Climate Variations, Fluctuations and Extremes impacts on future energy systems

IEA-ETSAP Seminar with ISIMIP - & CLIM2Power

Hosted by the Center on Global Energy Policy at Columbia University

Registration page:
https://columbiauniversity.zoom.us/webinar/register/WN_uoNBc-s6Q2qR-bXumSXG_g

Date: 21st of May 2021
Time: 10:30 – 13:00 Central European Time (CET – Brussels, Paris).

Event Description:
Climate change is impacting our environment and beginning to impact our lives with seasonal regularity. This last winter we have seen climate fluctuations impacting on the Texas Power grid security and stability. Previous summers we have experienced the impacts of the lack of cooling water to regulate nuclear and thermal power plants in europe during summer seasonal heat waves. This seminar explores the state of the art in energy system modelling to including future climate variability, fluctuations and extreme impacts in infrastructure planning. This research incorporates physical earth science understanding of future climate dynamics into engineering energy systems models to understand the long term climate impacts in net zero energy system planning for the future.

Moderator: Dr Anna Krook-Riekkola, Associate Professor, Luleå University of Technology.

Presentation 1

Making TIMES models respond to climate variability – experience from the Clim2power project

Presenter(s) **Patrícia Fortes[b], Edi Assoumou[c]**
Authors: Sofia G. Simoes[a], Patrícia Fortes[b], Edi Assoumou[c]
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ABSTRACT:
In the Clim2power project we have included long term climate projections and seasonal forecasts into TIMES power system models applied for the whole of EU and the Portuguese case-study. The objective was to assess what could be the effects in model results in terms of installed capacity, power generation and electricity storage among other. A new TIMES power sector model was developed for EU (eTIMES-EU) and adapted to Portugal to consider climate and weather effects in capacity factors for wind, solar and hydro power generation, as well as temperature impact on electricity demand for heating. Both models were run up to 2050 for 22 climate projections and for 60 seasonal forecasts (for the Portuguese case). We have managed to assess how climate affects the optimal operation of the power system and national/EU-wide RES and emissions target. The large climate data sets required some modifications in modelling approaches, although more improvements are still required to model sub-national climate variability.

Dr Patrícia Fortes

Patrícia Fortes is a researcher in the field of energy economics at the Center for Environmental and Sustainability Research (CENSE) of NOVA University (Lisbon). Her research explores the transition to low carbon energy systems, focusing on technological changes, energy-climate policies analysis, the feedbacks between the energy system and the macroeconomy and the design of socio-economic and emissions scenarios. More recently she has been working in the vulnerability and adaptation of energy systems to climate change, and the competition for water. She has almost 15 years of experience in energy system and computable general equilibrium modelling. She has worked in the Joint Research Center of Seville of the European Commission (2015) and cooperated in multiple national and international research projects on low carbon energy systems. She has also extensive experience in energy-climate policy support, having coordinated the Energy subject area of the Portuguese Carbon Neutrality Roadmap. She has a PhD in Environment.

Presentation 2

Investigating the Risk of Hurricane-Induced Cascading Failures in a Synthetic Power Grid for Texas

Presenter: **Julian Stürmer**
Masters Student
Nonlinear Dynamics in Complex Systems
Institute for theoretical physics, TU Berlin
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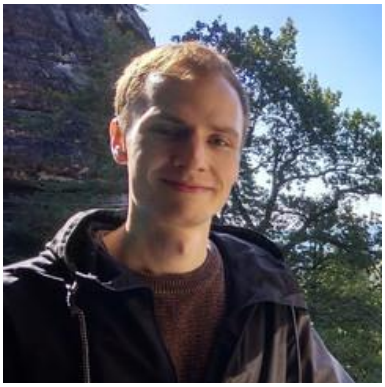
ABSTRACT
Coastal regions like the U.S. East Coast struggle almost annually with devastating tropical cyclones that destroy large parts of the power system infrastructure and can thereby cause major blackouts. This talk will present parts of our recent work, in which we study hurricane-induced cascading failures using historical storm data and a synthetic power grid data set for Texas. We model the fragility of overhead transmission lines with regard to wind-induced damage using a probabilistic approach and employ power flow analysis to calculate potential cascading failures. This allows us to study the statistics of power outages caused by different hurricane events.

Mr Julian Stuermer

Mr Julian Stuermer is a masters student in the nonlinear dynamics in complex systems group at the institute for theoretical physics in the technical university of Berlin. His research focuses on cascading failures in electricity grid infrastrcuture modelling.



Presentation 3

What are the Impacts of Weather Fluctuations and Extremes on (Future) Energy Systems? – Research Within the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP)

Presenter: **Christian Otto**
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Dr. Christian Otto
Group Lead Event-based Modeling of the Economic Impacts of Climate Change
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ABSTRACT
The inter-sectoral impact model intercomparison project (ISIMIP , www.isimip.org) offers a unique community-based framework for consistently modelling the impacts of climate change across affected sectors and spatial scales. So far the Energy Sector within ISIMIP has assessed the long-term changes of energy potentials and the resulting consequences for energy supply and demand under different climate change and socioeconomic scenarios. With the beginning of the third modelling round of ISIMIP in 2020, a new modelling track was established that focuses on the impacts of weather fluctuations and extreme weather events on energy systems. In this talk, I will give an overview of the ISIMIP project, discuss its basic concepts and how new impact modelling teams can join in. I will further detail on the climate and socioeconomic input-data provided by the ISIMIP team to the participating modelling teams and show how these data can be easily accessed via the new ISIMIP data portal.

Dr Christian Otto

Christian Otto leads the research group Event based modeling of the economic impact of climate change and is a sector coordinator for the energy sector in the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP). Together with his research group, he studies the socioeconomic impacts of extreme weather events such as tropical cyclones and fluvial floods at different timescales, ranging from direct (asset) losses over the spreading of indirect losses in the global supply network, to the long-term impacts of extreme weather events on economic development.

Presentation 4

How to incorporate climate variability and fluctuations from ISIMIP data into TIMES models

Presenter: James Glynn
@james_glynn (twitter) | linkedin.com/in/jamesglynn/

Dr James Glynn
Senior Research Scholar – Energy Systems Modelling
Center on Global Energy Policy
Columbia University

ABSTRACT
This approach explicitly models the hourly variations and fluctuating resource dynamics of wind, solar and hydro availability, integrated with the unit commitment (UC) constraints of dispatch fossil generation power plants all balanced with short term and long-term demand variations and fluctuations with capacity expansion. The approach captures integration with future projected climate change impacts upon energy resource potentials and operational constraints within the temporal and spatial ranges of variations, fluctuations and extreme climate impacts on the energy system.

The webinar section will provide guidance on how to explicitly incorporate future projections of climate fluctuations and extreme resource variations from the suit of climate models which underpin the ISMIP database. This method builds on previous webinar 6 on how to build high temporal and technical resolution within a TIMES model.

Dr James Glynn
James Glynn (PhD) is a Senior Research Scholar at the Center on Global Energy Policy at Columbia University. James is the Irish contact point for IEA_ETSAP and the Integrated Assessment Modelling Consortium (IAMC). James' research interests focus on the development and application of integrated energy systems models and their interactions with the climate, economy, and society to find resilient pathways to a future sustainable energy system. He is an expert developer and user of the TIMES source code.

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Discussion Panel with Presenters:

Discussion Panellist 1
Dr. Melissa C. Lott
Senior Research Scholar and the Director of Research
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Dr. Melissa C. Lott is a Senior Research Scholar and the Director of Research at the Center on Global Energy Policy, where she leads the Power Sector and Renewables Research Initiative. She has worked as an engineer and advisor for more than 15 years in the United States, Europe, and Asia. While her work has spanned the entire energy system, Dr. Lott is internationally recognized for her work in the electricity and transportation sectors. For her research and contributions to global energy sector dialogues, Dr. Lott has been featured as a Solar 100 Thought Leader, an IEEE Women in Power, and a Forbes 30 under 30 in Energy.
Dr. Lott specializes in technology and policy research, working to increase our understanding of the impacts of our energy systems on air pollution and public health. She directly applies this understanding to help decision-makers mobilize technology and policy solutions to support the transition to low-carbon energy systems. She has authored more than 350 scientific articles, columns, op-eds, journal publications, and reports. Dr. Lott was previously a founding author on Scientific American's Plugged In. An active public speaker, she has been featured in interviews with international news organizations including the BBC World Service, ABC News PM in Australia, and Scientific American magazine's French edition.

Discussion Panellist 2
Dr Sofia Simoes
sofia.simoes@lneg.pt
Resource Economics Unit – LNEG National Energy and Geology Laboratory Portugal
Head of Unit

Sofia is a researcher on energy systems focusing on low carbon energy systems and on energy transitions at European, national and urban scale. She has worked on climate services, competitiveness of hydrogen, electrification of the economy, materials and water use for low-carbon energy technologies, urban energy system transitions, as well as on the vulnerability and adaptation of energy systems to climate change. Within the last 15 years she has developed and used several energy systems models for research and policy support. The TIMES_PT model thay she developed is the basis of Portuguese climate change policies since 2008. She coordinated the ERA-NET CLIM2POWER project on climate change impacts on the European power sector and has cooperated in several EU and national research projects on energy-economy-environment modelling. Sofia worked as a researcher for the European Commission – Joint Research Centre with the JRC-EU-TIMES model. Since January 2020 she is the Head of the Resource Economics Unit at LNEG- National Energy and Geology Laboratory in Portugal. She has PhD from Leiden University, The Netherlands and a MSc from Lund University, Sweden.