ROADMAP SMART GRIDS
DUTCH BRANCHE ORGANISATION NETBEHEER NEDERLAND

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ABSTRACT

Smart Grids is seen by the Dutch branch organisation of network companies as a mean to facilitate the energy transition in the Netherlands. Smart Grids will reap many benefits for society and the involved actors. By formulating actions and steps in their roadmap, the Dutch network companies together address issues needed to resolve with other stakeholders in order to realise a sustainable, affordable and secure energy system now and towards 2050. This paper describes the content and process towards the formulation of the Roadmap Smart Grids of the branch organisation of Dutch network companies, Netbeheer Nederland.

INTRODUCTION

In order to realize the objectives and ambitions of the Dutch government in transforming the energy system in to a sustainable one, consequences are projected for the design, construction, operation and management of energy infrastructures. One of the leading solutions to face these consequences and challenges is the application or transformation of the energy supply system into a Smart Grid.

However, the perception and perspectives of the subject "Smart Grid" differ amongst involved stakeholders [1]. In 2009 the Dutch national industry association of network companies, Netbeheer Nederland, has formulated and presented its vision on Smart Grids [2]. Netbeheer Nederland is the independent branch or industry organisation of gas and electricity transport and distribution companies[1] in the Netherlands.

In order to continue the dialogue with relevant stakeholders, network companies have formulated their shared vision on Smart Grids in order to exchange thoughts, views and opinions about this development. This vision brings perspectives in the discussions and debates about this subject and explicitly puts forward the interest of network companies, their challenges and arguments.

[1] Netbeheer Nederland represents the following members (in alphabetical order): Alliander, Cogas, Delta netwerkbedrijf, Enexis, Gas Transport Services, Intergas, Rendo, Stedin Netbeheer, Tennet, Westland Infra Netbeheer.

A vision on Smart Grids serves as a point on the horizon in order to share views on future developments with involved stakeholders. In order to realise this goal and shared vision, steps are needed to be taken and actions will have to be implemented.

The energy sector in the Netherlands has undergone recently fundamental changes, due to liberalisation and unbundling and new organisations and corporations have been formed. Private production and retail companies are operating on the free market and network companies, due to the monopolistic nature of their business activities, are regulated. The network operators now have an independent role in relation to market parties, service providers and other market related stakeholders.

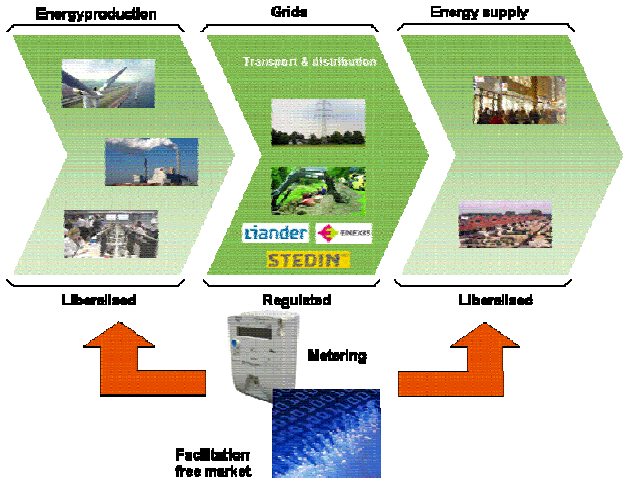

Figure 1) schematic market design of the energy sector in the Netherlands

Stakeholders involved in realising future Smart Grids are many, have a great variety in own interests and are interdependent on each other for realising them. By bringing the vision of Smart Grids closer to reality all stakeholders are invited and stimulated to take steps on different levels and on different subjects.

The roadmap Smart Grids contributes to the process of decision making for all involved stakeholders to start their dialogue on these matters.

ROADMAP SMART GRIDS

The project group Smart Grids of the industry association of

gas, electricity and heat network companies (Netbeheer Nederland) has developed a roadmap [3] in which steps needed to be taken are formulated and published. Starting in February 2010, the project group Smart Grids has organised several workshops and interviews in order to formulate and design the roadmap towards Smart Grids in the Netherlands.

Reasons for the Smart Grid roadmap

The reason for formulating a roadmap towards Smart Grids is that transforming the energy system into a "Smart System" is desirable and necessary. The Smart System does not only entail gas, electricity and district heat grids, but also (distributed) generation, (controllable) appliances at customers side and energy and system services of third parties. Facilitating the system as a whole, network companies will have to prepare their grids for future long term developments. New possibilities with regard to distributed generation and a shift towards electricity for transport and heat will cause changes in network planning, development and operation. Customers will have new and more possibilities and opportunities using the energy infrastructure through enhanced insight in consumption; the Smart Grid secures and enables additional comfort , but also enables users to enter new markets on innovative services and products.

The implementation of Smart Grids will equip the existing and future network with enhanced capabilities to incorporate distributed and intermittent (sustainable) production of energy. The networks of the future will need more flexibility in order to facilitate these developments, which are foreseen to increase in light of the energy transition in the Netherlands. Active customer interaction and local distributed production of "prosumers" will contribute to the needed flexibility of the system. Smart Grids will enable the necessary means, within and connected to the grid, to actively and passively contribute to enhance flexibility of the energy system.
In addition, Smart Grids are necessary to facilitate the distribution and transport of increased volumes of electricity. In the coming decades, developments such as heat pumps and electric transport will cause an increase in demand for electricity as an energy carrier. Therefore the network capacity will have to be reinforced and extended.

Thirdly, Smart Grids looks across all energy carriers, i.e. electricity, gas and heat, to find optimised solutions for energy solutions on the optimised level in the system. For instance, the Netherlands has a very dense network of gas distribution to households, so Smart Grids can unlock possibilities of (micro-)CHPs to ease capacity challenges on electricity networks.
Last, the implementation of Smart Grids secures and even enables additional comfort to users and opens new markets to offer innovative services and products within the realm of home automation or domotica.

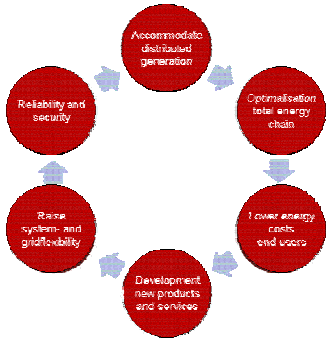

Figure 2) invigorative values of the Smart Grid

Benefits of Smart Grids

Smart grids are a collection of new generation electricity, gas and heat networks with large scale integration of information and communication technology. This holds new applications and benefits for all sorts of users. Amongst others these are:

- Smart Grids will offer consumers improved opportunities to contribute to the sustainable energy transition (energy saving, local energy production, contribution to system flexibility)

- Communities and municipalities can enlarge involvement for sustainable and energy awareness of their members and citizens

- Smart Grids offer governments sustainable and affordable networks maintaining the security of supply

- New business opportunities and challenges are made possible for energy retailers and energy service providers by direct involvement of their customers, enabled by Smart Grids

- (Dutch) economic development of new services and products which create value creation for (Dutch) society as a whole.

Analogue to the published vision in 2009 [2], the project group Smart Grids has made the effort to look at Smart Grids on a holistic and integral manner. Smart Grids is not technology and application alone; it has also consequences on systems like policy making, corporate strategy, social acceptance, etc.
Also systems such as the political and corporate decision making processes within individual stakeholders' organisations. The liberalised and unbundled characteristics of the Dutch energy sector have consequences to align decisions for the implementation of Smart Grids. Where "blueprints" used to be the paradigm to build and operate energy systems [4], involved stakeholders are now

interdependent on each other. The roadmap Smart Grids make steps envisioned by the Dutch network companies explicit to engage into dialogue with relevant stakeholders. The roadmap serves as an "agenda" for judicial and regulatory systems which will have to incorporate system innovations and, importantly, for the social systems (e.g. user acceptance, privacy and security issues).

THE PROCESS TOWARDS ACTIONS

The description of actions and steps needed to be taken are derived from three future visions. Three future configurations of the energy system in 2050 of electricity, gas and heat applications, sources and conversions are taken. These three scenarios are played on three levels:

- Micro: households and small enterprises
- Meso: District or industries
- Macro: national system (in relation to EU)

The three scenarios served to analyse which actions and steps needed to be taken to realise the vision. The projectgroup Smart Grids has focussed itself to formulate steps and actions for the first 15 years into the future, in correspondence to the interdependencies on involved stakeholders and the inability to design blueprints for the future. These 15 years (until 2025) are divided into three phases:

- phase 1: 2011-2013,
- phase 2: 2014-2018
- phase 3: 2019-2025

The more actions and steps are formulated in concrete and concise actions, the more these actions will need to be taken in the near future (phase 1). Formulating actions in steps in more detail for phase three proved to be difficult, whereas learned lessons and experiences in the days to come will serve as input to formulate future actions (phase 3).
Furthermore the actions are categorised into technological, policy and regulation and social issues.

The roadmap guides the different stakeholders involved in the energy sector of the Netherlands through the steps and actions needed to be taken to realise the vision of Netbeheer Nederland on Smart Grids. It not only stipulates the future actions to be taken by network companies in the Netherlands, but also addresses issues and timelines which have to be dealt with together with relevant stakeholders in order to successfully implement Smart Grids in the energy system of the Netherlands.

EXAMPLES OF ACTIONS

It goes beyond the scope and length of this article to describe all formulated actions; therefore we will address some examples.

Technological issues

- Research, development and demonstration of energy storage. Different methods to store energy in different forms and the theoretical possibilities increase the necessity to put efforts into this subject.
- Standardisation and specification of the "smart electrical room[2]". This subject is not related to the smart meter specifically but to smart "*metering*" in general. Smart metering in 2015 will have modular functionalities which enable the costumer to control the access to energy infrastructures through several cross sector communication channels.

Policy and regulatory issues

- Research into the requirements, demands and conditions of customers. Many Smart Grids concepts [1] will endure and last through customer acceptance. Therefore it is essential to gain insight into the customer's requirements and conditions.
- Development of methodologies to analyse societal costs and benefits of energy systems across different energy carriers. The vision to distribute cost and benefits as efficient as possible in society (including public values) for a energy system, it is important to incorporate the right elements in investment decisions. Therefore it is necessary to incorporate gas, heat and electricity applications and conversions of the energy systems into the new methodologies.

Social issues

- Contributing to the development of sustainable cities and districts. Many municipalities in the Netherlands have set sustainability objectives and ambitions. For example energy neutral districts. It is essential that energy network companies are involved in these developments in order to help, facilitate and test new concepts of sustainable energy systems.
- Increasing consciousness. Energy and for that matter, the infrastructures are not the most important concern of citizens and corporations. System innovation of energy systems into Smart Grids will endure or fall with the acceptance and support of citizens. Support and acceptance begins with the recognition of citizens into these issues and challenges of society.

[2] In the Netherlands household connections, meters and switchboards (e.g. water, gas, electricity, cable, etc etc) are placed in a standardised dimensioned cabinet in houses; NEN 2768:2005 "Meter boxes and associated constructional facilities for laying lines in homes"

NEXT STEPS

Next step of the industry organisation of Dutch network companies be to organise and initiate discussions and dialogues with the different stakeholders. An example of this is the instalment of the Taskforce Intelligente Netten [5], chaired by the minister of Economic Affairs, in which these issues are discussed. In addition, Netbeheer Nederland, and the project group Smart Grids initiates and participates in research, development and demonstration projects in order to gain insight in all aspects (judicial, regulatory, social, political and economical) of Smart Grids.

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