

Abstracts of the EIROforum – NLDC online event

Three round-tables were organised with participation of EIROforum and NLDC experts:

1./ Approaches to Decarbonization

- *ESO Towards Sustainability: A Status Report*, Claudia Burger, Director of Administration, ESO
- *Achieving Net Zero Carbon Emissions Through the Lens of the National Laboratories*, Martin Keller, Director, National Renewable Energy Laboratory
- *A Sustainable Future for Particle Physics at CERN*, Sonja Kleiner, Head of Environmental Protection Group, CERN
- *Overview of the U.S. Department of Energy's Net Zero Laboratory Pilot*, John Wagner, Director, Idaho National Laboratory

2./ Carbon-neutral energy and climate change research and technology at Big Science facilities

- *Leveraging Light Sources in Energy and Climate Research: Cycles of Learning Meet Machine Learning*, Steve Kevan, ALS Director, Lawrence Berkeley National Laboratory
- *Exploring Molecular and Cellular Biodiversity to Mitigate Climate Change*, Detlev Arendt, EMBL
- *Earth System Modeling for Actionable Science*, Ruby Leung, E3SM Chief Scientist, Pacific Northwest National Laboratory
- *Observing Climate Change from Space*, Maurice Borgeaud, Head, Science, Applications, and Climate Department, ESA
- *Accelerating Climate and Clean Energy Innovation - Role of DOE Nanoscience Research Centers*, Jeff Nelson, Manager, Center for Integrated Nanotechnologies, Sandia National Laboratories
- *Energy Storage Research and Applications at Large-Scale Instruments*, Matteo Bianchini, Faculty of Biology, Chemistry and Geosciences Bavarian Centre for Battery Technology (BayBatt), University of Bayreuth

3./ Fostering public engagement on clean energy and climate change research

- *Climate Change and Decarbonization: Public Engagement and Industrial Action*, George Crabtree, JCESR Director, Argonne National Laboratory
- *Fostering Public Engagement on Clean Energy and Climate Change Research*, Karl Tischler, Head of Communication, EUROfusion

EIROforum

Detlev Arendt, EMBL

“Exploring molecular and cellular biodiversity to mitigate climate change”

Climate change and loss of biodiversity are causally linked, and their impact on world ecosystems can only be understood and addressed jointly via concerted efforts. With its new programme ‘Molecules to ecosystems’ the European Molecular Biology Laboratory expands into new areas including planetary biology, human ecosystems, infection biology, and microbial ecosystems, to monitor living systems and their response to anthropogenic change across the planet.

Prof. Dr. Matteo Bianchini, ILL user, Faculty of Biology, Chemistry and Geosciences Bavarian Centre for Battery Technology (BayBatt), University of Bayreuth

“Energy storage research and applications at large-scale instruments”

Li-ion batteries are energy storage devices that had a tremendous impact on our daily lives. After powering a portable revolution, putting a smartphone in everyone’s pocket, they have now begun to power the automotive revolution, one of the fundamental pillars of the energetic transition we need

to reduce CO₂ emissions. Large-scale instruments represent unique tools allowing scientists to understand how battery materials with the desired properties can be made, and how they function at the atomic scale. In this contribution, I will highlight how neutrons and synchrotron radiation can be used complementarily to boost battery research. I will focus on two applications, both related to time-resolved studies. Firstly, I will show how in situ x-ray diffraction can provide unique insights into the synthesis, or preparation, at high temperature of battery electrode materials, leading to its optimization. Secondly, I will demonstrate how the working mechanisms of electrode materials for Li-ion batteries can be understood by operando XRD, i.e. by investigating the structural evolution of the materials in real time during battery operation.

Dr. Maurice Borgeaud, ESA Earth Observation Programmes, Head, Science, Applications, and Climate Department

“Observing climate change from space”

Since 2008, ESA has launched a programme to observe the effects of climate change using satellite data. The so-called ESA Climate Change Initiative is now monitoring 23 Essential Climate Variables (ECV), defined by the UN GCOS (Global Climate Observing System). The use of satellite data is of prime importance to derive the ECV due to the global, accurate, and long-term characteristics. The presentation will describe the CCI activities, show examples of ECV's (e.g. sea level raise, glaciers) and look at the future of this programme.

Claudia Burger, ESO, Director of Administration

“ESO towards sustainability: A status report”

ESO recognizes environmental protection as an important and value-adding component of the Organisation's projects and operations. The presentation will give an overview on the results of an external audit of ESO's carbon footprint and the follow-up analysis of the main sources of emissions. An action plan is being developed with the objective to improve environmental sustainability and reduce ESO's carbon footprint in the medium term.

Sonja KLEINER, CERN, Head of the Environmental Protection Group

“A sustainable future for particle physics at CERN”

Over the last five years, CERN has strengthened its longstanding commitment to minimise its impact on the environment. The Organization has fixed ambitious environmental objectives linked to climate change and other environmental domains, and initiated actions targeting both its scientific facilities, for example the Large Hadron Collider and its experiments, and its site and conventional facilities. The Organization will shortly be releasing its second Environment Report. This talk will outline CERN's environmental strategy and initiatives, discuss key figures of greenhouse gas emissions and the actions taken to reduce these emissions, and highlight the future plans of the Organization to address environmental challenges.

Karl Tischler, EUROfusion, Head of Communication

“Fostering public engagement on clean energy and climate change research”

How EUROfusion is fostering public engagement through its new exhibition: Fusion, Power to the People, with focus on the following topics: BREAKING THE MOLD – the exhibition has been designed to reach the non-attentive public, DEMOCRATIZING CONTENT – each visitor collects, connects and keeps all the content; DIALOGUE – the exhibition is just the start of the discussion about developing fusion energy; EMBRACING CONTROVERSY – to build a long term engagement with each visitor, we openly examine the scientific controversy surrounding fusion; DATA & ADAPATION – by learning how our visitors learn, we can adapt content quickly to geographic and demographic variables; FULL AGENCY – knowledge acquisition is determined by each visitor, not the venue.

NLDC

George Crabtree, Argonne National Laboratory and University of Illinois at Chicago

"Climate Change and Decarbonization: Public Engagement and Industrial Action"

Climate change is a unique world-wide threat following an uncertain trajectory, demanding an immediate response, international coordination, new decarbonization technology and with significantly unequal impact across wealth, ethnic and locational boundaries. The status and outlook for motivating public engagement and industrial action will be discussed.

Martin Keller, National Renewable Energy Laboratory (NREL), Laboratory Director

"Achieving Net-Zero Carbon Emissions Through the Lens of the National Laboratories"

Our planet needs us. More than it ever has before. Climate change, energy inequality, and environmental justice, these are just some of the challenges that face our nation as we work to transform energy and accelerate toward a clean energy transition. The Department of Energy's 17 national laboratories are playing a leading role in this transition to transform our energy systems and our future to realize an energy sector that is free of carbon emissions. This will depend on significant achievements in technology research and development, deployment, and advanced approaches-and the national laboratories are leveraging their unique lens to lead the way.

Steve Kevan, Lawrence Berkeley National Laboratory

"Leveraging Light Sources in Energy and Climate Research: Cycles of Learning Meet Machine Learning"

X-ray light sources around the world provide an ever-expanding suite of capabilities that have become essential to diverse areas of basic, applied, and industrial research. Nowhere is this breadth and impact more apparent than macromolecular crystallography, which now plays a key role in the development cycle of virtually every new pharmaceutical. I will discuss some of the ingredients for success in this and other areas, and how these ingredients might help leverage light source capabilities to make progress in climate and energy sciences.

L. Ruby Leung, Pacific Northwest National Laboratory

"Earth System Modeling For Actionable Science"

The impacts of climate change are felt most strongly through changes in extreme weather events that cause damage to infrastructure and the built environments and challenge the management of natural resources. To support mitigation and adaptation planning, storm-resolving Earth system modelling is needed to provide actionable information. I will discuss an ongoing effort to develop such a capability, highlighting the computational challenges and recent successes in building the foundation for taking advantage of exascale computers for Earth system modelling.

Dr. Jeffrey S. Nelson, Sandia National Laboratories, Center for Integrated Nanotechnologies, Director

"Accelerating Climate and Clean Energy Innovation- Role of the DOE Nanoscale Science Research Centers"

The five Department of Energy Nanoscale Science Research Center (NSRC) user facilities host more than 3500 US and international researchers each year. The NSRCs provide world-leading capabilities to create, characterize, and understand nanostructured materials, and a collaborative research environment where scientist and engineers advance nanoscale science. This presentation will highlight recent advances and the important role the NSRCs play to accelerate climate and clean energy innovation.

Dr. John Wagner, Idaho National Laboratory, Director

“Overview of the U.S. Department of Energy’s Net Zero National Laboratory Pilot”

On March 31, U.S. Department of Energy Secretary Jennifer Granholm challenged the national laboratory complex to build more sustainability into their operations and to significantly reduce carbon emissions. This talk discusses how four national laboratories – INL, NETL, NREL and PNNL, in coordination with DOE and the other national labs, will be demonstrating pathways to a net-zero carbon emissions future.