**Next Generation Challenges in Energy and Climate Modelling Workshop 2022**


**Thursday 15th September 2022: Plenary session**
*Abstracts and Biographies of Invited Plenary Speakers*


**Friday 16th September 2022: Breakout groups**
*Invited Speakers and Titles*

**Thursday 1320, plenary talk**

**The science of weather & climate: predictions & projections**
*Marisol Osman, Karlsruhe Institute of Technology*

*Abstract*
Weather prediction has improved significantly over the past 40 years, associated with advances in the numerical models developed to generate the forecasts as well as the initial conditions used to produce those forecasts. This progress in weather time scales has also pushed the demand for skilful forecasts that go beyond the weather forecasts. Forecasts for these time scales are very relevant for socio-economic sectors in which climate-related phenomena pose a continuous threat on their activities, such as agriculture, energy and water management, among others. However, unlike weather forecasts, for longer lead times some flow configurations can be more skilful than others (so-called "windows of opportunity"). In this talk, we will discuss some advances in the identification of these windows of opportunity and how we can exploit their potential to find value in forecasts previously regarded as not meaningful.

*Biography*
**Dr Marisol Osman** is a postdoctoral researcher working at Karlsruhe Institute of Technology. Coming from a town of farmers, she was always interested in how climate variability affects agricultural activity. During her Diploma and PhD, which she completed in Buenos Aires, Argentina, she worked on climate predictability and prediction on seasonal timescales over the Southern Hemisphere and South America. During her postdoc, she developed a probabilistic seasonal forecasting system for South America that is now used by the Argentinian Weather Service. As a researcher, she worked on interdisciplinary projects with anthropologists, economists as well as farmers to co-design and co-produce forecasting tools for the agricultural sector on subseasonal and seasonal timescales. Now at KIT she studies the predictability of different variables relevant for the energy sector on weather and subseasonal timescales.

**Energy system flexibility: considering daily, seasonal, and inter-annual weather variability**
*Jacqueline A. Dowling, Caltech and Tyler Ruggles, Carnegie Science*

*Abstract*
Our electricity systems are becoming more closely tied to the oscillations and variability in the climate and weather patterns because of increasing levels of wind and solar generation. Properly representing this variability and the potential impacts of infrequent and severe weather events, such as heat waves, cold snaps, and large-scale wind lulls, will be critical to designing and maintaining reliable and resilient power systems. In this presentation we will discuss the challenges of incorporating multiple decades of weather data into electricity system models and the benefits of using long data records. We use these data to study emerging technologies that increase system flexibility, such as low-cost energy storage and flexible electricity loads (e.g., electric vehicles), that could possibly change both the power supply and electricity demand landscapes. These emerging technologies could act to better align available power supply with electricity demands in spite of the daily, seasonal, and inter-annual variability of the climate and weather and could ease our transition toward low- or zero-carbon emission power systems.

*Biographies*
**Jacqueline A. Dowling (Jackie)** is a doctoral candidate in chemistry at the California Institute of Technology with a minor in environmental science and engineering. Her Ph.D. research focuses on energy storage from both a systems and technical perspective. She works with macro-scale models to understand the roles of energy storage in low-carbon electricity systems. In the lab, she develops catalysts to improve electrolytic hydrogen production. Her advisor is Caltech chemistry professor Nathan S. Lewis, and they collaborate closely with Ken Caldeira at Carnegie Science. (Research website: jadowling.com).

**Tyler Ruggles** is an ex-particle physics turned energy systems modeler. His work focuses on understanding the dynamics and tradeoffs between different low-carbon emitting technologies, especially green hydrogen, in future energy systems. His studies emphasize resource variability over decadal time scales and seek to understand what this variability could mean for system planning and grid reliability. Tyler currently works as a Senior System Modeling Engineer at LIFTE H2 in Boston, USA.

**Informing energy policies with climate seasonal information**
*Matteo De Felice, Joint Research Centre of the European Commission*

*Abstract*
Seasonal climate forecasts have proved to be useful to the energy sector but how can we use them better to support policy makers? This presentation will briefly discuss the potential and barriers in informing the EU energy policies with seasonal climate information.

*Biography*
Matteo De Felice is a Scientific Officer at the Joint Research Centre (JRC) of the European Commission. He is part of the "Knowledge for the Energy Union" unit in the Energy, Transport and Climate Directorate (Directorate C). His activity is focused on the modelling of European power systems and on the interactions between weather/climate and energy systems.

**Towards a future-proof climate database for European energy system studies**
*Laurent Dubus (RTE France) and Laurens Stoop (Utrecht University, Tennet and KNMI)*

The Pan-European Climate Database (PECD) is the reference dataset used at ENTSO-E and its members for different studies at time horizons from a few months to a few decades. So far, the different versions of the PECD have used reanalysis data. However, scientific evidence suggests, and recent European regulation requires, that power system adequacy studies should take climate change into account when estimating the future potential of variable renewable resources, such as wind, solar and hydro, and the impact of temperature on electricity demand. This talk will present the ongoing work that aims to provide a significant upgrade to the PECD, that will include climate projections from multiple models and different greenhouse gases emissions scenarios from the international community.

*Biographies*
**Laurent Dubus** is a senior scientist for weather and climate applications with RTE, the French Transmission System Operator. He is working on long-term power system prospective, resilience to climate change and short-term forecasts. His activities are dedicated to improving the effective integration of high-quality weather and climate information into energy sector planning, risk management and operational activities, to facilitate the energy transition towards net zero emissions targets.  He has skills and experience in climate system modelling, weather and climate forecasts, power systems management and climate services design and development.  He is also a co-founder and non-executive Director of the World Energy & Meteorology Council.  He holds an engineering degree in Marine Environment and a PhD in Physical Oceanography.
https://www.linkedin.com/in/laurent-dubus
https://www.researchgate.net/profile/Laurent_Dubus

**Laurens P. Stoop** is a PhD researcher within the Algorithmic Computing and Data mining for Climate integrated Energy System Models (ACDC-ESM) project. He is working on the integration of large climate databases into energy system models, with the goal to find critical events for highly renewable energy systems.   The ACDC-ESM project is a cooperation between the departments of 'Information and Computing Sciences' and 'Energy & Resources' at Utrecht University, the Dutch transimission system operator (TenneT TSO B.V.) and the Royal Meteorological Institure of the Netherlands (KNMI).   He has skills and experience in climate impact modelling, algorithmic data analysis of weather and climate data, extreme event assesment and in connecting energy and climate scientists. He holds an master's degree in Climate Physics and is working on finalizing his PhD on the interface of computing, climate and energy science.
https://www.linkedin.com/in/laurens-stoop/
https://www.uu.nl/staff/LPStoop

**Thursday 1435, invited panelists**


**Laura Fischer**
Laura Fischer is a Technical Leader Leader at the Electric Power Research Institute (EPRI). At EPRI, Ms. Fischer leads research on climate impacts and resiliency in the context of the electric power sector. She is the lead for Physical Climate Data and Guidance in EPRI's Climate Resilience and Adaptation Initiative (READi) and serves as an Author for the Adaptation chapter and Technical Contributor for the Energy chapter of the Fifth National Climate Assessment. She manages EPRI's Exploring Climate Impacts in Utility Operations and Planning Interest Group, a multi-company collaborative forum for sharing leading practices on identifying and assessing physical climate risk to the power sector.

Ms. Fischer holds a Master of Science with Distinction in Environmental Change and Management from the University of Oxford and a Bachelor of Arts in Government from Georgetown University. Her dissertation at Oxford explored the relevance of extreme weather event attribution to long-term planning for disaster risk reduction.


**Justin Sharp**
Dr. Sharp is the principal and owner of Sharply Focused LLC, a consultancy specializing in the intersection of atmospheric sciences and the electric utility sector. Justin began work in the utility business in 2004 and shortly afterwards joined the rapidly growing renewable energy developer and operator, PPM Energy (now Avangrid). There he built and directed Avangrid's renewable energy meteorology forecasting and operational analysis function from the ground up including: the first 24/7 wind energy forecasting group for operations and trading; analysis support for Avangrid's portfolio of operational wind farms; technical and policy support for rate cases and other regulatory arenas; and liaison with research labs and academia. Dr. Sharp founded Sharply Focused in 20112 with the objective of helping clients utilize weather and climate intelligence in the utility sector. His work includes research with labs and DOE; technical reports and research with entities like EPRI; legal, technical, and policy help for entities like GridLab ESIG, and the Energy Foundation; strategic support for utilities and energy meteorology companies; and training for system operators.

Dr. Sharp holds a Ph.D. from the University of Washington. His dissertation used Numerical Weather Prediction to understanding Columbia Gorge gap flow, a location that is now home to several gigawatts of wind capacity. Justin was a recent chair of the American Meteorological Society (AMS) Renewable Energy Committee and is an active member of the AMS and the Energy Systems Integration Group.

**Friday – Invited speakers at breakout groups (names and titles)**

**1 - Modelling infrastructure damage in current and future energy systems**
- Sean Wilkinson (Newcastle University): *Ensuring future climate resilience in electricity distribution networks*

- Sebastian Barlagan (TenneT): *Managing the impact of extreme weather events*

- Delavane Diaz (Energy Systems & Climate Analysis, Electric Power Research Institute (EPRI)): *Integrating Climate Change Understanding and Data to Build Energy System Resilience Research*

**2 - Planning for black and green swans: storylines for managing rapid transformations in climate & energy**
- Johannes Schmidt (University of Natural Resources and Life Sciences, Vienna (BOKU): *The Texas rolling blackouts: a black swan or a market failure?*

- Jakob Zscheischler (Helmholtz Centre for Environmental Research GmbH): *Compound weather and climate events and their relevance for future energy provision*

**3 - Forecasting and predictability: planning and managing variable renewables**
- Francesco Lombardi (TU Delft): *Perfect foresight and typical weather: too good to be meaningful?*

- Andrea Manrique Suñen, PhD. (EDP Renewables): *From weather forecasts to climate predictions, how far can we predict the weather?*

**4 - Energy models for all - open access to knowledge & tools for energy and climate modelling**
- Ekaterina Fedotova: *PyPSA meets Earth: energy modelling made global*