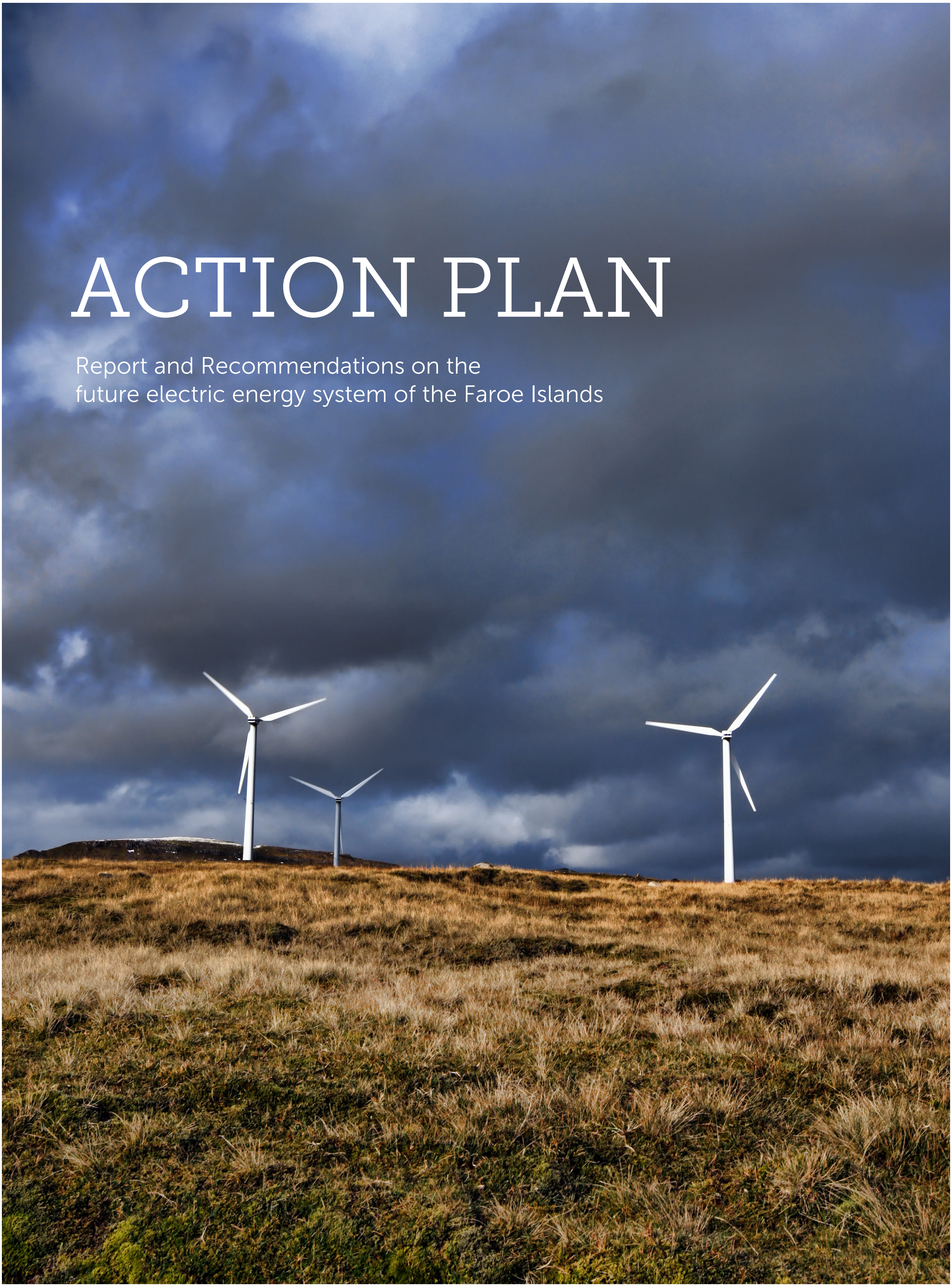
ACTION PLAN

Report and Recommendations on the future electric energy system of the Faroe Islands



Faroese Ministry of Trade and Industry January 2015

Terms of Reference and Working Group

In 2012, the Ministry of Trade and Industry established a Working Group to draft an Action Plan and a series of Recommendations regarding the future electric energy infrastructure in the Faroe Islands, which, to a greater extent than today, would be based on renewable energy resources. The Working Group was composed of representatives from the Ministry of Trade and Industry; the Faroese electric utility, SEV; the Faroese Earth and Energy Directorate (Jarðfeingi), and Dansk Energi.

The establishment of the Working Group was grounded in and constitutes a continuation of the work delineated in the report, Comprehensive Plan for Electric Energy in the Faroe Islands, published by the Ministry of Trade and Industry in October 2011. The Ministry of Trade and Industry, as the overarching national political authority, and the Faroese Municipal Association, which represents the shareholders of SEV, collectively stipulated the Terms of Reference for the Working Group. The goal was to draft a detailed Action Plan for the continued development and enhancement of the Faroese energy sector.

The Terms of Reference are:

> *"To carry out a technical and financial analysis of the potential to develop and enhance electricity production, the gird, and usage. The overarching goal is to facilitate the utilization of renewable energy resources in the Faroese energy sector as quickly and as comprehensively as possible."*

Members of the Working Group:

Pól Edvard Egholm	*Ministry of Trade and Industry*
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Kári Mortensen	*Earth and Energy Directorate*
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Table of Contents

Executive Summary

In 2012, the Ministry of Trade and Industry established a Working Group to draft an Action Plan and a series of Recommendations regarding the future electric energy system in the Faroe Islands, which, to a greater extent than today, would be based on renewable energy resources. The Working Group was composed of representatives from the Ministry of Trade and Industry; the Faroese electric utility, SEV; the Faroese Earth and Energy Directorate (Jarðfeingi), and Dansk Energi.

In this Action Plan, the Working Group recommends 26 initiatives and seven specific and detailed initiatives within the areas of production, energy storage, consumption, and the electric system. The Action Plan is based on a large and more comprehensive collection of White Papers that the Working Group drafted over the course of the past several years. The White Papers addresses several areas that are not taken up in the Action Plan. Several of these areas could be of major import for a future electric energy system in the Faroe Islands. For example, land-based transport, energy consumption at sea, and especially advanced technology, such as fuel cells. The Working Group at present has elected to focus only on the areas that are deemed, in all probability, to have the greatest import over the next 10 years.

The goal of the Working Group is to provide a solid foundation upon which to build a future energy system that in the main is based on renewable energy, so that the Faroe Islands is less and less dependent upon fossil fuel.

For many years, oil-fired (thermal) power plants have been the mainstay of Faroese electricity production, and they will of necessity remain so for many years to come. However, the erection of more wind turbines, the use of more hydropower and wind/water pump systems (Pumped Storage), together with the installation and development of more flexible components within the transmission grid could contribute to a significant reduction in oil consumption. At the same time, "greener" fuels are being developed for thermal power plants. This will also reduce the use of fossil fuel. Thermal power plants should be considered as electricity production plants that provide "secure energy". This is because they can produce electricity that is not dependent on external circumstances, such as rainfall and wind. They can produce electricity as long as oil is available.

The installation of wind turbines places unique demands on the electricity system, and often necessitates setting up special equipment to stabilize the electricity system.

At present, it is unknown exactly how much of the total electricity production could be derived from wind turbines.

When a major portion of the electricity production is derived from windpower, occasionally there will be an over-production of wind-generated electricity that cannot be used, so-called "wind spill" (Figure 2-1). This means that there will be times when the wind turbines cannot operate at full power capacity, e.g., at night when consumption is low.

The flexible components within the system could, e.g., be immersion heaters or heat pumps within the distance heating system in Tórshavn. Heat pumps in large buildings and private, single-family homes could also take advantage of and contribute to this necessary flexibility. Farther into the future, other household equipment, such as washing machines and driers, and other large power-consuming products could be part of a "flexible consumption" strategy.

Even farther into the future, it is anticipated that electric vehicles could also take advantage of this flexible power.

An undersea cable between the Faroe Islands and its close neighbours (e.g. Iceland and/or Shetland) could reduce the need for oil, but a single cable[1] cannot meet the required power demands. Therefore, the need continues for a full back-up of the energy demand envisioned for the years ahead, because any break in such a cable could possibility last several months.

Thus, other systems should be in place to provide the power required throughout the country regardless of the operational circumstances. What this means, moreover, is that the production capacity of secure power for the Faroe Islands should not be reduced, even though there might exist an undersea cable linkage to our neighbours.

Pumped Storage can reduce wind spill and enables enhanced effect from wind turbines. In plain language, Pumped Storage is an "energy storehouse" whereby

[1] A cable connection between the Faroe Islands and Iceland would use DC current. A DC cable can only provide limited power to the grid (inertia – cf. Section 5.1)

water is pumped from a lower reservoir to a higher reservoir and then subsequently used for energy production. Pumped Storage systems should be used when financially sustainable or where they could considerably increase production capacity.

The Working Group has offered several recommendations that are grounded in the idea that the entire energy system be considered as a unified system. In addition to the electricity grid, heat pumps and immersion heaters, as well as waste heat from oil-fired power plants and incinerators should operate together with large flexible energy storage systems in a district heating system.

Other countries are making considerable investment in renewable energy resources. The elected officials of the Faroe Islands need to recognize and appreciate that if there is to be a viable refocus on renewable energy it will require major investment in production and other initiatives that would ultimately shift consumption away from fossil fuel to renewable energy resources ("electrification").

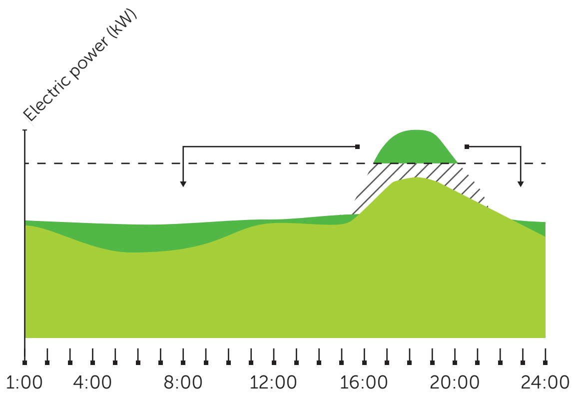

Figure 0-1

The graph above shows total electricity consumption through an entire day. At a certain point in the day, usage is quite high. It is possible that this consumption peak could be transferred to another period during the day such that usage could be more balanced. One example of equipment that could be shifted from the consumption peak is heat pumps that could be turned off during this period of high consumption.

A swift reorganization of the country's energy consumption could be accomplished either by legislative fiat or similar initiatives (the stick) or direct subsidies or other financial advantages (the carrot).

Energy conservation initiatives are a natural part of any future energy system. A comprehensive overview of possible energy conservation options within industry and large buildings could provide a solid foundation for energy savings.

It is deemed overly burdensome to categorize potential energy saving participants within the private sector. General energy conservation programs would be better.

The last section of the Action Plan lays out a proposal that discusses the financial consequences over a ten-year period (2015 – 2025) of a comprehensive refocus and shift of electricity production to renewable energy resources. The financial projections are based on the 2014 financial accounts of SEV and the planned expansions envisioned in the Action Plan. As a consequence, the projections are general in nature, contain much uncertainty, and should be read with caution. The proposal concludes with a discussion of six diverse financial scenarios that explore how the total debt and consumer pricing could be adjusted under different conditions. In all the scenarios except the first, wherein the price of electricity remains constant, the price of electricity would grow between 0.15 and 0.31 DKK per kWh and debt would increase from the now current 800 million DKK to 2,167 million DKK.

Because the work of the Working Group was not concluded in 2014 as envisioned, and because significant changes occurred in the last half of the year, the Working Group drafted a new analysis that was grounded in the specific conditions existing at year-end 2014.

This analysis is referenced as scenario seven and is considerably more optimistic than the other scenarios, especially because it reflects the major fall in oil prices.

If it is deemed advisable not to increase the price of electricity, our elected officials might wish to consider various support initiatives or amendments to the fee structures that could ensure that the price of electricity would not need to be increased or could even be lowered. This would be possible because in a shift from oil-based electricity production to renewables, together with the greater electrification of society, the country would save a significant amount on the import of oil.

Thus, there would be room for a revision of the fee structure such that there would not be any observable reduction in revenue to the country.

The various analyses demonstrate quite clearly that the decisions taken in the coming years on the future energy structure of the Faroe Islands will have major financial consequences.

The Working Group is hopeful that the Action Plan outlined herein will provide our elected officials, industry, and the public at large the inspiration and encouragement to unitedly work together to ensure that our future energy infrastructure is more and more independent of fossil fuel.

Good reading!

1.0 / Definitions

Central Production Area of SEV

The Central Production Area of SEV encompasses Streymoy, Eysturoy, Vágar, Kalsoy, Kunoy, Borðoy, Viðoy, Svínoy, Nólsoy and Sandoy, including the wind turbines at Neshagi, Húsahagi and Vestmanna; the hydropower plants at Eiði, Vestmanna and Klaksvík, and the oil-fired power plants at Sund and Klaksvík.

Synchronverters

A synchronverter or synchronized stabilizer is an electrical component that is connected to the electric grid and does not produce electricity. This stabilization device is used to provide the electrical system with inertia (see below). Synchronverters use very little power and thus contribute little to the overall power loss of the system.

Greater Mass Density at Hydropower Stations

A hydroturbine and a generator are connected via an axle that enables the generator to produce electricity when water flows through the turbine. A flywheel attached to the axle can increase the mass of the axle and thus increase the inertia of the system (see below).

Inertia

Inertia is kinetic energy that can be maintained at a given location. For example, a hydroturbine, a flywheel and a generator that all rotate around a common axle hold a certain amount of kinetic energy or inertia. This stored kinetic energy can dampen a sudden fluctuation within the electricity system, such as as short circuit. A short circuit stops the generator, but the inertia or kinetic energy stored within the generator enables the generator to continue to rotate and thus continue to produce electricity, providing the time necessary to isolate the short circuit from the rest of the electrical system.

Production and consumption shall remain equivalent each and every second

Electrical energy cannot be stored in large quantities and therefore must be used at the same moment it is produced. This means that production and consumption must be balanced each and every second.

Power Hub

A Power Hub is a special customer of SEV that has formally agreed to have its power cut off for a short period of time or longer if necessary to help stabilize power consumption within the grid. For example, if the frequency within the grid falls and the system must reduce the load or electricity consumption within the system, then the Power Hub option is activated and power is shut off to that particular Power Hub.

Electrification

The shift of power consumption to electric energy. An example of electrification is to shift from an oil-fired furnace to electric power for home heating.

2.0 / Introduction

The establishment of the Working Group was grounded in and constitutes a continuation of the work delineated in the report, Comprehensive Plan for Electric Energy in the Faroe Islands, published by the Ministry of Trade and Industry in October 2011. The Ministry of Trade and Industry, as the overarching national political authority, and the Faroese Municipal Association, which represents the shareholders of SEV, collectively stipulated the Terms of Reference for the Working Group. The goal was to draft a detailed Action Plan for the continued development and enhancement of the Faroese energy sector.

Terms of Reference

"To carry out a technical and financial analysis of the potential to develop and enhance electricity production, the gird, and usage. The overarching goal is to facilitate the utilization of renewable energy resources in the Faroese energy sector as quickly and as comprehensively as possible."

ÍIn 2012, total electricity usage in the Faroe Islands was 292 GWh. More than 60% of this energy was produced by oil-fired power plants.

In 2014, total electricity usage was 305 GWh; 51% or 155 GWh was generated from oil.

Over the last ten years, the price of oil has increased by over 300%. This in itself is a driving force toward a shift to green energy. At the same time, society in general is desirous of producing power from renewable energy resources in an effort to become more independent of oil.

A well-integrated system that encompasses a variety of production methods can more efficiently exploit multiple energy resources as greater electrification occurs. Moreover, CO_2 emissions can be reduced as well.

Over the last three years there has been a significant expansion in wind energy in the Faroes.

The last five years has seen an acceleration of electrification in home heating via heat pumps, which resulted in a considerable reduction in the total import of oil. Greater electrification and a shift toward electricity production from renewable energy go hand-in-hand.

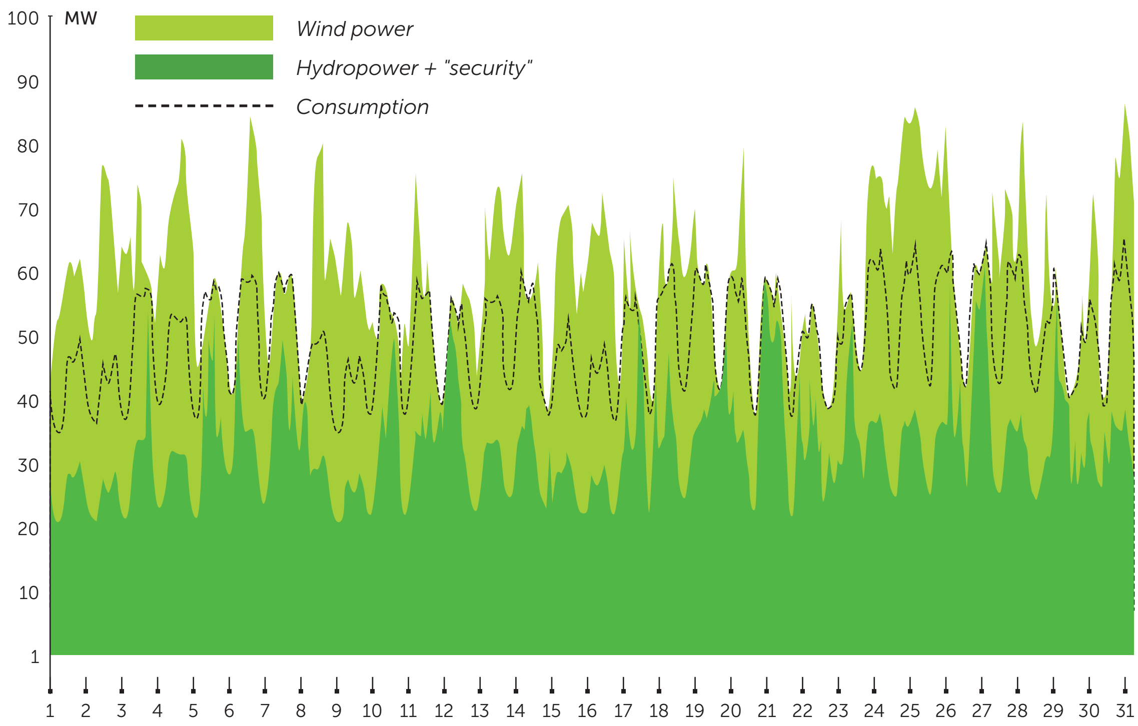

Diagram 2-1 An example of "wind spill" in a future electricity system projected for an October month in 2025.
Note: All the light-green production above the dotted black consumption line is energy that cannot be utilized – so-called "wind spill".

In 2012, five 900 kW wind turbines were erected. In 2014, 13 additional wind turbines were erected at Húsahagi. The combined power from the wind turbines is now 18.4 MW, which is somewhat more than the lowest amount of usage. This production overage is wind spill, i.e., underutilized wind energy (Figure 2-1).

Therefore, it is critical to set into motion initiatives directed at increasing the use of electricity – such as the electrification of heating in homes and buildings via heat pumps and the expansion of the district heating system with heat pumps and immersion heaters.

In addition, Pumped Storage offers the potential to store energy that can be tapped later. In combination with the Power Hub concept, this power source increases the flexibility of the electricity system, which is necessary to ensure a high degree of production security.

However, wind power makes the electricity system more sensitive relative to enhanced stability. Therefore, it is critical to strengthen the electricity system with units that can help ensure stability. This critical need was met in 2014 when some 13 additional wind turbines were erected.

Energy conservation initiatives are a natural part of an advanced and modern energy system and there is great potential among many consumers. A detailed analysis or mapping of the potential within industry and large public and private sector buildings could very well afford an excellent foundation upon which to launch energy-savings initiatives. At the same time, other initiatives could be directed at the small, private consumer.

The Action Plan explores 26 Recommendations and 7 Initiatives that are deemed critical for the ongoing development and expansion of the Faroese energy sector and especially the electricity system. For each recommendation / initiative a specific guarantor is delineated who is deemed responsible to carry out the recommendation or specific initiative outlined.

The last section of the Action Plan is a prospective analysis that elucidates the financial challenges over the next ten years of a comprehensive reorientation of production to renewable energy resources.

The entity that is accorded responsibility for a recommendation or initiative is urged to take the necessary steps to ensure that the tasks at hand are correctly organized and executed in a manner that ensures compliance with the referenced deadlines. The guarantor also has the responsibility and is encouraged to seize the opportunity to bring in and collaborate with other relevant participants to help ensure the best possible result.

Together, both the Faroese Earth and Energy Directorate and SEV play a major role in the development of the Faroese electric system. It is a given that, if one entity has specific responsibility for a particular task, there would be considerable dialogue with various other parties such that the relevant individuals and/or entities could effectively contribute to the collective effort required.

The Recommendations relate to procedural issues, plans and budgets, technical and financial evaluations, directories of technical programmes and actionable ideas or concepts, technical programming, incentives and political decisionmakers. The different Initiatives envisioned span the spectrum from journal articles, to the establishment of frameworks or paradigms for action, to grid expansion plans, and to the financial review of demonstration projects and the materials needed for preliminary, preplanning of projects.

For this Action Plan, the Working Group grounded its work on the voluminous White Papers drafted by the Working Group over the past several years and the Working Group has endeavoured to expand on and develop these further.

The purpose of this Action Plan has been to provide our elected officials, industry and the general public the well-grounded assurance that a shift toward green energy is possible without jeopardizing electric production security.

The Action Plan begins with two charts outlining who bears the responsibility for the Recommendations and Initiatives advanced by the Action Plan and which year each should be initiated. The charts also delineate who has the responsibility to carry out each Recommendation or Initiative.

Subsequently, the Action Plan discusses the current production infrastructure and new production methods and / or concepts that would be of interest in the Faroe Islands.

Following is an analysis of the grid and the distant heating system and the challenges associated with greater electricity production from windpower. Next is a discussion regarding consumption with a focus on the possibilities linked to expanded electrification, flexible production and energy-conservation efforts. This section also discusses special excise tax surcharges.

The Action Plan ends with two sections that analyze energy storage and a cable linkage to our closest neighbours, as well as a supplemental exploration of the financial consequences of a comprehensive shift toward and refocus on renewable energy resources for electricity production.

In the Action Plan, several words or phrases have been italicized. These words have been defined in Section 1.0.

3.0 / Overview of the Recommendations and Initiatives

The Recommendations and Initiatives, respectively, are shown in the two charts below. In total, there are 26 Recommendations that SEV, the Earth and Energy Directorate and the Ministry of Trade and Industry have the responsibility to carry out, as mentioned earlier.

The Working Group has decided to set into motion 7 Initiatives that are part of the ongoing effort toward a more fossil-free Faroe Islands. The responsibility for these initiatives is divided between SEV and the Earth and Energy Directorate (JAR).

Recommendations (Figure 3-1)	2015	2016	2017	2018	2019
1. Advisory Report on Wind Energy in the Faroe Islands			SEV		
2. Mapping of Wind Energy Locations		JAR			
3. Potential Long-term Development of Hydropower	SEV				
4. Reach Final Decision Regarding Víkarvatn Hydropower Plant			SEV		
5. Analysis of the Operation of Micro-hydropower Plants	JAR				
6. Long-term Plan for Thermal Relative to Hydropower and Wind Energy		SEV			
7. Technical Specifications for Tidal Current Power		SEV			
8. Parameters for Commercial Operation of Tidal Current Power Plants		JAR			
9. Technical Specifications for Solar Energy	JAR				
10. Study the Production of Heat and Electricity from Waste	JAR				
11. Technical Specifications and Parameters for Biogas Plant		JAR			
12. Technical and Financial Analysis of the Electric Energy System	SEV				
13. Technical Requirements (Grid Code)		SEV			
14. Expansion of District Heating with Immersion Heaters and Heat Pumps	SEV				
15. Analysis of Possible New District Heating Systems		JAR			
16. Analysis of Electrification, Consumption and Production	JAR				
17. Directory of Actionable Concepts Regarding Electrification	JAR				
18. Analysis of Variable Electricity Prices	SEV				
19. Implement Variable Pricing Schedule			SEV		
20. Analysis of Flexible Production		SEV			
21. Encourage Energy Conservation	VIN				
22. Compilation of Ideas on Energy Advice	JAR				
23. Support / Subsidy Regime for Green Energy Substitution	VIN				
24. Energy Excise Taxes	VIN				
25. Technical Specifications for Pumped Storage		JAR			
26. Study of a Cable Connection between the Faroe Islands, Iceland and Shetland			JAR		

Initiatives (Figure 3-2)	2013	2014	2015	2016	2017	2018	2019
1. Financial Analysis on the Expansion of Thermal Power Vs. a Cable Connection to Suðuroy	SEV						
2. Expansion of the Production Power at Sund Power Plant					SEV		
3. Demonstration Project for Tidal Current Power Plant	SEV						
4. Development Plan for the Electric Grid			SEV		SEV		SEV
5. Grid Plan and Prospect for Linking the Electric System			SEV				
6. Study on Integration of Pumped Storage into the Grid in Suðuroy	JAR						
7. Study on a Cable Connection between Iceland and the Faroe Islands		JAR					

4.0 / Production

4.1 / Introduction

Electricity demand in the Faroe Islands is met via power plants driven by oil, hydro and wind.

In 2012, total electricity consumption, including grid loss, was 292 GWh, with 181 GWh from oil, 100 GWh from hydro and 11 GWh from wind. In 2014, production from wind was 35 GWh and will in all probability in 2015 grow to 56 GWh annually. Generally, there is a period in the summer in the Faroes when rainfall is limited, coupled with periods when there is little or no wind. Ultimately, this means that the Faroes must rely on oil-fired power plants to produce electricity with water and wind playing a role in reducing our consumption of heavy oil.

The Figure below shows electricity consumption for each month in 2012 subdivided into oil, hydro and wind. It shows that in June, July and August the contribution from water and wind was very little and thus a greater portion of demand was met by production utilizing heavy oil.

The electricity system or infrastructure in the Faroes is, in the main, divided into two grids (see Figure 5-1), a small grid on Suðuroy and a somewhat larger grid in the Central Production Area of SEV. In addition, there are some smaller islands that derive their electricity from small, oil-fired plants.

4.2 / Production from wind

Wind turbines have been a part of the Faroese grid since 1993, but not until the five 900 kW wind turbines erected at Nes came online in November 2012 did wind energy make a meaningful impact on the net contribution

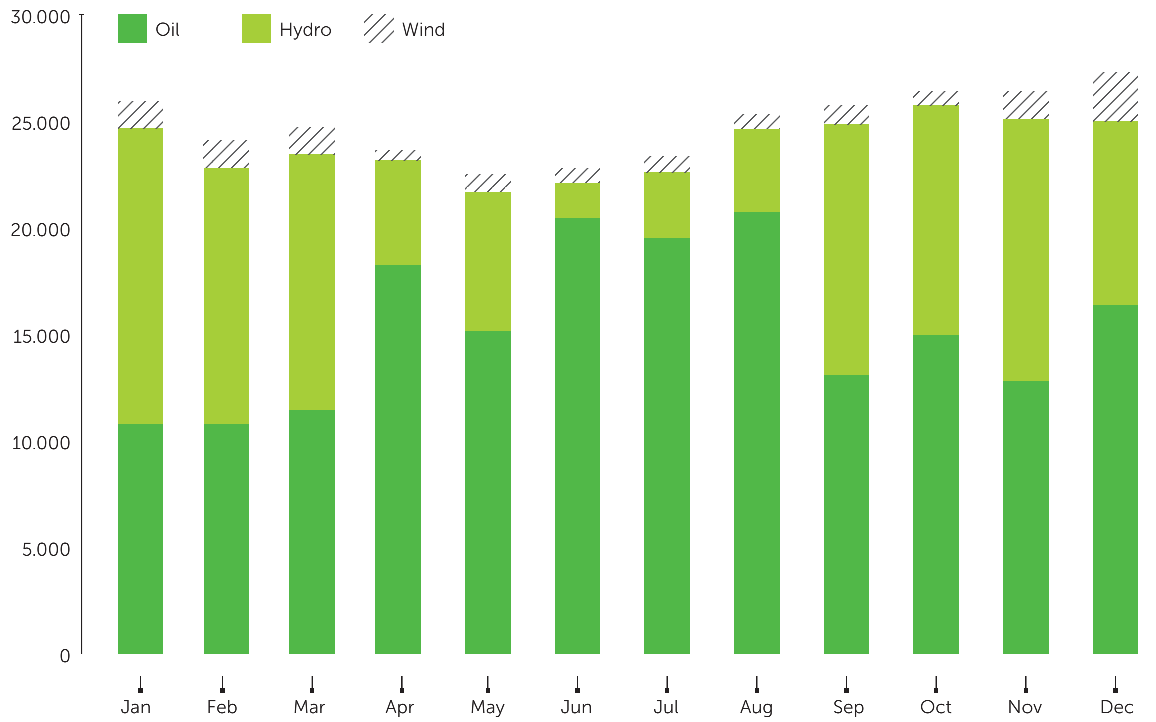

Figure 4-1
Overview of electricity production in MWh per month for 2012.

between oil, water and wind. When electric usage is low, e.g., at night, and wind is present, by year-end 2012 some 30% of production was derived from wind. With such a large portion of production coming from wind, several challenges arise, because wind energy is not stable, thus inertia and short circuits (see 5.1).

These challenges grew even more complicated in 2014 when thirteen 900 kW wind turbines came online. Now some 20 MW of wind energy is available, which corresponds to 40-50% of total annual available power. When such a large portion of total power is derived from wind, this places new demands on the grid, especially the small and vulnerable grids found in the Faroes.

Links into the resilient international grid infrastructure enables Denmark, for example, to export electricity when its production is greater than its demand and to import electricity when production is less. Therefore, Denmark can maximize production from wind (ca. 50% by 2020). At the same time, such a well-integrated AC electric grid can provide the necessary stability across international boundaries.

When wind turbines initially only contribute to a limited extent to the stability of the grid, any subsequent increase in the input of the wind turbines into the grid necessitates an ever-increasing need for grid stability from other sources. Here synchronverters and/or large flywheels at the hydropower plants could contribute to maintaining the stability of the grid.

In connection with the erection of 13 new wind turbines in 2014, SEV determined that the first two years of operation would be trial years during which the electricity grid and procedures could be developed and refined so that an greater amount of wind energy could be integrated into the Faroese grid.

It is intended that a comprehensive evaluation be conducted regarding the future expansion of wind energy in the Faroe Islands.

Recommendation 1

Advisory Report on Wind Energy in the Faroe Islands

Responsible Party: SEV[a] (2017)

Wind turbines have developed considerably over the last few years. With this in mind, it is recommended that possible locations for new windfarms be identified.

The resultant map shall be used to determine where the new windfarms should be located and to assist in planning how best to ensure that the grid can readily accept future wind production.

The government should assume the responsibility for arranging access to the designated areas, setting up the appropriate weather stations, carrying out environmental impact assessments and gaining the approvals necessary to implement a new option for wind energy potential.

The mapping of potential wind energy locations requires the participation of several government authorities. Close collaboration can help to ensure that any new windfarm projects can be quickly implemented.

Recommendation 2

Mapping of Wind Energy Locations

Responsible Party: Earth and Energy Directorate[a] (2016)

[a] Pursuant to § 11, paragraph 3 of the Electricity Production Act, SEV shall – in consultation with the Minister – evaluate and report on the future need to expand the electricity production capacity and the grid. SEV and the Earth and Energy Directorate both play a significant role in this endeavour.

4.3 / Production from hydropower plants

The first hydroelectric plant was built at Botni in 1921. Since then, hydropower has become a good supplement to the heavy oil power plants.

All the water turbines in the Faroes are considered to be base-load units, and thus can operate more than 7,500 hours per year (85%), if sufficient water is available.

The water reservoirs scattered throughout the country are subdivided relative to the amount of water required for normal operation and for emergencies. Thus, 45% of the reservoirs are for normal operation, while 55% are set aside for emergency use. Water seldom runs out over the dams, thus there is no wastage.

All hydropower plants have, however, limited water storage capacity, and under normal operations in the Central Production Area the time required to drain the reservoir is between 7 hours (at Strond) and up to 413 hours ~ 17 days (at Vestmanna). The power plant at Eiði has a joint reservoir for three turbines with a drainage time under normal operations of 135 hours ~ 5.5 days.

Under normal operations, the drainage time in Suðuroy is between 77 hours ~ 3 days (turbine 2 at Botni) and 217 hours ~ 9 days (turbine 1 at Botni).

The water catchment areas in the Faroe Islands are different from those in Sweden and Norway where considerable amounts of water are contained in the snow accumulation, which melts in the spring. This "reservoir" of water provides sufficient water for several months of production.

Short drainage times and a relatively long period with little rainfall during the summer months means that hydropower in the Faroes cannot be considered a source of "secure" power, but only as a supplement to total electricity production. The various reservoirs and possible catchment areas can thus contribute to reducing the consumption of heavy oil, but cannot lessen the need for other power sources.

It is recommended that a report be prepared that identifies the untapped potential for hydropower. The report should address the possible expansion of existing hydropower facilities via larger reservoirs and the installation of new turbines that could provide more power to the grid, as well as locating new areas where hydropower plants could be erected.

Hydropower has the potential to ensure the stability of the grid. In the event of a short circuit, hydropower could provide 5-6 times the normal power. Also, special flywheels could be attached to the turbines to increase the security and stability of the grid without requiring additional water (see 5-1).

Recommendation 3

Potential long-term development of hydropower

- Expansion of current hydropower plants
- New hydropower plants
- Operational parameters and constraints

Responsible Party: SEV (2015)

A study of the new hydropower plant at Víkarvatn has been concluded. It is recommended that this preliminary work be finalized so that a decision can be reached whether to proceed with this project.

Recommendation 4

Reach final decision regarding Vikarvatn hydropower plant

Responsible Party: SEV (2017)

The development of small, so-called micro-hydropower plants has advanced to the point that these could be of interest in the Faroe Islands. It is recommended that the potential for such micro facilities be investigated. The study should identify a place where such a power plant could be built.

Recommendation 5

Analysis of the operation of micro-hydropower plants

Responsible Party: Earth and Energy Directorate (2015)

4.4 / Production from oil-fired power plants

Oil-fired power plants have a long history and have always been a part of Faroese electricity production. These types of power stations are considered to be reliable and secure sources of energy because they are not dependent upon the external vagaries of wind and rain. Of course, there will be periods when the power plants will stand idle during routine maintenance or repair, but otherwise these power plants can operate on "stand-by" or generate a little or a lot of power depending on the need.

Originally, the power plants were built as individual local plants, but over time they were linked into the 60 kV gird and today they provide excellent electricity production security for the Faroe Islands as a whole.

The oil-fired power plants can be subdivided into:

- Base-load units – more than 7,500 annual operational hours (85%)
- Peaking units – up to 1,000 annual hours (<12%)
- Emergency units (limited hours – only as needed)

Similar to the hydropower plants, oil-fired power plants have the capacity to ensure stability within the electricity grid and can provide 5-6 times the normal power in the event of a power failure (see 5.1). Because electricity production to date has been derived from hydropower and oil-fired power plants, historically there has been excellent correspondence between consumption and capacity within the Faroese electricity grid.

On Suðuroy, the new pelagic fish processing factory has resulted in the base-load engine (motor 3 at the Vági power plant) running many hours under a heavy load, which increases the wear and tear on the engine. Therefore, a quick solution to increased power production is necessary. There are two possibilities: 1) lay a cable to the Central Production Area, or 2) increase the current capacity at the Vági power plant. An AC cable connection has the advantage that the total electricity grid is rendered bigger and the power plants in both Suðuroy and the Central Production Area could collectively contribute to greater capacity and stability throughout the entire system. Thus, a cable connection between Suðuroy and the Central Production Area would result in a stronger grid overall.

In 2013, SEV carried out a financial and technical study of this particular possibility to provide a better foundation for a final decision regarding which path to take.

Initiative 1

Financial analysis of the expansion of thermal power versus a cable connection to Suðuroy

Responsible Party: SEV (2013)

Today, in the Central Production Area there are several base-load motors (e.g. motors 3 and 4 at the Sund power plant) that have run for many, many hours and therefore cannot be expected to remain fully operational as base-load motors much longer. In future, these particular motors should be used as peaking load units (i.e. during periods of momentary high consumption) or in special circumstances, e.g., breakdowns.

Therefore, greater production capacity must be arranged that could replace these particular power plant motors. SEV has taken the steps necessary to obtain the required approvals from the government authorities and it is planned that a new power plant at Sund will be operational in 2017. This new power plant will incorporate advanced leading-edge technology to ensure a viable, long-lived future that will also include options for a variety of different fuel types.

Initiative 2

Expansion of production power at Sund and ensure a long-lived future that can integrate new types of fuel

Responsibility Party: SEV (2017)

At the same time as the new Sund power plant is readied, it is recommended that a future long-term plan be drafted that addresses the inter-relationship between oil-fired electric power plants and wind and hydropower plants relative to current and future, accelerated electrification as well as the possibilities of storing power, e.g., in a Pumped Storage system. This study shall contribute to and serve as a foundation for a more comprehensive plan for the expansion of the entire energy system in the Faroe Islands, a plan that will ensure, as much as possible, the use of renewable energy resources in the future.

Recommendation 6

Long-term plan for thermal energy relative to hydropower and wind energy

Responsible Party: SEV[a] (2016)

[a]Pursuant to § 11, paragraph 3 of the Electricity Production Act, SEV shall – in consultation with the Minister – evaluate and report on the future need to expand the electricity production capacity and the grid. SEV and the Earth and Energy Directorate both play a significant role in this endeavour.

4.5 / Production from tidal current power plants

There are several places with excellent conditions for tidal power generation, i.e. the tidal current is over 2.5 meters per second (5 nautical miles) and the depth is more than 40 m.

Moreover, peak tidal currents vary from place to place, meaning that the greatest potential for electricity production does not occur at the same time at the different locations. Two excellent locations are Skopun Fjord and Vestmanna Sound; the difference in peak tides is three hours.

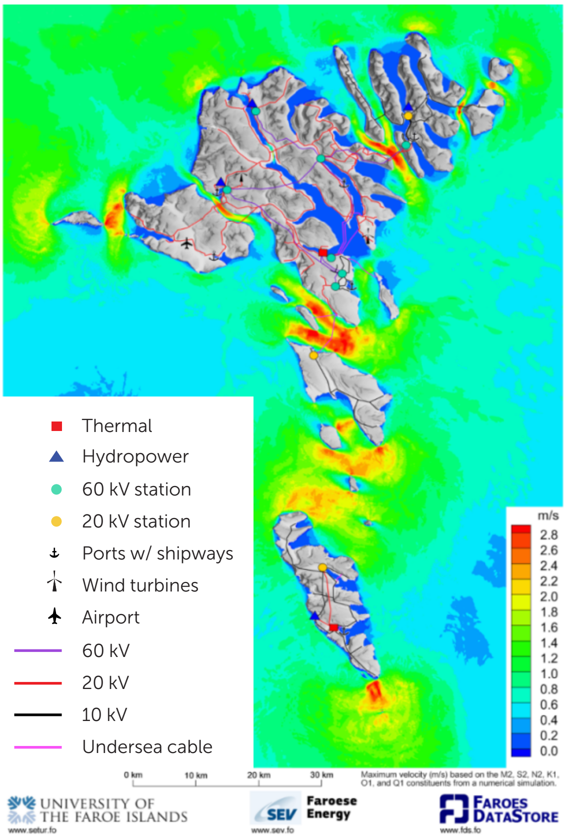

Figure 4-2
Tidal current energy potential in the Faroe Islands

Electricity production occurs in essentially the same manner as with wind turbines, except that the advantage of tidal current production is its predictability. Such a power plant can be viewed partly as back-up security and partly as a base-load unit.

The technology continues to be expensive to deploy, but its development should be closely followed. It is recommended that the technical specifications for such a power plant be compiled and the permitting requirements outlined so that it might be possible to launch several trials within the next few years.

Recommendation 7

Technical specifications for tidal current power

Responsible Party: SEV (2016)

Initiative 3

Demonstration project for tidal current power plant

Responsible Party: SEV (2013)

Given the belief that continued development will result in a more cost-effective power plant, it is recommended that the operational parameters be delineated. With these parameters in hand, it will be quick and easy to set up operations when the technology becomes more economically feasible.

Recommendation 8

Parameters for commercial operation of tidal current power plant

Responsible Party: Earth and Energy Directorate (2016)

4.6 / Solar energy

Solar energy can be utilized via solar panels that heat water or solar cells that produce electricity. Both possibilities have been tried in small settings in the Faroe Islands, but, compared to the investment, little is gained, especially in winter. Considerable development has occurred in solar energy over the past few years and production per area has increased and the cost is less.

The future outlook for solar panels and solar cells built into the exterior facing of a building (climate screens) appears good. When hydro and wind production is lowest in the summertime, solar energy could serve as supplemental production during this particular time of the year.

Developments in this area should be closely followed.

Recommendation 9

Technical specifications for solar energy

Responsible Party: Earth and Energy Directorate (2015)

4.7 / Waste incineration

District heating was implemented in the Faroe Islands in 1988 when central heating pipes were laid from the Sandvíkarhjalla waste incinerator to a new housing development above Hoyvík. In 2008, this infrastructure was expanded by laying central heating pipes to the Sund power plant. Thus, the district heating network was connected to two heat sources that in turn supported each other and increased overall energy security.

More wind energy production results in less oil consumption at the Sund power plant, which in turn reduces the production of heat from this power plant. It is recommended that the possibility of burning waste be investigated to enhance the expansion of the district heating system in Tórshavn, and that heat production be supplemented by immersion heaters and large heat pumps so that operations can remain flexible and of good quality.

Recommendation 10

Study the production of heat and electricity from waste

Responsible Party: Earth and Energy Directorate (2015)

4.8 / Biogas power plants

There is considerable organic waste generated by the fishing industry and agriculture in the Faroe Islands. This waste pollutes the environment and is difficult to dispose of safely. The fishing industry has, however, discovered a very clever way to handle a large portion of its "waste".

Another possibility is to use this organic waste as the basis for biogas production that could otherwise be linked into the district heating system.

It is recommended that the technical specifications for a biogas power plant be researched and compiled in order to explore and study the potential and the operational conditions of such a power plant.

Recommendation 11

Technical specifications and parameters for a biogas plant

Responsible Party: Earth and Energy Directorate (2016)

5.0 / The Grid and Electric System

5.1 / The electric system and stability

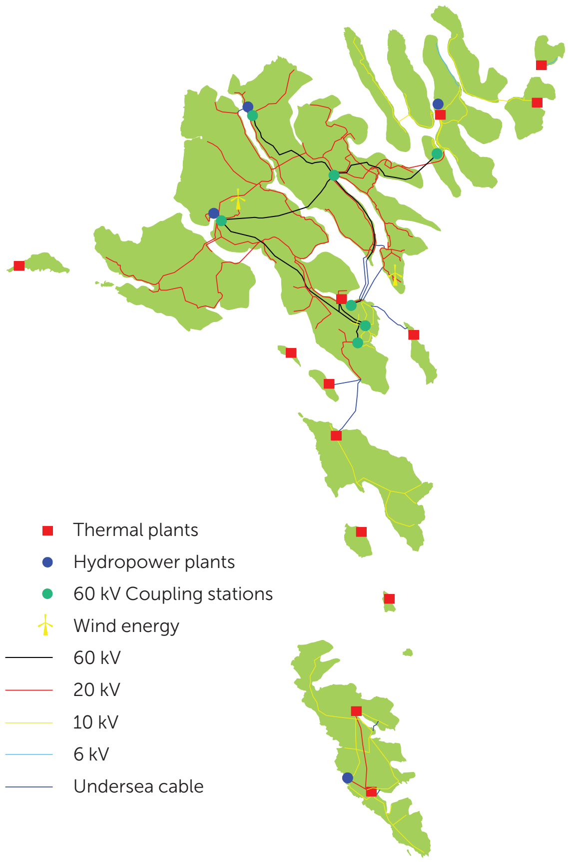

Figure 5-1
Faroese electric system

Certain prerequisites must be in place in order to adequately operate a national electric system. The system must have the requisite internal inertia that will ensure that everything operates as it should even in the event of a malfunction, such as a short circuit.

For us, it is the hydropower plants and the motors at Sund especially that ensure sufficient inertia within the system. The size of the flywheels on the water turbines are also of importance, because a large and thus heavier flywheel makes a considerable difference.

On the other hand, wind turbines to a much lesser degree are able to ensure sufficient inertia in the system, because they only supply a fifteenth of what the water turbines and the motors provide. This means that, if many wind turbines were linked into the grid, it would be necessary to ensure stability in another way, e.g., by having the motors and water turbines idling on standby or by linking synchronverters into the grid.

The Faroese electric system is small, tenuous and vulnerable because it is not linked to the grids of other countries. And this situation is compounded when even more wind turbines are linked into the system. Thus, it was considered that at most only 30 – 40% of total production could come from wind turbines. However, experience with the new wind turbines indicates that this percentage could be higher. Therefore, it is recommended that a detailed technical and economic analysis with recommendations be undertaken to ensure commercially reasonable investment when further wind turbine expansion takes place.

Recommendation 12

Technical and financial analysis of the electric system

· Stability
· Inertia
· System-wide production

Responsible Party: SEV (2015)

5.2 / Grid development plan

There is a need for a plan relative to the development and expansion of the electric system in the coming years. A grid development plan would be a useful tool and it is recommended that a report be prepared analyzing the various development options and the level of investment required.

Moreover, the plan should also address the transmission power line net, both the high and low tension lines, i.e. 60 kV, 20/10 kV and 230/240 V.

SEV anticipates that the first plan will be available in 2015 and subsequently updated every other year.

Initiative 4

Development plan for the electric grid

- Updating and connection of the grid to end users
- New conditions for connection and increased usage
- Updating/expansion of high, medium and low tension lines
- Projections of future electricity consumption

Responsible Party: SEV (2015 and every other year subsequent)

Initiative 5

Grid plan and prospect for linking the electric systems

(Central Production Area and Suðuroy)

Responsible Party: SEV (2015)

5.3 / Technical Procedures

In the future, more and more different types of electrical equipment will connect to the grid. In many cases, this equipment will be owned by the customers themselves and therefore it will be necessary to stipulate specific conditions and technical requirements relative to the connection of this equipment into the grid to ensure equal treatment for all. It is recommended that a distinction be made between production entities and large consumers, e.g., immersion heaters, heat pumps and other equipment with varying electricity consumption. Approved regulations regarding connection to the grid should be drafted.

Recommendation 13

Technical requirements (Grid Code)

- Production units
- Synchronous generators
- Asynchronous (induction) generators
- Inverter generators
- Large consumption equipment
- Heat pumps in large heating systems
- Immersion heaters in large heating systems
- Flexible consumption

Responsible Party: SEV (2016)

5.4 / Distant heating system

The district heating system will no doubt play a major role in the electric system. When wind turbine production peaks, any excess production can be used to heat up water in large storage tanks using immersion heaters and heat pumps for later use.

It is recommended that a study be conducted regarding how the district heating system in Tórshavn could be expanded and how immersion heaters and heat pumps could supplement heat production when the waste incinerator and the power plant at Sund are insufficient to meet demand.

Recommendation 14

District heating system in Tórshavn be expanded using immersion heaters and heat pumps

Responsible Party: SEV (2015)

In addition, the commercial feasibility of setting up a district heating system outside of Tórshavn should be studied.

Recommendation 15

Analysis of possible new district heating

Responsible Party: Earth and Energy Directorate (2016)

6.0 / Electricity Usage

6.1 / Electrification

Electrification, coupled with increased wind energy production capacity and possibly other sources of renewable energy, will enhance the potential use of electricity during periods of peak wind. Otherwise, the potential production will be lost.

At present it is not possible to store significant amounts of electricity, because, in the main, electric power must be consumed at the same moment it is produced. Thus, there must be a balance between production and consumption.

If it were possible to connect and disconnect large consumers of electricity, this would help minimize production loss. These consumers are, e.g., refrigeration compressors, immersion heaters and heat pumps. In addition, it is possible to use over production to pump water back up to a hydropower reservoir (Figure 7-1).

It is recommended to study how best to match consumption with production so that several more wind turbines could be erected.

Recommendation 16

Analysis of electrification, consumption and production

Responsible Party: Earth and Energy Directorate (2015)

At the same time, it is recommended that a catalogue of viable ideas or options be compiled regarding how greater electrification could benefit large-scale industry, public buildings and private households.

There should be an emphasis on how economic incentives could accelerate electrification efforts and how these could be advanced in a reasonable and effective manner.

Recommendation 17

Directory of actionable concepts regarding electrification

- Public buildings
- Financial incentives for electrification
- Approval process for recommended solutions

Responsible Party: Earth and Energy Directorate (2015)

SEV is underway to shift out all the electric meters. This work is planned to be completed in 2015 and thus it will be possible to wirelessly measure all electricity usage. In this connection, it is recommended that a study be carried out to determine if it would be desirable to adjust the price of electricity so that it would vary throughout the day and would also be linked to annual usage and power consumption. Also it should be studied whether the price of electricity could vary based on what the electricity is used for, such that less would be charged for electricity for heat pumps and immersion heaters.

Recommendation 18

Analysis of variable electricity prices:

- Wireless meters (set up everywhere 2015)
- Price varies throughout the day
- Price varies according to annual usage
- Price based on effect
- Price based on type of usage (e.g. heat pumps)

Responsible Party: SEV (2015)

A decision shall be taken as to whether a new price schedule shall be put into effect, and if so it should be announced in 2016.

Recommendation 19

Implement variable pricing schedule

Responsible Party: SEV (2017)

6.2 / Flexible production

In an electric system with a steadily increasing production from wind there is a need for equipment that over short intervals can regulate electricity consumption up or down based on the available electricity production. Such equipment could be, e.g., immersion heaters, heat pumps and pump stations, as well as Power Hub systems, all of which could assist in ensuring the necessary flexibility in the electric system as a whole. It is envisioned that in the future the equipment and machines of individual consumers could also contribute to this flexibility. So, for example, it might be possible for washing machines, dryers and dishwashers could be started and stopped so that consumption corresponded to production. However, such a transition will not happen immediately. In the next few years it is anticipated that there will be more and more electric cars on the the road, and it is envisioned that the charging of these cars will correspond to and adjust to electricity production.

Immersion heaters could very well play a major role in facilitating greater flexibility in the electric system, mainly because they can easily be brought on-line and off-line in a matter of seconds in response to fluctuations in production. The best are the large immersion heaters and especially those that work in sequence.

Heat pumps, as well, could contribute to a smoothly operating electric system. Again, the most appropriate are the large heat pumps designed for industry and large buildings. At the same time, household heat pumps could also play a useful role.

Under the Power Hub system, large consumers (e.g., freezer warehouses, fish farming operations, etc.) enter into agreements with SEV by which SEV is allowed to cut off power in the event of any instability within the electric grid. This is done to maintain overall stability within the system and to avert a possible black out. It is believed that the Power Hub system could also be used to help ensure production security when more wind turbines are added to the grid.

Recommendation 20

Analysis of flexible production:

- Immersion heaters
- Heat pumps
- Power Hub

Responsible Party: SEV (2016)

6.3 / Energy conservation

In a modern energy system, there should be a special focus on energy saving initiatives to reduce the dependency on fossil fuel. This should be a political decision such that the government authorities, utilities and private stakeholders understand the parameters designed to encourage consumers to conserve energy. These parameters could include specific requirements stipulated by legislative and regulatory fiat, bans on the use of oil-fired furnaces, or other initiatives designed to encourage or complement conservation when, e.g., a house is built or renovated or when an oil-fired furnace should be replaced.

It is recommended that a political accord be reached on the various initiatives that could be implemented.

Recommendation 21

Encourage energy conservation:

- Recycling
- Replacement of oil furnaces
- New apartments

Responsible Party: Ministry of Trade and Industry (2015)

There should be a direct focus on assisting consumers to implement energy saving initiatives and the various initiatives should be adapted to industry, government and private households. Industry and government offices should be of primary focus. Denmark, for example, has considerable experience over many years in identifying energy consumption and, based on these findings, has designed specific recommendations to reduce energy consumption. The savings are compiled and made available for all so that it is easy to see how effective a particular initiative otherwise might be.

On the other hand, advertising campaigns are especially effective in reaching private households. This is because it has been found to be too expensive and time-consuming for an individual consumer to identify and then register the savings that might be derived by a household.

For this particular sector, financial incentives produce greater energy conservation and this should be a part of the political decision-making.

Green accounting could also encourage interest in implementing energy-savings practices, because by utilizing this particular tool it would be possible to get businesses and government offices to compete among themselves.

Green accounting could moreover include waste and recycling computations such that a company would find it advantageous to take the trouble to use less energy and to implement good recycling and waste disposal initiatives.

It is recommended that a catalogue of ideas regarding energy-saving and conservation initiatives be compiled.

Recommendation 22

Compilation of ideas on energy advice:

· Businesses
· Government agencies
· Advertising campaigns aimed at the general public
· Green accounting
· Industry
· Public and private offices

Responsible Party: Earth and Energy Directorate (2015)

6.4 / Subsidy regimes and excise taxes

To hasten the shift to green energy resources, it is advisable to investigate various support initiatives relative to the purchase and installation of more green products or equipment. It should be possible to offer direct financial incentives, tax allowances, VAT-free or similar programmes to encourage the general public to invest in the latest and greenest technology.

Recommendation 23

Support / subsidy regimes for green energy substitution

Responsible Party: Ministry of Trade and Industry (2015)

Excise and similar taxes or surcharges could also be used as an effective tool to promote a more "greening" trend. For example, an excise tax could be levied on petrol for vehicles or on oil-burning furnaces. The VAT on heat pumps could be reduced and it is possible to offer tax allowances for renovations that reduce the heating demands of buildings and private homes. It is recommended that broad political agreement be forged in this area.

Such an initiative shall, however, be carried out consistent with a comprehensive evaluation of the economic impact and not just a desire to move from fossil fuel at any price.

Recommendation 24

Energy excise taxes

· Tax advantage for energy-friendly vehicles
· Oil furnaces
· Oil for heating

Lower surcharges or taxes or other economic incentives for:
· Purchase and operation of heat pumps
· Renovation of apartments
· Energy-saving regulations on the construction of new homes

Responsible Party: Ministry of Trade and Industry (2015)

It is recommended that the excise tax / surcharge system be periodically reviewed and revised to ensure that the Faroese energy system is overall as reasonable and effective as possible.

7.0 / Energy Storage

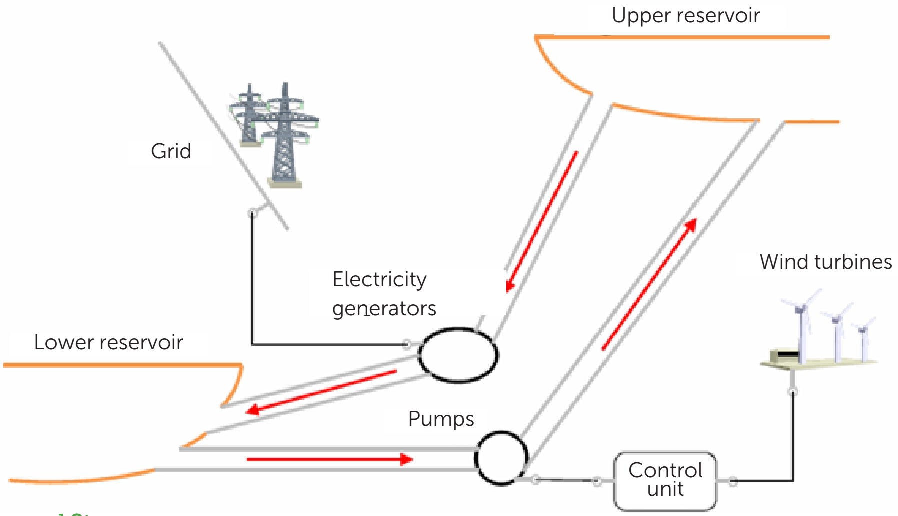

Figure 7-1 Pumped Storage
Demonstration of a wind/water/pump system

7.1 / Pumped Storage

Earlier studies have shown that there is good potential for the construction and operation of pumped storage power plants in the Faroe Islands. In 2013, the Nordic Council provided financial support for a preliminary study for such a facility in Suðuroy. The report shall examine the technical issues and focus especially on the optimal size and related costs.

Initiative 6

Study on integration of pumped storage into the grid in Suðuroy

Responsible Party: Earth and Energy Directorate (2013)

Based on the above-referenced report, a detailed analysis of the possibilities of constructing a pumped storage power plant is recommended. It will be a major challenge to discover exactly how pumped storage and wind power will work together and whether the pumps can quickly adjust to fluctuating wind. The report shall also discuss whether an independent, stand-alone power plant or one linked into the grid is the best option or whether it would be possible to use either. In addition, the report shall explore which locations in the Faroes are most appropriate. It is recommended that a Pumped Storage power plant be set up and evaluated in a special report.

Recommendation 25

Technical specifications for Pumped Storage

- Grid-integrated solutions
- Stand-alone solutions
- Potential locations
- Project prerequisites for governmental approval

Responsible Party: Earth and Energy Directorate (2016)

8.0 / Cable Link to Nearby Countries

8.1 / Undersea cable to other countries

For some years now, an electric cable running between Iceland and the Faroe Islands has been a topic of conversation. In November 2012, the ministers responsible for energy in Iceland and the Faroe Islands entered into an agreement to update a study conducted in 2007 regarding such a cable to determine if the prerequisites had changed.

The study should be expanded to explore the potential of a cable running to the south, to, e.g. Shetland.

The goal of an undersea cable running between the Faroe Islands and Iceland or between the Faroe Islands and Shetland is the potential to transmit electric power between the countries. However, it could be somewhat risky to have just one cable. Therefore, it is necessary to have a back-up in place ready to meet the demand. The savings to be derived from such a cable connection, in the main, are related only to operational costs and not the investment in production facilities. Moreover, it should be born in mind that it will not be completely free to maintain the cable in a stand-by mode. If the connection is both ways, i.e., to Iceland and to Shetland, security would be greater, as the likelihood of both going offline at the same time is minimal.

The study should be carried out in close collaboration with the energy utilities in Iceland, Shetland and the Faroe Islands, along with the relevant government agencies and ministerial authorities. Every effort should be made to complete this study on a cable connection with both Iceland and Shetland in 2016.

Initiative 7

Study of a cable connection between Iceland and the Faroes

Responsible Party: Earth and Energy Directorate (2014)

Recommendation 26

Study of a cable connection between the Faroe Islands, Iceland and Shetland

Responsible Party: Earth and Energy Directorate (2016)

A.0 / Projections of Investment and Pricing Trends in the Electric Energy Sector – 2015-2025

The Working Group in the Action Plan and related reports has addressed the technical options for the production of electricity from renewable energy resources and the electrification potential, in the first instance, for heating and later for transport.

The Oversight Committee indicated its wish that the Action Plan report also include a financial analysis.

This supplement briefly addresses the financial challenges relative to a shift toward more renewable energy resources for the production of electricity. It does not consider the challenges relative to electrification, even though, for example, the power consumption for heating alone would be double the current electricity production.

It should be noted that there is a high degree of uncertainty regarding the estimates for investment in the grid and power plants, specifically the total amount of an investment, when the investment will be made, and how the investments will be combined. The Working Group recommends that a special, detailed analysis be carried out of the suggested expansion before any final decisions are taken on how expansion will be undertaken in the coming years.

The supplement herein gives an indication of the impact on electricity prices resulting from the multitude of possibilities for expansion of both electricity production and the grid. The 2014 annual accounts of SEV, as well as the expansion plans for the projects deemed most likely to be carried out during the period 2015 – 2025, served as a foundation for the analysis contained herein. Who actually would make the investment, whether SEV or other stakeholders, was not considered. A period of ten years was selected, with the understanding that the full benefit of the various investments would not be realized during this ten-year period but in a time subsequent.

Summary

The continued electrification of the country and an emphasis on energy efficiency, such as encouraging reduced energy consumption, is a given. Local energy policies will have a major impact on the overall energy trends in the country, but at the same time events outside, such as the price of oil, will also have an impact. In the simulations set forth below that are designed to forecast the future price of electricity, one assumption is that the growth of electricity usage varies from year to year and varies for each consumer group. Total growth is assumed to be between 1-3% per year.

Actual electrification will lead to considerable growth in electricity sales (kWh) and will also lead to increased pressure on the grid, which in time will make it necessary to invest in strengthening the grid. In addition, electrification will stimulate investment in a variety of renewable energy resources.

In this connection, in 2014 the Ministry of Trade and Industry intends to issue a notice regarding how a support/subsidy regime relative to the transition to renewable energy might be structured. In addition, the Ministry also plans to disseminate a proposal on a surcharge / excise tax that could also underpin a long-term energy plan.

Because the actual amount of renewable energy used within the country's energy system is a critical parameter relative to its overall management, the energy policy of the country must without question address the energy system as a whole and thus, in addition, how much energy in the end will be used for heating and for transport.

The Working Group recommends that initially heating be shifted from oil to electricity. Later, transport also can shift to electricity.

This means that the demand for electricity will increase significantly, and for a time it might prove a challenge to increase the amount of electricity produced by renewable energy resources.

However, investment in renewable energy electricity production could contribute to meeting this increased demand.

Such initiatives as outlined above will no doubt over time have a positive impact on the price of electricity.

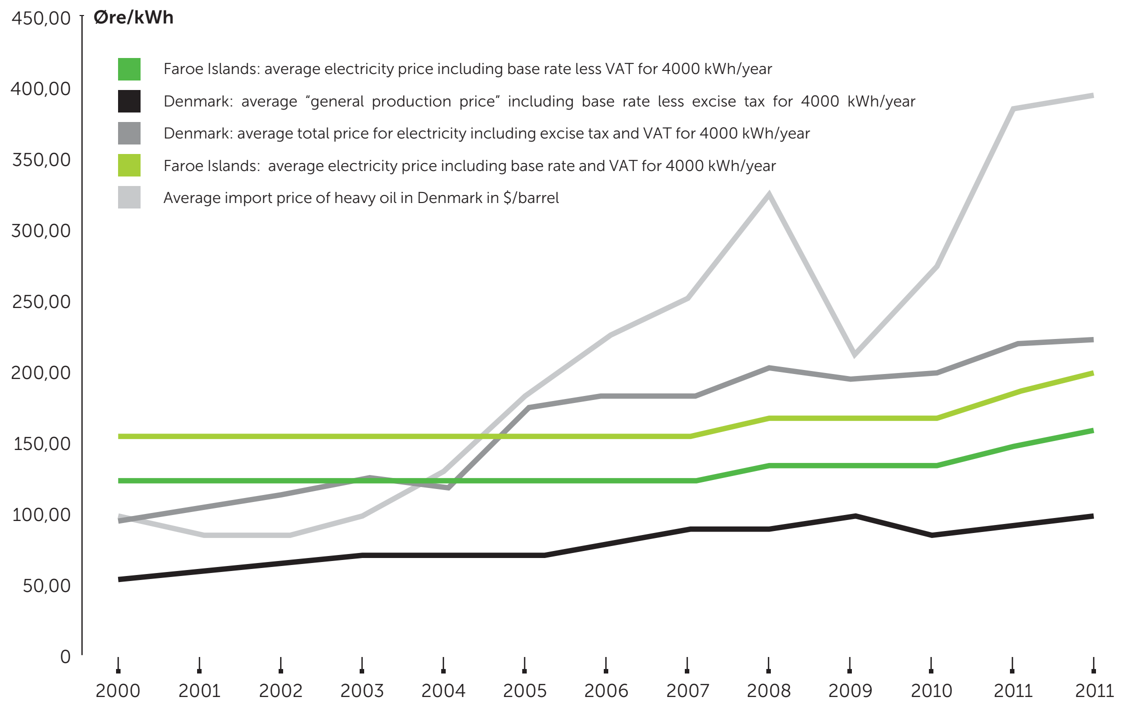

Figure 8-1
Electricity prices in the Faroe Islands and Denmark – 2000-2012 (Benchmark study, Deloitte February 2013)

The Working Group recommends a special focus on renewable energy and the role it might play in the total energy system of the the Faroe Islands, as well as the role of renewable energy in heating, transport and electricity production.

Introduction

An investment in components that produce electricity from renewable energy resources makes the Faroe Islands less dependent on oil, while at the same time having a positive impact on the environment.

Pursuant to the Electricity Production Act, operation of the electricity grid shall be "self-sufficient". Again, pursuant to the Act, electricity production, in accordance with the licenses granted, shall also be "self-sufficient". What this means is that electric utilities shall have the opportunity to realize the requisite income to ensure operations and essential new investment.

The legislation envisions that actors other than SEV could potentially compete in the production of electricity. Keeping in mind the coming expansion in electricity production and the grid, it could very well be possible to generate a reasonable profit of some 5-7% from production facilities and some 2% from grid operations.

It is also assumed that the realized profit from an investment shall be sufficiently commensurate with the risks found within the electric energy industry. The goal of a profit is first and foremost to afford investors a reasonable gain on their investment.

In addition, SEV and other production utilities that realize a reasonable operational profit and do not distribute excessive dividends to their investors, escape having to take on large debt when new investment in infrastructure must be made. Thus, self-financing from operational profit is a wise step. Moreover, ensuring sufficient liquidity is also wise.

If the electric energy industry yields a 5-7% profit, this would no doubt pique the interest of investors.

In conclusion, it should be noted that a persistent emphasis on rationalization of operations will of course increase the resultant profit margin.

At present, the purchase of heavy oil is 43% of total electricity production costs. Climate change policies and continuing high oil prices underpin investment in renewable energy solutions that not only reduce CO_2 emissions, but also reduce overall costs. The proportionally large investment in wind energy that has occurred and will occur is a critical aspect of the Action Plan and will in time contribute to a lowering of the price of electricity.

> Today, private consumers with usage under 10,000 kWh/year pay DKK1.89/kWh with VAT. The "industrial customer" group pays the lowest, DKK1.15/kWh without VAT.

The current low price for industrial consumers derives from an agreement forged between SEV and the Faroese government in 1992. The agreement provided that SEV would not have to pay an excise tax on heavy oil imports, but at the same time its industrial consumers would have their electricity price reduced by an equivalent amount.

At present, work is underway to revise the pricing schedule with a special focus on price differentiation, such as, e.g., a special price for electricity used for heating or for consumers who have fluctuating and controllable usage that can be linked to the actual swings in energy production.

It is anticipated that an investment of some DKK 1.4 billion will be made during the period 2014–2017. There is also a need for investment guidelines for the period 2015–2025, which would address investment in Pumped Storage (as referenced above), additional wind power, tidal current power, hydropower, an electric cable to Suðuroy and other grid-related extensions.

> The simulations below of the future price of electricity shows that, given the current pricing structure, it will be necessary to increase the cost of electricity, if there is to be any profit, new investment and sufficient liquidity.

If it is not desirable to increase the price of electricity, the elected officials could very well adopt various support/subsidy regimes or change the excise tax structure, which

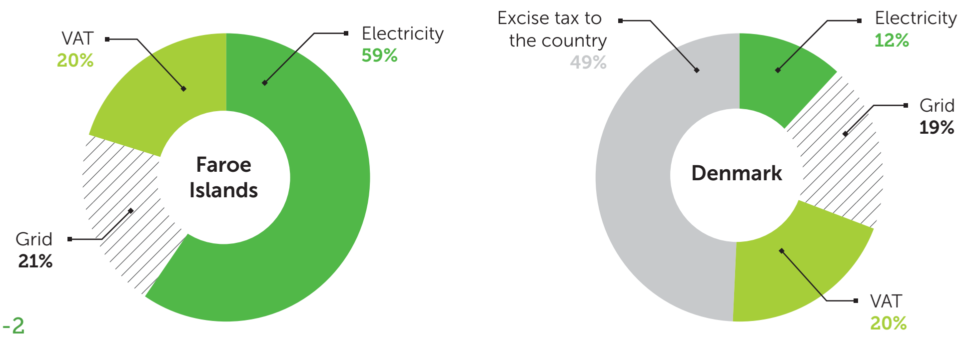

Figure 8-2

The Figure shows that production costs are 59% in the Faroes, compared to 12% in Denmark. Grid-related costs are 21% in the Faroes and 19% in Denmark. VAT is the same in both countries. Denmark levies a 49% excise tax; there is no comparable tax in the Faroes.

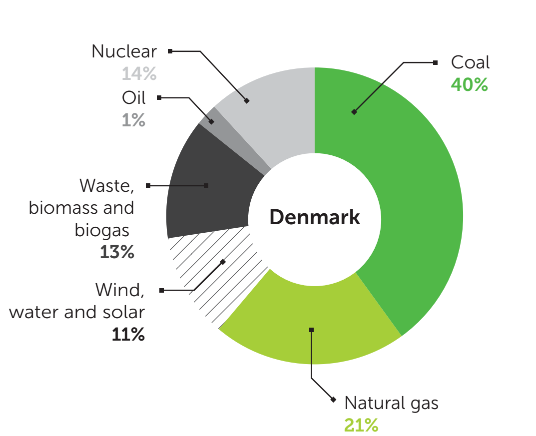

Figure 8-3

The Figure shows that in the Faroes the majority of electricity is produced from burning heavy oil, which is much more expensive than coal which is used in Denmark, among other energy sources. This is the principle reason for the great difference between production costs in the Faroes and those in Denmark. At the same time, a fall in production costs can be expected as more and more wind energy is brought online, assuming no other significant changes. In the section, "A.2 Projected pricing levels 2015-2025", future electricity prices are projected. Electricity prices are at such a level that there is room for an additional consumer surcharge or tax that could contribute to the financing of electrification, which in turn would provide the opportunity for greater production from renewable energy resources.

could ensure that the price of electricity did not rise or eventually could be less. This is possible because a shift in production away from oil to renewable energy resources, in combination with electrification of the country, could save the country the large cost of importing oil. Thus, there would be room to levy an excise tax, which in the end could ensure that the national treasury did not experience significantly lower revenues.

As referenced above, it is anticipated that over the next four or five years an investment of some DKK1.4 billion will be made and in the years beyond an even greater investment will be needed for Pumped Storage, additional wind power, hydropower, etc.

It is quite understandable that some might question the size of such a major investment. However, the Working Group hastens to note that an investment in renewable energy will greatly increase our energy self-sufficiency as a country and make the Faroe Islands less dependent on the import of oil.

Greater energy self-sufficiency will lessen the impact of fluctuating oil prices in the future. Electricity production will in the main be from renewable energy resources. This increased self-sufficient electricity production is expected in the future to have a significant positive impact on the country, extending to the construction industry, and resulting in a reduced import of oil.

Upon reviewing the numbers set forth in Figure 8-1, one can see that the consumer price of electricity in the Faroe Islands including VAT grew by 28% from 2000 to 2012. The consumer price of electricity in Denmark grew considerably more during the same period, namely:

· Price including surcharges and VAT increased: 132%
· Price less surcharges and VAT increased: 87%

However, the consumer price of electricity including surcharges and VAT in Denmark is 11% lower than in the Faroe Islands. And again, the consumer price, less any surcharges and VAT, is 58% higher in the Faroe Islands than in Denmark. This is simply because the production costs in the Faroe Islands are considerably higher than in Denmark. In Denmark, the price of electricity with excise taxes and VAT for an ordinary consumer that uses less than 10,000 kWh per year is around DKK2.08 per kWh. The comparable price in the Faroe Islands is DKK1.89 per kWh. For commercial customers in the Denmark, the price is DKK2.04-2.20 per kWh, while the cost in the Faroes is DKK1.44-1.89 per kWh (see also Table 3, 4). Thus, pricing is lower in the Faroes than in Denmark.

But after 1 January 2014, the excise tax for industrial customers will be lowered in Denmark. Thus, it is difficult to directly compare the electricity price for industrial customers in the Faroes and Denmark.

The electricity excise tax in Denmark is a type of tax levied on the public electricity transmission utilities. In Denmark, many different types of regulatory fees are levied, such as the public service obligation (PSO), a distribution fee, and an electricity savings tax. The fees are used to finance R&D in environmentally-friendly technology and energy efficiency.

Faroese electricity consumers do not pay similar taxes. At the same time, SEV carries out similar R&D to that funded by the Danish State via Danish consumer taxes.

Thus, it is difficult to directly compare prices, less the additional excise taxes, between the Faroes and Denmark.

During this same timeframe, the price of oil increased by 294%. On the other hand, Figure 8-1 above shows that the consumer price of electricity increased by some 30%. Thus, the price of oil had little impact on consumer prices in the Faroes between 2000 and 2012, even though oil purchases in 2012 were 46% of total expenses for SEV, the company that is responsible for nearly all of the electricity production in the Faroe Islands.

In 2013, SEV's total expenses amounted to DKK375.3 million. Total production was 292.5 GWh. This gives an average cost (for production and the grid) of DKK1.28/kWh. Of the total 292.5 GWh, 18.1 GWh is attributed to grid loss and own use.

Thus, the average production price for the 274.4 GWh that were sold is DKK1.37/kWh.

Thus, it is clear that the Faroese production cost is considerably higher than that for Denmark, but the private Faroese consumer pays much less per kWh than the Danish consumer. This is because the Faroes does not have the same taxes and surcharges on electricity as Denmark has.

Figure 8-2 compares the price of electricity in Denmark and the Faroe Islands. Figure 8-3 shows why the production costs in the Faroe Islands are so much higher than those in Denmark.

Taken together, one can see that the Faroese electricity prices have not increased very much over the last ten years. On the other hand, there have been considerable increases in nearly all the different cost areas. Two areas especially impacted are:

1. The outlay for oil is around 40% of total operational costs for electricity production. Without new investment in production from renewable energy (especially wind and water) it will be difficult to reduce these costs.

2. Financial expenses during the period from 2008 to 2013 increased due to loans taken out to cover new infrastructure investments. Anticipated investment in the coming years will increase the pressure on possible financing.

With regard to point 1 above, it can be noted that it will be necessary to analyze production costs more closely, because these costs also encompass expenses for system-wide provisioning of electricity. It will be necessary to register system-wide costs that vary among production methods, with the intent to ascribe to each production unit its actual cost. .

The Faroese electric system is independent and there is no cable linkage with other electric systems. Therefore, it is always necessary to have system-wide production, as well as back-up systems available. This, of course, means higher production costs. Therefore, it is impossible to compare the production costs in the Faroe Islands with those in Denmark, without due regard to the systemic infrastructure.

It is therefore recommended that in 2015 production costs be studied in detail with special attention on the expenses related to system-wide production and back-up systems.

A.1 / Future investment in the electricity sector 2014–2025

It is anticipated that an investment of DKK1.4 billion will be made in the period 2014–2017. There is a need for guiding investment plan for the period 2015–2025 that would address wind/water pumping facilities, more wind energy, tidal current energy, hydropower, undersea cables to Suðuroy and other grid expansion projects.

As mentioned previously, expanded electrification of the country is anticipated over the coming years, as well as increased focus on energy efficiency, such as initiatives designed to encourage reducing energy consumption.

The national energy policy will have a major impact on how these trends unfold, as well as circumstances outside the country, e.g., oil prices. In the simulations set forth below that are designed to forecast the future price of electricity, one assumption is that the growth of electricity usage varies from year to year and varies for each consumer group. Total growth is assumed to be between 1-3% per year.

Eventual electrification will result in significant growth in the sale of electricity (kWh) and will also increase the pressure on the grid, which will necessitate further investment to strengthen the grid. Electrification will also stimulate investment in more renewable energy production plants.

In this connection, in 2015 the Ministry of Trade and Industry intends to issue a notice regarding how a support/subsidy regime underpining the transition to renewable energy might be structured.

In addition, the Ministry of Trade and Industry in 2015 shall prepare a proposal for an energy excise tax or surcharge that could provide the foundation for a long-term plan for the energy sector.

The simulations below of the future price of electricity shows that, given the current pricing structure, it will be necessary to increase the cost of electricity, if there is to be any profit, new investment and sufficient liquidity.

If it is not desirable to increase the price of electricity, the elected officials could very well adopt various support/subsidy regimes or change the excise tax structure, which could ensure that the price of electricity did not rise or eventually could be less. This is possible because a shift in production away from oil to renewable energy resources, in combination with electrification of the country, could save the country the large cost of importing oil. Thus, there would be room to levy an excise tax, which in the end could ensure that the national treasury did not experience significantly lower revenues.

A.1.1 / Expected investment 2014–2017:

Investment (DKK millions)	2014	2015	2016	2017	**Total**
Sund power plant	66	235	195	225	**721**
Vágs power plant*	28	25	0	0	**53**
Húsahagi wind turbines	106	10	0	24	**140**
Suðuroy windfarm	0	30	0	0	**30**
Updating Vestmanna hydropower plant	19	0	0	0	**19**
Other production	20	2	2	3	**27**
Total for grid	140	162	56	54	**412**
Total	379	464	253	306	**1402**

Table 1

* At present, the investment for the Vágs plant has increased by DKK28 million and the investment for the grid in Suðuroy increased by DKK13 million, for a total of DKK94 million.

The amount of the investment for the new Sund power plant remains unclear. The reason for this uncertainty relates to how much extra investment will be needed to meet any possible strict environmental standards. Another reason is that the necessary expansion can be done in a step-wise fashion, and that other alternatives, such as, e.g., an LNG power plant (a floating natural gas power plant) might also be an interesting solution that will need to be discussed.

Investment is planned for other renewable energy power plants, such as, e.g. wind/water pumping stations. However, this investment is not likely until 2018 – 2019.

Possible investment in wind/water pumping stations should be carefully researched, focusing especially on the technical issues, size, total investment, and whether any improvements in the grid might be necessary to receive electricity from such power plants.

The possibility exists that the investment in a wind/water pumping system in, e.g., Vestmanna or Suðuroy could be moved forward to the period 2015-2017, if this is considered expedient.

Table 2 sets forth how investments (i.e., suggested investment) could be made in the electricity sector for the period 2018 to 2025.

A.1.2. / Suggested investment for the period 2018–2025:

Investment DKK million	2018	2019	2020	2021	2022	2023	2024	2025	Total
Renewable energy power plants	216	104	145	145	172	140	54	0	**976**
Grid	49	49	199	149	49	49	49	49	**642**
Total	265	153	344	294	221	189	103	49	**1,618**

Table 2

In the main, investment in renewable energy is:

- *Wind/hydro pumping stations - DKK290 million; of this, wind turbines DKK140 million*
- *Hydropower plant – DKK622 million (Víkarvatn)*
- *Tidal current energy system – DKK64 million*

In the main, investment in the grid is:

- *Cable to Suðuroy – DKK250 million*
- *Other expansion of the grid, etc. – DKK392 million*

A.2 / Projected pricing levels 2015–2025

The current price of electricity, with one particular change, namely the increase in 2014 of DKK0.05 per kWh for the "industrial customer" group, serves as the basis for SEV's 2014 budget and the projections for 2015-2025.

The projection of price levels during the period 2015–2025 – given anticipated and suggested investment – is based on current financial data, adjusted for the latest information on the price of oil and interest rates.

Annual usage kWh	Base rate	2011 price w/o VAT / w/ VAT	2012 price w/o VAT / w/ VAT	2013 price w/o VAT / w/ VAT	2014 price w/o VAT / w/ VAT
0-10,000	480	1.36/1.70	1.46/1.83	1.51/1.89	1.51/1.89
10,000-100,000	1,280	1.28/1.60	1.38/1.73	1.43/1.79	1.43/1.79
>100,000	5,280	1.24/1.55	1.34/1.68	1.39/1.74	1.39/1.74

Table 3
Current price schedule for regular consumers (DKK)

Annual usage kWh	Base rate	2011 price w/o VAT	2012 price w/o VAT	2013 price w/o VAT	2013 price w/o VAT
0–10,000	480	1.36	1.46	1.51	1.51
10,000–20,000	1,280	1.28	1.38	1.43	1.43
>20,000	9,080	0.89	0.99	1.10	1.15

Table 4
Price schedule for customer group "industrial enterprises, fish farming, agriculture, fishing industry, and certain ITC services"

The largest single expense is for oil. From November 2013 (when the SEV budget for 2014 was compiled) until January 2014, which is the reference point upon which the various scenarios outlined below are based, the price of heavy oil has both increased and decreased.

The price of oil, which served as the basis for the SEV budget, is from November 2013. The expenses for supplies and services are as envisioned by SEV for production, the grid and administration. Wage expenses are based on projected 2015 expenses; and any further wage increases for the period 2015–2025 are not assumed. It should be noted in this connection that SEV complies with the various union wage agreements in force from time to time.

Depreciation is compliant with generally accepted accounting principles and the depreciation periods for individual assets are set in consultation with the Electricity Production Commission. Costs grow quickly, because very large investments are made during the period. The same can be seen regarding interest expense. Each time interest expenses increase, there is a commensurate impact on the overall budget and therefore it is necessary to negotiate fixed interest rates.

SEV's 2014 budget is available at www.sev.fo

A.3 / Simulation scenarios

Six scenarios are outlined below.

Scenario 1

Profit projections if the price of electricity from 2014 onwards remains at the current levels

The profit on owner equity is between plus 0.9% and minus 2.9%. Assumptions: 2014 SEV budget, oil price as at 20 January 2014, lower sales to oil supplier, lower interest on part of the overall debt, 2014 electricity price unchanged 2015 – 2025. Average profit each year during the period equals minus 1.6%.

In this scenario, the debt would increase from DKK800 million in 2014 to DKK2,167 million in 2025. Total debt compared to EBITDA (Earnings Before Interest, Depreciation, Amortization) is 9.9 times greater in 2015, 11.7 times in 2020, and 9.2 times in 2025.

If annual average profit is 0%, the price of electricity must increase DKK0.04 per kWh. Then, the debt increases from DKK800 million in 2014 to DKK2,008 million in 2025. Total debt compared to EBITDA would be 9.1 times greater in 2015, 10.5 times in 2020, and 8.0 times in 2025.

This scenario projection would never attract investors to this industry sector, and the question as well is whether it would be possible to obtain a loan from a bank, and if so, would the interest be acceptable.

Therefore, for the following projections on electricity pricing, the average annual profit for the time period is set at 5%.

Scenario 2

Price projections, given an average 5% profit and with the same assumptions on average as in Scenario 1.

Under these conditions, the price of electricity should increase by DKK0.20 per kWh from 2014 to 2025. The price increase is not even throughout the time period.

Debt would increase from DKK800 million in 2014 to DKK1,448 million in 2025. Total debt compared to EBITDA would be 7.3 times greater in 2015 and 4.8 times in 2025.

This scenario would be of interest to investors who could realize an average profit of 5% in an industry sector that is not considered risky compared to other sectors. This scenario would also afford the opportunity of taking out a bank loan at an acceptable interest rate.

Scenario 3

Price projections with the same assumptions as in Scenario 2, but in this case the investment in a wind/water pumping station is increased by DKK200 million, for a total of DKK490 million.

The only change in this Scenario, compared to Scenario 2, is that the investment in a wind/water pumping station is increased by a total of DKK200 million in 2018 and 2019.

The result is that the price of electricity also increases, but now by DKK0.22 per kWh for the entire period, noting that the increase is not even throughout the period.

The additional price increase of DKK0.02 per kWh is small and in all probability would not become a reality. Debt would increase from DKK800 million in 2014 to DKK1,575 million in 2025. Total debt compared to EBITDA is 6.9 times greater in 2015, 7.0 times in 2021 and 5.1 times in 2025.

Scenario 4

Price projections with the same assumptions as in Scenario 2, but with a DKK584 million lower investment because the wind/water pumping station with a wind farm, the tidal current power plant and the cable to Suðuroy are not realized.

Compared to Scenario 2 above, in this scenario some DKK584 million less is invested.

Even with this considerably lower investment, the result saw the price of electricity increase by around DKK0.20 per kWh from 2014 to 2025. The increase was not even throughout the period.

Debt increased from DKK800 million in 2014 to DKK966 million in 2025. Total debt compared to EBITDA is 6.3 times greater in 2015, 6.7 times in 2017 and 3.6 times in 2025.

Scenario 5

Price projection wherein the price of heavy oil falls by USD100 per tonne and the investment is DKK584 million less because the the wind/water pumping station with the windfarm, the tidal current power plant and the cable to Suðuroy is not realized.

This scenario is the same as Scenario 4 except with the assumption that the heavy oil price is USD100 less over the entire period. This equates to a 17% decrease in the price of oil, compared to the current price.

Under this scenario, the price of electricity increases only around DKK0.15 per kWh from 2014 to 2025. The increase is not evenly distributed throughout this period.

Debt increases from DKK800 million in 2014 to DKK972 million in 2025. Total debt compared to EBITDA is 6.1 times greater in 2015, 6.5 times in 2017 and 3.6 times in 2025.

Scenario 6

Price projection wherein the price of heavy oil increases by USD200 per tonne and the investment is DKK584 million less because the wind/water pumping station with the windfarm, the tidal current power plant and the cable to Suðuroy is not realized.

This scenario is the same as Scenario 4 except with the assumption that the heavy oil price is USD200 higher over the entire period. This equates to a 34% increase in the price of oil, compared to the current price.

Under this scenario, the price of electricity increases by around DKK0.31 per kWh from 2014 to 2025. The increase is not evenly distributed throughout the period.

Debt increases from DKK800 million in 2014 to DKK1,064 million in 2025. Total debt compared to EBITDA is 6.6 times greater in 2015, 6.8 times in 2017 and 3.9 times in 2025.

Figure 8-4 shows the price of oil increasing until July 2008 when it suddenly fell precipitously to a low point in December 2008. Since then, it steadily rose to a high point in March 2012. At the end of 2013, the price of oil was USD608 per tonne. Subsequently, the price fell and on 20 January 2014 the price was USD588 per tonne. By March 2014, the price had risen to USD602 per tonne.

(http:// www.bunkerworld.com/prices/port/ae/fjr/)

Figure 8-4

The Figure shows the price of oil in USD from 1 January 1999 to 1 January 2014.

Scenario No.	Change in investment (DKK millions)	Electricity price	Change in price (DKK/kWh)	Change in oil usage SEV	Change in oil price	5% profit	Debt increase (DKK millions)	Debt/ EBITDA
1	No	No change		No	No	No	1,359	High
2	No	Increase	+0.20	No	No	Yes	648	Satisfactory
3	-200	Increase	+0.22	No	No	Yes	775	Sufficient
4	-584	Increase	+0.20	Increase	No	Yes	166	Satisfactory
5	-584	Increase	+0.15	Increase	Decrease	Yes	172	Satisfactory
6	- 584	Increase	+0.31	Increase	Increase	Yes	264	Satisfactory

Table 5
Overview of the six scenarios reviewed in the text.

Energy source (in %)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Wind	7	11	20	23	24	23	22	22	22	21	21	20	20
Hydro	31	39	38	38	38	36	35	34	34	33	32	32	41
Wind / water pumping	0	0	0	0	0	5	9	9	9	9	8	8	8
Tidal current	0	0	0	0	0	0	0	2	4	5	5	5	5
Thermal	62	50	42	39	38	37	34	33	33	32	34	35	26
Total	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 6
Overview of suggested distribution of electricity production power sources in the period 2013 to 2025.

A.3.6 / Review of the six scenarios

Table 5 shows a summary of the six different scenarios describe above. If the investment in the energy sector is to be undertaken as shown in Table 1, and if investors are to express an interest, an unquestioned prerequisite is that the possibility for a profit exists in this business sector. The investors themselves, of course, must determine if the profit margin of 5% used in the scenarios above, is acceptable.

The requirement for a profit of around 5%, all things being equal, will lead to an increase in the price of electricity. If it proves possible to reduce current oil and operational expenses, this increase could be reduced or be completely eliminated. While electricity production continues to be dependent on oil, oil price fluctuations will have a major impact on how much the price of electricity can be changed.

To ensure electricity production security, investment in a new power plant at Sund is necessary[3]. Such expansion, utilizing oil-fired motors, will burden the electricity consumer because oil, at present, is the most expensive source of energy for electricity. However, a modernized Sund plant will produce electricity at a price lower than the current installation because the oil consumed will be less.

New, large consumers have begun operations in Suðuroy, which greatly burden the electricity system[4]. Moreover, the back-up capacity is limited.

Initiatives being discussed involve the linking of Suðuroy to the Central Production Area via an undersea electric cable or expanding the capacity of the Vágs power plant by installing new motors. Investing in an undersea cable would no doubt raise the price of electricity. At the same time, however, given the current demand situation in Suðuroy and because of the risk of cable breakage, it will be necessary regardless to invest in the expansion of the Vágs power plant.

Scenario 7 – Latest assessment

Since the Working Group set forth different scenarios and projections on the possible price of electricity for

[3] See report "Etablering af nødvendig elproduktionskapacitet", June 2013, www.sev.fo
[4] See report "Muligheder for at dække det stigende elforbrug på Suderoy", June 2013, www.sev.fo

the period 2015-2025, which in the main was grounded on SEV's 2014 budget, SEV has now released its 2015 budget. Moreover, there have been major changes in the price of oil and the value of the dollar.

In order to offer a more useful and constructive projection of possible electricity prices for the period 2015-2025, it is necessary to address the changes that have occurred in the price of oil and the value of the dollar, and to use as a basis for the projection the 2015 SEV budget, rather than the 2014 budget.

In January 2012, the price of heavy oil per tonne peaked at USD753. In November 2014, the price was USD414, or, in other words, it had fallen USD339 per tonne. This lower price has a positive impact on SEV's production costs for electricity power. On the other hand, the value of the dollar versus the kroner has risen from around 5.70 DKK/USD to some 6.00 DKK/USD, which to a certain degree works against the positive impact of lower oil prices.

Scenarios 1 through 6 in the Action Plan use as a basis for their calculations an oil price of USD584 per tonne of heavy oil (as at 20 January 2014). In addition, in SEV's budget for 2015, the assumed oil price is USD519 and the dollar exchange rate is 6.15 DKK/USD. Thus, the oil price estimate is USD65 lower. Other changes reflect the postponement of the investment in Víkarvatn until 2026. The cable to Suðuroy is estimated to cost DKK150 million less than originally projected, while the investment in the grid and coupling stations is deemed greater than originally thought. Previously, it had been calculated that the investment for 2014-2017 would be DKK1,412 million, while current projections yield DKK1,560 million, or DKK148 million more.

Within SEV's 2015 budget, no special direct impact is incorporated into the budget regarding any shift in the use of electricity for heating, transport, etc. As a consequence, the financial result could be even better, if the trend continues with consumers shifting their own energy demand from oil to electricity. Growth in electricity sales is estimated to be 0.6% in 2014 and 1% annually from 2015 to 2025. For many years, SEV has experienced an annual growth in sales of 2%.

Since this was written on 16 December 2014, the price of oil has plunged even more. On 9 January 2015, the price of heavy oil was USD240 per tonne, which means that it has fallen 53 dollars from 16 December 2014. It goes without saying that if this decline in oil prices continues, it will have a positive impact on the price of electricity in the future.

Consequences for electricity prices

After evaluating these changes, the conclusion would seem to indicate that the price of electricity would increase by around DKK0.15 per kWh in 2017 and could very well decrease by DKK0.10 per kWh by 2022. Thus, the net increase during the period 2015-2025 would be DKK0.05 per kWh. This is considerably lower than projected in Scenarios 1-6. This means that an ordinary consumer would pay DKK2.08 per kWh and an "industrial" consumer would pay DKK1.63 per kWh including VAT. On 16 December 2014, the price of heavy oil was USD293.50 per tonne and this is 226 dollars less than calculated in SEV's 2014 budget. In the event that the price of oil holds at this level, this would mean that SEV would spend around DKK38 million less annually for oil and would reduce or result in no price increase compared to that projected for 2017.

Debt would increase from DKK750 million in 2014 to DKK800 million in 2025. Total debt compared to EBITDA is 7.0 times greater in 2015, 8.0 times in 2018 and 3.7 times in 2025.

The 2015 budget was also stress-tested, i.e., it was subjected to the worst conditions. The stress-test assumptions were the following, among others: the price of heavy oil increased to USD700 per tonne; electricity production from wind declined by 10%, and hydropower by 15%; sales of electricity declined by 1% annually from 2015-2025; interest rates rose by 3%. All these stress factors were applied at the same time. Given these factors, and if the necessary investment in infrastructure continued as planned, it would be necessary to increase the price of electricity by DKK0.30 per kWh in 2016, and again by DKK0.10 per kWh in 2017, such that the price of electricity would be DKK0.40 per kWh higher than today for the period 2017 – 2025. This would mean that an ordinary consumer would pay DKK2.39 per kWh and an "industrial" consumer would pay DKK1.94 including VAT.

A.3.7 / Suggested distribution among energy resources for electricity production

Table 6 shows the varying roles the different energy sources will play in overall electricity production. The suggested distribution is based on the expansion referenced in Tables 1 and 2 and a 1-3% annual electrification.

One must appreciate the latent uncertainty in this overview. The amount of production from a specific source can change, while total production could very well be greater than projected. These changes can dramatically influence the price of electricity and the resulting profit.

The projections shown in Table 6 assume a production in 2015 of 300 GWh, and for 2025, 376 GWh. This equates to a growth of 82 GWh in 12 years, or 6.8 GWh per year on average. This growth equates to a guarded growth in consumption of 2% per year.

Even though the distribution of renewable energy within the Faroese energy system is an important guiding parameter, it should be noted that the energy policy of the country of necessity must give due regard to the totality of the country's energy system, and therefore also how much energy could be used for heating and for transport.

The Working Group recommends that initially heating should shift from oil to electricity. Later, transport should also use electricity.

This will mean that the demand for electricity will grow considerably and for a time it will be challenging to increase the percentage of electric energy that comes from renewable energy resources.

An investment in electricity production utilizing renewable energy resources could help to meet the increasing demand for electric energy.

An increase in electricity consumption in turn allows for greater production using renewable energy.

Over time, all these factors will no doubt have a positive impact on the price of electricity.

The Working Group recommends that a special focus be placed on not only electricity production, but also the level of renewable energy in the total energy system of the Faroe Islands and in this regard as well the use of renewable energy for heating, transport and for electricity production overall.

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