S2S4E
Climate Services
for Clean Energy

SUBSEASONAL AND SEASONAL FORECASTS CAN HELP THE EU SPEED UP THE TRANSITION TO RENEWABLE ENERGY

By using subseasonal and seasonal forecasts, energy companies can improve their management of weather-related risk and potentially increase their profits. Such forecasts can thus contribute to speeding up the transition to renewable energy.

Under the 2015 Paris Agreement, the world's governments have committed to strengthening the global response to the threat of climate change by keeping the global temperature rise this century well below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C.

To reach the ambitions of the Paris Agreement, the EU has pledged to cut its greenhouse gas emissions by at least 40% by 2030 compared with 1990 levels, and is currently debating whether to increase this target to 'put the EU on a balanced pathway to reaching climate neutrality by 2050'.

Increasing the share of renewable energy will be key to cutting Europe's greenhouse gas emissions. Although the share of clean energy in Europe has been increasing steadily, the pace of growth has slowed down in recent years.

The share of renewables in the EU's gross final energy consumption stood at 18% in 2018, according to the latest figures from Eurostat. The EU aims to increase this to at least 32% by 2030.

Better forecasts can make renewables investments less risky

Renewable energy production is weather-dependent, and it is challenging to estimate how much clean electricity will be generated. The increasing integration of renewables into the power mix is therefore making the electricity supply more vulnerable to changing weather conditions.

That is why subseasonal and seasonal forecasts are needed, and why the quality of these forecasts must be improved. When subseasonal and seasonal forecasts are skilful and accurate, they can help producers of wind, solar and hydropower get better informed estimates of how much electricity their plants are likely to generate in the weeks and months ahead.

Improved estimates of future power output can enable them to make better decisions on issues such as when to sell their electricity to the market, how much they should sell, what price levels to expect, and when to schedule maintenance of their power plants.

Subseasonal and seasonal forecasts can therefore contribute to reducing the risks involved in investing in renewable energy and help companies invested in the sector to improve their risk management and production planning activities.

Climate services can contribute to ensuring security of supply

The increasing integration of renewable energy into the power mix is also leading to increased weather-related risks for grid operators, which at all times must maintain grid stability and ensure that sufficient levels of generation capacity are available to meet demand.

Electricity demand is also weather-dependent, and tends to increase both when it gets so cold that people turn on their electric heaters to stay warm and when it gets so hot that they switch on their air-conditioners to cool down.

Subseasonal and seasonal forecasts can help grid operators anticipate likely changes in both power demand and the production of electricity from renewable sources over the coming weeks and months. Such forecasts can thus play an important role in maintaining grid stability and preventing blackouts amid the growth of weather-dependent renewable energy.

THE S2S4E PROJECT CALLS FOR MORE POLICY SUPPORT FOR SUBSEASONAL AND SEASONAL FORECASTS

With a rising share of renewable energy in Europe's electricity supply, there is a need for new policies that reduce the risks involved in weather-dependent energy production and to mitigate the risks posed to security of supply by the growth of clean energy.

Subseasonal and seasonal forecasts have the potential to help increase security of electricity supply and better manage weather-related risks amid the growth of weather-dependent renewable energy. They can therefore help speed up the transition to renewable energy and contribute to reducing greenhouse gas emissions from the power sector.

Currently, however, there are few policy measures specifically designed to influence the use of subseasonal and seasonal forecasts at EU or national level, and such forecasts remain underused.

To increase the use of subseasonal and seasonal forecasts and improve the quality of such forecasts, **we propose the following six measures:**

The Copernicus Climate Change Service should make sub-seasonal forecasts easily accessible to everyone in its Climate Data Store

The Climate Data Store from the Copernicus Climate Change Service is the European initiative to provide a single point of access to a wide range of quality-assured climate datasets distributed online. The Climate Data Store already provides free access to seasonal forecasts, reanalysis, and observations. Sub-seasonal forecasts, however, are not available in this portal. To increase the use of sub-seasonal and seasonal forecasts it is necessary to ensure that both types of forecasts are easily accessible for everyone at the same time in operational real-time, ensuring a level playing field for all energy stakeholders. To encourage further work to improve these forecasts, sub-seasonal forecasts should be considered in the roadmap for inclusion of new datasets in the Climate Data Store. Furthermore, climate services providers should be encouraged to develop services that enable interested actors to integrate information from sub-seasonal and seasonal forecasts into their own existing decision-making structures.

Security of supply measures should promote the use of sub-seasonal and seasonal forecasts

Sub-seasonal and seasonal forecasts can support the adaptation of the energy system to the increasing share of renewable energy. All measures dedicated to guaranteeing security of electricity supply should therefore take such forecasts into account, or at least assess their potential inclusion. This means, for example, that the methodology the European network of transmission system operators (ENTSO-E) uses to conduct its seasonal adequacy assessments should be updated so that it recommends the use sub-seasonal and seasonal forecasts for assessments for time spans that are shorter than six months, such as month-ahead assessments. This methodology – adopted in March 2020 following the introduction of the EU's Risk Preparedness Regulation 2019/941 – currently only requires the use of weather forecasts, which typically only cover time spans for up to ten days ahead. A dialogue between transmission system operators (either individually or within the framework of ENSTO-E) and climate services providers should be encouraged, to ensure that the potential of sub-seasonal and seasonal forecasts to fulfil the requirements of such regulation is assessed. Further dialogue could also engage national gas transmission system operators within the framework of the European Network of Transmission System Operators for Gas (ENTSO-G).

Research into sub-seasonal and seasonal forecast systems should continue to increase their skill

Climate predictions – including both sub-seasonal and seasonal forecasts – have witnessed considerable technical improvements in the last decades demonstrating that probabilistic forecasting can inform better decision-making at some temporal scales and regions. However, despite these enhancements, further research is needed to improve the skill and reliability of these forecasts and advance the understanding of the sub-seasonal and seasonal timescales with special emphasis on high-impact weather events. Specific research priorities that need further effort include, but are not limited to: understanding systematic errors and biases, testing and evaluating multi-model combinations of sub-seasonal and seasonal forecasts and quantifying their uncertainty, identifying sources of predictability at different time scales and their impacts on weather variables, extreme events predictability and spread/skill relationship.

Promote the development of services consistent across all temporal scales

The S2S4E Decision Support Tool has demonstrated how it is possible to provide two different timescales while making transparent to its users the differences and challenges of presenting data in the same service from two different systems and models. This effort has focused on two timescales, but the energy sector also makes extensive use of shorter-range weather forecasts and longer-range climate projections. Future research and innovation actions should push the technical development of methods and services that bring together all relevant temporal scales from weather forecasts up to projections with a focus on the provision of indices and tailored products consistent across temporal and spatial scales. While sub-seasonal predictions have seen a major development in the last years, predictions on annual, multi-annual and decadal timescales need further research and the creation of an active research community to bring such predictions to operational climate services. Future research lines on decadal timescales should be fostered to mature the systems enough for decadal timescales to bridge the gap between climate predictions and climate projections as sub-seasonal forecasts do regarding weather forecasts.

Foster the integration of operational sub-seasonal and seasonal forecasts into quantitative models relevant to sectoral impacts and decision-making

Sub-seasonal and seasonal forecasts clearly have the potential to help companies invested in renewable energy improve their risk management, and the lessons learnt in the S2S4E project are a major step in understanding the challenges of the operationalisation of climate services for energy based on such forecasts. Barriers to uptake remain, however, particularly in the "last mile" of climate service provision - i.e., the creation of actionable information from raw climate forecasts. Further research on the integration of sub-seasonal and seasonal forecasts into quantitative energy-system models and quantitative decision-making is required to overcome this, supported by robust economic analysis of its value to specific users or sectors. This research should, for example, seek to identify and quantitatively express not only the behaviour of the energy system in response to the weather, but also the actions and risk-preferences of decision-makers responding to the resulting forecast. The development of operational demonstrators (and the underpinning research required to enable them) should therefore continue to be promoted in EU innovation and research actions to detect and overcome these "last mile" obstacles that hinder the adoption of sub-seasonal and seasonal forecasting technologies. Such research and innovation would also serve to strengthen the operational use of the Climate Data Store by the Copernicus Climate Change Service, spurring greater use of climate data in a wide range of sectoral applications, both by public and private sector service providers.

Need for more research to better understand the needs and decision-making processes of potential users of climate services

More research is needed to better understand the needs of the energy industry and other potential users of climate services. Future EU research policy on climate services should therefore focus more attention to the "demand side" of climate services, and particularly on understanding the extent to which the decisions faced can map onto the quantitative use of meteorological forecast information (e.g., risk tolerances and preferences). This could help uncover the barriers to the potential users' uptake of sub-seasonal and seasonal forecasts and could thus lead to increased use of such forecasts. Currently, the apparent benefits of using information from sub-seasonal and seasonal forecasts are not fully realised among potential users. While the attention among those who provide the forecasts tends to focus on improving their skill, users also benefit from knowledge-based insights about uncertainties related to the decisions they take.
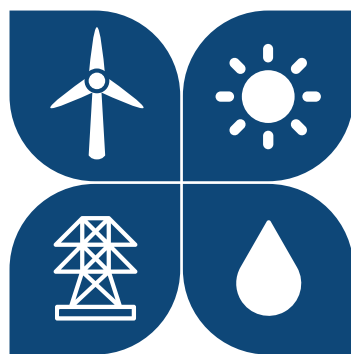
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This policy brief summarises insights from the S2S4E white report. Please read the S2S4E white report for more information about existing policy support in Europe for the use of subseasonal and seasonal forecasts, the S2S4E project and its research on subseasonal and seasonal forecasts, and about how the energy industry can benefit from increasing its use of such forecasts.

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