GRENSELANDET, ST1 NORWAY GRID CONNECTION

Addendum - Grid Connection Study Davvi Wind Farm

Grenselandet AS

Report no.: 70000232 Addendum1, Rev. 1.0
Date: 2021-03-15

Project name:	Grenselandet, St1 Norway Grid Connection	DNV GL - Energy
Report title:	Addendum - Grid Connection Study Davvi Wind Farm	Power System Analysis
Customer:	Grenselandet AS	P.O. Box 6046
Contact person:	Harald Dirdal, harald@nyenergi.as	171 06 Solna
Date of issue:	2021-03-15	Sweden
Project No.:	70000232 - 10280138	Tel: +46 587 940 00
Organisation unit:	DNV GL, Energy	Registered Sweden 556450-3836
Report No.:	70000232 Addendum1, Rev. 1.0	

Prepared by:	Verified by:	Approved by:
[signature]	Karlsson, Daniel — Digitally signed by Karlsson, Daniel Date: 2021.03.15 16:30:16 +01'00'	Lucas Thomée — Digitally signed by Lucas Thomée Date: 2021.03.16 15:10:11 +01'00'
Ylva Hawkins	Daniel Karlsson	Lucas Thomée
Engineer	Senior Principal Engineer	Team Lead

DNV GL Distribution:

☐ Unrestricted distribution (internal and external)

☐ Unrestricted distribution within DNV GL Group

☐ Unrestricted distribution within DNV GL contracting party

☒ No distribution (confidential)

Keywords:
Davvi wind park, availability study, grid connection

Rev. No.	Date	Reason for Issue	Prepared by	Verified by	Approved by
0.1C	2021-02-11	Addendum 1	Y. Hawkins	D. Karlsson	L. Thomée
0.1D		Addition of case C	Y. Hawkins	D. Karlsson	L. Thomée
0.1E	2021-03-03	Redo analysis for a 2030 scenario	Y. Hawkins	D. Karlsson	L. Thomée
1.0	2021-03-15	Final report	Y. Hawkins	D. Karlsson	L. Thomée

Table of contents

1 EXECUTIVE SUMMARY

This addendum is based on the same 2025 model of the Norwegian, Swedish and Finnish grid as in the report 70000232, with the changes that the 420 kV line from Varangerbotn to Pirttikoski is not included, Andmyran wind farm is not included, a 420 kV line from Skaidi to Hammerfest is added, and load in Finnmark, Troms and Nordre Nordland is added. The model built for this analysis is a prediction of how the grid will look like in 2030 rather than 2025, as that is the new estimated time of completion for Davvi wind farm.

Two cases were investigated, one with a low load which means the local load was set to 50%, and 50% of the minimum estimated load increase in the region up to 2030 was added, and one high load case which means 100% of the maximum estimated load increase. The first case was to investigate a strenuous, but still probable, situation, and the second was to demonstrate how the power from Davvi would be needed if all the expected power consumption was developed. No line outages were carried out in this analysis but based on the results from the original report it is possible to assume that curtailment will be necessary to avoid overload ov the line along Stora Lule älv for several N-1 scenarios. The conclusion of this analysis is that a connection of all wind power is feasible, but measures have to be taken in the low load case as there is a 16% overload of the line between Vietas and Porjus.

2 INTRODUCTION

Grenselandet AS, a joint venture by energy company St1, Vindkraft Nord AS (VKN and Ny Energi AS), is developing the 800 MW Davvi wind power plant project in Finnmark county, Norway. DNV GL performed 2019 a grid connection study to analyse bottle necks and availability in the Nordic grid (Norway, Sweden and Finland) with the project number 70000232. In that study a model of how the transmission grid would look like in 2025 was created, as the Davvi wind park was planned to be built in 2025.

St1 has now tasked DNV GL to perform a complementary availability study as there has been changes to the prediction of production/consumption units and grid near Davvi, and the estimated date for completion of Davvi has changed to 2030.

3 BASIS FOR WORK

3.1 Report 70000232

The conclusion from report 70000232 can be summarised as:

"Overall a connection of all the potential wind power (1400 MW) in Finnmark is feasible, as long as the 420 kV line between Skaidi and Pirttikoski is built. Certain scenarios and trips of lines will pose problems for some lines in the transmission grid, but measures to combat this have been identified. This study has not investigated how common or plausible these scenarios are."

3.2 Scope of work

The estimated time of completion for Davvi wind farm has since the original study changed from 2025 to 2030, and this addendum looks at how the differences implied by this change will affect the possibility of a grid connection for Davvi. This addendum investigates bottle necks and potential overloads in a similar way as the original study. Since the scope of this study is much smaller than the original, only two cases are investigated, a low and a high load situation, and no line faults were applied to investigate a N-1 scenario. The findings are summarised as a short addendum to the original report.

3.3 Data

The same model for the Nordic transmission grid as was used in the original study, is used for this follow up. Information about changes to the production and consumption from the original study has been provided by the customer in the following documents:

- Davvi vindkraftverk - Notat om fremtidig last og produksjon
- Davvi vindkraftverk - Oppdatert produksjon og forbruk v1

Information regarding changes to the transmission grid has been sourced from Svenska Kraftnät's and Statnett's respective websitets.

3.4 New 2030 cases

Two cases were simulated, one low and one high load case.

3.4.1 Planned grid developments

The changes in the grid compared to the 2025 model in the original study can be seen in Table 1. A map of the transmission grid for the Nordic and Baltic countries is presented in Figure 1. The grid looked the same for both cases.

Table 1 Changes to the grid compared to the original study.

Object	Comment
The 420 kV power line "Arctic circle" Skaidi (NOR) – Varangerbotn (NOR) – Vajukoskki (FIN)	It will be assumed that the "arctic circle" will be built up to Varangerbotn but not further, meaning no 420 kV connection to the Finnish grid. (However, the existing 220 kV connection southwards to Pirttikoski will remain).
NordSyd-package	The grid transporting power from SE2 to SE3 is nearing its technical time limit. Nuclear power is being dismantled in the south of Sweden. Consumption in the south is increasing and production in the north is increasing. With all these above

	mentioned facts, Svenska Kraftnät has planned its biggest investment so far with the NordSyd-package, where the entire grid in this area will be rebuilt to increase stability and transmission capability. For this study however, this is too far south to be of interest, but it is important to note that this improvement is planned as it will be beneficial for Davvi.
Trolltjärn	Between Arvidjaur and Piteå, Europe’s biggest land based wind power plant is being built, Markbygden. To facilitate its connection to the transmission grid, a new 420 kV station along Line 3 in Figure 2 will be built, called Trolltjärn. This station is too far south to be of interest in this study, and was therefore not included in the new model.
420 kV line from Skaidi to Hammerfest (Melkøya)	As Melkøya is planning on being electrified, an additional 400 MW is needed in the LNG facility. This will need a new 420 kV line from Skaidi to Hammerfest which Statnett is planning on building. The 420 kV station in Hammerfest that will connect Melkøya is called Hyggevatn. This line, with its new 420 kV bus, was included in the model for this analysis.

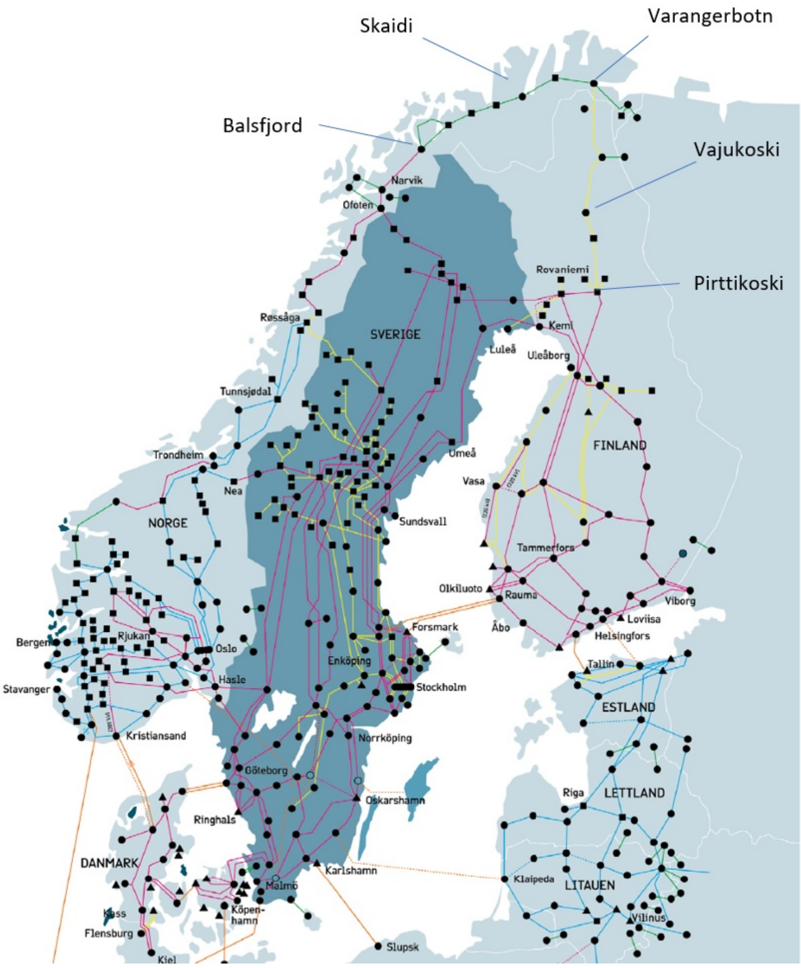

Figure 1 The transmission grid in the Nordic and Baltic countries, where the key points for this project have been pointed out by DNV GL. (Svenska Kraftnät, 2013)

3.4.2 Planned production developments

The changes in the production units compared to the 2025 model in the original study can be seen in Table 2.

Table 2 Changes to production compared to the original study.

Name	Developer	Installed power	Produced energy	Status	Original	Addendum
Hamnefjell Vindkraftverk	Hamnefjell Vindkraft AF	51.75 MW	408 GWh	Drift	Present	Present
Rakkocearro (Raggovidda) vindkraftverk	Varanger Kraftvind AS	45 MW	680 GWh	Drift	Present	Present
Rakkocearro (Raggovidda) vindkraftverk Trinn 2	Varanger Kraftvind AS	50 MW			Present	Present
Kjøllefjord vindkraftverk	Kjøllefjord Vind AS	39.1 MW	132.94 GWh	Drift	Present	Present
Havøygavlen vindkraftverk	Arctic Wind AS	40.5 MW	153 GWh	Drift	Present	Present
Dønnesfjord vindkraftverk	Dønnesfjord vindpark AS	14.1 MW	47.94 GWh	Konsesjon gitt	Present	Present
Fakken vindkraftverk	Troms Kraft Produksjon AS	54 MW	207 GWh	Drift	Present	Present
Kvitfjell vindkraftverk	Tromsø Vind AS	200 MW	680 GWh	Under arbeid	Present	Present
Raudfjell vindkraftverk	Raudfjell Vind AS	100 MW	640 GWh	Under arbeid	Present	Present
Sandhaugen teststasjon	Sandhaugen Vindkraftverk AS	16.8 MW	57.12 GWh	Konsesjon gitt	Present	Present
Nygårdsfjellet vindkraftverk trinn 2	Nygårdsfjellet vindpark AS	32.2 MW	136 GWh	Drift	Present	Present
Andmyran vindkraftverk	Andmyran Vind AS	160 MW	544 GWh	Konsesjon gitt	Present	Not present
Ånstadblåheia	Ånstablåheia Vindpark AS	50.4 MW	170 GWh	Drift	Present	Present

The only difference between the original study and the addendum is that Andmyran is disconnected in the addendum. The connected production was the same for case A and B.

3.4.3 Estimated load development

In the original study no increase in power consumption was included as the main aim of that study was to look at the worst case scenario, which means a minimum local load. For this report, however, an increase in consumption was included as per requested by the customer.

Both values for the minimum estimated load increase and maximum estimated load increase for Finnmark, Troms, Nordre Nordland and Midtre Nordland between 2020-2025 and 2025-2030 were provided by the customer. Midtre Nordland is more than 400 km away from Davvi and that estimated load increase was therefore not added to the model.

As a strenuous, but still probable, case was to be investigated in this study, a low load case was created. To this case, minimum estimated increase in power consumption was added, as well as 400 MW to Melkøya, as per requested by the customer. On top of the strenuous case, a high load case was also created with all of the maximum estimated increase in power consumption. Since the loads were of a significant value, they were added mainly directly to 420 kV buses in the respective counties, with an exception to Melkøya where 200 MW was added to the existing bus, and 200 MW to the new 420 kV Hyggevatn bus. The values for the estimations can be seen in Table 3.

Table 3 Predicted increase in consumption up to 2030.

County	Minimum increase in future estimated power consumption	Low load (50% of min)	High load
Finnmark	217 MW + 400 MW	108,5 MW + 400 MW	1052 MW
Troms	18 MW	9 MW	60 MW
Nordre Nordland	155 MW	77,5 MW	335 MW

3.4.4 Cases in original study

In the original study, the investigated cases were the following:

1. High load all around, high surrounding wind production (80%), adjusted hydro power to fit the scenario, export as per received net (low).
2. Minimum local load, high load in net, maximum surrounding wind production, high hydro production, adjusted export to fit the scenario.
3. The same as 2 but maximum local load.
4. Minimum wind production (Davvi as well), minimum local load, high load in net, high hydro production, adjusted export to fit the scenario.

4 ANALYSIS

4.1 Limits for network equipment overload

As in the original report, Rate A was used as a limit for overload for lines in Sweden, and Rate C for lines in Norway (rates for a warm summer day). Only overloading of transmission lines in SE1 and north of SE1 are of interest in this analysis. Some lines were already overloaded in the received models, these were not in the areas of our interest and were therefore ignored.

4.2 Limits for under- or over voltages

As in the original study, only buses that did not have already breached voltage limits were investigated. Only breaching of limits of buses in the transmission grid in SE1 and north of SE1 are addressed in this analysis.

4.3 Cases investigated

4.3.1 Low load case

In order to simulate a strenuous case, a low load case was investigated where the local load was set to medium (50%), and the local production to maximum. Melkøya is an exception to altering of local load as it is considered a base load, and is kept at the same value as it is in the high load case received from Statnett. Hydro power was adjusted to fit the scenario and export was kept as it was in the received grid. The load in the rest of the grid was high. A summary of the low load case can be seen in Table 4.

Table 4 Summary of low load case.

Other local WPP production	Hydro production	Added load	Load Finnmark and Troms	Export
100%	60%	Minimum estimated load development + 400 MW Melkøya	50%	Kept as in received grid

4.3.2 High load case

This case had all of the maximum estimated load development in the area, and both the local load and the load in the rest of the grid was high. Hydro power was adjusted to fit the scenario and export was kept as it was in the received grid. A summary of the high load case can be seen in Table 5.

Table 5 Summary of case B.

Other local WPP production	Hydro production	Added load	Load Finnmark and Troms	Export
100%	80%	Maximum estimated load development	100%	Kept as in received grid

4.4 Line outages applied in original study

In the original study, 15 different line outages were applied. Of them the one that created the most severe overloading and other issues was the trip of the 420 kV line between Davvi and Adamselv (effectively choking power evacuation towards Finland). These line outages were applied without any foregoing fault.

5 RESULTS AND DISCUSSION

The results from the analysis of the low load and the high load cases are presented in this chapter. Both cases are without any line trips.

5.1 Low load case

5.1.1 Voltage level violations

For the low load case, voltage levels were breached for buses, see Table 6.

Table 6 Breaches of voltage levels for the low load case.

Geographical area	Low/high limit	Rough percentage	Discussion
Båtsfjord	Low limit breaches	0,8676 pu where 0,9 is lower limit = 96% of minimum limit	This bus is situated geographically close to the wind farms Hamnefjell and Raggovidda. In 2030 they are expected to together have increased their installed power by 220 MW, which the current grid could not handle. Therefore, the wind parks were moved from their original position to the 420 kV bus Varangerbotn, which means a reduction in reactive power from this part of the grid. It is assumed that in the future when these farms are extended and built the local grid will be reinforced to handle the increased power production.

5.1.2 Line thermal breaches

For the low load case, the lines that had their thermal limits breached can be seen in Table 7.

Table 7 Breaches of thermal limits in lines for the low load case.

Geographical area	Rough loading	Discussion
Melkøya to Hyggevatn	172 MVA (146%)	As 200 MW load was added to the original 132 kV bus Melkøya, the lines to the 420 kV buses are overloaded. It is assumed that lines and equipment will be upgraded and reinforced adequately prior to electrification of the facility.
Regional 132 kV line between Sildvik in Norway and Tornehamn in Sweden	121 MVA (103%)	See the discussion in Section 4.2 in the original report regarding this line.
132 kV line between Håkøybotn and Kvaløya	150 MVA (137%)	This line is overloaded due to newly installed wind power and it is assumed that it will be reinforced before that wind

		power is built. See chapter 4.1 in 70000232 for further information.
The 420 kV line along Stora Lule älv between Vietas and Porjusberget	1265 MVA (116%)	As not that much power can evacuate to Finland, like it did in the original study, and the local load is low, it goes through this thin passage in Sweden. See Figure 2 for how the grid looks like around this line.

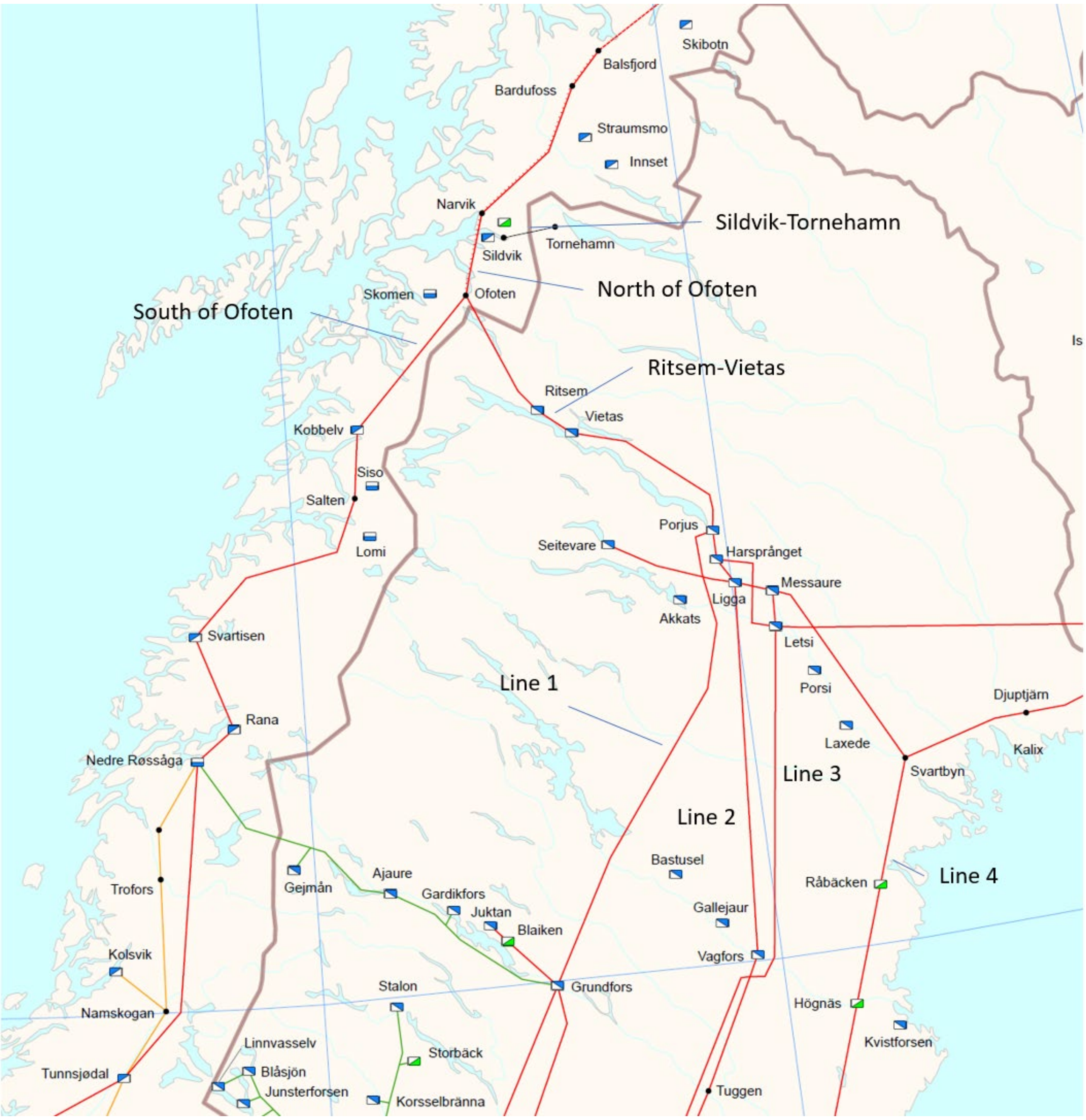

Figure 2 Hydro power along Stora Lule älv

5.2 High load case

5.2.1 Voltage levels in buses

For the high load case, voltage levels were breached for buses, see Table 8.

Table 8 Breaches of voltage levels for the high load case.

Geographical area	Low/high limit	Rough percentage	Discussion
Båtsfjord	Low limit breaches	0,8616 pu where 0,9 is lower limit = 96% of minimum limit	See Table 6 for a discussion regarding this bus.

5.2.2 Line breaches

For the high load case, the lines that had their thermal limits breached can be seen in Table 9.

Table 9 Breaches of thermal limits in lines for the high load case.

Geographical area	Rough loading	Discussion
Melkøya to Hyggevatn	172 MVA (146%)	As 200 MW load was added to the original 132 kV bus Melkøya, the lines to the 420 kV buses are overloaded. It is assumed that lines and equipment will be upgraded and reinforced adequately prior to electrification of the facility.
132 kV line between Håkøybotn and Kvaløya	182 MVA (166%)	This line is overloaded due to newly installed wind power (not Davvi) and it is assumed that it will be reinforced before that wind power is built. See chapter 4.1 in 70000232 for further information. The loading of this line is slightly lower than in the analysis in the original report as the added consumption for Troms was added on the Kvaløy-bus.

5.3 Line outages

The scope of this project did not include line outages, and they were therefore excluded in this analysis. Based on the results from the original report however, a couple of comments can be made on possible risks with different N-1 scenarios. From the original report, the line outage that caused the most problem was the 420 kV line between Vietas and Ritsem, where the simulation blew up which means a remedial action scheme to trip generation in case of line loss. It is reasonable to assume the same would happen for the studies in this addendum.

Other line outages that posed problems were the 420 kV line between Davvi and Adamselv, and the 132 kV line between Lakselv and Adamselv, effectively cutting power transmission to Finland. These lead to an overload of the line by Stora Lule älv, as well as the 132 kV line between Lakselv and Adamselv (for the first outage). As both cases for this addendum study has an increase in consumption locally it can be assumed that the grid is less vulnerable to power evacuation disruptions, but it can still be assumed that if the 220 kV line to Finland was out it would lead to overloads of the line by Stora Lule älv.

Other line outages that posed major problems were tripping the 420 kV line south of Ofoten, and line 1 between SE1 and SE2, see Figure 2. The same line as usual, the line by the Stora Lule älv is the one that becomes overloaded. The conclusion from the line outages is that the line along the Stora Lule älv is a bottle neck.

5.4 Wind park development in Finnmark and Troms

There is a threshold for the amount of wind power that can be developed in Finnmark and Troms with the expected 2030 grid. This study has not investigated what that number is, but placement of the plants is of less importance compared to the totally installed power.

6 CONCLUSIONS

With the estimated load increases to 2030, and the extension of the 420 kV grid to Varangerbotn, a connection of all planned wind farms as well as Davvi is possible. This is with the assumption that all existing lines will be upgraded where necessary to accommodate both load and power developments. Given that the 420 kV line from Skaidi to Varangerbotn is built, no other reinforcement is needed to the existing grid for the connection of Davvi wind farm. In the unlikely low load case, a 16% overload of the line between Vietas and Porjus along Stora Lule älv occurred, and in order to avoid this, measures have to be taken. These could be measures such as curtailment of power production or reinforcement of line. No line outages were carried out in this analysis but based on the results from the original report it is possible to assume that several N-1 scenarios would lead to a overloadings of the line along Stora Lule älv.

7 REFERENCES

Svenska Kraftnät. (2013). *Perspektivplan 2025 – En utvecklingsplan för det svenska stamnätet.*

APPENDIX A POWER CONSUMPTION DEVELOPMENT

Internt notat	
Til:	**Grenselandet AS**
Fra:	**Kristian L. B. Ek**
Kopi:	**Kjetil Mork**
Dato/Sign.:	**21. januar 2021**

Davvi vindkraftverk
Gjennomgang kraftsystemplaner m.m.

Oppgave

27.02.2019 ferdigstilte DNV GL rapporten «70000232, Grid Connection Study Davvi Wind Farm». DNV GL skal oppdatere denne rapporten, og samtidig finne ut om det er kapasitet til full utbygging av Davvi selv uten en oppgradering av ledningen fra Varangerbotn til Finland.

Dette notatet oppsummerer endringene i forventet forbruk og produksjon i Nordland, Troms og Finnnmark siden første utkastet ble laget.

Metode

Det er tatt utgangspunkt i «Table 4» fra DNB GL sin rapport for forventede produksjonsdata. Disse er blitt oppdatert ved hjelp av følgende kilder:

1) https://www.nve.no/konsesjonssaker/
(Status på utbygginger og søknader om utsatt frist for idriftssettelse)
2) https://www.nve.no/energiforsyning/kraftmarkedsdata-og-analyser/ny-kraftproduksjon/
(Status på anlegg under bygging og idriftssettelse 3. kvartal)
3) https://temakart.nve.no/tema/vindkraftverk
(Kontrollsjekk av 400 km radius fra Davvi vindkraftverk, som forutsatt for «Table 4»)
4) Kraftsystemutredninger fra følgende områder:
    a. 22: Finnmark
    b. 21: Nord-Troms og Midt-Troms
    c. 20: Sør-Troms og Nordre Nordland
    d. 19: Midtre Nordland
    e. 0: Sentralnettet/Transmisjonsnettet (Nettutviklingsplan 2019)

   Hentet fra: https://www.nve.no/energiforsyning/nett/kraftsystemutredninger/

Vedrørende forventet fremtidig last, fremkom det ikke tydelig i rapporten hvilke laster som var lagt til grunn i DNV Gl sin analyse. Det var således ikke mulig å angi endringene i fremtidig last ift. rapporten, men det er medtatt en tabell med forventet fremtidig last i 2025 og 2030 basert på KSU-gjennomgangen.

Forventet produksjon

Det er tatt utgangspunkt i «Table 4» fra DNB GL sin rapport for forventede produksjonsdata. Av de nevnte kraftverkene er det kun Andmyran vindkraftverk (100 MW) som ikke fikk utsatt sin idriftssettelsesfrist, som utløp 31.12.2020.

Blant de resterende kraftverkene som enda ikke er satt i drift, er idriftssettelsesfristen foreløpig satt til 31.12.2021, i tråd med NVEs praksis. Disse utgjør til sammen 282,10 MW, som potensielt ikke blir realisert. Disse er markert med gult i oversikten under.

Vilgesrassa Vindpark på 300 MW ble meldt inn 01.01.2020, men melding vil foreløpig ikke bli behandlet av NVE. Dette kraftverket er ikke inkludert i listen nedenfor, da det anses som usannsynlig at det kan komme på drift før 2025.

Som planlagt / driftssatt	Utsatt frist / fortsatt mulig	Utgår, ikke bygget innen frist

Name	Installed power MW	Planned power 2025 MW	Kommentar	Estimated power 2025 [MW]	Difference
Hamnefjell Vindkraftverk	51,75	120,00	Frist 31.12.2021 Påbegynt?	120,00	0,00
Rakkocearro (Raggovidda) vindkraftverk Trinn 1	45,00	45,00		45,00	0,00
Rakkocearro (Raggovidda) vindkraftverk Trinn 2	-	52,00	Frist 31.12.2021 Monteres sommer	52,00	0,00
Rakkocearro (Raggovidda) vindkraftverk Trinn 3	-	103,00	Frist 31.12.2021 Mulig utvidet frist, har klaget til OED	103,00	0,00
Kjøllefjord vindkraftverk	39,10	39,10		39,10	0,00
Havøygavlen vindkraftverk	40,50	45,00	Frist 31.12.2021	45,00	0,00
Davvi	-	800,00		800,00	0,00
Dønnesfjord vindkraftverk	-	14,10	Frist 31.12.2021	14,10	0,00
Fakken vindkraftverk	54,00	54,00		54,00	0,00
Kvitfjell vindkraftverk	-	197,40	Frist 31.12.2020 Antatt ferdig	197,40	0,00
Raudfjell vindkraftverk	-	84,00	**Frist 31.12.2020 Ferdig 07.11.2020**	84,00	0,00
Nygårdsfjellet vindkraftverk trinn 2	32,20	32,20		32,20	0,00
Andmyran vindkraftverk	-	100,00	Ikke bygget innen fristen, fikk ikke utsatt frist	0,00	-100,00

Ånstadblåheia	50,40	50,40		50,40	0,00
Total	**312,95**	**1736,20**		**1636,20**	**-100,00**

Forventet last

KSUene i de fire områdene har oppsummert sine antagelser om fremtidig last på forskjellige format og detaljnivå. Finnmark var særlig detaljert beskrevet, med enkeltprosjekter og omtrentlige plasseringer, samt anga antatt største og minste effektbehov knyttet til forbruket. Troms-området nevnte få enkeltprosjekter, men beskrev heller områder med forventet effektøkning i årene fremover, samt årsak for dette. Noe tilsvarende var også formatet brukt for Nordre og Midtre Nordland.

Fullstendig oversikt over fremtidig lastutvikling er vedlagt som Excel-ark. Tabellen under viser hvordan forventet lastøkning fordeler seg i områdene for 2025 og for 2030.

År for effektøkning fordelt på områder	Sum av Minste est. last [MW]	Sum av Største est. last [MW]
2020 - 2025	**383**	**1322**
Finnmark	85	902
Troms	8	30
Nordre Nordland	115	215
Midtre Nordland	175	175
2025 - 2030	**277**	**395**
Finnmark	132	150
Troms	10	30
Nordre Nordland	40	120
Midtre Nordland	95	95
Totalt	**660**	**1717**

I 2025 antar de utredningsansvarlige at det minst vil være en økning på 383 MW totalt i områdene, men at det kan bli opp mot 1322 MW økt last. Minste økning legger til grunn befolkningsvekst og lav-middels utsikter for elektrifisering på kort sikt. Høy økning drives i stor grad av Melkøya (estimert opp mot 400 MW), produksjon av hydrogen og ammoniakk i Berlevåg (200 MW) og elektrifisering av plattformer, fergesamband, landstrøm og oppdrettsanlegg på land.

Fra 2025 til 2030 legges det til grunn at minst 277 MW lastøkning vil tilknyttes nettet, kanskje opp mot 395 MW dersom elektrifiseringen av samfunnet og prosjekter går raskt. Dermed vil total last i 2030 være fra 660 MW til 1717 MW høyere enn i dag.

About DNV GL

DNV GL is a global quality assurance and risk management company. Driven by our purpose of safeguarding life, property and the environment, we enable our customers to advance the safety and sustainability of their business. We provide classification, technical assurance, software and independent expert advisory services to the maritime, oil & gas, power and renewables industries. We also provide certification, supply chain and data management services to customers across a wide range of industries. Operating in more than 100 countries, our experts are dedicated to helping customers make the world safer, smarter and greener.