

Highlights of IAEE 2021 Online Conference's Main Sessions

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On 7-9 June 2021, the International Association for Energy Economics (IAEE) organised its first online conference, gathering almost 1000 attendees and 600 speakers in more than 150 sessions. It was a unique opportunity to understand what are the topics most debated in energy economics and get a comprehensive overview of what is the state of the art. The Florence School of Regulation (FSR) and its researchers closely followed the conference, providing the audience with comprehensive coverage of several sessions on Twitter. A [series of highlights](#) on each of the main sessions was published close to real time. In what follows, we reorganise these highlights into six short blocks.

Energy access

Despite recent progress, we are still far from achieving Sustainable Development Goal n. 7, i.e. to ensure access to affordable, reliable, sustainable and modern energy for all. In many parts of Africa, but also Asia and other continents, energy access cannot be taken for granted yet. Academic research on the topic is growing, but still much remains to be done. In particular, scholars must look at the implications of the local context and develop policy recommendations that take into account the significant heterogeneity in framework conditions characterising countries with energy access issues: no silver bullet exists. Contrary to the expectations of many, energy distribution looks like one of the most problematic elements of the supply chain and the one responsible for unsatisfactory progress in energy access in several places, as for instance India. Distribution requires large investments, but flawed regulation that does not ensure adequate cost recovery often hinders public and private initiatives. The result is unreliable energy supply even if sufficient generation capacity is available. Some scholars have recently proposed an integrated distribution framework that suggests the use of alternative strategies to ensure the distribution of energy, depending on the different local conditions (e.g., grid expansion vs mini-grids development). Applied research and experience from the field finally highlight the importance of adequately consider the political landscape and the complexity of policy implementation: in many countries around the world, power and politics are closely intertwined.

This topic was mainly addressed in the morning parallel session 2.1, "Energy access around the world". To know more about the content of that session, you may listen to the [interview](#) with Anna Creti (University Paris-Dauphine) by Swetha RaviKumar Bhagwat (FSR).

The incumbents: oil, natural gas and nuclear

The energy transition challenges the role of the main sources in the current energy mix. This is true not only for coal, but also for oil, natural gas

and nuclear. The growing political support for the reduction of greenhouse gas (GHG) emissions and the rapid development of clean technologies imply that 'incumbents' will have to adapt. However, the way and pace at which change will take place are unknown. Uncertainty is dominant. For instance, according to certain scenarios oil demand may have already peaked, while according to others, it will continue to grow for several more years. In this context, companies have to develop contingency plans and governments have to take clear policy decisions that provide consistent signals to stakeholders and investors.

Oil and gas companies could try to reduce uncertainty about their future prospects by focusing on cost and emission reductions, developing reserves with a shorter time to market, shifting their business towards petrochemicals, and investing in low-carbon technologies like carbon capture, utilisation and storage (CCUS), hydrogen and other 'green' gases. A reduction in methane emissions along the entire supply chain represents the low-hanging fruit that oil and gas companies could achieve in the short to medium term, often in a cost-effective way. Governments in oil and gas producing countries should act as well and streamline their efforts in the diversification of their economies and the management of strandable assets. This is particularly relevant for major exporters like Saudi Arabia.

In the case of nuclear, the need for rapid and deep decarbonisation of the energy mix could open a window of opportunity for re-launching a low-carbon energy source whose relevance has shrunk over the years in many advanced economies. This may have positive implications in terms of local employment and security of supply. However, the risks associated with the use of nuclear energy in liberalised electricity markets require a strong and credible commitment by policymakers.

Several sessions of the conference addressed these topics. Among them, afternoon parallel session 1.2 "The role of gas in energy transition", afternoon parallel session 3.1, "Oil in times of energy transition", and afternoon parallel session 3.2, "The role of nuclear in decarbonisation strategies". To know more about the content of those sessions, you may listen to the [interview](#) with Olivier Massol (IFP School) by Maria Olczack (FSR), to the [interview](#) with Adam Sieminski (KAPSARC) by Mohamed Hendam (FSR), and to the [interview](#) with Michel Berthélemy (OECD NEA) by Nicolò Rossetto (FSR).

Hydrogen as a novel energy vector

Hydrogen plays a minor role in the energy sector today, but it has gained significant attention over the past few years due to the possibility of using it to reduce the cost of future decarbonisation and

utilise some already existing infrastructure. Hydrogen production, today mostly derived from the reforming of natural gas, is expected to grow significantly in the next decades and increasingly relies, under certain assumptions, on the use of electrolyzers, which turn electricity and water into oxygen and hydrogen. Consumption is assumed to increase many times as well, mostly in transport and industry. Hydrogen looks suitable to many applications, either as a feedstock or as an energy vector that can be easily stored, contributing to better and more efficient integration of intermittent renewables like wind and solar (power-to-hydrogen and hydrogen-to-power). However, there is a widespread acknowledgement that some conditions must be satisfied. First, public support and favourable regulation are necessary for the coming years to foster research and development (R&D) activities and kick-start the deployment of hydrogen assets. Second, improvements in technology are fundamental to ensure cost-competitiveness. They are likely to materialise via breakthrough innovations as well as learning by doing. Thereby, economies of scale in the production and consumption of hydrogen matter. Finally, exploitation of renewable energy sources must grow in order to generate cheap electricity that allows the production of hydrogen at low costs (developments of CCUS and nuclear can also positively affect the outlook for hydrogen, but the use of those technologies is more debated). The importance of electricity prices highlights the role of hydrogen as an enabler of sector coupling, a development that calls for further economic and regulatory research.

This topic was addressed in several sessions of the conference. Among them, the keynote session on day 2, “The future of hydrogen”, and morning parallel session 2.2, “Power-to-hydrogen and hydrogen-to-X”. To know more about the content of those sessions, you may listen to the [interview](#) with Marina Holgado (IAE) by James Kneebone (FSR).

New Trends: local governance, circular carbon economy and shared electric vehicles

The transition towards a more sustainable energy system entails the abandonment of many elements that characterise current energy systems and the emergence of new trends.

First, a growing role of the local dimension and its governance. The decentralisation of the energy system means that a higher share of energy is produced and delivered at the local level. This is particularly visible in electricity, where the deployment of solar PV, wind turbines, small-scale gas turbines, domestic storage and the like results in many kWh never leaving the distribution grid in which they are injected first. In this context, the role played by distribution companies is changing and becoming key to the effective and efficient activation of customers. In many parts of the world, distribution companies are aware of that and are often enthusiastic about their growing centrality; however, they frequently struggle to address contrasting societal goals, as for instance the

mandate to be cost-effective and at the same time treat all customers in a fair way. Distribution locational marginal pricing has been proposed in this regard as a solution to foster the coordination of investment and asset operation at the distribution level, by providing every user of the network with a detailed signal about the costs his or her decisions mean for the system. However, practical implementation has been so far almost non-existent due to technical challenges, public opposition and a difficulty to convey a clear and palatable message to retail customers. Appropriate pricing of local resources is not the only challenge local governance must confront with. Growing local opposition to the construction of any new infrastructure, including renewable power plants, represents a serious issue that may hinder the achievement of net-zero (NIMBY syndrome). Innovative and inclusive approaches that expand ownership in new infrastructures and the abandonment of a litigious legal culture are important steps in a broader strategy to speed up the energy transition.

Second, the replacement of the classical linear and sectoral approach to energy with a circular and cross-sectoral one. Climate change calls for the use of all the available tools and levers. No single solution is likely to be cost-effective and acceptable to every stakeholder. In this context, the circular carbon economy (CCE) is a new approach that builds on the principles of the circular economy and applies them to carbon emissions. This approach, recently proposed by Saudi Arabia and endorsed by the G20, aims to be holistic, integrated, inclusive and pragmatic. It is based on the ‘four Rs’: reduce carbon emissions; re-use carbon as an input to produce feedstock and fuels; re-cycle carbon via natural carbon cycles and bioenergy; and remove excess carbon from the atmosphere and store it geologically. Adopting this approach can represent a step forward in the active involvement of countries with large fossil fuel reserves in the fight against climate change. However, more thinking and technological investigation is needed to beef up the CCE concept.

Third, a new culture of mobility based on shared electric vehicles. The established view that privately owned cars running on fossil fuels satisfy best individual mobility needs represents a major obstacle to the transition towards a sustainable energy system. Private passenger cars are a significant and rising source of GHG emissions, remain idle most of the time, and constitute a substantial cost for families and society at large. Today, technological development and digitalisation offer new opportunities that can be cleaner, safer and more convenient. If managed in a smart way, EV fleets can provide valuable services not only to passengers but also to the electricity grid (vehicle-to-grid solutions). However, changing entrenched habits and established infrastructures by investing in expensive new assets is not easy. Therefore, governments have an essential role to play in promoting the uptake of a new mobility culture.

Several sessions of the conference addressed these topics. Among them, afternoon parallel session

1.2, “Shared autonomous electric mobility: triple revolution”, afternoon parallel session 2.1, “Energy transition and local governance”, and afternoon parallel session 2.2, “Circular carbon economy”. To know more about the content of those sessions, you may listen to the [interview](#) with Ramteen Sioshansi (Ohio State University) by Golnoush Soroush (FSR), to the [interview](#) with Michael Pollitt (University of Cambridge) by Athir Nouicer (FSR), and to the [interview](#) with Noura Mansouri and Adam Sieminski (KAPSARC) by Maria Olczak (FSR).

Hybrid markets for electricity and carbon pricing

The energy transition requires a massive amount of physical investments in low carbon technologies. An adequate market design and long-term price signals are necessary to provide investors and market participants with the right incentives. In the case of electricity, there is a growing consensus among scholars that short-term energy only markets (EOM) cannot do the job alone. Introduced in the 1990s and 2000s when the new dominant technology was represented by combined cycle gas turbines running on natural gas, EOMs provide incentives for an efficient operation of existing generation capacity, but appear less capable of stimulating the necessary investment in new capacity, especially when generation technologies are highly capital intensive, as it is the case with nuclear and many new renewable energy sources. The political commitment to a rapid decarbonisation of the electricity generation mix only exacerbates the issue and suggests the need for a rethinking of electricity market design and the adoption of some ‘hybrid architecture’, capable of providing sufficient long-term signals while preserving the short-term incentives that EOMs produce. There are already some early attempts to provide a coherent theoretical framework, but the details of how a hybrid market should look like are still subject to investigation. Nevertheless, it seems clear that reaching net-zero in less than 30 years cannot be done with uncoordinated patches on current electricity market designs.

Pricing carbon so that externalities in its production are duly considered when assessing investment choices is an important policy tool that is gradually gaining ground around the world. Today, more than 20% of the CO₂ emissions at the global level are subject to some form of explicit pricing, either via a tax or as part of a tradable quota system. These pricing mechanisms incentivise the use of low-carbon technologies and provide governments with an additional source of revenues. However, the future of carbon pricing is uncertain and the role of researchers in this field is far from exhausted. High carbon prices, as those required to foster the decarbonisation of our economies in the coming decades, have important distributive implications. Since they generate winners and losers, at least in the short to medium term, they tend to be politically sensitive. They also interact with other public policies like support mechanisms for renewables or the general taxation system. Therefore,

any meaningful assessment of carbon pricing cannot occur in isolation, but must consider these additional dimensions. Finally, the need to expand the outreach of carbon pricing and cover economic activities that were previously exempted calls for new research efforts capable, in particular, to highlight the barriers that may limit the effectiveness of the various carbon-pricing mechanisms.

These topics were mainly addressed in morning parallel session 1.1, “The future of carbon pricing”, and in morning parallel session 1.2, “Hybrid market architectures for ensuring investments in the European electricity sector”. To know more about the content of those sessions, you may listen to the [interview](#) with Jan Horst Keppler (University Paris Dauphine) by Tim Schittekatte (FSR).

Energy transition

Energy transition represents today the *fil rouge* connecting most of the issues addressed by energy economists. It constitutes a massive challenge for the energy sector and society at large. A consensus on the need to deeply decarbonise the economy by 2050 in order to mitigate climate change is now well established, but the specific policies and the implementation pace of those policies are subject to intense debate and alternative views are apparent. This situation is often the natural consequence of the different conditions and interests, characterising different countries, industries, companies and people. The enormous transformations that the energy transition entails inevitably present relevant costs and a significant redistribution of wealth. Not everybody will be affected in the same way. At least in the short and medium term, it is likely that we will have winners and losers. This explains the enduring disagreement about the most appropriate policies to adopt and their timing.

Nevertheless, there is a growing understanding that concrete and far-reaching measures must be taken now. Waiting another few years would only narrow the already demanding pathway to net-zero and increase its cost. In particular, continuing to invest in carbon-intensive technologies today risks intensifying the problem of stranded assets and the need for an even larger and faster re-allocation of capital and labour in the coming decades. Indeed, the profound restructuring of the economy that deep decarbonisation implies unequivocally calls for a significant role by governments. They are expected to ‘guide’ the transition by coordinating or guaranteeing the economic decisions of companies and customers, by supporting financially much needed investments in R&D and early deployment of clean technologies (either directly or indirectly, as the financial industry seems ready to act), and by ensuring that nobody is left behind. Leaving the job to competitive markets alone, with no clear signal or credible target, is less and less considered a choice compatible with the timing and the scope of the energy transition.

Policymakers should take bold, constructive and realistic decisions. Those decisions must be credible and this, in turn, requires consistent choices and measures that adequately consider those that are worse off due to the transition and those that do not have the economic resources to afford it. Solidarity must be a guiding principle at the domestic and international level. Coordinating decarbonisation strategies across borders is essential to address climate change, but we should shy away from the idea that there is only one road to net-zero. Given the uncertainty regarding future technological developments and the different situation in the various countries around the world, alternative approaches are possible and worth to be explored. Continuous interactions among policymakers and further research by scholars and practitioners will allow, over time, to identify and possibly converge on the best solutions to the challenges of the energy transition.

Several sessions of the conference addressed this topic. Among them, the opening keynote on day 1, “Energy transition in times of Covid”, morning parallel

session 3.1, “The future energy mix”, morning parallel session 3.2, “Lessons from leaders in energy and climate policy”, the concluding keynote on day 3, “Shaping a clean energy future after Covid”, and the closing plenary session on day 3, “The new energy landscape”. To know more about the content of those sessions, you may listen to the [interview](#) with Yannick Perez (Centrale Supélec) by Nicolò Rossetto (FSR), to the [interview](#) with Keigo Akimoto (RITE) by Piero Carlo dos Reis (FSR), to the [interview](#) with Christophe Bonnery (Enedis) by Tim Schittekatte (FSR), and to the [interview](#) with Yukari Yamashita (Institute of Energy Economics, Japan) by Swetha RaviKumar Bhagwat (FSR).

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Call for Newsletter Articles

The current transition to renewable and sustainable energy represents a significant change in our energy systems. Germany’s Energiewende, the push towards EVs, conditions for development of decentralized generation, and energy efficiency and other initiatives are all looking to reduce the global reliance on fossil fuels and reduce greenhouse gas emissions.

We are interested in how energy transitions are moving forward around the world. What is working, and what challenges lie ahead? We call for you to share how, (and what and when,) energy transition is affecting you in your geographic locale and are soliciting articles representing all aspects of energy transition.

If you are interested in submitting an article (non-technical in nature) for the Energy Forum on these topics, please email iaee@iaee.org. Articles should be between 750 and 3000 words and submitted in MS Word. Please make sure to include a short (50 words or less) capsule/abstract that overviews the article with your submission.

We need your article for consideration no later than Friday, September 3.