Question	Answer
Do you forsee data centers having substantial impact on Nordics el. consumption in the future?	25 TWh in 2030 and 35 Twh in 2040 in the scenario, slide 22 in presentation materials: https://www.epressi.com/media/userfiles/107305/1613133858/webinar_presentations-1.pdf
Do the generatos need a license to put up their plants(renewable or others) in Nordic region? I am asking it as to what is the certainty of assuming generation capacities at a particular location for which the transmission lines are being planned.	They need several licensces and permits. TSOs are of respobsible for example for creating the grid codes and the generators need to comply.
Do you include the future hydrogen-based iron/steel production processes under P2X, and could these have a different price threshold for hydrogen production than hydrogen for general hydrogen sales?	For the Hybrit project we are modelling an annual demand and an one-week storage - as communicated by Hybrit. For the rest of the hydrogen production we price thresholds.
Are the investments in wind and PV based on market prices, i.e. is it based on modeling in a common model?	Not directly, but indirectly it is. The scenario is made by gathering input from different national scenarios, as well as the DE-scenario for Europe. Therefore t Neutral Nordics is not directly developed via specific prices for e.g. wind and PV, but this is taken into account in the studies that CNC is based upon.
I would expect the hydrogen price to relatively stable comparable to the price for natural gas, at least for Germany due to future seasonal storage capacities.	We agree. We consider the price changes over long period, but the price is constant during 1 year period
What is the future of biomass in your scenarios?	Check slide 29 in the presentation materials: https://www.epressi.com/media/userfiles/107305/1613133858/webinar_presentations-1.pdf
How will hydrogen be stored and at what capacity?	We do not make explicit assumptions on how hydrogen will be stored and at what capacity, as hydrogen infrastructure is out of scope of the NGDP21. We do for e.g. natural gas, where this is not modelled in the electricity market model. But in order to have a stable hydrogen price, it can be assumed that there in the will be some kind of hydrogen infrastructure in place. For inspiration on initial perspectives on this, you can dive in to the study European Hydrogen Backbo
6 GW of offshore wind in Sweden 2040 seems very low compared to what is currently planned and looking at existing grid connection applications. What are your assumptions behind this number?	The capacity for offshore wind was kept low on purpose, partly to make the scenario a bit more demanding for the system, and partly because of uncertainty v would be a support scheme for offshore wind. With the recent development, the offshore wind capacity will be increased. The scenario is still being develop capacity can not yet be provided.
The scenarios appear optimistic concerning up-scaling of renewables. Which factors might slow development down - or making it even faster?	There are many factors that affect the development. Higher CO2 prices, technology development and decreasing costs can introduce a faster development. Ot reduced CO2 prices, and less technology development might slow down the investments in renewables. Important factors as market development and politics a major role here.
What is your view on the downward pressure on tariffs for Nordic distribution companies in the light of the accelerated electrification assumptions and subsequent increase in investment needs? "	DSO tariffs are out of the scope of our NGDP work.
Is the powerpoint material that you share here public ?	Yes, see: https://www.fingrid.fi/en/pages/news/news/2021/grid-development-towards-climate-neutral-nordics--webinar-recording-and-material-available/

1) Have you done some sensitivity analysis on the importance of lower biomass power capacities for your results? This might be quite relevant	Not yet, this might be done later.
2) Has France been excluded from your model due to computational limitations? Otherwise the impact of their nuclear fleet might be relevant to include in the system analysis - depending on how flexible the nuclear plants are assumed to be in the model"	It is included in the model.
Discussion on P2X was about power-to-gas and hydrogen. How do you see the development of power-to-heat in industry, district heating and distributed heating with heat pumps and electric boilers? These technologies have higher efficiency than electrolysers, and much heat is needed in the Nordics.	We have included it in the models. This will be discussed more in the final report of the NGDP project.
Seeing that in 2025-2030 smaller nuclear units producing cheap CO2-free power will be commercially available, should you maybe consider including this possibility in the scenarios?	If the small scale reactors start to be commercially available, we will consider them in the future analyses.
Is it realistic to assume it will be cheaper with P2X and demand respons than CHP?	They are not direcly comparable in our view.
How do you see the emergance of a Nordic or European Hydrogen market, and which links do you see between the present day powe market and a potential hydrogen market. Will there be stornger link than just the price-linking or do you foresee effect-coupling of some time?	We do not make explicit assumptions on a future hydrogen market, as hydrogen markets and infrastructure is out of scope of the NGDP21. But in order to ha hydrogen price, it can be assumed that there in the long term will be some kind of hydrogen infrastructure in place that will facilitate a hydrogen market. If th capacity will increase at the rapid pace, that we see in the NGDP21, there will in time be a strong linkage between the price interactions in the electricity mar price formation in the hydrogen market, as exemplified in slide 27 (model 1): https://www.epressi.com/media/userfiles/107305/1613133858/webinar_presen Our draft Hydrogen price, is an estimate of condensing these interactions into just one price.
Considering the quite high and several convertions losses using PtX, and the ever better, cheaper and higher capacity batteries, is it not a bit optimistic to include so much PtX in the scenarios?	The PtX included in the scenario is not primarily developed for the purpose of being an electricity storage, but rather to utilize green and plentifull electricity usefull in hours where there is a lot of RES-production. The produced hydrogen can then be used in hard-to-abate sectors like industry, heavy transport, steel synthetic fuels and export. Through future acess to relatively cheap and large scale storage flexibility of hydrogen, we can decrease the need of high quality el storage in batteries. In the scenario there is battery capacity that might be able to provide flexibility to the power market, e.g. from the fleet of EVs. From the trajectories on technology prices, this seems to be a realistic approach, but if technology prices develop differently in the future, we will of course adapt in fut
How does this scenario affect the ancillary service markets ?	Not analyzed yet, might be analyzed later.
The projected price of H2 is 1,8Euro/kg. 1 kg H2 contain 120 MJ. Gasoline contain about 44 MJ/kg. The price of H2 is about 1/3 of current price of energy in gasoline. Will it be beneficial for investors to invest in H2 electrolysis or do you assume heavy subsidizing of electrolysis equipment?	We do not make explicit assumptions on the subsidy need for electrolysers in the scenario, but from observations and interaction with stakeholders we see th need for subsidies today, and get clear indications that this need will decrease in the future, just as it has done for e.g. wind. Our foundatation, is that we in th will see a market driven build out of the energy system. The development of RES and new flexible demand like PtX are mutually dependent, and our first in that it could be profitable to invest in PtX capacity, possibly in conjunction with RES-capacity as it will decrease risk.
You mentioned that you are learning from the Danish expereinces with offshore islands, what are your assumptions on hybrid offshore projects (windfarms connecting to several markets, with transmission lines also functioning as interconnectors) in the other Nordic countries?	At the moment, we have not considered hybrid offshore projects in the Climate neutral Nordics scenario. However, we have a focus area study "Offshore win our NGDP2021 project, where we plan to investigate the offshore wind topic more closely.
Svenskt Näringslivs study Kraftsamling have a very accurate estimation of the most efficient production mix, why is not your estimation in line with this?	This scenario is based on a modelling approach, and assumptions, jointly made by the four Nordic TSOs.

Have you thought about how all this new infrastructure should be financed?	This is out of scope of NGDP2021.
Is there a formal cooperation on offshore grid in the North Sea as well – like in the Baltic Sea?	There is strong collaboration between the North Sea countries in many different fora, e.g. through the ENTSO-E regional group North Sea or the project Nor Power Hub. Here there is cooperation on many different topics, among those, the perspectives or possibilities for future offshore grids.
Is this senarios used of the TSO for example Svk in Sweden.	This scenario is still being developed. It is planned to be one of four scenarios to be included in the next Long-term Market Analysis (LMA) for Svk, planne published in May.
Is it possible to get the background data an see how is build? Example where the powerexpansions is calculated.	The scenario is developed by gathering country specific data from the nordic TSOs on how the electricity system can develop in line with policitical decarbo If you are to dive deeper into the background data, we then will then refer you to the national analysis of the TSOs. For the European scenario, you can dive i background material at the TYNDP20 webpage.
Is it possible to get more informations about the standardsenarios. How you chose to set the standardsenarios.	More information about the ENTSO-E scenarios is available here: https://tyndp.entsoe.eu/scenarios/
We have calculated with 15-30% of installed onshorewindpower in diffrent senarios as baseload. What is your thoughts about that?	We will do a separate adequacy analysis later in our NGDP2021 project.