# Introduction

## Milestones

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1 INTRODUCTION

This report is a continuation of a former traditional yearly report by Nordel. In Nordel times it contained the status of the Nordel strategic projects according to the common Nordic Master Plan. It has now been adopted in the regional group Baltic Sea and has been enhanced with a subset of projects from the Pilot-TYNDP. Projects presented here are decided projects suggested by earlier common studies in Nordel, Baltic Sea and Poland. In the future the status reporting of the decided investments is planned to be continued in the Regional group Baltic Sea as part of the Regional Investment plans and ENTSO-E wide ten year network development plan (TYNDP). As these plans are due biannually a separate report might be drafted on those years when Regional Investment plan or TYNDP are not published. The format of reporting is under development.

2 MILESTONES

Status and expected milestones for carrying out the projects are shown in the table below. For connections that relate to two countries, the decisions and approvals in one country can be made ready earlier than shown.

<table>
<thead>
<tr>
<th>Connection (reinforcement measure):</th>
<th>Fenno-Skan 2</th>
<th>South-West Link</th>
<th>Skagerrak IV</th>
<th>Ørskog – Fardal</th>
<th>EstLink 2</th>
<th>The Arctic Region</th>
<th>NordBalt</th>
</tr>
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<tbody>
<tr>
<td>Connection between/in countries/country:</td>
<td>Finland – Sweden</td>
<td>Sweden – Norway and southern Sweden</td>
<td>Norway – Denmark</td>
<td>Norway</td>
<td>Finland – Estonia</td>
<td>Norway</td>
<td>Sweden – Lithuania</td>
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¹ The decision in some countries may cover whole project implementation, whereas in other countries it is merely a decision to start the process of achieving public approval for the project.

² Northern and Southern parts.
### BALTIC SEA REGIONAL PROJECTS – STATUS REPORT  
**Date:** 1 March 2011

#### Connection (reinforcement measure):

<table>
<thead>
<tr>
<th>Connection between/in countries/country:</th>
<th>LitPol Link</th>
<th>GerPol Improvements</th>
<th>GerPol Power Bridge</th>
<th>Wind Integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithuania – Poland</td>
<td>Poland – Germany</td>
<td>Germany – Poland</td>
<td>Poland</td>
<td></td>
</tr>
</tbody>
</table>

#### Decision:

- LitPol Link: 2008
- GerPol Improvements: Apr. 2010
- GerPol Power Bridge: Q1 2011
- Wind Integration: 2010

#### Public approvals:

**Investment decision/start construction:** 2010/2012

**Commissioning:**

- LitPol Link: 2015
- GerPol Improvements: 2014
- GerPol Power Bridge: 2020
- Wind Integration: 2015

- LitPol Link: 2020
- GerPol Improvements: 2025
- GerPol Power Bridge: 2020

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3 Western part.  
4 500 MW.  
5 1000 MW.  
6 5000 MW wind power, 7 8000 MW wind power.
## 2.1 Fenno-Skan 2

### Key figures:
- **Type:** HVDC
- **Length:** 300 km
- **Voltage level:** 500 kV
- **Capacity:** 800 MW

### Description:
A new HVDC connection will be built in parallel with the existing one between the countries. On the Swedish side, a 70 km direct current overhead line will be built to a new substation Finnböle where the converter station will be placed. The planned capacity is 800 MW.

### Local reinforcements:
- **Finland:**
  A converter transformer feeder bay at Rauma
- **Sweden:**
  New 400 kV switchyard at Finnböle. Renovation of series capacitors on two 400 kV lines and increase of cross-section of phase conductors on 400 kV overhead line (Stackbo-Hamra).

### Status:
Cross border consents as well water permits have been granted. The submarine cable has been purchased from Nexans and the converter stations from ABB. AC-substation from Siemens.

The HVDC overhead line has been purchased from Vattenfall Service Nordic.

AC reinforcements are proceeding in Finland and in Sweden.

### Benefits of the reinforcement:
Capacity congestion and number of hours with market division will be reduced. Redispatching of load flow between 400 kV interconnectors at North and Fenno-Skan will reduce active power losses. Cost of ancillary services can be decreased. Risk of shortage of energy will be reduced in the Nordic power system.

### Milestones:
- Subsea cable manufacturing started autumn 2009
- Converter station project expected to be completed Q4 2011.
- Commissioning of Fenno-Skan 2 is expected late 2011
### 2.2 South-West Link

#### Key figures:

- **Type:** VSC HVDC and AC overhead line
- **Length:**
  - Northern and Southern parts: 436 km
  - Western part: 380 km
- **Voltage level:** 400 kV AC ±300 kV VSC HVDC
- **Capacity:** 1400 MW

#### Description:

The transmission capacity to southern Sweden and between southern Norway and Sweden is proposed to be improved by a combined grid reinforcement. A three-terminal VSC HVDC link will connect the Oslo region in Norway to Skåne in Sweden with a terminal midway in Sweden. From that terminal a 400 kV AC line will be used to reinforce the grid to Hallsberg in Sweden, creating a strong, controllable reinforcement of the Nordic main grid in the area.

#### Local reinforcements:

A new substation will be established in the area of Hallsberg. New substations will also be required at the middle terminal as well as in the southern end-point.

In Norway a new substation is planned in Tveiten plus voltage upgrade of 300 kV line Rød – Tveiten to 420 kV.

All switchyards are designed as two-breaker schemes in order to achieve best reliability.

#### Status:

Investment decision taken by the Board of Svenska Kraftnät in November 2005. Feasibility studies describing different line routings and corresponding investment costs have been performed. Environmental impact assessment is currently being performed. The technical solution was agreed in January 2008.

#### Benefits of the reinforcement:

The transmission facility will improve the reliability substantially and will furthermore give better transmission capacity in cross-section 4 in Sweden as well as between southern Norway and Sweden (The Hasle-cross section). This gives an improved Nordic market, improved security of supply as well as improved operational possibilities.

#### Milestones:

- Permit from authorities: Northern and southern part: 2012 Q1, Western part: 2014
- Commissioning: Northern and southern part: 2014 Q4, Western part: 2016 Q4
## 2.3 Skagerrak IV

### Key figures:
- **Type:** HVDC
- **Length:** 245 km
- **Voltage level:** DC 500 kV
- **Capacity:** 700 MW

### Description:
The existing Skagerrak interconnection with a 1000 MW capacity connects Kristiansand in Norway with Tjele in Denmark. Statnett and Energinet.dk are increasing the capacity by 700 MW by laying down a fourth cable along the existing three cables.

### Local reinforcements:
Reinforcements in Denmark are not assigned solely to Skagerrak IV.

### Status:
By end of 2010 Energinet.dk and Statnett had received all major approvals from authorities, and the construction phase started 01.01.2011. The cable contracts were signed first week of January 2011, and the signing of the converter contract is planned for mid February.

### Benefits of the reinforcement:
Increased capacity between Norway and Jutland will
- reduce the occurrence of bottlenecks and thus strengthen the common Nordic power market
- save costs relating to trade in reserve power and ancillary services
- increase competition in the markets
- increase security of supply

### Milestones:
- Construction work is expected to start in Denmark in the beginning of 2011
- In Norway construction work is expected to begin late 2011
- Commissioning end of 2014
## 2.4 Ørskog – Fardal/Sogndal

<table>
<thead>
<tr>
<th>Key figures:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type: HVAC</td>
</tr>
<tr>
<td>Length: 285 km</td>
</tr>
<tr>
<td>Voltage level: 420 kV</td>
</tr>
<tr>
<td>Capacity: 400-800 MW</td>
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</tbody>
</table>

### Description:
The project comprises a new 420 kV transmission line between Ørskog and Sogndal in Norway. The length of the transmission line will be appr. 280 km.

### Local reinforcements:
The project includes 5 new substations (Ørsta, Åløften, Moskog, Høyanger and Sogndal).

### Status:
Concession was applied in February 2007.

### Benefits of the reinforcement:
The new transmission line will contribute to the improvement of the trading capacities and robustness of the Nordic transmission grid. It will be an important part of the reinforcements to improve the security of supply of Mid-Norway. It will also enable the integration of new renewable energy production.

### Milestones:
- Statnett aims for final concession by OED in 2011
- Earliest date of commissioning is 2015

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8 The capacity to Mid-Norway will increase with 400 to 800 MW depending on how the production is distributed.
2.5 **EstLink 2**

**Key figures:**
- **Type:** HVDC
- **Length:** 170 km
- **Voltage level:** 450 kV
- **Capacity:** 650 MW

**Description:**
Fingrid and Elering have decided to construct and take into operation EstLink 2, a LCC monopole HVDC interconnection with insulated metallic return between Finland and Estonia. The rated voltage of the EstLink 2 is planned to be 450 kV and transmission capacity 650 MW. The new interconnection will increase the electricity transmission capacity between the two countries from the present 350 MW up to 1000 MW.

**Local reinforcements:**
- Püssi 330 kV switchgear (bay and bus bars).
- Eesti-Püssi 330 kV overhead line (third conductor) – completed in 2009.
- Balti-Püssi 330 kV overhead line (reconstruction) – completed in 2010.
- Anttila 400 kV switchgear (reconstruction and extension).
- 400 kV OHL-s in Finland (lead-in of 4 lines).

**Status:**
Project is currently at the beginning of construction/manufacturing phase. All main components’ contracts for the HVDC part were signed at the end of 2010 and design works for manufacturing the EstLink 2 cable and converter stations have started at the beginning of 2011. Overhead line reinforcement works in Estonia have been finalized. Reinforcement works in substations of Püssi and Anttila are ongoing.

**Milestones:**
- Commissioning in the beginning of 2014.

**Benefits of the reinforcement:**
Socio-economic benefit and increased security of supply for the Baltic countries.
### 2.6 THE ARCTIC REGION (OFOTEN – HAMMERFEST)

<table>
<thead>
<tr>
<th>Description:</th>
<th>Local reinforcements:</th>
</tr>
</thead>
<tbody>
<tr>
<td>The new line will double the capacity between Ofoten and Balsfjord (present bottleneck), and will be the first 420 kV-transmission line in Norway to go further north than Balsfjord. The increased capacity is necessary to meet the needs from both common use and development of the petroleum industry in Northern Norway.</td>
<td>Several substations have to be expanded, and there will also be some new substations.</td>
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<table>
<thead>
<tr>
<th>Key figures:</th>
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<tbody>
<tr>
<td><strong>Type:</strong> HVAC</td>
</tr>
<tr>
<td><strong>Length:</strong> Appr. 520 km</td>
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<tr>
<td><strong>Voltage level:</strong> 420 kV</td>
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<tr>
<td><strong>Capacity:</strong></td>
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<tr>
<td>Ofoten-Balsfjord: 1000 MW</td>
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<tr>
<td>Balsfjord-Hammerfest: 300 MW</td>
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<table>
<thead>
<tr>
<th>Benefits of the reinforcement:</th>
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<tbody>
<tr>
<td>Increased security of supply.</td>
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<table>
<thead>
<tr>
<th>Status:</th>
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<tbody>
<tr>
<td>The application for concession for the section between Balsfjord and Hammerfest was sent to NVE in May 2009.</td>
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<tr>
<th>Milestones:</th>
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<tbody>
<tr>
<td>- Start of construction in 2012/2013</td>
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<tr>
<td>- Commissioning Ofoten-Balsfjord 2014/2015</td>
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# 2.7 NordBalt

## Description:
The NordBalt project comprises the interconnection of the Swedish and Lithuanian electricity transmission systems by means of a High Voltage Direct Current (HVDC) submarine/land cable with a capacity of 700 MW. The general outline of the project is to allow power to be transmitted between the Swedish and Lithuanian electricity transmission systems. The interconnection is dedicated to facilitate the long-term goal to integrate the common Nordic electricity market with the common Baltic electricity market in order to develop a common Nordic-Baltic electricity market with sufficient transmission capacity.

## Key figures:
- **Type:** HVDC/VSC
- **Length:** 450 km
- **Voltage level:** 300 kV
- **Capacity:** 700 MW

## Kurzeme Ring:
- **Type:** AC
- **Length:** 380 km
- **Voltage level:** 330 kV
- **Capacity:** 600 MW

## Local reinforcements (not included in the project):
- **Kurzeme Ring:** New 330 kV transmission lines Grobina-Ventspils-Dundaga- Tume-Riga(Imanta), with new 330/110 autotransformers substations in Ventspils and Tume. Additional capacity of 600 MW.
- Two new 330 kV lines in Lithuania.

## Status:
- Organisation of the tender for procurement of the cable with engineering and installation services completed – turnkey contract signed with ABB AB the 17th of December 2010.
- Organisation of the tender for procurement of converter with engineering and installation (construction) services completed – turnkey contract signed with ABB AB the 20th of December 2010.
- The application for concession for the Swedish part has been sent to EI in Dec 2010
- Territory planning documents under preparation.

## Milestones:
- Contracts for the submarine cable and converters are expected has been signed.
- Commissioning expected 2015-16
- Kurzeme Ring expected commissioning in 2018

## Benefits of the reinforcement:
- Isolated systems will be connected. Baltic states will have possibility to trade with ex-Nordel countries. Increase security of supply. Possibility to connect offshore wind farms. Future possibility to develop multi terminal HVDC system (in conjunction with 300 kV HVDC South West Link in Sweden).

Kurzeme Ring:
- provide the most efficient use of the proposed interconnection between Sweden and Lithuania;
- development of power generation, in particular wind generation capacity;
- improving of security of supply in the region;
- amount of reserve capacity may be reduced while maintaining the same level of security of supply.
### 2.8 LitPol Link

#### Key figures:
- **Type:** Back-to-back
- **Length:** 154 km (direct double circuit line)
- **Voltage level:**
  - 330 kV (LT)
  - 400 kV (PL)
- **Capacity:** 2x500 MW

#### Description:
Interconnection of Lithuania and Polish transmission grids, by building new double circuit 400kV interconnection line Elk – Alytus with 2x500MW back-to-back convertor station and strengthening internal high voltage transmission grids in Poland and Lithuania.

#### Status:
Investigation of environmental impact assessment in Lithuania and Poland. Study for choosing route for building overhead lines in Poland under preparation. Study for necessary reconstructions in 330 kV Alytus substation to construct BtB under preparation.

#### Local reinforcements:
Internal grid strengthening in Lithuania involves new double circuit 330 kV overhead line, in Poland additional ~6 overhead single and double circuit 400 kV lines, seven new 400 kV substations, new reactive power controlling equipment. Internal Polish transmission grid reinforcements to make possible power import capacity of 500MW from Lithuania to Poland.

Additional PL transmission grid reinforcements to make possible power transfer capacity of 1000MW.

#### Benefits of the reinforcements:
- Isolated systems will be connected
- Baltic states will have possibility to trade with Poland
- Increased security of supply
- Incorporation of Baltic States into Internal Electricity Market (IEM) of EU. PL-LT interconnection will allow integration of the Baltic System to the IEM.

#### Milestones:
Commissioning 2015 (500 MW) and 2020 (1000 MW).
### 2.9 GERPol Improvements

**Key figures:**

- **Type:** AC, PST
- **Voltage level:** 400 kV

**Description:**

Conversion of existing 220 kV double circuit line Krajnik (PL) – Vierraden (DE) into a 400 kV line together with phase shifting transformers (PST) installation on 400 kV lines Krajnik (PL) – Vierraden (DE) and Mikułowa (PL) – Hagenverder (DE).

**Local reinforcements:**

Upgrading and extending Krajnik and Mikułowa substations.

**Status:**

Preparatory phase.

**Benefits of the reinforcements:**

- Decrease the loop flows from DE to PL and to CZ/SK
- Improve the security of supply
- Increase the power exchange capacity between PL and DE on PL/DE/CZ/SK synchronous profile.

**Milestones:**

- Upgrading 220 kV double circuit line Krajnik – Vierraden to 400 kV, extending Krajnik substation with installation and commissioning of PSTs on the Krajnik substation – 2013
- Installation and commissioning of PSTs on the Mikułowa substation – 2014.
2.10 **GERPOL POWER BRIDGE**

**Year 2020 – phase I**

**Key figures:**
- Type: AC, Voltage level: 400 kV
- Total length: 420 km

**Description:**

The investment project consists of:

- 3rd PL-DE interconnection defined as the sequence of transmission substations and power lines for development starting at the Polish/German border, through substations Gubin, Zielona Góra, Plewiska II and Plewiska
- Sequence of transmission substations and power lines for development between substations Krajnik, Baczyna, Gubin, Zielona Góra and Polkowice
- Sequence of transmission substations and power lines for development between substations Mikulowa, Swiebodzice, Ząbkowice and Dobrzen.

**Status:**

The project is currently in the pre-planning phase.

**Year 2025 – phase II**

**Key figures:**
- Type: AC, Voltage level: 400 kV
- Total length: 800 km

**Local reinforcement:**

By 2020 phase I will be realized:

- Gubin-Plewiska II-Plewiska line with new substations Gubin, Plewiska II and necessity rebuilding of Plewiska substation,
- optional installation of PST in station Gubin,
- Krajnik-Baczyna line with station Baczyna,
- Mikulowa-Swiebodzice line.

**By 2025 phase II will be realized:**

- Baczyna-Gubin, Zielona Góra-Polkowice with new substation Zielona Góra and necessary rebuilding of Polkowice substation
- Gubin-Plewiska II line put into Zielona Góra substation.

**Benefits of the reinforcements:**

The construction of this connection and necessary network reinforcement will increase the Polish import capability and could be the first stage of expansion of the 400 kV system in the western part of the country.

**Milestones:**

Commissioning is expected 2020 (phase I) and 2025 (phase II).
### 2.11 Wind Integration

**Key figures:**

- **Type:** AC
- **Voltage level:** 400 kV
- **Total length:**
  - 370 km (2015)
  - 810 km (2020)

**Description:**

Reinforcement transmission network for power evacuation from on-shore wind farm.

**Local reinforcements:**

Upgrading existing 220 kV lines to double circuit 400 kV and building new 400 kV substations.

**Status:**

Preparatory and pre-investment phase.

**Benefits of the reinforcements:**

Reinforcement of transmission network to allow connection of new wind farm and power evacuation around 5000 MW in 2015 and 8000 MW in 2020 total installed capacity.

**Milestones:**

Up to 2015 it is planned to commission the first part of the investment projects. The second part will be commissioned from 2015 to 2020.