

## MINNISBLAÐ

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### SENDANDI

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Kolbrún Reinholdsdóttir

### VERKHEITI

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**Connections to Grundartangi**

### VERKKAUPI

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Summary of the report on the Icelandic transmission system

## Introduction

Qair Energy has plans on building a Hydrogen Ammonia production at Grundartangi and the plan is to utilize wind from Qair Wind Farms that are planned around the country. Qair's proposed Hydrogen Ammonia production capacity at Grundartangi is 840 MW and will be implemented in three stages 280 MW. First stage is planned to be online in 2028.

In this summary the Icelandic transmission system will be analysed with regards to its future transmission capacity and possible new production.

Prerequisites for the Hydrogen Ammonia production is a flexible production that can follow either the available energy in the power system or the production of energy from the planned Wind Farms. Given that a significant portion of the energy allocated for this production is intended to be generated through wind power, the flexibility of Hydrogen Ammonia production holds significant value owing to the intermittent nature of wind power generation.

## Landsnet's grid expansion plan

According to the Electricity Act No. 65/2003, Landsnet is to publish a grid expansion plan for the transmission system every other year. In the newest publication there is a plan for strengthening the system in West of Iceland. There is a plan of building a 220 kV connection from Akureyri to Grundartangi with three series connected overhead transmission lines which will mostly lie in parallel to the preexisting 132 kV line. These three lines are:

- **Blöndulína 3 (BL3):** A new 220 kV, 550 MVA transmission line from Blanda to Akureyri. (Northwest)
- **Holtavörðuheiðalína 1 (HH1):** A new 220 kV overhead line from Klafastaðir to Holtavörðuheiði with a planned 900 MVA capacity to be built in 2024-2026, and a new substation at Holtavörðuheiði. (Northwest)

- **Holtavörðuheiðalína 3 (HH3):** A new 220 kV overhead line from Blanda to Holtavörðuheiði with 900 MVA transmission capability which will close the semicircle from Fljótsdalur to Brennimelur. (Northwest)

These projects will increase the transmission capacity from the north to south and the capacity to Grundartangi. Furthermore, there are several potential wind park projects in the western region of Iceland that cannot proceed until these lines are constructed.

## Grundartangi

Today, Grundartangi is a big demand centre in the Icelandic transmission system, but there is a 600 MW bottleneck in the transmission to Grundartangi which Landsnet calls transection VI or “Snið VI” in Icelandic. It is defined by the transmission capacity to Grundartangi in N-1 situations and depends on the capacity of lines Sultatangelína 1 (SU1) and Brennimelslína 1 (BR1) combined when Sultatangelína 3 (SU3) is out of operation. The new 900 MVA transmission line from Holtavörðuheiði will resolve the bottleneck and increase the transmission capacity to Grundartangi upwards to around 1400 MVA in a N-1 system with disturbances on SU3. Disturbances on the line HH1 from Holtavörðuheiði to Brennimelur/Grundartangi will be more difficult to handle because some of the proposed new Wind Farms in the West will be connected to HH1 and will therefore have to be disconnected or the production lowered in case of disturbances.

Today the load at Grundartangi is 674 MW so with the new 900 MVA line from Holtavörðuheiði in place the area should be able to handle the load increase associated with Qairs proposed three stage development of 840 MW Hydrogen Ammonia production (280 MW each stage) at Grundartangi in a stable, disturbance free system. That is if Qair’s hydrogen production at Grundartangi will be flexible and the production of the Wind Farms can be reduced without significant consequences. In case of a disturbance the system will however handle increase around 400-450 MW, or less than two of the Hydrogen Ammonia production stage in (N-1 system). And that is the total increase in load at the site, including other developments scheduled at Grundartangi.

There is a possibility of increasing the transmission systems voltage at Grundartangi/Brennimelur, from 220 kV to 400 kV as SU3 line is designed to be able to operate at higher voltage and so is the transmission line Búrfellslína 3 (BU3) - which goes from Búrfell at Hamranes. Only the BR1 line would then need to be rebuilt for 400 kV operation if that will be the solution in the future.

## Generation

There are currently no large-scale Wind Farms in operation in Iceland and only a small portion of the energy generation is done by wind.

Qair Energy is the owner of several Wind Farms development projects around Iceland, and has submitted applications to The Master Plan for Nature Protection and Energy Utilization for the following projects:

QAIR PROJEKTS IN MASTER PLAN	MW
Hnotasteinn	190
Sólheimar	163
Grímsstaðir	134
Norðanvindur	62
Þorvaldsstaðir	45
Butra	18
Foss í Hrunamannahreppi	56
Tjörn á Vatnsnesi	56

Múli í Borgarbyggð	73
<b>Total</b>	<b>797</b>

Two of Qair's Wind Farm developmental projects will be taken into addressed by the Master plan committee in 2023 or 2024. Those are Hnotasteinn and Sólheimar with a total rated capacity potential of 353 MW.

The total capacity potential in the Master Plans energy utilizations category is now in total 1299 MW, see table below.

ENERGY UTILIZATION CATEGORY	MW
Water	214
Wind	220
Geothermal	865
<b>Total</b>	<b>1299</b>

Even though project are filed under the utilization category, there is no guarantee that the project will go further in the planning, Environmental Impact Assessment (EIA) or the licence procurement process. There is a long way from the utilization category in the Master Plan until the commissioning of the power plants. Many projects change during the EIA process and then there are several licensing processes that they must go through. This process can take many years and some projects will never materialize.

There are many projects which will have to be taken into consideration in the Master plan's newest phase, the fifth phase. These projects remain uncategorized, and there is no assurance that any of them will come to fruition. The table below shows the summation of capacity of the projects in the Master plan's fifth phase according to the power source.

MASTER PLAN PHASE 5	MW
Water	525
Wind	800
Geothermal	100
<b>Total</b>	<b>1425</b>

As a summary, there are many different opportunities for power production in Iceland. The projects currently under development are in different stages and while some could start production within few years' time, others have a longer way to go. Qair's plans of building a Hydrogen Ammonia Production in three stages has the potential to materialize even though the timeline is not decided yet and the strategy of implementing the production in several stages is a sensible solution.

Orkustofnun bendir á að fyrirhuguð aflþörf framkvæmdarinnar er afar mikil. Jafnframt er óljóst um orkuöflun verkefnisins en tilgreindir orkuöflunarkostir þurfa sjálfstætt umhverfismat. Telur Orkustofnun þó æskilegt að vikið verði að þeim þætti í matsvinnunni. Þá liggur fyrir að styrkja þarf flutningskerfið vegna framkvæmdarinnar og skv. raforkulögum, nr. 65/2003, þurfa slík áform að vera tilgreind í

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kerfisáætlun Landsnets sem er háð umhverfismati áætlana. Orkustofnun bendir jafnframt á að kerfisáætlun flutningsfyrirtækisins er háð yfirferð og samþykki stofnunarinnar, sbr. 2. mgr. 9. gr. b. raforkulaga. Engar framkvæmdir þar að lútandi eru tilgreindar í matsáætlun.

Orkustofnun gerir að öðru leyti ekki athugasemdir við framlagða matsáætlun.