

Committee on Energy

Written report for Executive Council (8 March 2022)

The Committee on Energy's objective is to be the Engineering reference for programs, strategies and policies aiming to move toward sustainable and resilient energy systems around the world. As energy is intimately linked to transitions in societies and economies, the Committee's considerations include the consequences of the Covid-19 pandemic.

MAIN THEMES COVERED IN THE PAST TWO YEARS:

For the past two years, due to the pandemic, the Committee on Energy has been meeting once a quarter by videoconference. In addition to these plenary meetings, the working groups dedicated to a theme or to the preparation of an event meet regularly.

Several Task Groups were created or re-launched two years ago: Solar Power, Energy Internet, Energy Storage, Hydrogen and Electrification. These groups provide the factual knowledge from which documents presenting more systemic approaches are developed. This is, for example, the case of the contribution "Developing Sustainable and Resilient Energy Systems" to the UNESCO report "Engineering for Sustainable Development", which highlights the contribution of different energy sources and technologies to progress towards SDGs.

The pandemic has not only disrupted the Committee's way of working, it has also put new risks and challenges at the top of the agenda. Rapid changes in stakeholder behaviour have led to major shifts in energy supply and demand and to a reconsideration of strategies and policies in a new context where engineering will play a major role. This is the motivation of the Symposium organized by the Committee on Energy on October 6 and 7, 2021: "Energy transition and Covid-19 crisis: the role of engineers".

Our societies demonstrated strong resistance and resilience. However, in addition to the challenges that existed before the pandemic to move towards sustainable energy systems, new challenges have emerged that must be addressed by a world impoverished and exhausted by the health crisis. More than ever, then, the notions of optimisation, resilience, and efficiency will form the cornerstone of the system we must rebuild – and that is the role of our engineers.

The Symposium has first focused on the feedback from this period: how resilient were the energy systems to the Covid-19 crisis. Then, a session was dedicated to think about a broader definition of energy system resilience, based on a new understanding of risks. Sessions discussing the evolution or disruption of energy demand and supply have shown the importance of social behaviour (both consumers and citizens) which is a key driver of the transformation of our societies beyond the Covid crisis itself. At the end of the symposium, a roundtable has given the opportunity to precise what could be the contribution of engineers in the world to come.

Many outputs have been made available, including the proceedings of the Symposium, freely accessible, which bring together in a coherent way all the interventions and discussions.

The Committee on Energy continues to work actively on other global issues. After the COP26 meeting, it was decided to think, from an engineer's point of view and in a very pragmatic way, about the technologies that could actually be used. A working group has been set up in this sense and should make recommendations on technologies that will enable us to move towards the necessary carbon neutrality.

UPDATE ON PROGRESS OF THE WORKING GROUPS

Electrification Abubakar Sambo

The Electrification Working Group noted that the areas of the world with less than 100% electricity access largely fall within the tropical region and of this it is sub-Saharan Africa that has the poorest electrification rate of about 43% while the world's figure is about 86%. The Working Group is attending to sub-Saharan Africa first before focusing on the rest of the world with inadequate electricity access. From a recent study, the key challenges hindering adequate and reliable electricity supply in sub-

Saharan Africa have been identified and the strategies for significant improvement are being worked out.

Hydrogen Jean Eudes Moncomble

The work on hydrogen began with a general reflection organized around the question of the development of the hydrogen vector: why, at what level, how and with what constraints. The next part of the work consists in detailing the value chain of decarbonized or low-carbon hydrogen and in examining in detail some links of this chain which deserve an in-depth reflection. Particular attention will be paid to technologies (contribution, maturity,...) and to the complete costs.

Energy storage Philip Pascall

The Task Group has held two Zoom meetings.

It is developing a concept of an energy storage matrix the purpose of which is to identify the needs for storage in different environments and the technologies that might be most applicable to the range of geographical and demographic situations. The intention is then to match the needs with the availability of energy storage resources that pertain across the globe.

The types of energy storage to be considered include 'electrical' (PSH, CAES, CO₂ cycle, etc), chemical (batteries of various types), gas (synthetic hydrocarbons, hydrogen, bio), and thermal mass. Synergies may be an important aspect of what forms of energy storage work best in different environments, so members will try to include these in their concept.

They will also try to give some broad indications of comparative costs and economics of energy storage alternatives.

Energy Internet Hongbin Sun

The WG on Energy Internet collaborated with Elsevier to carry out a comprehensive review on the progress of Energy Internet in the past ten years. The report presented the most exciting research progresses and real-world applications, which covers multi energy systems integration, cyber-physical systems, virtual power plant and so on. Also we described an overview on the activities related to Energy Internet, such as the funding of different countries, the collaboration map of different institutions and groups, and the most fruitful scholars, etc.

Solar energy Carsten Ahrens

There are at least four main topics the Solar Group will tackle.

1. Development of materials and the efficiency of cells and modules, the costs of manufacturing, the exploration of rare elements and the regions of production
2. For PV as one of the fastest-growing, most mature and cost-competitive renewable energy technology it is necessary to find and use the necessary applications, locations and surfaces to allocate solar PV-panels or films in the respective (integrated) building and rural places, and in off-grid locations
3. PV (big) installations are often placed in very remote regions with different weather and climate conditions, which brings up the question how to maintain the technical and surface qualities and efficiencies. It is also a question, where to use PV for production of green hydrogen.
4. Even today it has to be questioned what to do with the decommissioned PV panels. It is necessary to build raw material extraction processes and waste disposal, and to end with holding producers responsible for their products and packaging 'from cradle to cradle.'

In addition the "old" Study on Solar Energy should be updated.

COP27 Jorge Spitalnik

The objective is to prepare a text of engineers from the energy sector to contribute on the climate issue. People attending COP meetings are not exclusively engineers or scientists. They come from NGOs, Governments and Political Bodies. The document has to provide information they would understand. In this way, engineers' opinion will gain trust. It has to be a very didactic document.

A preliminary list of subjects to consider in such document will deal among others with: infrastructure changes due to migration to electricity usage; net zero carbon technologies and potential risks; electricity transmission constraints; baseload requirements; hydrogen economy; SDGs limitations; carbon capture and efficiency aspects.

KEY ACHIEVEMENTS, PUBLICATIONS, DECLARATIONS ETC.

Two key achievements are representative of the work of the Committee on Energy during the last two years:

- the contribution to the UNESCO report "Engineering for Sustainable Development" because it starts from the scientific and technical expertise to elaborate recommendations on the energy systems considered globally ;
- the Symposium "Energy transition & Covid-19 crisis: the role of engineers" which highlights the link between the sustainability and the resilience of energy systems; proceedings have been edited and circulated.

NEXT STEPS

The goal for the coming year is twofold:

- on the one hand, to conclude the work started in the various working groups with a short publication as a result;
- to organize a new international seminar on a theme to be discussed in the committee.

Jean Eudes Moncomble, chair
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