

“Because we believe it’s the right thing to do”

In this interview, Rune Hylsberg Jacobsen, associate professor at Aarhus University introduces a promising, sustainable approach to energy consumption – the SEMIAH project. He also reveals the interesting opportunities this project holds in store for both consumers and investors.

The project name “Scalable Energy Management for Aggregation of Households” may sound cryptic for someone not directly involved in the energy métier. Therefore, Rune, please explain what exactly SEMIAH is about.

I understand that it may sound cryptic, but there is some sense about it. What we are aiming at in the SEMIAH project is to benefit from a large number of flexible consumption patterns from residential households and to provide a better integration of renewable energy sources. For example, if a household would tolerate the temperature to drop or to increase a degree below or above comfort level; this provides a flexibility in case you have an electrical heating system, thus enabling you to turn off the heating for a period of time to save energy in the short run and later you can heat the house again. Another example would be the use of home appliances. You may provide flexibility saying that you do not have to wash your clothes or dishes right now, but instead you want the job done at a particular time, so you can provide a flexibility of, for instance, a few hours during the day.

These are examples of regular work processes in the household, and in the SEMIAH project, we want to aggregate – or sum up - the flexibilities

About Rune:

Rune Hylsberg Jacobsen, associate professor at Aarhus University, is a M.Sc. in physics and chemistry and holds a Ph.D. in laser physics and optoelectronics from Aarhus University.

He has published more than forty articles and has taken part in several prestigious projects, one of which is the EU-funded SEMIAH project, where Rune was appointed Project Coordinator.

Facts about SEMIAH:

- Stands for: Scalable Energy Management Infrastructure for the Aggregation of Households.
- Commissioned and Funded by the European Union
- Launched 1 March 2014
- Duration 36 months
- Website: <http://www.semiah.eu/>

of individual households. However, in order to get an amount of flexibilities that has any significance to the grid, we need to scale to a large number of households. Therefore, we are talking about managing energy in the houses. It has to be scalable and it has to be based on a large sum or aggregation of households.

According to your academic profile, you have conducted some research in the field of Smart Grids. This is also one of the core aspects of SEMIAH. Could you elaborate on the concept of Smart Energy Grid, please?

The Smart Grid combines Information Communication Technology with the more traditional control of the electricity grid. It allows communication technologies to report on activities all the way from the consumption side to the generation and control sides. This could be monitoring of an instantaneous consumption, which means that the Smart Grid monitors what is going on in a household at a certain moment in time. The collected data will be reported to a system that can also send information, such as prices of electricity. This bi-directional communication combined with the consumption of electricity is what makes it a smart energy grid.

On the SEMIAH website, the project was described as “A novel and open ICT infrastructure for the implementation of automated Demand Response in households...” Please explain to us what *ICT Infrastructure* and *Demand Response* mean.

Demand Response resolves from the fact that the electricity grid needs to be balanced. Supply and consumption demand must not outweigh

each other at any time. The consumption side is represented as Demand and if there is a surplus or a deficit of supply, we need an appropriate response. Demand Response would therefore be to adjust the Demand side as a response to what is available at the Supply side. We can fortunately use Information Communication Technology to support this by measuring or monitoring the Demand side, to register the need for future demand by forecasting of Demand and to have knowledge of the electricity generation. By combining this information, we provide Demand Response in order to create a better balance between supply and demand of electricity in every second.

As for the ICT infrastructure, ICT means Information Communication Technology and that is what we use to provide Demand Response. This could be computers, servers, network technology and the Internet.

The concept of Demand Response is nothing new per se. What distinguishes SEMIAH from already existing frameworks or projects?

SEMIAH is an open framework for actually building an ICT system to enable Demand Response. By open, I mean that we are not locked in to specific equipment types that you need in the households. We focus on working on the conceptual level to find out the concepts of flexibilities. We also work with open standards in communication to allow different vendors to enter the Demand Response market to provide Demand Response applications.

What also distinguishes SEMIAH from other projects is its focus on scalability, meaning that we can have a large number of small, flexible consumption patterns and aggregate these. Therefore, we need technology that is scalable



in combination with efficient and coordinated actions to provide Demand Response.

Catastrophes such as Fukushima and the dwindling oil and coal resources make it clear that renewable energy sources are the future of energy consumption. How can SEMIAH contribute to make this happen?

Overall you may say that the SEMIAH project supports the continuous integration of Renewable Energy Sources, as for example wind power and solar energy, in the European electricity grid. This can be achieved by shifting consumption towards periods with large fractions of renewable energy sources available and shifting away from periods with mainly conventional energy accessible.

In this way, we may contribute to avoid future catastrophes such as Fukushima and help reducing our dependence on fossil fuels.

What are the main obstacles or challenges SEMIAH tries to overcome on its way to becoming a serious alternative to conventional energy consumption patterns?

I see two obstacles to overcome. The first one is the engagement of the consumer, because he or she has to rethink their consumption behavior. Nowadays, we are used to have instant access to power when plugging in our electric devices. However, in the future, I believe, we need to add the concept of flexibility. We have to ask ourselves: Do I need the electricity now or do I have some flexibility? Is it okay if the dishes will be done a bit later? After all, for the consumer the priority might be that the dishes are done at

a certain time, for example before dinner. Until then he or she might offer flexibilities to the energy market. Getting the consumers to accept this new way of consuming energy will be a challenge.

The other obstacle could be to smoothly integrate the business aspect into the project. For now, we are still working on a strategy how to integrate SEMIAH into a business context. We have to find a way to link our concept with the wholesale energy-trading model that is emerging in Europe. While still identifying this as a challenge, I think we are on our way to building a business model around SEMIAH.

Halfway through its 36 months running time, SEMIAH now needs to come up with a solution to exploit the results of its ongoing research economically. This ambitious project aims to attract investors in order to implement DR systems in up to 200.000 households, with more to come. What makes investing in these systems attractive and what can be done to further promote private investment?

For now, there are two business opportunities. First, a distribution system operator, which is the company taking care of delivering electricity to the consumers, and by owning the necessary infrastructure making sure you have a stable energy supply.

These companies are interested in reducing consumption in certain peak-periods, often occurring during the evening when people start preparing and cooking their dinner. By flattening the peak through shifting energy consumption by means of Demand Response, they can

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postpone a necessary reinforcement of their grid due to high demand during peak hours. This cost-saving measure can justify the further promotion of private investment.

The other aspect is to promote investments for the emerging role of an aggregator in the electricity grid. In the future, the aggregator would be a commercial actor who aggregates flexibilities from a large number of, for example, households and then coordinates the onset of consumption or the shift of it to a later time. This would enable the aggregator to participate in the energy market by providing up-regulation or down-regulation services and to make bids on either an increased or a decreased consumption of energy. These bids can be used to provide a better balance between demand and supply of electricity.

Research has shown that setting up a Demand Response infrastructure in your household saves you about €83 a year, which does not cover the initial outlay of installing the necessary hardware. What kind of incentives will be put in place in order to attract private households to invest into a Demand Response system?

Being engaged in a project involving SEMIAH, there is a need to install an ICT system including hardware and software. It is also true that the financial gain from shifting consumption towards low-price periods is low. In many European countries, we do not even have differentiated electricity prices for the residential consumer. However, I expect them to come.

“The incentive is not an economic, but an ethic one.”

It can be compared to our view on organic food. Even if it is more expensive to buy organic food there is a tendency towards buying it regardless the price because we believe it is the right thing to do. This applies to the better integration of renewable energy sources, which SEMIAH helps to promote, too. Here, the incentive is not an economic, but an ethic one.

Another way to attract private households to install an energy management system with Demand Response capability could be some sort of loyalty program. The more flexibilities

you provide, the more benefits you can gain. It could be comparable to a Coop Card. Participation is of course voluntary and the consumer will always have access to electricity on demand if he or she cannot provide flexibilities at a specific moment for some reason.

All these issues are being addressed in the business modeling part of SEMIAH to make sure we have incentives for all the actors in the value-adding chain.

Security and Privacy are important issues when dealing with systems connected to the internet. How do you plan to provide protection for both companies and consumers?

In the SEMIAH project, we work together with a team of skilled security experts who provide us with the necessary expertise to anticipate threats and successfully protect against them.

When you sign up for a Demand Response system, you may expose vulnerable data via your appliances. Therefore, we take privacy and



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security very seriously, which is why we have implemented mechanisms to anonymize consumer data in order to provide effective protection.

Being the Project Coordinator, what are your responsibilities and what made you want to work for this project in the first place?

The role of the coordinator in a European research project such as SEMIAH is to be overall responsible for carrying out the work. This is done in combination with a number of work package leaders that act as project managers for dedicated tasks in the project. Furthermore, the project coordinator is an intermediary between our funding agency, which is the European Commission, and the project. This also associates some administrative tasks with the role of the coordinator, for example to ensure that the grant agreement is in place, that we have a consortium agreement and so on.

I wanted to work with the project because I am interested in the application of Information Communication Technology to the energy domain, and to see technical solutions being combined and meeting needs of the consumers.

Last, but not least, do you think SEMIAH will have had a visible impact on the way we consume energy ten years from now?

If we look ten or twenty years ahead, I think SEMIAH will have contributed to the overall introduction of Demand Response in Europe and I do believe Demand Response is coming because it is a clean way to use ICT. It is the right way to start adjusting the demand side while meeting the supply side and to provide a better integration of renewable energy.



The reason I think Demand Response is the right way to go is because of its competitiveness. For instance, the battery technology has issues with recycling decommissioned batteries. Due to their toxic waste, they have a negative impact on the environment.

In ten years ahead, I definitely think Demand Response will be widely deployed and we will start changing the way we look at consumption even though changing the mindset and behavior of people is a long-lasting process.

The technology developed by SEMIAH will help Demand Response get on its way in the near future.

Jonas Backsen led the interview.

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