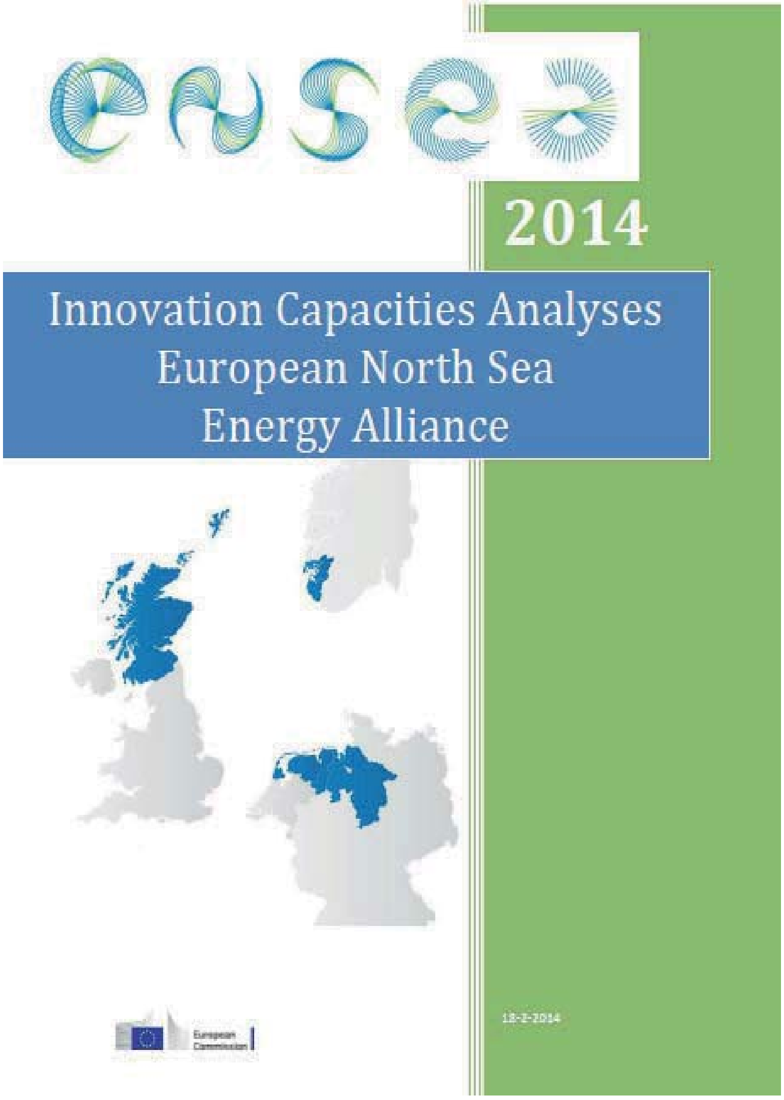
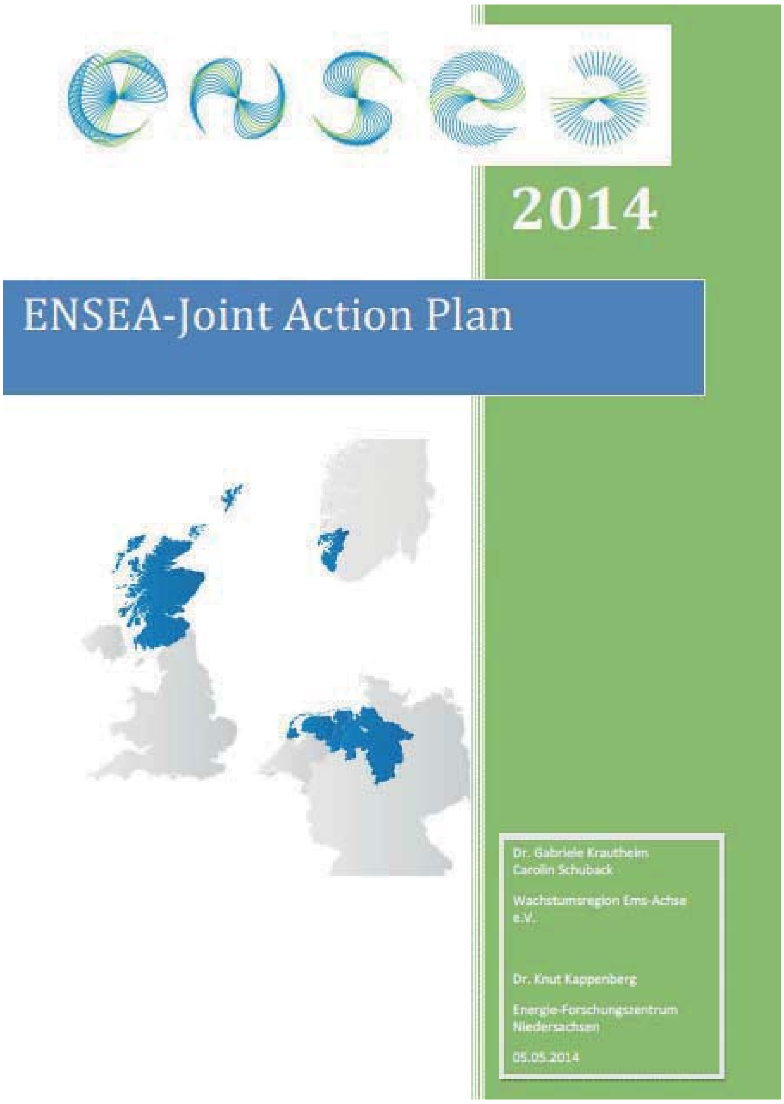
III Innovation Capacities Analyses European North Sea Energy Alliance



s. pdf-Anhang (294 Seiten)

IV ENSEA ‘Joint Action Plan’



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V Measures Towards Implementation of the Joint Action Plan

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VI Energy Systems Integration: The Agenda for the Future – Policy Brief

As the European energy landscape develops, the need to integrate our energy systems is increasingly recognized. Integration enables greater security of supply, higher levels of new and renewable low-carbon energy sources, reductions in the cost of energy, and requires increased deployment of low-carbon infrastructure. It compels us to create a system reflective of our changing energy use, and the changing energy landscape.

What is not as clearly understood, however, is how best to achieve the integration required. To be successful it must occur at all scales and in all sectors. It demands a holistic approach and coordinated, long-term policy commitment.

The European North Sea Energy Alliance (ENSEA), an EU-funded project looking at Energy Systems Integration (ESI) around the North Sea regions, has brought together experts in the field to discuss key issues and priority actions for enabling ESI across Europe. We present our priority actions below.

There are many organizations across Europe which could pursue these actions, however for the purposes of this report the actions are addressed primarily to the European Commission and the Directorate Generals for Energy, Climate Action, Enterprise and Growth, Digital Agenda and Consumers.

Definitions

Energy Systems Integration (ESI) describes the optimization of the design and performance of the supply of all forms of energy (electricity, heat, transport fuels and others) at all scales (consumer, community, regional and inter-regional).

Quadruple-helix approach refers to bringing together academia, industry, the public sector and civic society to work together.

The benefits of integrated energy systems

Integrating our energy systems brings multiple benefits to different players – from generators and consumers to system operators. We outline below how bringing our energy systems together can have positive effects on the three pillars of the energy trilemma.

Security of Supply: Bringing together different areas of our energy systems reduces our dependence on particular sources of energy. Variable generation is better managed in an integrated system and actively managed networks reduce the likelihood of outages and grid constraints. Energy systems integration creates resilient energy networks encompassing a wide range of technologies. Crucially, it reduces the need for imports from outside the EU and reduces the need to use finite energy sources.

Cost savings: Integrating our energy system drives efficiencies. Consumption can be reduced and smart systems mean less wasted energy. These energy efficiencies equate to cost savings for both businesses and consumers. By minimizing reliance on hydrocarbons, consumers are protected from their volatile costs.

Low-carbon generation: Energy systems integration enables better use of our low carbon generation capacity. For example, integrating wind power with energy storage, or converting excess renewable electricity to hydrogen for alternative uses, means that more of our generation can be low and zero-carbon. Energy systems integration supports energy efficiency measures, heat networks and decarbonized transport, helping to integrate renewable generation into the energy system.

The Vision
Our energy system is locked in a 'trilemma' as we try to balance the need for secure energy supplies, low-carbon sources, and affordable consumer costs. If we are to tackle the energy trilemma we need to see an integrated energy system where:
1. There is a holistic approach to energy systems policy-making and governance.
2. Integration is achieved through cooperation between the 'quadruple helix' of academia, industry, civic society and the public sector.
3. The public is educated and engaged, with 'pro-sumers' a key element of our demand and generation profile.
4. Policy aims to harmonize markets and frameworks for integration across Europe.
5. Infrastructure that facilitates integration between different energy sectors is prioritized.
6. Ambitious EU-wide R&D programs underpin continual technology development.
7. Data are shared and Active Network Management occurs at scale.

Key Barriers and Recommendations
Significant changes need to be made before our current energy system can resemble the holistic system we need to create. We outline below what we consider to be the key barriers to creating an integrated energy system across Europe within the four (overlapping) areas of *Technology; Infrastructure; Policy, Governance & Markets*; and *Consumers*. Through detailed stakeholder engagement across the 'quadruple helix', ENSEA has identified a series of priority actions to help overcome these barriers.

Principal Recommendation
Establish an Energy Systems Integration Forum to address in a holistic way the issues of Policy and Governance, Technology, Infrastructure, and Consumer Engagement.

The relevant Directorates of the European Commission should work together to seek new models of cooperation to encourage quadruple helix, cross-discipline and cross-sector collaboration.

Technology
We welcome the European Commission Communication "Towards an Integrated Strategic Energy Technology (SET) Plan" and the inclusion of energy demonstration projects in the Horizon 2020 program. However further action is necessary to fully and holistically address systems integration and to get genuine commitment. This includes the following action areas.

Action Areas:
1. Ensure continued R&D funding is made available for technology development and system integration research.
2. Encourage uptake of EU-level frameworks and guidelines which can support long-term stability and comparability of national support schemes.
3. Create a pan-European Energy Systems Integration demonstration roadmap, mapping existing demonstration projects as well as potential future projects.
4. This requires establishment of a cross-discipline, cross-sectorial technology grouping.

5. Create a pilot 'Energy Island' which is connected to a national energy network to test theoretical ideas in a location which isn't isolated. This would prove/disprove the feasibility of various technologies.
6. Involve SMEs working in the field through engagement programs to ensure coordinated approaches to technology development.

Infrastructure

Long lead times for energy infrastructure mean there is a need for strategic planning. Existing infrastructure needs to be better utilized, with priority infrastructure projects identified and network design improvements coordinated.

Action Areas:

7. Conduct gap analyses and determine top priority European infrastructure projects.
8. Launch a project turning selected existing assets into test-beds for new and smart systems.
9. Conduct a series of projects scaling-up the injection of hydrogen and bio methane into the grid.
10. Analyze the energy performance of cities using future cities technologies for integrated energy systems.
11. Develop auditing tools and frameworks for zero carbon zones and communities.
12. Develop a 'smart-neighborhoods' project focused on district heating, assessing roll-out potential from existing demonstration projects.
13. Coordinate an approach to develop all scales of storage solutions.
14. Develop a feasibility study and/or test cases for infrastructure synergies and Intelligent ICT pilot programs.
15. Create a pan-European network design roadmap, mapping existing infrastructure projects as well as potential future projects.
16. Conduct a SWOT analysis of discrete energy networks that have been designed latterly to identify strengths and weaknesses, and assess potential replicability.
17. Conduct an infrastructure ownership assessment and drive results into policy and regulations.

Policy, Governance and Markets

While we welcome the Energy Union strategy we recognize that further efforts are required to implement a holistic European approach to policy, governance and markets. Climate change considerations must be central to the European energy strategy: ambitious and binding targets need to underpin a multidisciplinary approach to projects, and regulatory landscapes and market mechanisms should be synergized.

Action Areas:

18. Establish binding targets and a strong governance framework for carbon reduction targets out to 2050 and energy efficiency incentives to create an appropriate investment climate into clean-technology development.
19. Assess the policy initiatives in the Energy Union strategy which can aid the facilitation of Energy Systems Integration.
20. Encourage uptake of EU-level frameworks and guidelines which can support long-term stability and comparability of national support schemes.
21. Develop frameworks for, and implement, zero-carbon zones in areas across member states, which are linked to technology demonstration zones and integration-enabling infrastructure projects.

22. Require all EU-funded energy projects to have a steering committee in place with a quadruple helix structure.
23. Develop an EU-wide position paper on principles for local governance of integrated, low-carbon, energy systems.

Consumers

The Commission's 'New Deal' for consumers initiative, and focus on consumer savings, choice and protection is welcome, particularly with regard to tackling fuel poverty. However, the role of the consumer within a more integrated energy system will change. Consumers will become 'pro-sumers', both generating and consuming energy. Appropriate structures to facilitate this transition for consumers (and communities, through the democratization of energy governance) need to be developed.

Action Areas:

24. Encourage national and/or regional governments to consider suitable local approaches for community-level engagement in energy projects

Conclusion

The energy system Europe needs looks very different from our system today. To tackle the energy trilemma – ensuring secure and cost-effective energy supplies while reducing carbon emissions – we need to integrate all parts of our energy system at all scales. This report has presented the barriers to reaching that vision and sets out what we believe to be the priority actions required to overcome those barriers.

Our findings are based on three years of stakeholder engagement with all energy sectors, academia, the public and private sectors, and community energy specialists across Europe and internationally – from grass-roots activity through to representatives from the European Commission and DG Energy. Our research is thus some of the most comprehensive on the topic and we would strongly encourage our recommendations be given full consideration in future policy development.

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Innovation Capacities Analyses European North Sea Energy Alliance

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Lead Partner:
Energy Valley Foundation
Laan Corpus den Hoorn 300
9728 JT Groningen
The Netherlands

E-mail: info@ensea.biz
Phone: +31 (0) 50 789 00 10

European Commission | CAPACITIES

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Executive Summary

Author(s):
David Butler
Prof. Catrinus Jepma
Jannes Kalfsbeek
Natasha Madeira

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1 Introduction

This study is the first substantive result of the collaboration of the partners in the European North Sea Energy Alliance (ENSEA) project. This project is supported by the European Commission through the Seventh Framework Program for Research and Technological Development (FP7) and started in October 2012.

ENSEA aims to increase the competitiveness of research-driven energy clusters through better coordination and exploitation of research to support innovation in Energy Systems Integration.

Energy Systems Integration (ESI) describes the optimisation of the design and performance of the supply of all forms of energy (electricity, heat, biofuels and other fuels) at all scales (end user, local community and regional levels). It incorporates consideration of the interactions and interdependencies between the energy system and other systems; such as economic, data, regulatory and social dimensions. Energy systems are currently undergoing considerable change as the European Union (and other regions and countries) seeks to transition away from fossil fuels and cut carbon emissions. ENSEA seeks to better understand, and make use of, potential co-benefits that increase reliability and performance, reduce cost, and minimise environmental impacts.

Energy activity in and around the North Sea is growing rapidly for a number of reasons and considerable innovation can be found in this region which is related to all kinds of technologies and energy carriers. However, a clear vision about how all this energy innovation hangs together, how it could be coordinated and what would be required in terms of organisation and collaboration, is simply absent. In order to get solid North Sea energy system integration machinery off the ground that is robust enough to provide the EU industrial heart with sustainable and renewable energy, formidable organisational effort and challenges still lie ahead, such as:

- Balancing the future grid, given the substantial increase of intermittent resources;
- Developing sufficient new storage technology and capacity;
- Organizing sufficient backup facilities;
- Managing demand;
- Lining up the various grid systems connecting the various sources of supply and demand of energy;
- Dealing with the decommissioning challenges and turning this into new opportunities for sustainable energy production and storage;
- Involving smaller companies in energy transition activity; and
- Organizing, not only supporting research and development, but also training activity.

None of these challenges can be tackled without good professional triple-helix support and international cooperation, collaboration and co-investment and design.

In the ENSEA project, the partner organisations are comprised from the leading energy triple helix (industry-government-academic research and development) organisations in each of the four partner regions; North Netherlands, Lower Saxony (North West Germany), Rogaland (South West Norway) and Scotland. Together, the ENSEA partners are estimated to cover and represent about half of the innovative energy research and development capacity around the North Sea.

In preparing this study a large group of experts from the four regions has worked intensively together in the last year. As well as regular teleconferences and use of other electronic means to exchange information, several joint workshops have taken place.

In order to be able to initiate new joint initiatives, a review was undertaken to identify regional strengths, weaknesses, opportunities and threats (SWOT Summary) in relation to Energy Systems Integration, and illustrate the capabilities of the partner regions. The results of the study are summarised in this Work Package 2 Report. The types of questions covered included:

- What distinguishes the regions in this regard?
- What have the regions in common?
- What are the particular strong points in one region or in the other?
- What can be said about existing networks, initiatives, triple-helix strengths?
- What are the key players in the area of energy system integration?

In the following sections, an overview is provided for each of the four regions of their activities in relation to Energy Systems Integration. It covers aspects such as; the main organisations involved in research and its exploitation, the drivers of innovation, key policies, and support mechanisms. The work illustrates, not only what is going on in the regions, but also assesses in which aspects are considered to be relatively strong or weak.

In comparing the four regional reports, it became clear that there are a number of clear similarities between the regions, such as: the general difficulties of involving small and medium sized enterprises in the triple-helix innovation process; the challenges of linking academic research to business activity; the lack of communication and coordination between the traditional fossil fuel based companies (and related stakeholders) and the newer, renewable ones; the lack of a sense of urgency to change thinking along the lines of energy system integration; or the generic lack of a collaborative vision on how to develop the North Sea area as an energy region.

On the other hand, the regional overviews revealed quite distinct differences between the regions, as described below:

The Energy Valley region, for instance, has a very strong focus on gas based on natural gas reserves and related production, transport, storage and research services. More recently, modern gas-related activity (e.g. based on green gas, small scale application of LNG, power-to-gas, gas and mobility)is increasingly a topic of innovative activity.

The North West of Germany turned out to be especially strong in renewables and technology development in, for instance; wind turbines, offshore technologies, biogas production, and energy storage. The Energy Valley and the North West Germany regions, both share a rapid power production capacity increase, as well as a rapidly growing offshore activity related to North Sea offshore wind.

The Rogaland region has substantial offshore oil and gas activity and is particularly strong in hydropower (flexible generation).It is interesting to note that the hydro capacity of Norway is, or will be, linked with the other regions in the ENSEA project through interconnectors in order to help with grid balancing. Carbon capture and storage was identified as another area of particular focus and strength.

Scotland, like Rogaland, also has a strong oil and gas cluster which shows good collaboration between business and innovative researchers. Of significance to energy systems integration, power networks and smart grid development along with systems integration methods (such as