting the smart grid with the 'conventional' grid, essentially why the conventional grid is not sufficient for fulfilling this technical necessity.

In the conventional electricity grid the grid is designed for transporting electricity from a central point of electricity generation over high-voltage transmission cables and medium- and low-voltage distribution cables to the final customer. The size of the conductors is determined by the loads that the electricity grid serves and the actual amount of electricity that is transmitted under central control of system operator. The conventional electricity grid is tailored for a centrally organised system whereby central generation is tailored to local demand.

The technical necessity to change the central organisation and control of the electricity system stems from policy efforts and technical innovations which aim at decarbonising the electricity sector by fostering electricity generation from renewable energy sources (RES), linked to rising electricity demand (for example electric mobility) and maintaining energy efficiency.

[3]See for a general overview of smart grids with its general features and functionalities for example Maria Lorena Tuballa and Michael Lochinva Abundo, 'A Review of the Development of Smart Grid Technologies', (2016) Renewable and Sustainable Energy Reviews 59 710.

Increasing RES generation and demand cause unpredictable electricity flows that cannot be controlled efficiently in a centrally organised system. In contrast to electricity generated from fossil or nuclear sources, electricity generated from RES also enables small scale generation which is connected to the medium- and low-voltage distribution grid. This is often called ‘distributed generation’. DG is located closer to the loads that it serves and therefore contributes to energy efficiency, as transmission losses are minimised. Unlike in the conventional electricity system where electricity flows are mostly unidirectional from central generation to final consumption, DG implies ‘horizontal’ and ‘bidirectional electricity flows’ on the low-voltage distribution grid. Additionally, the intermittent character of RES causes difficulties to control electricity flows because peak generation periods can hardly be predicted. Similarly, increasing electricity demand, for example for electric mobility, also causes unpredictable peak loads. All three developments, DG, increasing loads, and intermittency, were not considered in the design of the ‘conventional’ electricity system. The conductors of the distribution grid are not capable of carrying the peak amounts of electricity that result from the hardly predictable bidirectional flows of electricity.

One solution to maintain the capability of the distribution grid to accommodate the developments (DG, increasing loads, and intermittency) is to increase the size of the conductors of the grid. Heavier cables and transformers would serve the purpose of integrating DG of RES and increasing loads. This is sometimes called ‘fit and forget approach’ as the size of the conductors is simply ‘fitted’ for maximum peaks loads, ‘forgetting’ about economic efficiency. Not only would this be a very costly endeavour, but economically it would also be a very inefficient scenario as this grid design approach leaves a great proportion of the grid idle for most of the time. Surely, DG of RES and increasing demand will cause load peaks that are largely unpredictable due to intermittency and for example electric mobility. Yet, expectedly those peaks will only occur in short time periods during the day, therefore taking those maximum peaks as guiding factor for designing the grid seems unproportioned.

The idea of smart grids provides a different approach to maintain the reliable functioning of the grid. “An alternative to the traditional network enforcement is to meet part of the demand for energy services locally through DGs, storage and managing demand through demand response and energy efficiency measures. This is to use distributed resources whether on the supply side (DG and storage) or on the demand side […] to avert the need for lumpy investment in costly redundant transformers”.[4] In that sense, smart grids are not only enabling the integration of DG of RES but their *efficient* integration.

The smart grid approach to cope with the challenge to facilitate DG of RES and at the same time maintain efficiency entails matching electricity generation and loads instead of providing endless grid capacity. The maximal potential of matching is exploited if flexibility is increased. On the supply side flexibility is restricted due to RES intermittency and limited use of aggregation of those intermittent sources. Therefore flexibility needs to be increased on the demand side. Focussing on the demand side in grid management is new but promises great potential for not only saving energy in form of simply using less, but especially by shifting demands to times of high supply and restraining demand in times of low generation. This is often referred to as ‘demand-side management’ (DSM) and considered a desired result to be achieved through smart grids. A stimulus for final customers to adjust their demand upon generation are varying prices for electricity and dynamic network tariffs. Both measures aim to reflect the actual costs incurred of consumption and grid usage. DSM requires the deployment

[4] Rahmatallah Poudineh and Tooraj Jamasb, ‘Distributed Generation, Storage, Demand Response and Energy Efficiency as Alternative to grid Capacity Enhancement’ (2014) 67 Energy Policy 223.

of information and communication technology (ICT) to exchange real-time information on loads so that all connected grid users can adapt their generation and consumption upon that information.

The technical necessity of smart grids as a response to decarbonisation and efficiency efforts implies a complete overhaul of the current organisation and design of the electricity grid. Yet, this is not only the case for the technical operation of the grid infrastructure, but equally for the governance structures in the electricity system. The technical options of the smart grid enable and even require complete new forms of governance that are not existent in the conventional system. The incumbent governance structure is enshrined in the current regulation of the electricity sector. Therefore, the claim for a new regulatory framework which enables and incentives governance forms for smart grids is pressing and persuasive.

2.2 The Quest for Regulation Enabling Smart Grid Governance Structures

The introduction stated that the effective deployment of technical innovations requires their implementation by actors. Yet, due to the network-bound character of the electricity sector, the governance structures are highly regulated. That implies that the actors and their tasks are strictly defined in the regulation of the electricity sector which is tailored to the technical setting of the system, the conventional structure. For the effective deployment of smart grids this is an obstacle as the current regulatory setting does not allow for governance structures that are necessary for smart grids. This is confirmed by EU wide research on smart grid initiatives: the main uncertainties in the deployment remain in "roles and responsibilities of actors, sharing of costs and benefits and consequently new business models"[5] revealing the need for a legal framework which enables technical- and governance settings of smart grids. Yet, developing a legal framework to this end is challenging as the technical development of smart grids is rapid and continuous. More specifically, "the concern for dynamic efficiency, through securing and, if possible fostering technological innovation in infrastructures and infrastructure-based services poses a wicked regulatory challenge."[6]

As mentioned, the current legal framework is tailored for governance structures of the conventional electricity system. Firstly, this implies the correspondence of governance structures with the technical top-down organisation (electricity flows from central generation to the final customer). More specifically, this entails that most of the grid operation- and planning responsibilities are located at transmission level with the TSO (transmission system operator) and at the distribution level with the DSO (distribution system operator). Consumers remain largely passive as they have no possibility of acting upon variable electricity prices. Secondly, the legal framework tailored for the conventional electricity system implies the strict division between market- and grid activities. The liberalisation of the electricity sector gradually fostered the strict unbundling between the market (generation and supply) and grid operation tasks.

[5] Joint Research Centre – Institute for Energy and Transport, 'Smart Grids Projects 2014 Outlook' (Publications Office of the European Union, 2014) 11. Accessed 19.1.2016 from http://ses.jrc.ec.europa.eu/sites/ses.jrc.ec.europa.eu/files/u24/2014/report/ld-na-26609-en-n_smart_grid_projects_outlook_2014_-_online.pdf

[6] Lesly Broos, Marc Harmsen, Michiel Heldeweg, 'Regulating (Network) Experiments – Design of 'Regulatory Holidays to Foster Innovation in Telecommunication and Energy Infrastructures' (2014), Paper for the 7th Annual Conference on Competition and Regulation on Network Industries, Brussels, 7 November 2014 2.

However, enabling governance structures for the deployment of smart grids requires certain adjustments to the governance of the current legal framework. The strict top-down organisation of the sector is overhauled in the smart grid which aims at facilitating the efficient integration of DG of RES. Additionally, this requires the utilisation of demand-side flexibility by enabling consumers to play an 'active role' (on basis of variable price incentives). The strict division between market- and grid related tasks requires consideration with regard to newly emerging tasks in the smart grid. Those are for example storage, peer-to-peer supply, operation of ICT infrastructure, aggregation of demand flexibility, and aggregation of small-scale generation. Whether those activities are defined as market- or grid related task determines the governance thereof. These are only general observations how the current legal framework clashes with governance structures in smart grids. Still, this exemplifies the need for reconsidering the current legal framework, and if needed develop a new legal framework which enables and incentivises governance structures for smart grids.

Arguably, "whether law really will support beneficial innovation depends mainly on its quality and its capacity to maintain the connection with technological innovation"[7] Therefore, the successful development of a legal framework which enables governance settings of smart grids requires close interaction with technology. An example how this approach can practically be applied is the approach in the Netherlands where regulated governance for enabling smart grids is possible on basis of a legal derogation from the standard legal framework of the electricity sector. The underlying expectation is to gain insights in possible governance structures of smart grids which could eventually provide reason for transforming the legal framework for the purpose of smart grid deployment.

3. Innovating Legislation Upon Experimentation: Regulated Governance Experimentation in the Netherlands

3.1 Pilot Projects

In 2009, the Dutch government established a 'Taskforce Intelligente Netten' ('Taskforce Smart Grids') to further investigate the emergence of smart grids in the context of achieving the "transition towards affordable, secure, and clean energy supply".[8] This resulted in 12 pilot projects (so called *IPIN* projects[9]) which were mainly launched in the beginning of 2012 for three or four years. The goal for these projects was to investigate "the integration of distributed electricity production and storage, the effect of demand-response for different categories of consumers, development of new services and products in different possible institutional settings".[10]

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[7] Bärbel Dorbeck-Jung, 'How Technology Governance Mirrors the Relation between Law and Innovation: Transcending the Myth of Law's Stifling Innovation' in Aurelia Colombi Ciacchi, Michiel Heldeweg, Bernd van der Meulen, and Richard Neerhof (eds), *Law & Governance: Beyond the Public-Private Law Divide?* (Eleven International Publishing, Governance and Recht Series, 2013) 181.

[8] Besluit van de Minister van Economische Zaken van 26 oktober 2009, nr. WJZ/9182801, houdende de instelling van een Taskforce Intelligente Netten (Instellingsbesluit Taskforce Intelligente Netten), art.2 and explanatory notes.

[9] "Innovatie Program voor Intelligente Netten" (Innovation Program for Smart Grids).

[10] Besluit van de Minister van Economische Zaken van 26 oktober 2009, nr. WJZ/9182801, houdende de instelling van een Taskforce Intelligente Netten (Instellingsbesluit Taskforce Intelligente Netten), toelichting.

The projects[11] mainly focussed on the implementation of technical innovations, albeit the fact that the changing role of various actors in the *IPIN* projects was listed as equally important. For example, whereas the consultation procedure of the discussion document of the 'Taskforce' considers a prominent role of DSOs undesirable due to the risk of creating a dominant position in various services (that could also be undertaken by other parties), in the majority of the projects (9 out of 12) the regional DSO became the leading actor in the project.[12] Additionally to this, a range of other governance obstacles appeared during the projects. For example, 'flexible system operation' (combining generation, transport, storage, and supply), which is not allowed under current legislation that strictly unbundles market from grid activities. Also the current rules on electricity supply are perceived as obstacle by the actors: current legislation requires a licence to supply electricity which makes peer-to-peer supply of electricity impossible for local actors. Additionally, static electricity prices and network tariffs were an obstacle in several *IPIN* projects. Whereas technically the demand side could actively participate through DSM, the financial incentive of dynamic pricing was missing in most projects.[13]

To conclude, the *IPIN* projects demonstrated that new technical options enable, and even require new forms of governance. Linked to this, the final report of the pilot projects pointed out the need to consider transforming the legal framework with regard to enabling the deployment of smart grids.[14]

3.2 Exemption Rule

As several governance obstacles appeared in the *IPIN* projects, finding new governance forms which enable smart grids is crucial. This triggered the approach of regulated governance experimentation in the Netherlands.

On 1 April 2015, the Crown decree for experiments with decentral renewable electricity generation[15] (short: Besluit DDE and in the following *Exemption Rule*) entered into effect.[16] In brief, Article 2 of the *Exemption Rule* empowers the MEA to grant individual exemptions to Article 16, third paragraph[17] of the Dutch Electricity Act, which states that no one can take over the tasks of DSOs. By lifting this ban, other actors are – under specific conditions – allowed to

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[11] Each project is briefly introduced in a factsheet from 2013 which can be retrieved on http://www.rvo.nl/documenten-publicaties-archief?f[0]=field_publicatiesoort_tax%3A26869&f[1]=field_subsidies_tax%3A3896 (those are only available in Dutch). Recent factsheets (2015) on the progress of the projects are also available in English and can be retrieved from http://www.rvo.nl/subsidies-regelingen/factsheets-eng-2015

[12] Ministerie van Economische Zaken, 'Op Weg Naar Intelligente Netten in Nederland', Einddocument van de Taskforce voor Intelligente Netten, Mei 2011, 21.

[13] See for the identification of this problem especially the pilot project *Intelligent Netwerk en Energietransitie in Zeewolde*, resultaten September 2015. The position paper can be retrieved from http://www.rvo.nl/sites/default/files/2015/09/5339-IPIN-FS-Zeewolde%20%5Bweb%5D.pdf

[14] Ministerie van Economische Zaken, 'Op Weg Naar Intelligente Netten in Nederland', Einddocument van de Taskforce voor Intelligente Netten, Mei 2011, 24.

[15] Besluit van 28 februari 2015, houdende het bij wege van experiment afwijken van de Elektriciteitswet 1998 voor decentrale opwekking van duurzame elektriciteit (Besluit experimenten decentrale duurzame elektriciteitsopwekking), Stb 2015, 99. In the following Besluit DDE (*Exemption Rule*).

[16] The decree is part of the ongoing legislative process 'wetgevingsagenda STROOM', which attempts to change and combine the Dutch Electricity Act and the Dutch Gas Act.

[17] The tasks of DSOs, as stated in the Electricity Act mainly consist of connecting users to the grid (article 16c), the construction of cross-border electricity grids, and the operation and maintenance of electricity grids (article 15, par. 1).

carry out grid operation tasks.[18] This facilitates local projects to experiment with new forms of governance for the implementation of local generation, distribution, peer-to-peer supply, and dynamic electricity prices and network tariffs. Despite the fact that the *Exemption Rule* was not specifically designed for smart grids, the addressed components are all relevant for the deployment of smart grids.

The *Exemption Rule* allows for regulated governance experiments in the electricity sector for the purpose of increasing DG, RES, and consumer involvement. 'Experiment' refers to the Dutch government's definition of an experimental determination of whether a specific instrument contributes to solving a societal problem.[19] After four years and three months, the projects will be evaluated on basis of whether they contribute to developments in the area of DG of RES, decrease the load on the electricity grid through DSM, and increase consumer involvement.[20]

The *Exemption Rule* applies to projects operated by associations, meaning owners' associations and energy associations.[21] These associations must be entirely controlled by their members, which means that DSOs and energy suppliers are not allowed to exercise any control,[22] but members decide on the organisation, progress and distribution of costs of a project.[23] This governance choice to not include DSOs and energy suppliers seems to be influenced by the undesired dominant position of these two entities in the *IPIN* projects. Associations have to demonstrate in their application that they have the necessary organisational, financial and technical expertise to fulfil all required goals of an experiment.[24] Hence, in order to become producer, supplier and system operator of a local grid, associations have to prove that they can ensure reliability, safety, consumer and environmental protection, and comply with the technical standards that apply to DSOs.[25] Additionally, the association has to finance the entire project.[26] Associations hence become the generator, supplier, and system operator of a local grid. This has two main consequences: first, the strict division of market and grid activities vanishes. Secondly, associations take over the responsibilities, and in consequence the powers, of current DSOs and energy supply companies.

[18] This exemption applies only to 'project grids' . In 'large grid projects' DSOs continue to exercise their legal tasks. Due to this, this paper focusses on 'project grids' and does not refer to 'large grid projects', unless specifically mentioned.

[19] For detailed information on experiments in the Dutch context see for example Michiel Heldeweg, 'Experimental Legislation Concerning Technological & Governance Innovation – An Analytical Approach' (2015) The Theory and Practice of Legislation, 3(2), 169.

[20] Besluit DDE art. 3(1), art. 8(2), and art. 16.

[21] For more detail on the phenomenon of energy associations (also referred to as local renewable energy initiatives) in the Netherlands, see for example Maarten Arentsen and Sandra Bellekom, 'Power to the People: Local Energy Initiatives as Seedbeds of Innovation? (2014) Energy, Sustainability and Society, 4(2) and Thomas Hoppe, Antonia Graf, Beau Warbroek, Imke Lammers, and Isabella Lepping 'Local Governments Supporting Local Energy Initiatives: Lessons from the Best Practices of Saerbeck (Germany) and Lochem (The Netherlands)' (2015) Sustainability, 7(2), 1900. For the provision of the Besluit DDE see art. 3.

[22] Besluit DDE art. 7(1)(j).

[23] Besluit DDE, art.7(1)(k).

[24] Besluit DDE, art. 7(1)(m).

[25] Besluit DDE, art. 4 and art. 7(1)(d) and (e).

[26] Besluit DDE, art. 7(1)(l).

4. Looking Inside Regulated Governance Experimentation: Generation and Supply

The foregoing sections outlined the quest for novel regulation which incorporates governance structures of smart grids and the approach of regulated experimentation to gain knowledge about those governance structures chosen in the Netherlands. This section specifically addresses the emerging governance structure in the *Exemption Rule* projects for particular aspects of the electricity sector, namely generation and supply. The first tender procedure for projects applying for an exemption was opened in 2015 and as of June 2016 resulted in four projects which gained exemption.[27] The choice to take a closer look at the specific activities of generation and supply stems from the fact that two of the projects incorporate collective generation and three projects mention peer-to-peer (P2P) supply as a main component.[28] This section briefly outlines the main current rules on generation and supply activities and compares these with the new governance forms of generation and supply that are emerging in the projects. Under the current regulation of the electricity sector, electricity generation and supply are market activities which means that they can be, subject to a permit, carried out by any person not involved in regulated grid activities.

4.1 Generation & Collective Generation

In the conventional set-up of the electricity system generation is often mentioned as the first point in the electricity chain. As electricity generation is a market activity, the Dutch Electricity Act does not designate specific entities for the generation of electricity. Generators are broadly defined as any 'organisational entity that generates electricity'.[29] Yet, the high investment needs of deploying generation capacity and the technical necessity to coordinate generation with grid capacities and consumption requires regulation to define the responsibilities thereof.

The planning of generation capacity is completely left to competitive market forces. Due to the concern that market forces may not ensure the right investment signals for new generation capacity, the MEA can open a tender procedure for new generation capacity in case of concerns that generation capacity will not be sufficient. In that sense, some governmental control remains for the sake of ensuring security of supply concerns.[30] Similarly to generation capacity, the choice of energy sources for generation is also left to the competitive market. However, the Electricity Act does require the generators to endorse environmental responsible generation of electricity.[31] Additionally, the electricity generation sector is subject to the EU Emission

[27] These projects are 'ZwijsenVeghel', 'Blackjack', 'Endona' and 'Greenparq'. A detailed description of these projects can be found in the Annex, Table 1; here the paper only mentions several overarching elements of the four projects.

[28] This section mainly refers to the Electricity Act of the Netherlands as the projects are carried out in the Netherlands, yet most of the provisions stem form EU legislation on the electricity sector and therefore are also valid in a broader context within the EU.

[29] Elektriciteitswet 1998 Wet van 2 Juli 1998, houdende regels met betrekking tot de productie, het transport en de levering van elektriciteit, Stb. 1998, 427, art. 1(g).

[30] Ongoing discussions still search for optimal regulatory approaches which address the problem of inadequate investment signals but at the same time leave the market as undistorted as possible. For a comparison of the two most discussed regulatory principles, the capacity market and strategic reserve mechanism, see for example Nicolas Hary, Vincent Rious, and Marcelo Saguan, 'The Electricity Generation Adequacy Problem: Assessing Dynamic Effects of Capacity Remuneration Mechanisms', (2016) 91 Energy Policy 113.

[31] Elektriciteitswet 1998, art. 68.

Trading Scheme which allocates allowances per emitted unit of Green House Gases (GHG).[32] Ideally, the EU ETS scheme influences the choice of energy sources by making the generation of electricity from conventional sources that cause GHG emissions more costly. Thus, despite the fact that capacity and sources of electricity generation are generally left to market forces to a large extent, some minimum governmental oversight remains with regard to the overall objectives of ensuring security of supply and sustainability.[33]

All *Exemption Rule* projects implement collective generation. As mentioned above in section 2, DG is one of the main reasons that cause the necessity for the further implementation of smart grids, and linked to this, smart grid governance. Collective generation is a viable option to increase DG of RES, because financial means and local facilities are pooled for that purpose. Collective generation means that ownership of several small DG facilities is shared which allows the entity to fall under the definition of a generator, an entity that generates electricity. Single customers installing DG do not fall under the definition of generator which requires at least an 'organisational entity'. Jointly, collective generation accounts for such an organisational entity, which subsequently can act as a real generator, meaning selling electricity also to others than their contracted supplier (which is the only commercial partner for single customers that produce electricity).

Whereas shared ownership of electricity generation is possible under the current legal framework, and not a new development, what is new is that in the *Exemption Rule* projects the association or collective is also the supplier of the generated electricity for their own members. In combination with P2P, collective generation might gain new significance as generation and supply can efficiently be matched and also locally consumed which reduces upstream grid loads and transmission losses.

4.2 Supply & Peer-to-Peer Supply

The Dutch Electricity Act defines a supplier as 'organisational entity that supplies electricity'.[34] However, electricity suppliers for domestic customers need to have a license for supply.[35] The license regime aims at establishing a certain degree of protection for domestic customers with regard to continuous supply and fair prices for electricity.[36] The Dutch National Regulatory Authority (NRA)[37] grants licenses on basis of an assessment whether the applicant has the required organisational, financial, and technical competences and is considered to be capable of fulfilling the responsibilities of electricity suppliers as established by the Electricity Act.[38] The main responsibility of electricity suppliers is to supply domestic customers with electricity in a reliable manner and for reasonable tariffs.[39] On a yearly basis the suppliers have to submit

[32] Directive (EC) No 2003/87 Establishing a Scheme for Greenhouse Gas Emission Allowance Trading within the Community and amending Council Directive 96/61/EC [2003], art. 4 and annex I.

[33] Considering that the amount and impact of DG of RES will increase in the near future, governmental oversight with regard to generation capacity adequacy and the variety of electricity sources deployed might need to respond to those developments.

[34] Elektriciteitswet 1998, art. 2(f)

[35] Elektriciteitswet 1998, art. 95a(1)

[36] Martha Roggenkamp, 'Energy Law in the Netherlands' in Martha Roggenkamp, Catherine Redgwell, Anita Rønne, and Iñigo del Guayo (eds) in *Energy Law in Europe – National, EU and International Regulation* (3rd edn Oxford University Press 2016) 783.

[37] The Dutch NRA is called 'Autoriteit voor Consumenten & Markt' (ACM).

[38] Elektriciteitswet 1998, art. 95(d)

[39] Elektriciteitswet 1998, art 95(b).

their supply tariffs to the NRA who then decides whether the tariffs are indeed reasonable.[40] Additionally to the traditional task of supplying electricity to their customers, suppliers are obliged to buy electricity in case that their customers are also producing electricity that exceeds their own consumption.[41]

As mentioned, the focus in all projects of the *Exemption Rule lies* on collective generation and peer-to-peer supply. Peer-to-peer supply means that any domestic customer generating electricity can supply that electricity to any other domestic customer. In the context of the increasing amount of DG, within collective generation or as single customer, peer-to-peer supply can contribute to higher efficiency by using any surplus of electricity generated and by consuming it locally close to generation. Customers who also act as generators are often referred to as 'prosumers' (producing and consuming electricity). 'Prosumers' are limited to sell the surplus of electricity that is not needed for own consumption to the contracting supplier. So, under the current legal framework domestic customers who start generating electricity are not entitled to freely supply excess electricity on the market and are therefore not enabled to develop an independent role in the electricity market. This obstacle is eliminated in the projects as peer-to-peer supply is allowed. Here, the license to supply electricity is automatically granted together with the general exemption.[42] Additionally, associations can determine their own local (dynamic) electricity tariffs,[43] as the ACM does not control the height of these tariffs anymore, but merely oversees whether the association used an appropriate method for calculating them. The supply (and linked to this the dynamic pricing) is however limited to the members of the project.

To sum up, collective generation and P2P supply are made possible by the *Exemption Rule*, and both are expected to be promising tools to achieve the objectives of increasing DG of RES.

5. Facilitating the Shift from Experiments to Standard Regulation

The introduction of this paper stated that one of the main obstacles for implementing smart grids on a larger scale is the legal framework which consolidates governance structures for the conventional electricity system. In order to find new governance forms which enable the implementation of smart grids, the Netherlands established regulated governance experimentation. The results of the regulated governance experimentation are expected to serve as knowledge source for developing possible legal adjustments. In that sense, the regulated governance experimentation is considered as a transition phase between 'old' and 'novel' regulation for the electricity sector. In this transition phase, four projects gained exemption under the *Exemption Rule's* tender of 2015. These projects create diversity and innovation outside the standard legal setting of the electricity system. The goal of these experiments is to obtain information about the governance of projects involving DG of RES.

This begs the question whether the projects provide relevant information for developing a legal framework which enables the large scale deployment of smart grids. Therefore, this section discusses the findings of the foregoing section with regard to the question posed in the introduction, to what extent can the generated information serve as source for developing a

[40] Elektriciteitswet 1998, art 95 (b) 2
[41] Elektriciteitswet 1998, art.95(c) 2 and art. 31(c)
[42] Besluit DDE, art 13.
[43] Besluit DDE article 12.

legal framework which enables smart grids. Key for the analysis is in how far the *Exemption Rule* contributes to the implementation of smart grid technology, and more specifically in how far the specific projects help facilitating the shift from the transition phase by providing information whether and how the legal framework needs adjustments for scaling up smart grid technology implementation.

As stated in section 3, the *Exemption Rule* does not specifically address smart grids, yet, the objectives are strongly related to the goals that smart grids are envisaged to facilitate. Briefly recalling from section 2 and 3, those are mainly the efficient integration of DG of RES, efficient use of the grid infrastructure, and involvement of consumers.

Collective generation and P2P supply
All projects implement collective generation and P2P supply. Both, collective generation and P2P, especially taken in combination, are new forms of governance that are expected to facilitate and accelerate DG of RES and improve energy efficiency by stimulating local electricity consumption. Whether this is indeed the case, remains to be seen until the first official evaluation of the projects.

Dynamic pricing
Crucial for the functioning of smart grids is not merely the local generation and P2P supply, but the matching of generation and consumption in order avoid the "lumpy investments in current grid infrastructure".[44] Efficient matching of generation and consumption requires DSM, which is facilitated by dynamic pricing of electricity close to real-time and network tariffs which reflect the actual use of the grid. The *Exemption Rule* allows the projects to determine their own local (dynamic) electricity prices and also to adjust the network tariffs.[45]

Involvement of consumers
The effectiveness of decreasing the electricity load of the grid, avoiding peaks, and thereby using the grid infrastructure efficiently strongly depends on the involvement of single grid users. Smart grids and especially DSM can only function well when grid users actively participate and ideally shift their demand. Considering that the projects consist of one integrated actor who is generator, system operator, and also incorporates the consumers as members, the involvement of grid users will indeed be effective.

New actors
Currently, in larger settings outside of these experiments merging all actors as one entity in the electricity sector is not possible. While the *Exemption Rule* allows to experiment with having market and grid activities undertaken by one single actor (associations), it does not provide room for other actors nor allows for the emergence of new ones. The introduction of completely new actors like aggregators who manage flexibility of grid users (generators and consumers) on a larger scale, or operators of storage facilities are however viable options for operating smart grid projects on a larger scale. Storage could on the other hand also be a new commercial activity in the electricity sector. Yet, these roles and responsibilities are not defined in the decree and new actors are not provided a place in the projects under the *Exemption Rule*.

The findings reveal that the generated information can only serve to a limited extent as source for developing a legal framework which enables smart grids on a larger scale. The projects

[44] See section 2.1 'Smart Grids – Enabling Sustainable and Efficient Grids'.
[45] The Dutch NRA, ACM, does not control the height of these electricity tariffs anymore, but merely oversees whether the association used an appropriate method for calculating its tariffs. Besluit DDE art. 12.

might re-establish that new governance forms for the implementation of smart grids are necessary, however, specific information about how those governance forms could look like on a larger scale is currently limited in the *Exemption Rule*.

6. Conclusion

The objective to maintain a secure, affordable, and sustainable energy system requires a new technical design of the electricity grid. However, the benefits of the (smart grid) technology can only be reaped if the legal framework allows for new forms of governance that are needed for the actual implementation. However, finding those suitable governance forms (through experimentation) is more than challenging. On the one hand, security- and technical standards need to be preserved, on the other hand sufficient space needs to be provided for possible new forms of governance to develop. Therefore, this paper answered the question of whether the governance structures of the Dutch experiments provide new governance models for developing a legal framework which enables smart grids on larger scale. The example of innovating electricity legislation upon regulated governance experimentation in the Netherlands reveals that the small scale projects only address a small range of issues. Due to their limited extent these experiments do only provide limited information for considering adjustments for a legal framework which applies to the whole electricity sector. Whereas derogation from specific legal rules allows for collective generation, P2P supply, dynamic electricity tariffs and involvement of consumers, it does not facilitate the emergence of new actors that could very well play a relevant role with regard to smart grid operation. The *Exemption Rule* is limited to associations that are allowed to carry out all the tasks in the electricity supply chain. Therefore, this paper concludes that the results from the projects under the *Exemption Rule* can only to a limited extent provide a source of information about new governance models for developing a legal framework that facilitates the implementation of smart grid technology on a larger scale.

Annex

Project name	**Exemption Holder**	**Stakeholder in the lead**	**Details on the project**	**Technology**
ZwijsenVeghel	Owners association ‘Collegepark Zwijsen Veghel’ (founded april 2015)	Project developer Starlight B.V.	Ca. 115 apartments will be build inside a former school complex.	Energy generation (solar PV panels, CHP) Energy management via ICT for residents’ appliances Dynamic electricity tariff
Blackjack	Owners association ‘VvE-gebouw Black Jack’	JansZon B.V., a supplier and installer of solar PV panels	An apartment complex will be constructed.	Energy generation (214 solar PV panels) Peer-to-peer supply Energy management via ICT
Endona	Energy association ‘Endona U.A.’ (founded 7 april 2015, preceded by energy association Ecozon). Note: the association’s board has as of fall 2015 not yet started to actively attract members.	Energy association Escozon Coöperatie U.A.	The main project is the construction of an ‘energy-park’, consisting of ca. 7200 solar PV panels.	Energy generation (solar PV panels in energy-park and on residents’ roofs) Energy saving via energy management in households Peer-to-peer supply Purchase and sale of renewable energy from a bio-digester
Greenparq	Owners association ‘VvE Park Reeuwijkse Plassen’ (founded september 2015)	Real estate company D&M Properties (working for investment company GREEN Real Estate B.V., whose subsidiary Green Reeuwijkse Hout B.V. is officially leading the project)	Holiday homes will be constructed in an recreational area.	- Energy generation (solar PV panels on the roofs of common facilities, CHP) - Peer-to-peer supply

Table 1: Details on the four projects of the *Exemption Rule* tender fall 2015