AN ENERGY VISION FOR THE NORTH SEA REGION

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PROJECT OUTCOMES & RECOMMENDATIONS

Energy Vision North Sea Region

SUPPORTED BY:

The Interreg IVB North Sea Region Programme

Investing in the future by working together for a sustainable and competitive region

European Union — The European Regional Development Fund

COLOPHON

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EUROPE'S ENERGY CHALLENGE

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Since fossil fuels will become depleted and CO2 emissions have serious impacts on our climate, the European Commission (EC) has released a roadmap for moving toward a competitive low-carbon economy by 2050. This roadmap clearly states that the European energy system must change significantly and rapidly. Two of its central goals are visualised in Figure 1. They entail;

- A decrease in primary energy demand;
- Large-scale deployment of renewable energy resources and technologies

Completion of the transition will make Europe a frontrunner in the field of sustainable energy, and innovation and investment in clean technologies and low- or zero-carbon energy will boost Europe's economy. Within this context, the EC acknowledges the renewable energy production capacities of the Northern Seas. The recent rapid expansion of renewable power, mainly wind and solar energy, has cemented its position as an indispensable part of the European Union (EU) energy mix. By 2015, renewable energy is expected to comprise almost one-third of the total electricity produced in the North Sea Region (NSR).

Renewable energy is one of the main themes of the INTERREG IVB North Sea Region programme. The Energy Vision North Sea Region (EVNSR) project is an INTERREG IVB project aimed at clustering the INTERREG IVB energy projects executed in the last program period, running from 2007 to 2013. The EVNSR project draws on the values and strengths identified within projects and the involved regions to apply these in an interrelated and mutually reinforcing way, thereby facilitating an aligned regional expression and implementation of the EU 2050 climate and energy goals.

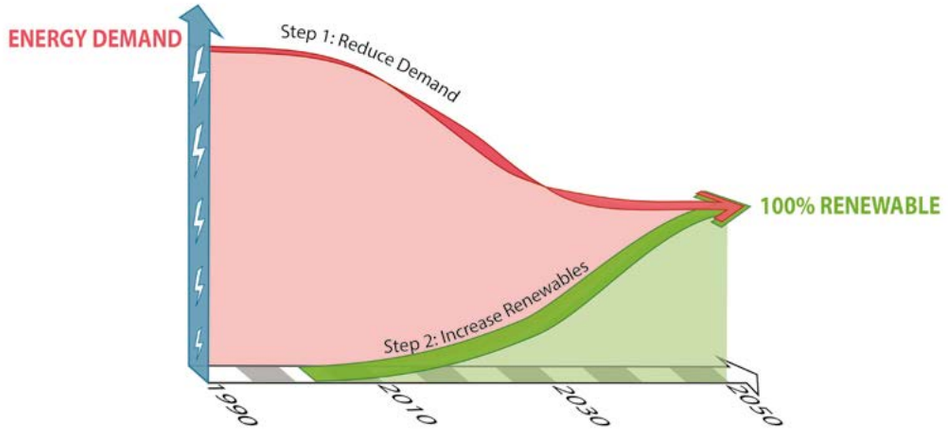


Figure 1: Pathway for a prosperous low-carbon North Sea Region: reduced energy demand and increased uptake of renewable energy technologies

Based on the lessons learned, EVNSR aims to speed up the energy transition in the NSR. However, the need to reduce energy demand and speed up the rate of deployment of renewable energy sources requires a holistic approach that can tackle a diverse set of energy transition barriers influenced at multiple levels of aggregation. In this EVNSR document, identified key results and policy recommendations are addressed that will help capitalise on complementary regional expertise and sustainable energy sources to provide the basis for a pathway to a prosperous low-carbon North Sea Region. This Energy Vision analysis for the North Sea region contributes to an integrated vision on how the NSR can contribute to the European energy transition and help define policy objectives that will strengthen its position as a European region with optimal prerequisites for an efficient, significant energy transition.

THE NORTH SEA REGION AND ITS CONTR

THE NORTH SEA REGION AND ITS CONTRIBUTION TO EUROPEAN ENERGY CHALLENGES

The ongoing energy transition is reshaping the roles of regions within the wider energy system. Two apparently contradictory developments have contributed to this and influenced, for example, the realisation of sustainable energy goals and a low-carbon economy by 2050.

First, the development of large-scale offshore and onshore wind parks are significant within the NSR. Energy production from wind is highly intermittent and requires balancing or integration with other renewable energy resources and technologies. To support these developments, large infrastructure projects are under way within and around the North Sea, creating an increasingly integrated energy system.

Second, small-scale or decentralised renewable energy production is also swiftly developing. Small- and medium-sized organizations together with households, local communities, neighbourhoods and regional cooperatives are playing an increasingly important role in local and regional energy supplies.

The development of both large- (centralised) and small-scale (decentralised) energy production has a positive impact on regional economies, labour markets and regional knowledge infrastructures. It provides opportunities for synergetic cooperation, knowledge spillovers and new market development. Although these developments take place at the regional level, the energy market is becoming increasingly integrated on a European or even a worldwide level, complicating regional energy planning.

Within the NSR, the EVNSR draws on values and strengths in existing regional energy plans, strategies and visions that are often similar and highly complementary, but that could work more efficiently toward a prosperous, low-carbon Europe. Considering these developments, cross-border cooperation and knowledge exchange are vital to an efficient, swift energy transition, and regional strengths should be considered as starting points for high-value, smart, interregional cooperation and specialisation. Different regional strengths can be visualised as follows (See Figure 2).

The shared geographic and demographic characteristics of the regions around the

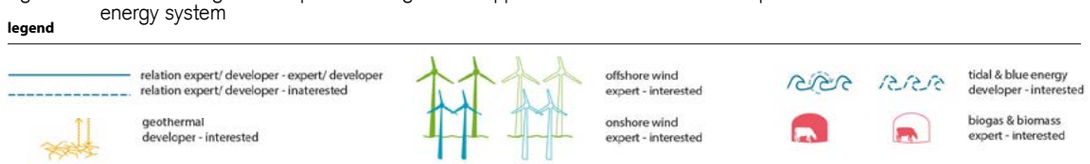
Figure 2: Strengths of the North Sea energy regions: for an efficient, swift energy transition

North Sea have led to a common understanding of the actions required to significantly speed the deployment of renewable energy technologies. Currently, many different regions are taking advantage of the unique opportunities around and within the North Sea Basin, often in very similar ways. Inspired by the demonstrated success of different renewable energy technologies within a particular region, other regions have developed plans to achieve similar success. Consequently, significant opportunities exist for regions to learn from each other's best practises and thereby achieve a more efficient North Sea energy transition. In addition, the alignment of potentially synergetic regional energy strategies could hasten the deployment of renewable energy technologies and create the critical mass needed to apply innovative new ideas.

THE NORTH SEA REGION AND ITS CONTR

Figure 2a: Smart interregional cooperation: large-scale opportunities for efficient development of a renewable North Sea energy system

Figure 2b: Smart interregional cooperation: small-scale opportunities for efficient development of a renewable North Sea energy system



After strategic regional analysis, following are examples of how to use existing North Sea expertise for a more efficient energy transition:

➔ Considering available assets and expertise, the NSR has huge potential for renewable energy produced from **onshore** and large **offshore wind** farms in the North Sea. Experts in large-scale offshore wind developments can be found in Denmark, Scotland and northern Germany. Considering our challenges in Europe's plans for a low-carbon society in 2050, further development of this renewable energy potential should include regions of Halland (Sweden), West Flanders (Belgium) and the Energy Valley region in the Northern Netherlands. These regions possess expertise in; for example, harbour logistics, offshore infrastructure and the facilitation of social consensus, which may prove highly valuable when existing offshore wind development plans achieve a scale similar to what is anticipated.

➔ The production of **biogas** and energy using **biomass** and waste streams plays an important role in regions of West Flanders (Belgium), central Denmark and Schleswig Holstein (northern Germany). The Energy Valley region (Northern Netherlands) and region of Halland (Sweden) are seeking opportunities to implement concepts like those already successfully implemented in these regions. The exchange of best practises between the interested regions and the regions already operating successful concepts could facilitate a very efficient implementation of new technologies.

➔ **Tidal energy** is a new development and has the potential to contribute significantly to the NSR energy mix. Currently, east Scotland plays a leading role in the development of technology, knowledge and expertise. Others areas, such as West Flanders and the Energy Valley region, are searching for opportunities to take advantage of similar opportunities.

➔ **Geothermal** energy production is being applied in northern Germany whilst the Energy Valley region is developing concepts and could benefit from lessons learned and best practises.

➔ Small-scale **energy production from households** (decentralised energy production and consumption) is widely applied in Schleswig Holstein (northern Germany) while the Energy Valley region and east Scotland are highly interested in these developments.

➔ By applying **ICT infrastructure** to small-scale energy production and consumption, intelligent local energy grids are being developed. Currently, Schleswig Holstein and the Energy Valley region can be perceived as frontrunners in these developments, while east Scotland, West Flanders and central Denmark are following these developments with keen interest.

➔ Facilitated by intelligent communications infrastructure, small-scale or decentralised energy production may in time lead to **self-sufficient energy communities**. The Halland region is an expert in developing these concepts and generating the social awareness and acceptance it requires. West Flanders, Schleswig Holstein, central Denmark, and the Energy Valley region are all highly interested in these developments.

➔ From the perspective of small-scale energy production within households, **district heating** systems are playing an important role in regional renewable energy developments in West Flanders and the Energy Valley region. Halland and the central Denmark Region have implemented very successful heating concepts that could be the basis for very valuable interregional cooperation.

➔ The concept and role of sustainable mobility have been studied and implemented in the region of Halland; East Scotland, West Flanders, the Energy Valley region and Denmark could benefit from Swedish best practises.

THE NORTH SEA REGION AND ITS CONTR

Figure 2c: Smart interregional cooperation: balancing and storage opportunities for efficient development of a renewable North Sea energy system

legend

relation expert/ developer - expert/ developer
relation expert/ developer - inaterested
H2 storage expert - interested
LNG - gas expert - interested
co2 capturing developer - interested
potential storage underground developer - interested

➔ Remarkable developments are ongoing in East Scotland and Belgium with respect to **hydrogen,** which could be useful to developments in central Denmark and the Energy Valley region.

➔ **Carbon capturing,** storage and reuse is a topic of similar interest to east Scotland and the Energy Valley region. Synergetic cooperation could be possible between these two regions.

➔ **Liquefied natural gas** (LNG) infrastructure currently in development in the Northern Netherlands will offer great possibilities for harbours in West Flanders and other regions around the North Sea.

➔ **Underground gas storage** is an important topic in the Energy Valley region and Schleswig Holstein. The region of Halland is significantly interested in expertise on this topic.

Figure 2d: Smart interregional cooperation: distribution opportunities for efficient development of a renewable North Sea energy system

legend

relation expert/ developer - expert/ developer
relation expert/ developer - inaterested
system integration different sources expert - interested
Harbour logistics expert - interested
offshore infra and storage developer - interested

➔ The **integration of renewable energy sources** is an expertise of the Swedish region of Halland. Central Denmark, West Flanders, east Scotland, Schleswig Holstein and the Energy Valley region are very interested in learning from Swedish experiences on this topic.

➔ **Harbour infrastructure** and logistics are an expertise in the Schleswig Holstein region, West Flanders and central Denmark. The Energy Valley region could benefit significantly from best practises and lessons learned.

➔ Northern Germany and Schleswig Holstein can be considered experts in the development of **offshore infrastructure,** while East Scotland and the Energy Valley region are developing similar concepts.

THE NORTH SEA REGION AND ITS CONTRI

Regional strategy analysis shows that the NSR has all the ingredients to speed up the implementation of renewable energy and fully unlock the real economic potential of a low-carbon, prosperous Europe. The exchange of best practises between regions will achieve a more efficient, faster deployment of a diverse set of energy technologies; it will help create jobs, strengthen regional economies and deliver a significant contribution to wider European energy challenges.

Policy recommendations for smart interregional specialisation and cooperation:

- Renewable energy policies, derived from EU ambitions, are too nationally focused: Structural collaboration and knowledge sharing across NSR borders in the field of renewable energy technology and technology integration offer huge potential for speeding up the deployment rate of renewable energy technologies.
- Focus on wind and biomass renewable energy technologies can generate a leading, competitive position for the NSR.
- The role of the NSR is not just to provide the right knowledge base for making the appropriate decisions regarding the renewable energy deployment rate, but also to take advantage of each other's regional strengths. A joint implementation strategy based on renewable energy strengths will boost the development and competitiveness of the EU renewable energy mix.

INTERREG IVB'S CONTRIBUTION TO EUR

INTERREG IVB'S CONTRIBUTION TO EUROPEAN ENERGY CHALLENGES

Considering the aforementioned energy challenges are largely shaped at the regional and especially interregional level, the role of the INTERREG IVB NSR Programme in developing projects for interregional cooperation in the deployment and demonstration of renewable energy technologies is expected to be prominent. After clustering nine different renewable energy-related projects executed in the current 2007-2013 NSR programme, the EVNSR concludes that INTERREG IVB has played an important role in generating momentum on a wide variety of renewable energy focus areas, creating momentum for a potentially highly efficient NSR energy transition.

Drawing on the strengths and best practises identified in the individual projects, the Energy Vision project has interconnected individual results and is amplifying successes to build a renewable energy strategy. The following key results (so-called "big wins") and recommendations from these projects have delivered input for an integrated perspective on the NSR energy transition.

- ANSWER has developed useful **tools** to stimulate energy efficiency and introduce renewable energy. ANSWER has shown that a low-carbon economy can be created in local communities.
- ARBOR has proven new **biomass conversion** technologies and stated that new international market regulations must be set up to improve the biomass market.
- Cradle2Cradle Islands has shown that, through local commitment and participation, **social acceptance** and the deployment of renewable energy can be really increased.
- E-Harbours demonstrated the role of increased **flexibility** within a wider, integrated energy system. Flexibility of the energy system in itself has gained a price, and therefore, it is stimulating renewable energy business cases.
- ENERCOAST has focused on operative bio-energy supply chains and mobilisation strategies. Development of sustainable business models promotes implementation of local development strategies and **commercial mobilisation of bio-energy resources**.
- HEC noted that, for an optimal energy market, an understanding of national energy markets is needed. Only **multi-level cooperation** can achieve future system integration.
- IFP has delivered tools for shaping and planning the **future**. Information gathering is a key success factor for international cooperation of regions and clusters. Focusing on offshore wind, IFP has developed concrete recommendations on how to develop the supply chain in the North Sea Region.
- North Sea SEP announced that integrated **energy planning** is the heart of a region's sustainable development.
- North Sea Supply Connect (NSSC) has built a **network of SMEs** to facilitate renewable energy business. NSSC stated there must be more EU focus on SMEs to speed up international innovation processes.

From the INTERREG IVB energy projects we conclude the following overall policy recommendations for an efficient NSR energy transition and regional business development:

- Coherent policy and a transparent political support system is necessary. Improved interaction between different political levels can improve coherency.
- Prominent inhibitors are financial reluctance and an uncertain investment environment due to unclear future policy developments and the lack of clear political regulatory measures and incentives. Furthermore, prices on conventional energy resources and products are relatively low, which impedes the transition to renewable energy. The NSR needs a more level playing field.
- Innovation drivers are needed to encourage companies to develop new innovative market-driven technologies and to go beyond the lab to full-scale demonstration. SMEs operating alone on a vulnerable market miss out on innovation possibilities and are potentially subject to great costs and risks. That is, networking and knowledge sharing should be promoted.
- The insecurity of society and individual citizens is conspicuous when discussing the social challenges of change. Hesitant development results from uncertainty regarding economic consequences. The 'not-in-my-backyard' (NIMBY) effect is present, as is the lack of good examples needed to overcome the hesitation among decisions makers and investors.
- Bridging cultural and institutional differences is difficult and requires a strong effort to communicate and attention to the dissemination of results and experiences.
- Complementary demonstration is needed, including system integration and compatibility for the development of new renewable energy technologies. The road to the market is rugged for SMEs and their products. Demonstration facilities and sharing and strengthening the knowledge base will help lead the way. The reluctant market would also benefit from standards.
- Biomass is restricted in total quantity and spatial distribution; it is on the top of the list when discussing environmental barriers. Furthermore, the claim for a sustainable transition and development leaves the inherent dilemma of utilising a multi-purpose resource and respecting versatile global and local needs. The rather restrictive environmental and spatial planning legislation restrains the potential for regional development, but of course, serves other purposes.
- A clear legal framework is necessary for regional development and a smooth energy transition in the NSR; this must serve its purpose and address the ambitious visions of the regions. Changing inconsistent legislation and subsidy systems have been identified as prime barriers for investments.

ANSWER – A North Sea way to energy-efficient regions · Arbor – Biomass for Energy · cradle to cradle islands · e-harbours electric · enercoast · Hansa Energy Corridor · hec · IFP – innovative foresight planning for business development · NorthSea SupplyConnect · North Sea Sustainable Energy Planning

AN EFFICIENT SOLUTION FOR EUROPE'S

AN EFFICIENT SOLUTION FOR EUROPE'S ENERGY TRANSITION: ENERGY SYSTEM INTEGRATION

Generally, a future North Sea energy system will prove to be a complex linkage of different technologies that must be developed and integrated further to achieve the ambitious European energy goals. Ideally supported by the INTERREG IVB program, the integration of different renewable energy resources will create a holistic technological energy system able to capitalise on geographic and demographic NSR characteristics. The development of this integrated technological system will be directly facilitated through particular boundary conditions currently perceived as transitional barriers. In addition, its development will take place on different levels of aggregation both locally (e.g., decentralised energy production) and transnationally (centralised energy production), which will provide business opportunities that best fit large- or small-scale operations.

Drawing on the strengths and best practises identified in the individual projects, EVNSR has identified different energy transition 'enablers' to facilitate the development of individual regions and the integration of different renewable energy technologies.

The North Sea energy transition enablers include:

- ➔ Increased social awareness of society's role in facilitating the energy transition (includes solving the NIMBY syndrome);
- ➔ Policy consensus between and across municipalities, regions and nations;
- ➔ Intensive cooperation within the triple helix: knowledge institutions and private and public organisations;
- ➔ Increased SME networking to reduce disadvantages resulting from small economies of scale and scope;
- ➔ Increased cooperation between different industries to create synergies and knowledge spillovers, which is especially relevant for the energy and creative industries; and
- ➔ Development of demand-driven (private sector-driven) education at lower vocational, vocational and scientific levels.

Smart interregional cooperation on the aforementioned renewable energy topics should lead to further regional specialisation and more pragmatic cooperation on renewable energy technologies. In a time of economic uncertainty, this may be considered a precondition to achieving our shared energy and climate goals. More importantly, however, close and synergetic cooperation will create critical mass and the markets required to commercialise the innovative ideas that will radically change our future. Our transition toward the uptake of more renewable energy resources is only possible through further integration of the different renewable energy technologies and North Sea energy system integration.

THE NORTH SEA ENERGY SYSTEM INTEGRATION MODEL

The future North Sea energy supply system is characterised by the simultaneous use of multiple renewable resources, interlinking technologies, high technological intensity and high resource interdependencies. An integrated energy system is necessary to facilitate the transition from old, wasteful energy resources to this preferred option, influenced by the inflexibility of more durable energy resources and their effect on the electricity grid.

- ➔ This integrated system can balance the use and development of different renewable energy resources simultaneously, including on- and offshore wind energy, solar energy, wave and tidal energy, and blue energy. These renewable forms of energy will deliver large amounts of electricity on the European and North Sea electricity grid. As such, they are perceived to cover **central energy** production within the North Sea energy system integration model presented in Figure 3.
- ➔ It is important to consider that large-scale fossil energy use can only be replaced through a combination of many different complementary renewable energy resources. Additionally, the intermittencies caused by these inflexible renewable energy resources (e.g., wind energy, solar energy) will create a volatile European electricity grid. This electricity grid will need to handle large amounts of electricity produced at windy or sunny moments or when a rough North Sea is producing large amounts of energy through wave/tidal production. **Electricity distribution** will need to consider that, when energy demand is low, the surplus of energy produced from renewable sources needs to be stored.
- ➔ Taking advantage of existing North Sea expertise and infrastructure, the surplus of renewable electricity may be converted into gas or heat. This concept is commonly known as 'power-to-gas' and 'power to heat' allows significant amounts of power to be stored, thereby balancing renewable energy production with energy consumption. An interesting example of this process is the production of 'green hydrogen' by means of electrolysis. The hydrogen can be fed into the gas infrastructure, where it will increase the energetic value of natural gas.

THE NORTH SEA ENERGY SYSTEM INTEG

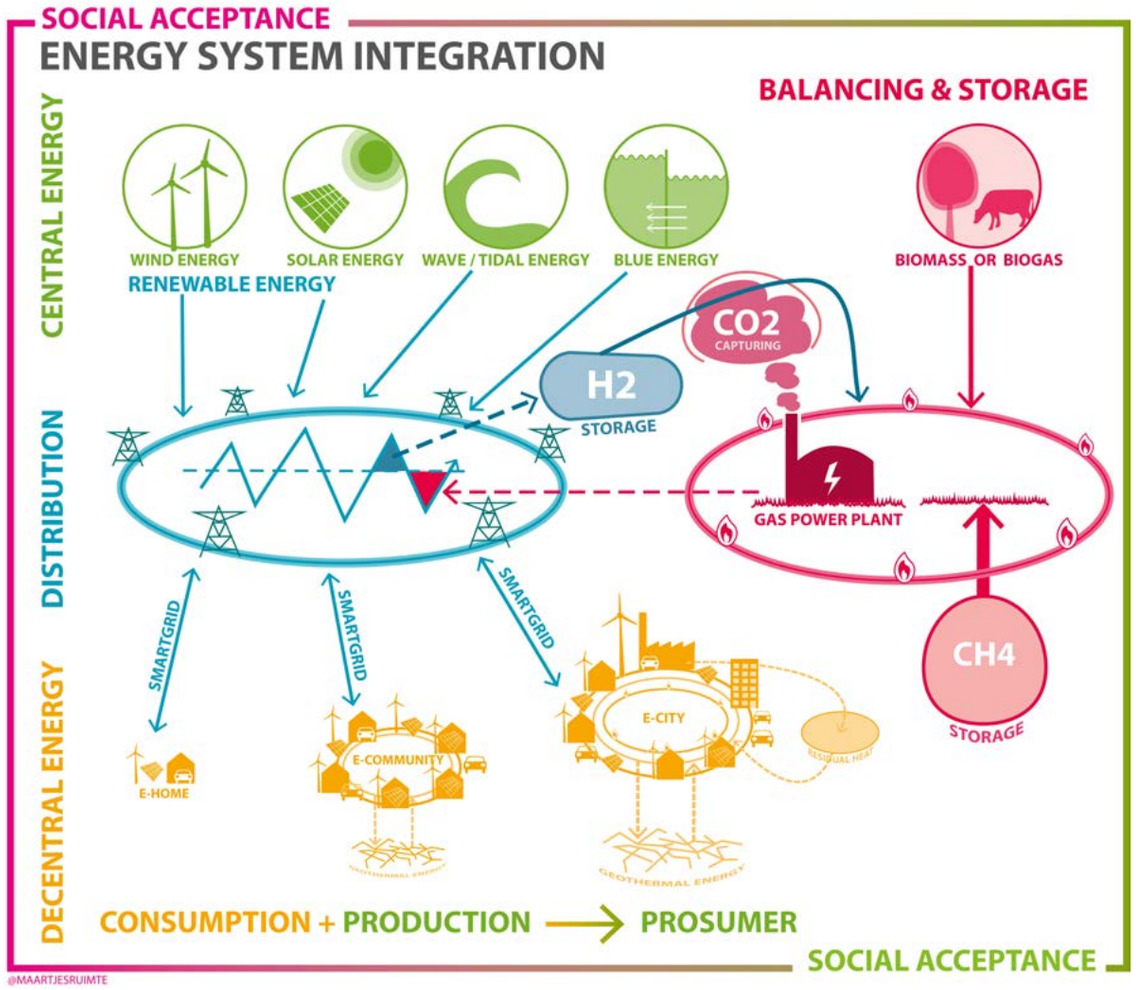


Figure 3: North Sea energy system integration: a holistic approach for integrating renewable energy technologies and achieving an efficient North Sea energy transition

➔ The gas infrastructure plays an important role in an energy system integration model appropriate for the NSR. It does not only allow for the balancing of surplus energy with energy demand; it also allows production of "green gas" by means of **biomass** fermentation processes, which can green-up the natural gas stream. The role of natural gas (infrastructure) as an energy transition vehicle is further underlined by its ability to take advantage of **underground gas storage** opportunities to increase its energy balancing and storage potential. In addition, gas-fired power plants using **carbon-capturing** technologies can reuse CO2 to produce bio-fuels (e.g. methanol) and create natural gas quality methane by combining CO2 with (stored) 'green hydrogen'.

➔ Small-scale electricity production (e.g., solar energy, small, small wind turbines) entails the concept of **decentralised energy production and consumption** in which **households, neighbourhoods** and **cities** start to produce electricity for local consumption and by means of intelligent local electricity grids. This new role for household energy consumers becomes more significant when considering that households may start to produce energy and can balance their energy production with other local energy producers on a neighbourhood or a city level and taking advantage of existing geothermal and residual heat infrastructures. Within the wider system, this form of simultaneous production and consumption will have an interesting role in balancing demand and supply on a higher aggregation level. This new role is known as the "**prosumer**" concept and offers unique business opportunities for new product and service development. Market developments on this decentralised (prosumer) level will prove increasingly interesting for knowledge-intensive SMEs in the not-too-distant future.

BUILDING BLOCKS FOR ENERGY SYSTE

BUILDING BLOCKS FOR ENERGY SYSTEM INTEGRATION

Increased international cooperation on these interconnected and interdependent technologies is necessary, in order to prevent inefficient resource use and accelerate the energy transition. In the future, we will need to make use of more-diverse sets of durable resources, if we are to replace fossil fuel resources. In more practical terms, we will need to fill the energy gap whenever wind and sun are not available. With the coming offshore wind developments on the North Sea, these issues are now more pressing than ever; they require a coordinated response throughout the triple helix—one that is aligned with regional expertise. Whereas historically the North Sea basin has been seen as our "backyard"—characterised by the exploration for and production of oil and gas—we can now proudly return our focus to the sea and recognise its role in the on-going energy transition.

The EVNSR project has the clear value of bearing **a long-term energy vision**. Consensus vis-à-vis common and ambitious energy and climate targets for 2050 will create certainty, consistency, and stability in tackling long-term problems. That vision must be built up through the broad support of society and parties along all parts of the political spectrum. This alignment should start at the regional level and leverage existing regional strategic development and expertise.

Enabling energy transition through smart regional cooperation.

The EVNSR project identifies key transition enablers that must be present in future interregional energy cooperation projects: a triple-helix cooperation structure, the alignment of education and research activities, the demonstration of new technologies, increased social acceptance, new business models and funding schemes, adjusted governance structures, and true leadership.

Promote technology development and integration.

In considering from an integrated perspective the transition challenges inherent in the NSR energy transition, it is clear that the integration of various renewable-energy technologies is essential. Shared geographical characteristics will define technological energy transition opportunities, but technological integration is nonetheless required. EVNSR strongly recommends working on system integration in the NSR; this work will be driven by regional strengths and the exchange of best practices. The role of the INTERREG B NSR Programme in initiating and supporting required technological and enabling developments could be very significant, in this regard. EVNSR has identified the following building blocks in forming the foundation for future energy cooperation and creating a critical mass in capitalising on identified opportunities:

➔ Use existing offshore oil & gas infrastructure for storage and balancing of North Sea renewable-energy production. Many platforms in the North Sea will be decommissioned in the coming 20-40 years. Some can be re-used in the context of storage and balancing of energy in the context of energy system integration. A new mind-set that the existing North Sea infrastructure is an important asset for the North Sea Region and her wanted energy transtion needs to be developed. The Baltic Sea region in this context needs be aligned as well.

➔ Speed up onshore wind deployment with (local) community participation models. There are a lot of onshore wind projects going on in the North Sea Region, but the public opinion on wind as an important energy source still varies among people. Total acceptance is still not gained although wind power was introduced already in the 1990's. There's a need for a higher level of acceptance, nowadays developments of wind parks are slowed down by lack of social acceptance. We suggest an active involvement of the public in wind discussions by focussing on youngsters. They will be the decisions makers of the future and will live and work in the area around wind farms. A Wind Challenge aims at increasing social acceptance for onshore wind energy by mobilizing local communities and developing a methodology that increases the involvement of young people.

➔ Develop highly demand-driven education platform at college and academic level to resolve human capital issues. The oil & gas sector is highly knowledge intensive. Around the North Sea basin we see universities and colleges specialized in energy. Renewable energy however is requiring a whole new set of

FUTURE

skills and knowledge base. Looking at the labor market situation the renewable energy business is requiring human capital which is not available and is competing with traditional oil & gas labor market. Different countries around the North Sea are investing in their education and research infrastructure. We suggest a better international alignment of (especially) education and research institutions in order to help the development of renewable energy sector.

CONSUMPTION + PRODUCTION → PROSUMER

➔ Focus on E-Homes: energy production and storage within households. Households play an important role in the energy system. Their energy demand takes up to 20% of the total energy demand. The role of households will change the coming years. Besides consumers they become producers of renewable energy. Storage of energy within households offers even more opportunities for households to become a real market player in the energy system. Demand side management and flexibility of the energy system start with the wishes and window of opportunities of the end-customers. A lot of new SME's are developing hardware and software that provide a range of new smart gird-technologies and services. We suggest investing in local and regional smart grid opportunities with the focus on households in order to tackle issues (such as energy management at home, energy for sale, and intelligent grids at work) that also play a role in creating a smart energy network on a larger (European) scale.

➔ Benchmark, align, and disseminate information regarding biobased business opportunities. Biomass is an essential part of the energy mix and can play an important role in balancing the different energy flows. The international biomass market functions far from optimal due business case failures, lack of right conversion technologies, sustainability discussions on resources and energy-inefficient transport routes. This while biomass offers great bio-based opportunities for energy efficiency and renewable energy. We recommend an interregional redefinition of the biomass optimization chain, identifying better, more regional oriented, biobased business opportunities true cooperation.

➔ Create sustainable heat networks that combine with geothermal energy developments. One of the biggest unlocked renewable energy potentials is in the heat of the core of our earth. Renewable energy developments tend to focus on producing electricity, but our heat demand (especially in the Northern part of Europe) tends not be sourced by electricity. We suggest interregional cooperation on developing sustainable heat networks. The market models, knowledge and expertise tend to differ over the North Sea region. Geothermal energy is unlocked potential that needs to explored and combined with heat networks in order to become a more indispensable part of the energy mix.

➔ Promote the creation of innovative SME networks at the interregional level. Renewable energy business is a sector which is technology driven and is highly innovative. Although large scale investments in renewable energy are done by large (international) companies, SME's tend to be more knowledge based, spend relatively more money on R&D and are better capable in adapting to new technologies. Looking to the renewable energy businesses we must conclude the sector is not international oriented also due to (national) subsidy-schemes. Innovation (technology development) is increasing the deployment rate of renewable energy. Therefore we recommend investing in the development of international renewable energy SME networks. Also by linking traditional Oil & gas-companies and their suppliers to the renewable energy sector.

➔ Develop interregional sustainable communities. Energy Transition is a two-way process. A top down approach is needed to align energy systems and a bottom up approach is creating a local and regional energy dynamics. More and more people are producing their own renewable energy; thereby they are contributing to the European climate goals. Local energy production is stimulating energy consciousness, is creating new alliances between people, strengthens the local economy and leads to innovation in technology and new forms of business. Even more so a bottom up approach is needed to involve people in larger scale developments and thereby raising awareness and increase the (social) acceptance of renewable energy technologies.

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