

## Virtual Workshop

### Flexibility in integrated energy systems

How will a decarbonized energy system balance supply-demand operation to reach at least 60-70% of renewable energy sources (i.e., solar and wind) by 2050? Flexibility will be at the centre to integrate renewables, support efficient system operations, and ensure security of supply. However, incentivizing and raising flexibility touches upon multiple technological and structural challenges (e.g. market and regulatory). To this end, the objective of the workshop is to discuss:

- How to characterize flexibility (and what services)? From demand-to-supply side options.
- What market designs will provide the right investment signals to guarantee a business case (long term perspective) for flexibility providers (from aggregators to gas power plants)?
- What new technological developments (e.g. electricity storage or hydrogen) will deliver short-term flexibility?
- Which digitization tools or setups are needed for unlocking the flexibility needed for the low-carbon society? Are smart grids still a thing in providing meaningful flexibility?
- Is the current regulatory framework setup (tariffs, energy taxes, sector coupling, etc.) incentivizing or blocking the use of flexibility?

**Speakers and panel discussants:** Confirmed international speakers (see next page) will present and discuss up-to-date research and challenges on flexibility in integrated energy systems.

**Workshop Organized** by Pedro Crespo del Granado (NTNU), Mark O'Malley (NREL), Henrik Madsen (DTU) and Asgeir Tomasgard (NTNU)

**Workshop format:** The workshop will be entirely online and follow webinar style format. The **registered participants** ([by invitation only](#)) will receive an invitation link the day prior to the workshop in order to login to the webinar telco tool. For inquiries or further details contact: [pedro@ntnu.no](mailto:pedro@ntnu.no)

**Date and time:** Thursday March 26<sup>th</sup> 2020, from 9:45am to 14:30pm.

## Programme:

The workshop covers multiple aspects of Flexibility in Integrated Energy Systems. Three main sessions will be part of the workshop, which is as follows in the program:

09:45 – 09:55	<p>Welcome Virtual Coffee</p> <ul style="list-style-type: none"> <li>- Asgeir Tomasgard (NTNU) and Pedro Crespo del Granado (NTNU)</li> </ul>
09:55 – 10:55	<p><b>Part I: Flexibility characterization, value, use cases and enablers</b>  <b>Chair: Asgeir Tomasgard</b></p> <ul style="list-style-type: none"> <li>- <i>The multiple dimensions of Flexible Electricity in Power and Energy Markets, <b>Asgeir Tomasgard (NTNU)</b></i></li> <li>- <i>Characterization and use of flexibility for the future smart and integrated energy systems, <b>Henrik Madsen (DTU)</b></i></li> <li>- <i>New power tariffs in Norway – impact on peak load for households, <b>Karen Lindberg (SINTEF)</b></i></li> </ul> <p><b>Panel discussion:</b> Goran Strbac (Imperial), Asgeir Tomasgard (NTNU), Henrik Madsen (DTU), Karen Lindberg (SINTEF)</p>
10:55 – 11:05	Stretch your legs break
11:05 – 12:15	<p><b>Part II: Energy systems integration, key flexibility technologies and industry perspective</b>  <b>Chair: Henrik Madsen</b></p> <ul style="list-style-type: none"> <li>- <i>How can we utilize hydrogen technology to increase the value of renewable energy?, <b>Vibeke Nørstebø (SINTEF)</b></i></li> <li>- <i>Tales from a utility software vendor: How the Energy Transition impact requirements for our products, <b>Christian Skar (Powel)</b>,</i></li> <li>- <i>Planning energy systems while considering high operational detail <b>Juha Kiviluoma (VTT)</b></i></li> </ul> <p><b>Panel discussion:</b> Henrik Madsen (DTU), Vibeke Nørstebø (SINTEF), Christian Skar (Powel) and Juha Kiviluoma (VTT)</p>
12:15 – 13:00	Lunch break
13:00 – 14:15	<p><b>Part III: Market design, regulation and barriers.</b>  <b>Chair: Mark O'Malley</b></p> <ul style="list-style-type: none"> <li>- <i>Physical and institutional barriers to flexibility, <b>Mark O'Malley (NREL)</b></i></li> <li>- <i>Integrated Approaches for TSO-DSO coordination, <b>Gerard Doorman (Stattnet)</b></i></li> <li>- <i>Market design for energy and flexibility services in low carbon systems, <b>Goran Strbac (Imperial)</b></i></li> <li>- <i>Optimality Conditions and Cost Recovery in Electricity Markets with Variable Renewable Energy and Energy Storage, <b>Magnus Korpås (NTNU)</b>.</i></li> </ul> <p><b>Panel discussion:</b> Mark O'Malley (NREL), Goran Strbac (Imperial), Gerard Doorman (Stattnet), and Magnus Korpås (NTNU).</p>
14:15 – 14:30	<b>Conclusions and wrap up, Dr. Pedro Crespo del Granado</b>