



e-harbours

WP 3.7 Application of Smart Energy Networks

Organisational and Legislative Analysis

Summary results of showcase REloadIT at Zaanstad



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Release date

: Wednesday, 20 November 2013



1 Introduction

Smart energy networks are intelligent and flexible solutions which combine flexible energy consumption, local generation of (renewable) energy and energy storage on different levels. In any smart energy network, the presence of both technical/economical and organisational/legislative conditions is crucial.

The e-harbours report 3.5 focuses on the *technical and economical aspects* of smart energy solutions. The scope of WP3.5 is the translation of the 6 universal business cases (e-harbours report WP3.4) on the level of every showcase. It gives an overview of the potential for the exploitation within the existing local (national) rules and regulations.

This e-harbours report 3.7 focuses on the *organizational and legislative aspects* of smart energy solutions. A list of barriers has already been composed (deliverable 3.3).

This report 3.7 addresses the analysis on a local level, and gives an overview of barriers which hamper the exploitation of smart energy systems.

1.1 Description showcase

The municipality Zaanstad has ambitious goals to become climate neutral in 2020. Local renewable energy production, as well as clean mobility is stimulated. Within the REloadIT project a smart grid system has been developed tested to examine whether the benefits of renewable energy production can be matched with flexible energy consumption. To accomplish this goal, three core activity areas have been defined: 1) energy reduction 2) introduction of renewable energy production and 3) innovation. Project REloadIT is an example of goals 2 and 3.

Renewable energy generation by photovoltaic and wind, energy storage, electric driving, balancing energy and the role of the electricity network are aspects of energy transition that are not common practice for the municipality. This document covers the study on the organisational and operational impact of the introduction of a smart grid system: that is the development and implementation of a smart energy system based combining renewable energy production and flexible energy usage by electric cars. The ICT-system comprises two main components: a car reservation system for electric cars, and a smart energy algorithm which controls the smart charging of electric cars.

The main objectives to be addressed were:

1. To optimise the usage of renewable local energy to be consumed by the electric cars of Zaanstad by developing a smart grid system (development of software, and integration with present hardware).
2. Demonstration of the capability of the smart grid application under practical conditions: i.e. the reliability of the ICT-system, and availability of electric cars, and the operational aspects.
3. Study on possible business cases (scope 3.5) and focus on organisational and legislative aspects.

1.2 The strategy/approach

This report reflects on the organizational and legislative aspects of the showcases, conclusions and lessons learned. We make a distinction between Zaanstad-internal and smart grid specific matters. The next project phases were followed:

- Determine the objectives of the municipality (to be documented in the project plan);
- Organising a startup of a REloadIT user group consisting of personnel from various departments of the municipality, partners of e-harbours, car park owner and operator;
- Writing a REloadIT project plan (planning in time, roles, finances etc.), reviewed and approved by the REloadIT
- Writing the functional and system requirements of the REloadIT SmartGrid;
- Subcontracting and development of the software application;
- Commissioning of the system ;
- Exchange experience with the user group. Further developing and improving the system.
- Study on barriers of the possible business cases (see report 3.5) but focus on organisational and legislative aspects that hamper the introduction of smart systems.

In chapter 2 the different project phases (summarised in 4 phases) are elaborated.

1.3 Scope of the e-harbours showcase in Zaanstad.

Current situation charging infrastructure

The new City Hall was completed and the infrastructure for charging the cars has already been operational. There are solar panels installed on the municipal bicycle building and there are solar panels on other buildings.

Contracts

The contracts of the energy supplier until now played a minor role in the possibility to reduce energy costs. Zaanstad is anticipating future sustainable development with the procurement of new energy contracts for the municipal organization. There are several questions and barriers which REloadIT encountered in the realization of this project.

Preconditions

Important precondition starting the REloadIT development is that the current operational ICT-systems within the Zaanstad municipality should not be affected by the implementation of REloadIT. The charging stations were not capable to be used as dis-charging systems, which could be a future functionality in case storage of energy and feed into the grid should be an option.

Questions to be answered & challenges encountered by the introduction of the smart system:

- How to involve end users: examine aspects on behaviour, how is good behaviour (planning & realization energy question) rewarded?
- What did we learn, what is needed to overcome the technical and organisational hurdles, how to accept and embed the knowledge gained into the hearts and minds of the personnel (and in the management system)?
- Different parties are involved; this increases the complexity of the project organisation how to manage this?

WP 3.7 REloadIT

- How to manage the changed perception of costs and or investments during the running time of an experimental contract?

REloadIT deliverables

- 1) Work Plan REloadIT (Dutch)
- 2) System Specification (functional & technical) REloadIT
- 3) Design document (July 2011)
- 4) Financial planning REloadIT (Oct 2011)
- 5) Software application REloadIT
- 6) Smart grid application REloadIT
- 7) Web application (user interface) REloadIT
- 8) Internal presentations between August 2011 and April 2013
- 9) Project meeting agenda's & minutes
- 10) Minutes stakeholder meetings.
- 11) Questionnaire electric transport Zaanstad

2 SUMMARY RESULTS

2.1 SHOWCASE RELOADIT

2.1.1 Introduction

The municipality of Zaanstad aims to be climate neutral in 2020. Local renewable energy production, as well as clean mobility is stimulated. Within the REloadIT project a smart grid system has been developed and tested to examine whether the benefits of renewable energy production can be matched with flexible energy consumption. The following paragraphs depict the process of the development of the smart system, the organisational aspects focused on organisational and legislative barriers...

2.1.2 Investigation results

A) REloadIT start-up phase

During the start-up phase of REloadIT the project-team was established. The REloadIT project partners included: the municipal car park operator (Q-Park), the charging equipment company (IMTECH), the responsible for the electric cars within the municipality (Zaanstad), the project leader electric transport (Zaanstad) the regional DSO (Alliander), the University from Amsterdam (UvA) and the project leader from Zaanstad. In this phase the partners where getting acquainted with the concepts of a smart grid. The technical specialists were in the lead, guided by the REloadIT project leader and supported by Vito.

Deliverables: Project work plan and a functional specification of REloadIT.

Barriers encountered:

- 1) Getting some of the regional partners committed to the project was difficult.
- 2) Especially the commercial partners, persuading them to invest time and efforts in such experiment without having a short term commercial benefit.
- 3) Nobody truly responsible for energy-related matters: it was (very) difficult during both start-up and lifetime of the project, to keep our won organisation involved municipality of the added value of (smart) energy management

B) The REloadIT system design phase

During the period August to November 2011, the REloadIT system was defined. This included the system functional and technical specifications, and specification of the development path (including testing, evaluation and adding improvements). The project team realised a project plan, including a project finance scheme. As Smart Energy Systems are new at Zaanstad, they consulted the e-harbours partners VITO, who supported Zaanstad during this phase.

Deliverable: System specification REloadIT.

Barriers encountered:

- 1) Cooperation within the municipality: the department responsible for IT within the municipality was requested to collaborate, but this was hard, given the pressure of operational issues and the nature of an innovative Smart Energy experiment. It could not fit in the present ICT-infrastructure within the time frame of e-harbours.

- 2) The commitment of partners was not always obvious; it was not always possible to get the promised contributions from some partners (in spite of frequently requesting). No sanctions lead to less commitment of partners.
- 3) It was quite difficult to gather information of the equipment: concerning the solar systems, and the car charging equipment.
- 4) During the period of further tuning the design REloadIT system objectives written into the functional technical specifications document the subcontracting procurement was also initiated
- 5) Within the organisation of the parking (too) many stakeholders are involved. They are partially responsible for the operations. Not clear where/whom to ask your questions.

C) The REloadIT system development and implementation phase

Introduction

The municipality had difficulties to assess the investments involved to develop such a system. A tendering process was initiated, by approaching four companies to submit a tender. An internal debate about the tendering procedure took quite some extra time and proved to be a serious barrier for the REloadIT project realisation. The selection process resulted in the selection of the best offer on value for money. EnergyGO was selected not only because they submitted the best offer, but also because they were prepared to invest in the development of the REloadIT system.

REloadIT system implementation

During the technical development phase of REloadIT (March-October 2012) the project team worked on the technical options. The Zaanstad authorities, the electric car park manager, the technology provider, and other stakeholders all contributed to the system design.

The involvement of the operational departments (Services and ICT) was not well established in this phase. During the development of the technical and functional specifications the ICT department unfortunately was not involved. Technical and organisational issues were foreseen by the ICT-department. The project e-harbours decided to go on to the next stage, in order to proceed and meet the demands of the international planning.

Internal inventory on car usage

A questionnaire regarding electric vehicle utilisation was executed, providing an inventory with opinions and desired functionality to optimise electric car utilisation. This proved to be important input for the developers of the REloadIT system. The outcome of the questionnaire also emphasises that there are barriers to overcome to improve the utilisation of electric vehicles. Employers still prefer a fossil based car above an electric car due to: unfamiliarity of automation driving and uncertainty if the battery is sufficient loaded for their planned travel.

Barriers encountered:

1. Employers are not yet familiar with the peculiarities of electric cars. More instructions are necessary about the operation of an electric car.
2. Subcontracting ICT-scope was a new aspect for the Zaanstad team.
3. Estimating costs and efforts for this type of ICT-project is difficult.
4. The continuous involvement of the stakeholders (especially internal departments) is necessary, but a challenging process. This turned out to be the mayor barrier. Internal cooperation with too many stakeholders .

2.1.5 Legislative and contractual barriers (smart grid related)

During the REloadIT project it became clear that the current energy legislation, regarding regulations of tariffs, taxes and requirements for owning and using the grid, is not optimal to promote the introduction of smart grids. This is illustrated by the following arguments.

The existing energy tariff structure is based on the conventional energy supply and transportation. There is no incentive to use renewable energy production directly for energy demand. Flexibility in capacity tariffs regarding this situation -sustainable production and local demand energy management- is not yet available.

Energy tax legislation is not appropriate to anticipate on innovative developments, such as more local decentralized renewable energy production and the increase of (de)charging of electric vehicles. REloadIT indicates that the revenue for the produced solar electricity strongly depends on existing energy contract for energy consumption of the building on which roof the panels is installed. The revenues differs if the contract is based on large (for instance, in case of centralised procurement) or small consumers. When the own produced solar energy is consumed on another location nearby (own smart grid) the consumer pays energy tax for its own produced renewable energy. Several stakeholders asked the national government to adjust energy policy to encounter this issue.

REloadIT has to make clear agreements about ownerships and usages of the charging points, electric vehicles, public space (), energy-infrastructure, renewable energy units have to be made. Juridical responsibilities have to be appointed in an early stage of the project if possible.

During the service contracting phases of the parking lot, not yet all learnings/ins and outs of REloadIT were available. This led to a current situation in which the flexibility of the project can't fully be used for cost reduction. It is recommended to beware of consequences of agreements to be made. This means that during contracting phase specific attention has to be paid to:

- How to value the balancing of energy supply and demand.
- New responsibilities have to be defined and agreed upon. For instance regarding performance of installations, software applications, customers' satisfaction about reservation and use of electric cars etc.

Energy contract

Another spinoff of the REloadIT project is the latest energy contract rewarded by GreenChoice to the municipality Zaanstad. During the REloadIT trajectory the existing energy contract ended. Inspired by the energy specialists in the e-harbours team, the idea emerged to start an energy procurement based on new smart energy elements in it: balancing, flexibility, apx, esco-experiences and own (green) production. Core of the innovation is to include energy saving requirements as an incentive for the supplier.

Lessons learned and recommendations of the accomplishment of the energy contract are published in a small document titled *Local Procurement of Renewable Energy - Cooperation between the Municipality of Zaanstad and the energy provider.*

2.1.4 Spin off REloadIT

Innovation award 2013

REloadIT is one of the first operational systems where renewable energy generation and local consumption are locally optimised. This resulted in more clean energy concerted into 'work' with a minimal impact on the electricity grid. This is one of the reasons that REloadIT has been rewarded the with the Alliander Innovation award 2013, our regional DSO.

Reuse of ReloadIT

The system was presented to the project team (December 2012). The idea emerged to consider whether the energy and electric vehicle management tool could be applied broader in the municipality.

A smart municipality wide transport strategy support could increase the added value of REloadIT. This is still in the planning, but at present the real-time testing of REloadIT is ongoing and this phase will be finalised October 2013. An evaluation will be executed and provide knowledge regarding the future application and development of REloadIT technology.

3 Conclusions

The REloadIT project shows that technological issues are not the real challenge. The REloadIT project demonstrated that a technical ICT-infrastructure is an essential element for the realisation of a sustainable energy supply in the future.

The real challenges are related to communication, finances and organisation. Finances regarding energy, taxation, energy-network issues is a field for specialists.

Organisational issues when executing innovation in an operational environment with multiple stakeholders brought other barriers.

During the startup-, development-, implementation- and testing phases many barriers were identified. This is however a natural process of innovative project activities which are developed in large organisations with a large variety of (inter-)processes and procedures.

Zaanstad related aspects:

- This project created internal support for electric mobility and renewable energy, and could inspire regional partners.
- Within the municipality a greater support for smart energy systems has been created, the term 'SmartGrid' has been established;
- Internal collaboration within the municipality can be difficult. The REloadIT activities increased the work load
- Two consecutive project leaders left the project, this hampered the continuity, created a knowledge gap of new PL. Fred: adviseer om voortaan een externe ICT-expert aan te wijzen...
- Change management in large organisations is an important issue to address, create good expectation management by open communication and early involvement of personnel.
- The REloadIT project created a knowledge base in Zaanstad, which could be reused for other projects.

Smart grid related aspects

- Present legislation (national) not yet fit for upscaling smart energy systems ; private nets are forbidden.
- For the sake of demonstration: Virtual cases (based on scenario's EnergyGO report) were defined to obtain a feasible and representative business cases;

4 Lessons learned

4.1 Organisational issues

Organisational – lessons learned (Zaanstad specific)

- In 2010 energy management was an underrated topic in the Municipality, were little knowledge was available.
- The staff originally appointed to this tasks had no experience leading ICT related projects nor with smart grid applications. This was worsened by the fact that various staff changes occurred during the definition and development phase of REloadIT.
- Specific external/internal expertise is needed to lead and develop a smart grid application.
- Continuous internal communication is essential from concept to implementation of an application. Pay attention to accessibility of crucial information at an early stage of the project and arrange easy access to information.
- Take into account it takes a lot of effort to change existing operational processes and habits. Example: The involvement of the ICT department
- Different organisational procedures or governance is needed to realise local owned smart grids based on renewable. Public Private Partnerships (PPP) can be a complicating solution for this type of projects.

Organisational – recommendations (Zaanstad specific)

- Elaborate (and embed into the management system) organisational guidelines to established local owned smart grids based on integration of renewable energy. Requirements of organisations, skills, expertise, finances and capacity;
 - ü Make a check list of crucial information and requirements and an overview of the responsible persons within organisations to get access towards this information;
 - ü Characteristic of a smart grid demonstration project is that different organisations are involved. Which persons have the right competence and authority to make the needed decisions;
- Define ownership, maintenance and operations divided between different organisations/departments of Zaanstad or subcontracted activities.
- Arrange regional and national networks to start exchanging best practices;
- How to better involve/embed the ICT department in future projects it is suggested to define preconditions concerning ICT-security aspects, and internal ICT-standards.

4.2 Legislative issues (Smart grid specific)

Legislative – lessons learned

- Present national energy regulations and energy contracts are not suited for the introduction of smart grids;
- Interest of the national government regarding legislation and revenues by taxes partly conflict with upscaling ReloadIT finding
- Energy taxes are not supportive to increase the REloadIT business case.
- In general investments costs are high.

4.3 Ideas for further investigation

Networking, embedding and exploiting REloadIT

Future of REloadIT in a regional and national context. The REloadIT system is actually in a testing and evaluation phase, but the municipalities, ministries, provinces and commercial organisations show interest.

1. The great Metropole region of Amsterdam expressed their interest to participate in further extension of REloadIT.
2. A delegation of Rome visited Zaanstad to learn from the REloadIT achievements, the Ministry of Transport and Infrastructure, Directorate General Rijkswaterstaat visited Zaanstad to get acquainted with REloadIT technology and functionality.
3. The launching of REloadIT in the municipality the 1st of March 2013 attracted attention of 120 attendees, companies, municipalities outside Zaanstad, and energy agencies.
4. Various follow up initiatives have been initiated at national and European level. REloadIT is taken up as a Good Practice in the EU funded GreenITNet project (www.GreenITNet.org).
5. Actually the last year of the REloadIT project is ongoing, and the concretisation of the broad scope of this technology is in full development. This will be assessed during the coming half year and prominent present during the final e-harbours event planned in February 2014.

New innovative initiatives

1. The next SmartGrid generation will possibly optimise the adaptation of the present charging stations (remote load and higher charging currents of the batteries),
2. Introduction of a more accurate method of "car energy usage" forecasting.
3. Zaanstad has various proposals submitted targeting further project development, in EU context (FP7, Optimus, IEE ProSmart) and at national scale.

5 References

- 1) Website of REloadIT: www.reloadit.nl
- 2) Available presentations and brochures, refer to e-harbours website: <http://eharbours.eu/showcases/showcase-zaanstad>
- 3) Questionnaire about the use of electric cars
- 4) Note/report conclusions questionnaire
- 5) Note/report test of users electric cars within the REloadIT project
- 6) Report Lars Botman *Onderzoeksverslag Evaluatie vervoermanagementplan (only in Dutch)*