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Assessment of the draft National Energy and Climate Plan of Denmark

Accompanying the document

Commission Recommendation

on the draft integrated National Energy and Climate Action of Denmark covering the period 2021-2030

{C(2019) 4404 final}

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1. SUMMARY

Main observations[1]

- ✓ Denmark's draft integrated National Energy and Climate Plan (NECP) is based on the National Energy Agreement of 29 June 2018 between all parties in the Parliament, and on the Climate and Air Proposal of the Government from 9 October 2018. The draft plan provides a rather complete overview of the decarbonisation dimension, from concrete objectives to policies and measures and assessment of their impacts. The other dimensions of the Energy Union that underpin the required transition and decarbonisation of the economy need to be further developed in view of the submission of the final plan. In particular, objectives and targets are not presented for all dimensions.
- ✓ Denmark's 2030 target **for greenhouse gas (GHG) emissions** not covered by the EU Emissions Trading System (non-ETS), is -39 % compared to 2005, as set in the Effort Sharing Regulation (ESR)[2]. With existing measures, the European Commission estimates that Denmark would miss this target 16 percentage points and have a deficit of 35.6 Million tons of CO2 equivalent over the period 2021-2030. The draft NECP indicates that implementation of additional measures, use of ETS flexibility and potential credits from LULUCF may be used to reach the non-ETS target, as provided for in the ESR, but it is uncertain whether the described measures will be sufficient. The final plan would benefit from further clarification of the planned use of flexibilities. Significant emission reductions can be achieved through the planned transport policies, but some of these policies need to be further defined. Further efforts to increase energy efficiency, notably in buildings, would also contribute to additional emission reductions.
- ✓ As regards **renewable energy**, Denmark indicates a 55 % share of renewable energy in gross final consumption of energy by 2030 as its contribution to the EU renewable energy target for 2030. This is significantly above the 46 % share in 2030 that results from the formula in Annex II of the Governance Regulation[3]. The projections based on the existing policies and measures indicate a share of 48 % of renewable energy by 2030, highlighting that additional policies and measures will be needed to reach the 55 % share. An indicative trajectory well above the reference points provided for in the Governance Regulation[4] was set out, however without specifying the actual shares reached. The final plan would benefit from elaborating further on the policies and measures allowing the achievement of the contribution and on other relevant sectorial measures.
- ✓ As regards **energy efficiency**, with a contribution of 15.8 Million tons of oil equivalent (Mtoe) for final energy consumption in 2030, and of 18.6 Mtoe for primary energy consumption, Denmark's contribution is very low considering the need to increase efforts at the EU level to collectively reach the Union's 2030 energy efficiency targets. The final

[1] In addition to the notified draft NECP this assessment also considers informal bilateral exchanges, which are part of the iterative process established under the Governance Regulation.
[2] Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013.
[3] Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action.
[4] Pursuant to Article 4(a)(2) of Regulation 2018/1999.

would benefit from providing more clarity on planned policies and measures, including concerning the transport sector.

- ✓ The proposed objectives and targets for **energy security** focus on the development of interconnections across sectors and borders, international cooperation, and an open market for electricity and gas. Denmark's reference to cybersecurity in the energy sector, viewed as a strategically important issue to address in the years ahead, is worth highlighting.
- ✓ Concerning the **internal energy market**, Denmark is already well interconnected. Still, Denmark's draft NECP does not put forward an interconnection level indicator for 2030 nor other national objectives and targets. Additional information in these areas would benefit the final NECP, in particular considering the essential role of interconnectors to achieve the high ambition in terms of renewable energy.
- ✓ As regards the dimension **research, innovation and competitiveness**, the draft plan includes funding targets. More details about the national objectives it wants to achieve by means of the reported funding targets would be welcomed.
- ✓ Overall, **policies and measures** are consistent across the different dimensions of the Danish draft NECP. The draft plan is also consistent between its policy part (objectives and targets and policies and measures) and its analytical part for elements related to greenhouse gas emissions reduction. However, for the other dimensions, the information provided is insufficient to assess consistency.
- ✓ There is already good **regional cooperation** taking place between Denmark and the other Nordic and Baltic countries, with potential for enhanced cooperation in areas such as renewables and research and innovation. Cooperation efforts with Germany could be further developed.
- ✓ The final plan would benefit from extending the provided analysis of **investment needs** by estimating public and private investment needs of the planned policies to achieve the climate and energy objectives up to 2030 and indicating the likely sources to finance them. This would ensure full advantage is taken of the role NECPs can play in providing clarity to investors and attracting additional investments in the clean energy transition.
- ✓ The draft plan makes several useful references to the integration between climate and air policies, highlighting some synergetic measures in **transport, domestic heating or agriculture**. The final plan would benefit from further demonstrating the integration, synergies and trade-off effects of these two policy areas, including also quantitative information on air pollutant emission impact of planned policies.
- ✓ Consideration on the **just and fair transition** and employment impacts related to the clean energy transition should be better addressed in the plan, including in relation to changes between sectors or industries, related skills impacts, and distributional effects.
- ✓ A list of all **energy subsidies**, including in particular for fossil fuels, and concrete actions undertaken and planned to phase them out needs to be included in the final plan.
- ✓ As a **good practice**, it is noted that the draft plan describes in some detail the prioritised budget for the additional policies and measures of the Danish 2018 Energy Agreement up to 2025. The budget is foreseen to increase gradually and amount to DKK 2.8 billion in 2025, which is in the order of magnitude 0.1 % of GDP. The draft plan includes also a list of measures to reduce emissions from agriculture and increase the LULUCF sink.

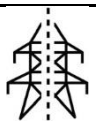
Preparation and submission of the draft plan

Denmark submitted its draft National Energy and Climate Plan (NECP) to the European Commission on 21 December 2018. To prepare the draft NECP, a dedicated project group has been established between the Danish Ministry of Energy, Utilities and Climate and the Danish Energy Agency. The overarching responsibility of the development of the draft plan was held by the Ministry of Energy, Utilities and Climate, while the Danish Energy Agency was responsible for the modelling and scenario development.

There has been a close cooperation between Denmark and the other Nordic countries via the Nordic Council of Ministers during the preparation of the draft NECP. The draft NECP itself has not been subject to a public consultation at this stage.

Overview of the key objectives, targets and contributions

The following table presents an overview of Denmark's objectives, targets and contributions under the Governance Regulation[5] as presented in Denmark's draft NECP:

	National targets and contributions	Latest available data	2020	2030	Assessment of 2030 ambition level
	Binding target for greenhouse gas emissions compared to 2005 under the Effort Sharing Regulation (ESR) (%)	-19	-20	-39	As in ESR
	National target/contribution for renewable energy: Share of energy from renewable sources in gross final consumption of energy (%)	35.8	30	55	Above 46 % (result of RES formula)
	National contribution for energy efficiency: Primary energy consumption (Mtoe)	17.7	16.9	18.6	Very low
	Final energy consumption (Mtoe)	14.6	14.7	15.8	Very low
	Level of electricity interconnectivity (%)	51	59	Not provided	N/A

Sources: EU Commission, ENERGY STATISTICS, Energy datasheets: EU28 countries; SWD(2018)453; European Semester by country[6]; COM/2017/718; Danish draft NECP.

[5] Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council.

2. ASSESSMENT OF THE AMBITION OF OBJECTIVES, TARGETS AND CONTRIBUTIONS AND ADEQUACY OF SUPPORTING POLICIES AND MEASURES

Dimension decarbonisation

Greenhouse gas emissions and removals

In addition to the binding target for **non-ETS emissions** of -39 % by 2030 compared to 2005, Denmark has set the objective of achieving climate neutrality by 2050.

Based on the with existing measures scenario, the European Commission estimates that Denmark would miss its 2030 non-ETS target by 16 percentage points and have a deficit of 35.6 Million tons of CO_2 equivalent (Mt CO_2eq) over the period 2021-2030. The draft plan includes additional policies and measures from the Danish Energy Agreement adopted in June 2018 as well as planned policies and measures presented in the Climate and Air proposal from October 2018. The impact of these additional measures on Effort Sharing Regulation (ESR)[7] emissions is estimated to be 10.2 Mt CO_2eq over the period 2021-2030, and would thus not be sufficient to close the gap to the 2030 target.

The draft plan indicates that greenhouse gas removals from land use could have a mitigation impact of 12.9 Mt CO_2eq and transfer of ETS allowances could account for another 8 Mt CO_2eq for compliance with Denmark's non-ETS target over the period 2021-2030. However, the draft plan does not clearly state whether Denmark plans to use these flexibilities to their full amount. Even if fully implemented, a gap to the 2030 target may still remain.

The draft NECP applies the accounting rules in the **LULUCF** Regulation[8] for its "with existing measures" projections which show accounted annual credits around 1.3 Mt CO_2eq until 2030 in the LULUCF sector. It also explains the projections for the sector in detail, although it does not provide the expected mitigation impact of LULUCF policies. With respect to the National Forestry Accounting Plan including the national Forest Reference Level, submitted by Denmark as required by Article 8(3) of the LULUCF Regulation, the Commission has put forward technical recommendations requesting action on a number of issues, detailed in SWD (2019)213.

Denmark's draft plan contains a range of policies and measures which, if implemented, would help decarbonising the **transport sector** which is currently responsible for nearly 40% of Danish effort sharing sector emissions**.** In particular, electromobility and other forms of zero-emission mobility are supported, with an ambition to phase out the sales of new petrol and diesel cars and city buses by 2030, and further measures in the transport sector in support of alternative powertrains and energy including vehicle taxation, benefits for electric company cars and support to charging. The quantitative impact is estimated for some of the planned policies and measures, among which cleaner cars and buses would deliver the highest impact.

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[6] https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/european-semester/european-semester-your-country_en.

[7] Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030.

[8] Regulation (EU) 2018/841 on greenhouse gas emissions and removals from land use, land use change and forestry.

For the **agriculture sector**, responsible for around 30% of effort sharing emissions, several policies and measures are described. Planned measures to foster an efficient and modern agriculture include the promotion of precision agriculture and research as well as the support pf private afforestation on agricultural land. The final plan would benefit from indicating how the Common Agricultural Policy would be considered for reducing GHG emissions and increasing removals.

The draft NECP does not include **adaptation** goals, despite the fact that Denmark has a well-established national and local framework for adaptation action.

Renewable energy

With the policy agreement reached in June 2018, Denmark expects to reach a **renewable energy** share of 55 % in gross final consumption of energy in 2030, and proposes this share as its contribution towards the 2030 EU target. This contribution is significantly above the share of 46 % that results from the formula in Annex II of the Governance Regulation. Denmark does not express this share in absolute values with respect to the total gross final energy consumption in 2030.

An **indicative trajectory** well above the reference points foreseen in the Governance Regulation[9] has been depicted in a graph in the draft NECP, however without specifying the actual shares reached. The surplus of 12 % above the 2020 target is planned as early effort contribution that will enable Denmark to keep a lower increase rate of its renewable energy share without compromising its end target. Considering that the modelling taking into account the current National Energy Agreement would lead to a share of 48 % of renewable energy, additional policies and measures will be needed to achieve the contribution of 55 %.

The draft plan provides an overview of the renewable energy shares in sectors and of the various technologies, but only in the form of modelling or projections. With the exception of the electricity sector, they are not yet expressed as objectives neither in terms of shares nor absolute contributions.

As regards the **electricity sector**, Denmark has a very ambitious objective of a 100 % renewable share in electricity in 2030. The projections for electricity on the basis of the National Energy Agreement reach a level of 90 % of renewables, thereby indicating that additional policies and measures will be required. For offshore wind, the administrative procedures have been streamlined with a single contact point handled by the Danish Energy Agency, and this is in preparation for other renewable energy projects as well. The promotion of self-consumption is facilitated by a measure that exempts such consumers from the electricity tax. The compatibility of such measure with state aid rules would need to be considered.

For the **heating and cooling sector**, the draft plan describes general policies in district heating. In the district heating sector, although projections show that 90 % of heating will be based on other sources than fossil fuels in 2030, the lack of estimated trajectories per technology makes it difficult to assess if the 1 % increase per year in the share of renewable energy will be achieved. This is also true for the overall renewable heating and cooling trajectory. Denmark does not indicate the projected 2020 shares in this sector, which is needed as the baseline to calculate the indicative 1.3 percentage point as an annual average for the periods of 2021 to 2025 and 2026 to 2030 respectively. In view of the final plan, a better description of the role of waste heat and how

[9] Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action.

Denmark intends to increase renewable energy in the heating and cooling sector would be welcomed.

Concerning the **transport sector**, Denmark already has a blending obligation of 5.75 % of biofuels for transport. The Government has proposed to increase the share of biofuels in petrol and diesel to 8 %. For the next framework starting from 2020, a blending obligation of advanced biofuels of at least 0.9 % is required, but details on the timeline of such obligation are not included in the draft plan. The plan does not set a target for renewable energy in transport for 2030 although the share of biofuels is expected to increase. In fact, the projections with current polices indicates a 13 % share of renewable energy in transport by 2030. The electrification of the rail network could also contribute; Denmark has a low share of electrification of its railway network (in 2016: 24.5% compared to an EU average of 53.7%). However no details were given on the contributions of all eligible fuels as well as the limits for conventional fuels produced from food and feed crops, applicable multipliers and the sub target for advanced biofuels in 2030.

Dimension energy efficiency

Denmark's draft NECP contains a **contribution to the EU headline target for 2030** of 15.8 Mtoe of **final energy consumption**. This consumption level would be 7.5 % above Denmark's own indicative target for 2020. The EU28 as a whole needs to reduce final energy consumption between 2020 and 2030 by 11.6 %. Compared to Denmark's energy consumption in 2017, its proposed contribution for 2030 would represent a growth in final energy consumption of 8.5 %, whereas the EU28 as a whole needs to reduce by 18.5 % in the same period.

In primary energy terms, Denmark's contribution corresponds to 18.6 Mtoe of **primary energy consumption**. This level would be 10.3 % above Denmark's own indicative target for 2020. The EU28 as a whole needs to reduce primary energy consumption between 2020 and 2030 by 11.4 %. Compared to Denmark's actual consumption in 2017, 18.6 Mtoe in 2030 would represent a growth in primary energy consumption of 5 %, whereas the EU28 as a whole needs to reduce primary energy consumption by 18.5 % in the same period.

Overall, Denmark's contribution is unambitious considering the need to increase efforts at the EU level to collectively reach the Union's 2030 energy efficiency targets. No specific justifications or reflections is provided for why Denmark's energy consumption should increase, in contrast to the EU's overall effort.

Denmark's calculated its contribution as the projected consumption levels in the Danish Energy Agency's 2018 Energy and Climate Outlook adjusted to take into account the effects of measures included in the National Energy Agreement of June 2018. The measures mainly relate to the deployment of renewable energy measures and the lack focus on the efficient end-use of energy would result in a small impact on final energy consumption.

In order to assess how the Danish energy efficiency contribution will contribute to achieving the EU 2030 target, the NECP would benefit from including important elements such as an indicative trajectory, a clear indication of the contribution of the Long Term Renovation Strategies, and energy savings to be achieved in public buildings from 2021 to 2030. The draft NECP does contain an estimate of Denmark's cumulative savings requirement under Article 7 of the Energy Efficiency Directive for the period 2021-2030 (271.7 Petajoules, or 6.5 Mtoe).

As regards **policies and measures**, the Danish draft NECP contains few additional policies and measures specifically targeting energy efficiency. The draft NECP provides little information on what measures will be used to deliver the savings required post-2020 under Article 7 of the Energy Efficiency Directive. Given that the current Energy Efficiency Obligation Schemes so far

used to deliver savings in the 2014-2020 period will end and does not seem to be replaced with measures with equivalent funding levels, at the same time as energy taxes are lowered, this is a particularly important point to clarify in the final NECP. The most important new measure is a tender-based scheme for energy efficiency improvements in businesses and buildings, to which DKK 500 million will be allocated each year from 2021 to 2024. Thereof, DKK 200 million will target buildings, especially those with high efficiency potentials. Given the significant contribution of a cost-effective transformation of existing buildings into nearly zero-energy buildings to the Union's energy efficiency target, more information on realistic and ambitious policies and measures for the implementation of a coherent long-term renovation strategy could be developed. An additional DKK 500 million for "green transport solutions" over the years 2020-2024 might also affect energy efficiency although it remains to be decided how it will be used, and the relation with the additional green transport measures proposed by the Danish Government in the October 2018 climate plan. The plan would benefit from covering measures that contribute towards more efficient organisation of the mobility system and thus towards improved energy efficiency and emissions reductions (e.g. incentivising multimodality and modal shift, intelligent transport systems, digitalisation and automation).

The measures with the greatest impact on primary energy consumption compared to the with existing measures scenario (WEM) relate to renewable energy. As regards the effect on final energy consumption, the envisaged DKK 500 million energy efficiency fund in 2021-24 for businesses and buildings is the most important measure, but it is partly offset by the impact of lower energy taxes. More importantly, the measures will not be in addition to the current Energy Efficiency Obligation Schemes, but only replace them. This shift, if not accompanied by further new measures, would represent a very significantly reduced funding considering that the funding now generated by the scheme amounts to approximately DKK 1.5 billion per year.

Overall, the policies and measures targeting energy efficiency included in Denmark's draft NECP appear to represent a significant weakening compared to Denmark's current efforts. Especially when measured in final energy terms, the reduction in energy taxes and the important net reduction in funding levels available for end-use efficiency actions consecutive to the end of the current Energy Efficiency Obligation Scheme illustrate a decline in energy efficiency ambition. This is also reflected in the unambitious absolute contribution, and participates to the potential gap in terms of greenhouse gas emissions reduction referred to above.

Dimension energy security

The draft NECP provides information under all headings of Annex I of the Governance Regulation related to the energy security dimension, but with limited details.

On the one hand, the move towards an electricity system with less coal and more renewable energy will decrease import dependency on third countries and, on the other hand, it increases the need to achieve a fully functioning electricity market in the Nordic region.

The proposed policies and measures are increased diversification, interconnection, and investment in new technologies. For both the natural gas and the electricity sector, Denmark identifies increasing physical interconnections and ensuring a common understanding of risks to supply as key topics in view of developing further international cooperation. Regional cooperation in the Nordic region, including at the level of Transmission System Operators, is rightly identified as a way to mitigate the potential security of supply issues caused by the increase of intermittent wind and solar power sources concomitant to the decrease in baseload generation capacity. The energy security implications of the refurbishment of the Tyra gas field would need to be spelled out.

Dimension internal energy market

Denmark has an **interconnectivity** level of 50.6 %, Denmark is already well interconnected, and the draft plan does not state any objective or strategy on electricity interconnection level indicators. The final plan needs to include an evaluation of the interconnectivity situation and needs in 2030. Interconnections should thereby not only be seen in view of a target, but as a tool to achieve objectives in the other dimensions of the Energy Union, notably decarbonisation, security of supply, energy efficiency and other aspects of the internal market.

Denmark plays an active part in cross-border gas and electricity trade. As illustrated by the recent increase in the use of the existing electricity transmission capacities between Denmark and Germany, the specification of levels of congestion at interconnectors as well as measures aiming at further increasing tradeable capacity would improve the evaluation of other targets and measures specified throughout the draft plan. Such information would improve the final plan and allow for an informed assessment of further development of renewable generation capacity in Denmark, in particular wind energy.

In terms of participation of renewable energy, demand response and storage in **energy markets**, Denmark provides a description of the current situation that shows that it is implementing some measures. This is illustrated for instance by the fact that ancillary services markets are open to participation from renewable energy. The final plan would benefit from additional information on specific objectives with regards to demand response, aggregation, system flexibility, smart grids, storage, distributed generation, consumer protection and competitiveness in the retail energy sector. This would enable a better understanding of how Denmark intends to achieve its ambition also in other dimensions, for instance 100 % of renewable in the electricity sector in 2030.

The draft NECP does not include specific objectives or information on energy poverty. Denmark generally addresses energy poverty through social policy. Still, the social implications of the clean energy transition, including on energy poverty, remain to be addressed in the final plan.

Dimension research, innovation and competitiveness

Denmark intends to increase state funding for **research, development and demonstration** in the fields of energy technology and climate to reach DKK 1 billion in 2024. This represents a steady increase compared to the DKK 292 million baseline (2015-2016), reported by Denmark for Mission Innovation. It is however not clear whether this funding will be maintained up to 2030, and Denmark does not provide details about the national objectives it wants to achieve by means of the reported funding targets, and how these national objectives would relate to the Energy Union research and innovation objectives, notably those under the **Strategic Energy Technology (SET) Plan**.

According to the Danish national export strategy for the energy sector, the country will aim to double the exports of Danish energy technologies and services from 2015 to 2030. This welcomed ambitious objective supports the view that high objectives in renewable energy can also serve as a tool to boost competitiveness of certain industries. For instance, Denmark has today a strong leadership position worldwide in the wind industry as a consequence of sustained investment in the sector in previous years. In view of the final plan, a deployment strategy would strongly support Denmark's export objectives as it would provide clarity, including for investors, on which subsectors will be targeted to increase global market shares of energy technologies and services. Similarly, the assessment of impacts of the implementation of the draft NECP on the competitiveness of businesses, in particular in renewable energy technologies and energy-intensive industries, would enrich the final plan.

The Nordic Energy Research programme is presented in detail as regards its current features, and information as regards planned activities for the period 2021-2030 would be a useful addition in view of the final plan. The SET plan is referred to in the draft NECP, and clarifying how the SET Plan objectives are being translated to a national context would add clarity on how Denmark intends to achieve its objectives, including by allowing to identify possible areas for cooperation with other Member States.

The draft NECP includes a good initial description of the low-carbon technology sector, providing a general overview of the state of play of research and innovation in the sector and referring to the strategy for the export of energy technology which was set in place to strengthen the position of the sector on the global market. The final NECP would benefit from presenting a more comprehensive analysis on where the low-carbon technologies sector, including for decarbonizing energy and carbon-intensive industrial sectors, is currently positioned in the global market, highlighting areas of competitive strengths and potential challenges. Building on the strategy for the export of energy technology, measurable objectives for the future could be included in the NECP, together with policies and measures to achieve them, making appropriate links to industrial policy.

Information on public and private spending has also been provided according to the requirements of the Governance Regulation.

3. COHERENCE, POLICY INTERACTIONS AND INVESTMENTS

The Danish draft NECP is consistent between its policy part (objectives and targets and policies and measures) and its analytical part for elements related to greenhouse gas emissions reduction. For the other dimensions, the information provided is insufficient to assess consistency.

Interactions are mentioned within the decarbonisation dimension, between greenhouse gas emissions reduction and an increase in renewable energy. From the draft NECP, other interactions can be identified, in particular between decarbonisation and energy efficiency. Policies and measures in the dimension research, innovation and competitiveness are also used to achieve objectives in the other dimensions. Overall, policies and measures are consistent across dimensions.

Several planned policies and measures from the Climate and Air Proposal targeting the transport sector and presented in the section on greenhouse gas emissions and removals are also relevant for the renewable energy sector. A number of other additional measures principally targeting renewable energy, greenhouse gas emissions reduction or low-carbon transport will also likely have an effect on energy efficiency. For instance, this is the case for the measures promoting new renewable energy capacity, such as the 2400 megawatts of new offshore wind farms foreseen.

On the other hand, the draft NECP does not contain information on how climate change risks might affect energy supply (e.g., wildfires and storms destroying biomass resources and power networks), despite having identified the energy sector among the key priority sectors for climate resilience. Information is also lacking on adaptation co-benefits for energy efficiency, such as in the thermal management of buildings.

The draft plan builds on the Climate and Air Proposal, which addresses both greenhouse gas emissions and **air pollution**. The draft plan highlights some synergetic measures in transport, domestic heating and agriculture and the underpinning analysis includes the air emission targets as set in Directive 2016/2284. The extent to which the air and climate projections are integrated and the quantitative analysis of the impacts on air pollutants could be better explained.

The relevance of the **circular economy** for greenhouse gas emissions reduction could be reflected in the final plan. The Danish Circular Economy policies are ambitious. The draft plan mentions waste preventive measures such as circular buildings, but without referring to the national circular economy strategy.

The draft plan explains that solid biomass will play an important role in the conversion of the remaining coal power plants. The final plan would benefit from an assessment of the potential sustainable supply potential of biomass and the impact on the LULUCF sector and on biodiversity.

Consideration on the **social and employment impacts** related to the clean energy transition should be better addressed, this includes elements related to changes between sectors or industries, related skills impacts, and distributional effects.

The draft plan includes planned public investments up to 2025 to implement the National Energy Agreement. The investments are indicated to increase gradually and amount to DKK 2.8 billion in 2025. The European Commission estimates that this corresponds to investments in the order of magnitude 0.1 % of GDP. The final plan would benefit from having estimates of investment needs up to 2030 for planned policies and measures. A description of assumptions with regards to private investment needs would also enrich the final plan.

Links with the European Semester

- Identifying financing needs and securing the necessary funding will be key to deliver on energy and climate objectives. The Commission addressed this question as part of the 2019 European Semester process.
- Based on the 2019 Country Report for Denmark, published on 27 February 2019[10], the European Commission's recommendation for a Council recommendation for Denmark issued on 5 June 2019[11], in the context of the European Semester, highlights in particular the need to invest in '*sustainable transport to tackle road congestion*'.
- When preparing its overview of investment needs and related sources of finance for the final plan, Denmark should take into account these recommendations and links to the European Semester.

Information on subsidies is provided only for those related to renewable energy. The Commission Report on Energy Prices and Costs in Europe[12], based on internationally used definitions for subsidies, identifies subsidies in Denmark, including for renewable energy but also to a lower extent for fossil fuels. The draft plan includes the general approach on national policies, timelines and measures to phase out energy subsidies, but no concrete measures to reduce fossil fuel subsidies.

[10] SWD(2019) 1003 final: Country Report Denmark 2019.
[11] COM(2019) 504 final: Recommendation for a Council recommendation on the 2019 National Reform Programme of Denmark and delivering a Council opinion on the 2019 Convergence Programme of Denmark.
[12] Commission Staff Working Document Accompanying the Document Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Energy prices and costs in Europe, COM(2019) 1.

4. REGIONAL COOPERATION

There has been a close cooperation between Denmark and the other Nordic countries via the Nordic Council of Ministers during the preparation of the draft NECP. Denmark stresses its involvement in the North Seas Energy Cooperation (NSEC) and intends to continue investigating on concrete cooperation projects, which will facilitate further interconnection, as some of the existing interconnectors are reaching the end of their expected lifetime. In that perspective, cooperation efforts with Germany could be further developed.

Denmark is an active contributor to regional fora such as the Nordic Council of Ministers, the North Sea Energy Cooperation (NSEC) and Baltic Energy Market Interconnection Plan (BEMIP). For renewable energy, this includes work on coordinated timing of tenders, spatial planning and best practices on support schemes. As illustrated by the draft NECP, the platform for exchanges provided by the NSEC allowed developing concepts for potential joint wind offshore projects and coordinated electricity infrastructure.

Denmark also has the experience of entering into a cooperation agreement with Germany for solar photovoltaic under the renewable energy directive. Regional cooperation could be further enhanced on other cooperation mechanisms in the area of renewable energy, such as planned statistical transfers or hybrid projects, where offshore wind electricity is connected to more than one market.

The focus of the draft NECP on regional interconnection is illustrated by Denmark's objectives regarding energy security. These objectives are to develop interconnections between subsectors and across borders to achieve an efficient use of intermittent renewable energy, to further develop international cooperation on security of supply by increasing interconnections and ensuring a common understanding of supply risks, and to ensure international cooperation within the oil sector in the North and Baltic Seas and international market. Regional cooperation has a key role in assessing regional system adequacy as foreseen in the Electricity regulation[13]. This will become even more important in the light of increasing shared of renewable energy and corresponding need for system flexibility.

As regards research and innovation, enhanced regional cooperation would allow better coordination, including regarding funding. Translating the SET Plan objectives at the national level would help identifying synergies with other Member States and avoiding duplication of efforts.

In May 2017, the Clean Energy for EU Islands Initiative was launched, aiming at accelerating the clean energy transition by helping islands reduce their dependency on energy imports and making better use of locally available renewable energy sources. It also provides a forum for exchange of best practices and aims to promote modern and innovative energy systems and reduce greenhouse gas emissions on islands. Although Denmark is a signatory to the political declaration for this initiative, it has not mentioned this in the draft NECP. Denmark could consider doing so in its final plan, and enhance cooperation with other Member States and island regions.

[13] Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity.

5. COMPLETENESS OF THE DRAFT PLAN

Information provided

The submitted draft NECP includes national contributions and targets for 2030 for GHG emission reduction, renewable energy and energy efficiency. The level of detail of the information on policies and measures is variable across dimensions.

The dimension **decarbonisation – greenhouse gases** of Denmark's draft plan follows the structure required by the Governance Regulation and is mostly complete. However, it does not include an estimation of the binding trajectory under the Effort Sharing Regulation. The draft NECP does not include Denmark's adaptation goals, nor does it describe and address potential climate change risks and hazards or policies to address them.

Regarding **renewable energy**, Denmark provides objectives and targets and policies and measures, but the sectoral and technology trajectories were not provided and for example there is no information on trajectories of bioenergy disaggregated between heat, electricity and transport in Mtoe. Furthermore, there is no inclusion of trajectories on biomass supply, by feedstocks and origin and trajectories for forest biomass, an assessment of its source and impact on the LULUCF sink, which is however especially important given the prominent role of bioenergy in the draft NECP. Planned capacities are generally described, without splitting between new capacities and repowering. Policies and measures are generally presented in a format that makes it difficult to differentiate between existing and additional policies and measures and to determine the extent to which they are included in the scenarios described. For a full picture of Denmark's policies and measures in the renewable dimension, the final plan should include detailed and quantified measures in all sectors; including measures to facilitate the uptake of power purchase agreements (PPAs) and the provision of information and training.

Concerning **energy efficiency**, Denmark's draft NECP formally addresses most of the required elements. Clear and comprehensive information is provided on historical measures and strategies, and to a lesser extent on new measures that have been politically agreed or proposed. However, information is incomplete on the total floor area to be renovated or equivalent annual energy savings to be achieved in central government buildings from 2021 to 2030. On buildings more generally, elements on the long-term renovation strategy are not provided.

On **energy security**, information is lacking on how future electricity generation adequacy will be ensured in light of the ambitious renewable energy target, including in relation to demand response and storage. Information on short and long term domestic gas production and the oil sector would also be important to assess Denmark's future situation with regards to energy security situation.

The draft NECP does not provide detailed information on the nature and impacts of policies and measures for energy security, references to existing risk assessments and risk preparedness plans, and, for the gas sector, references to the preventive action and emergency plans[14].

While the draft plan states that Denmark will increasingly rely on cross-sector and cross-border interconnections to ensure security of supply, it does not further elaborate on specific policies and measures supporting this ambition. In particular regarding cross-border interconnections, the

[14] Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010.

draft plan does not include an analysis of system resilience when neighbouring Member States increase their share of intermittent renewable energy sources.

The refurbishment of the Tyra gas field is described across different sections of the draft plan, but its impacts on gas exports and imports, in particular the resulting gas import dependency and energy mix, are not specified. As regards the oil sector, information is missing on objectives and targets, policies and measures, as well as the quantitative analysis.

As regards the **internal energy market**, the draft plan contains only limited information on core quantitative parameters on the functioning of the national retail and wholesale gas and electricity markets. Clear, measureable and forward-looking objectives are also missing. Verifiable targets and corresponding measures would allow better assessing their impacts on the energy system, including on other dimensions, as well as greatly improve the timely monitoring of the implementation of the Danish NECP. Information is also lacking on areas like interconnectivity indicators, system flexibility and energy poverty. Although the use of the existing transmission capacities at Denmark's interconnectors has been increased recently, the specification of levels of congestion at interconnectors as well as measures aiming at further increasing tradeable capacity are not included in the Danish draft NECP.

A timeline for the roll-out of smart meters is presented, and similar information for other policies and measures would be welcomed. Detailed information is included on consumer protection and dynamic pricing, but information on other policies and measures would allow a better assessment of how objectives and targets are planned to be met.

An assessment of the number of households in energy poverty is needed in the final plan as it would allow assessing the possible need for an indicative objective for reducing energy poverty. In addition, no reference is made to the just transition aspects required as part of the macroeconomic assessment.

As regards the dimension **research, innovation and competitiveness**, Denmark puts forward an objective to double the exports of Danish energy technologies and services from 2015 to 2030. The policies and measures to achieve this are however missing. The draft NECP refers to funding objectives in 2020 and 2024, but is missing objectives and funding targets for research and innovation to be achieved by 2030. The draft plan does not include objectives related to the deployment of low-carbon technologies, which would be particularly relevant in order to better plan and implement Denmark's export strategy and objective for renewable energy development. Apart from the funding target of DKK 1 billion by 2024, information on post-2020 policies and measures is also missing. A national research program for international participation is mentioned, without however providing details on which objectives it aims to achieve.

Robustness of the Danish draft National Energy and Climate Plan

Some of the required elements of the **analytical basis** are present in the draft plan. Details on projections of with existing measures (WEM) scenario are reported using the voluntary templates to report on quantitative projection parameters and results. A with additional measures (WAM) scenario is announced for the final plan, and is necessary also in view to better understand how Denmark will reach its objectives, such as the target of having a 100 % renewable electricity by 2030. Some data sources of tables and graphs can be inferred from the text, but it would be preferable to always mention clearly the data sources.

The **WEM projections** partly cover the five dimensions of the Energy Union. Most variables have been reported, but additional information would be welcome on the differentiation of sectoral GHG emissions between those covered by the EU ETS and those falling under the Effort

Sharing Regulation, non-GHG air pollutants, energy-related investment needs and electricity interconnectivity levels.

Model based projections are presented in a largely transparent way, with notably key parameters provided. The transparency of the projections could be even further improved by adding information on freight ton kilometres and heating and cooling degree days. References to sources of the key parameters and to the tools used for the modelling are positively noted.

For the base year 2015, key parameters and variables are aligned with EUROSTAT figures with the exception of energy consumption. The draft plan also follows its own fuel and emission price assumptions and the Gross Domestic Product (GDP) growth assumptions used in the Danish forecast[15] appear lower than those in the 2018 Ageing Report[16] projections.

Elements of the **impact assessment** of planned policies and measures are included in the draft plan and the results are presented in a transparent way. The impact assessment is described as preliminary and Denmark indicates that it will be updated in view of the final plan. The final plan should complete the assessment of macroeconomic and, to the extent feasible, the health, environmental, employment and education, skills and social impacts, including just transition aspects.

[15] https://ens.dk/sites/ens.dk/files/Analyser/forudsaetningsnotat_til_basisfremskrivning_2018.pdf, p. 24.
[16] The 2018 Ageing Report, Economic and Budgetary Projections for the 28 EU Member States (2016-2070), https://ec.europa.eu/info/sites/info/files/economy-finance/ip079_en.pdf.