EERA Joint Programme on Digitalisation for Energy (DfE)

FACTSHEET

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Why a Joint Programme on Digitalisation for Energy (DfE)?

EERA has revised its Mission into "catalysing European energy research to achieve a climate neutral society by 2050". Also, a Clean Energy Transition should provide enough flexibility to accommodate the evolution of requirements over the coming years, and recognise the evolution of boundaries from other initiatives and programmes. EERA, therefore, proposes to define the Strategic Research and Innovation Agenda at the level of the "Challenge Driven Transition Initiatives" that will embed this level of flexibility, while ensuring that the nature of the societal challenge and its targeted impacts are met. In this context, digitalization is identified as one of the technologies and initiatives that will enable this challenge-driven transition. Even more, digitalization should be perceived as an opportunity and an 'enabler' that will connect Energy technologies in a cross-cutting and holistic fashion.

Advanced digitalization can be enhanced by changing the way in which research is being done providing new results, impact, revenue, and value-producing opportunities, a fact that will have a positive impact in EERA's community practices. Under this scenario, it is a clear asset to count on a JP capitalizing the related EERA interests and priorities in order to improve the value chain in the energy sector carrying out specific research on the targeted topics, provide an important reference point for the EU research agenda, and ensure a better coordination with ongoing and future initiatives coming from the IT world.

JP Digitalisation for Energy – vision and objectives

In order to maximize the impact of digitalization as a cross-cutting activity within EERA, this new Joint Programme (JP) is conceived as a transversal (tJP) structure, constituting a new concept that could be later addressed by new initiatives, if the opportunity arises. The transversal Joint Programme Digitalisation for Energy (tJP DfE) aims at defining key priorities for DfE that will derive in research activities as well as to act as a contact point with major European initiatives on supercomputing, big data, artificial intelligence, open science, etc. it will also tackle the European Digital Strategy, which is strongly pushing these IT services. The tJP DfE is launched with a modular structure, i.e. profiting from ongoing EERA initiatives by keeping and integrating their structure as Subprogrammes (SPs) into the new tJP and also kicking-off specific SPs tJP focused on digital activities, in a transparent and agnostic way. By doing so, in the future it will be straightforward to integrate new SPs and initiatives coming from either vertical JPs, as they also evolve in time, or coming from the tJP itself.

Some of the strengths that would rise from the launch of this tJP and produce the pursued R&D investment are summarized below:

- Reinforcement of the EERA position in Europe in topics related to DfE
- Performing of cross-cutting research activities that can be only achieved by close collaboration of scientists and researchers from the energy and digitalization sectors
- Internal coordination and integration of EERA JPs' interests related to DfE, avoiding duplicated efforts and profiting from lessons learnt (some of the solutions are usually of application to several domains)
- Coordination and collaboration with external initiatives focused on developing digitalization activities in order to put the energy sector on board as 'major use case'
- Collaboration with the HEU managerial structure for advocacy related to joint energy– digitalization interests to be included in future work programmes
- Stronger liaison with industry on digitalization, acting as a first point of contact
- Networking during events focussing on the use of digital technologies in support of CET.

More information

https://www.eera-set.eu/

JP Digitalisation for Energy sub-programmes

Sub-programme 1: High Performance Computing (HPC)

Coordinated by Edouard Audit (CEA)

It is becoming increasingly apparent that the future of the energy ecosystem will heavily rely on digitization to drive essential innovations in production and storage technologies, mitigate power source variability, and manage its distribution via a complex hierarchy of micro- and macro-networks. One of the main parts in which this digitalization can be achieved is by linking together, through a multi-disciplinary platform of high-performance computing (HPC) and numerical mathematics, a network of experts in computational and energy sciences. The drive towards exascale computing over the next 5 years will enable significant step changes in the predictability and management of renewables as their share of the energy mix increases towards 100% over the coming decades.

Sub-programme 2: Data Science & Artificial Intelligence

Coordinated by Volker Hoffmann (SINTEF)

With the advancement of digitalization in all areas of energy research, large amounts of data are generated every day offering new and innovative ways to optimize energy supply and demand and to steer the transition to a more sustainable energy system. Artificial intelligence tools and algorithms offer a unique possibility to support the analysis of the data and automatize many processes. However, the lack of standards for data storage, processing, and quality is severely limiting these options. Also, the decarbonisation of the economy through the development of sustainable energy systems requires the integration of interdisciplinary and complex data. This means that it is not sufficient to only account for physical and technical attributes, but also for socio-economic and environmental ones.

ESI transversal Sub-programme: Technology

Coordinated by Peter Breuhaus (NORCER)

Energy systems have evolved over decades from individual energy devices and small sub systems into a complex set of systems, both physical, institutional, and at all scales. The energy system is indeed so wide that it can be defined as "the whole set of technologies, physical infrastructure, actors, institutions, policies and practices, located in and associated with a geographical area, which enable energy services to be delivered to consumers". The interactions are driven by a desire to improve performance, increase efficiency, and are enabled by ubiquitous cheap data and control infrastructure and political and economic cohesion (e.g. European Union). The SP is devoted to model, simulate, and operate integrated energy systems.

AMPEA transversal Sub-programme: Multiscale modelling of materials, processes and devices

Coordinated by David Lacroix (Lorraine University)

The goal of this SP is to coordinate a concerted effort to identify current challenges and forthcoming trends in multiscale modelling and simulation. This effort is critically important in advancing materials, processes and devices for energy applications, while ensuring sustainable production route and fostering circular economy: firstly, innovative energy materials are often complex structures or "high technology" products (multi-functional), which cannot be described by basic models; secondly, the formation and application of such structures are very much dependent on conditions of processing and utilisation; and thirdly, the integration of such materials in devices is intricate and thus requires careful design and optimisation.

Hydropower transversal Sub-programme: Digitalization

Coordinated by Eduard Doujak (TU Wein)

The scope of this tSP is to find solutions and answers related to digitalization of business processes in hydropower. The SP may cover the whole value chain including planning, building and renewal, maintenance and asset management, production planning, marked analysis and environmental monitoring. Digitalization provides new opportunities in many sectors, and hydropower is no exception. The overall aim is to reduce costs and increase the income for the entire lifespan of hydropower assets. This is done by optimizing business operation with improved business processes and models. Digitalization goes beyond automatization, digitization (converting analogue to digital data) and using digital tools. Thus, digitalization will change the way how a utility runs the business.

Nuclear Materials transversal Sub-programme: Physical modelling, materials health monitoring and non-destructive microstructure examination for nuclear materials

Coordinated by Marjorie Bertolus (CEA)

The performance of nuclear materials used in structural components is essential for the development of sustainable nuclear energy. Materials in fast reactors that are part of the upcoming nuclear technologies will be exposed to higher temperatures and higher irradiation levels than today's light-water reactors. Fast reactors also use non-aqueous coolants, for which the full compatibility of materials still needs to be demonstrated. Physical modelling and advanced microstructure examination on the one hand and in-service inspection for nuclear power plants on the other hand are powerful tools to support safe and reliable operation. These topics are closely linked to the topics of the digitalization JP: HPC, big data, Artificial Intelligence.