# Assessing the Potential for Smart **Energy Grids in the Northern Periphery**

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#### Introduction

The global economic and environmental challenges rising at the turn of the 21st century are pushing for the development of sustainable solutions aiming at reducing the environmental impact while maintaining a positive economic trend. Global warming, energy security and scarcity of resources define a framework where the European energy network, a major contributor in terms of green/house gas emissions [1], will have to be rethought taking into consideration new needs, technological breakthroughs and economical environment [2]. In this scenario, supporting solutions based on decentralized energy production can play a key role for achieving a sustainable development regime.

This work aims to assess the potential and the challenges of a distributed energy production in a particular environment such as the Northern Periphery [3].

#### The Northern Periphery

This project focuses on a geographical area denominated as Northern Periphery (NP) (Fig. 1). Regions comprised in the NP area share important common features in terms of challenging climate, population density, and natural environment. Traditionally very resource intensive, they have been dependent of fossil resource of energy due the challenging topography and harsh winters



Figure 1 - The Northern Periphery area as defined by the Northern Periphery Program

In particular, our work aims to assess the potential for a smart grid based energy market in the northernmost North Calotte Area. Members of the largest electricity market in the world [4], Finland, Sweden and Norway, the countries of this region, are characterized by a common set of strengths and challenges. All are rich in natural resources, with high standards of services, widespread use of technology, high quality of education and a particular strength in the so-called "heavy high-tech" industry. At the same time, the current economic development gives grounds for an intensive exploitation of local natural resources, causing conflicts related to multiple and competing interests. All this in an environment characterized by an ecologically sensitive nature that regenerates slowly.

### Micro Energy to Rural SMEs

The aim of the "Micro Energy to Rural Enterprises" (MicrE) project [5] is to promote competitiveness through increasing the capacity for innovation and networking in rural and peripheral areas, and strengthening the synergies between environmental protection and growth in remote and peripheral regions. This project seeks to enhance the capacity for self-sustaining business and organisation life in rural NP regions. This can be achieved by developing a service that will make energy from waste technologies for small scale renewable energy generation available to small and medium-sized enterprises (SMEs) in rural NP regions on a viable and economically feasible scale.

## Smart Grids and Energy Services

Within the framework of the MicrE project, this research is dedicated to the assessment of the potential for a smart energy grid in the North Calotte NP Area. It is being developed taking into consideration three different and closely interconnected aspect of the issue: Environmental aspect

Analysis of the effects of developing micro waste-to-energy solution for SMEs coupled with a sizable integration of a distributed renewable energy capacity into the grid.

Technical aspects

Analysis of the grid development in the NP area envisioning a transition to a decentralized energy system

Economical aspects

Economical coherence and consistency of the envisioned development taking into consideration the local (i.e. Nord Pool Spot energy market) and the global socio-economical framework.

The transition such as the one mentioned earlier implies a more interactive and participatory role of the consumer. Owing to a real-time two-way communication, consumers will have to be able to gain by saving energy, by reorganizing their energy usage and by selling energy back to the grid. Such a system envision a process of democratization through participation of the energy market. With a shift in the energy industry business model: from growth through quantity to growth through quality.



Figure 2 – Indicative (and not exhaustive) representation of the different elements required for an effective and comprehensive energy service to play a role in a smart grid based energy system

It is believed that, for such a radical transformation, it is required that an important share of the future energy business is to move from the production and commercialization of energy to the offering of comprehensive energy services. Customers' services would include monitored grid access, real-time information on costs and consumption, possibility to customize the service's profile and the possibility to sell small renewable energy production in an open, transparent and easily accessible manner and technical assistance (Fig. 2).



Figure 3 – Expected role of the envisioned energy service within a smart grid based energy system Figure based on [6]

Likely to have a more direct impact mainly on the role of the distributed generator and retail market operators (Fig. 3), the envisioned microenergy services are expected to work as a driver toward solutions socially acceptable, economically sound and environmentally sustainable.



(1) K. A. Baumert, T. Herzog, and J. Pershing, "Navigating in the Numbers, Greenhouse Gas Data and International Climate Policy" World Resource Institute, 2005, pp. 9–19. [2] "European SmartGrids Technology Platform, Vision and Strategy for Europe's Electricity Networks of the Future" European Communities, 2006. (available online at http://ec.europa.eu [3] http://www.nordpoolspot.com

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