ISES webinar "Dispelling the Myths – Renewables in the Grid" on January 29, 2019

Q&A Session

During this webinar, the speakers received questions regarding the different infographics that were presented during the webinar. Some of these questions were answered during the webinar, these are marked and a timestamp is added as to where to find the Question on the webinar recording.

For those questions, that were not answered during the live webinar, the speakers have added some more answers and information in written form which you can find in this document!

We hope you will find these additional answers helpful and please do not hesitate to contact ISES at public.relations@ises.org should you have any further questions on the webinar!

Q: Regarding to Myth 2, solar power predictability, the most challenge is PV rooftop systems, "AKA, behind the meter" - Is this myth of solar prediction difficulty solved?

A: Answered by Tyler, Mark and Charlie, starting at min 40 of the recording.

Q: What are other technologies that can be used in combination with storage to increase flexibility in the grid for renewables integration?

A: (Mark) Conventional hydro and pumped hydro, both on-river and off-river; concentrated solar thermal with thermal storage; demand response; open-cycle gas turbines and diesel generators running on renewable fuels.

Q: In a large electric system with high penetration of renewable energies, how large should the running reserve be?

A: Answered by Charlie and Mark, starting at min 37 of the recording.

Q: What's the state of art in Power to Gas, particularly for storage purposes and also for fuel cells, micro-turbines, etc.?

A: Answered by Charlie and Mark starting at min 46 of the recording.

Q: I'd like to ask if you think we will someday get to a point in which we can predict exactly the "good" or "bad" sun days? - In a Month that is.

A: Weather prediction for the next day, is now very good, both for solar and wind, but predicting next month's weather is very uncertain, except in drought

Q: Can all discuss the future importance of CHP? And of CHPB (B for biochar)?

A: (Charlie) CHP is of critical importance to integrate the electric system with the thermal system. A CHP plant, especially one with thermal storage, as in Denmark and northeast China, can be very effective in transferring renewable energy from the electric system to the thermal system.

Q: Question for Charlie and/or Mark - Myth One: To what extent is this transition to renewables + batteries e.g. from coal (like the e.g. in CO) happening because of subsidies or support? Are these transitions inevitable despite, quote, 'hostile' political policies to the contrary?

A: (Mark) Electricity from large-scale solar PV and wind energy is now cheaper than from new coal-fired power stations, and is much cheaper than nuclear electricity, in most regions of the world where there are significant solar and wind resources. Batteries are still expensive. Subsidies were necessary for PV and wind several years ago, but now are being reduced in many regions. So the transition to renewable energy (and, don't forget, energy efficiency) is inevitable, but is being slowed down in some countries and states whose governments have close relationships with the fossil fuel industries. The main barriers are political and institutional. For example, an institutional barrier to 100% large-scale renewable electricity in some countries comprises the market structure and rules that were designed for electricity grids with large-centralised power stations, one-way flows of electricity and significant fuel costs.

Q: (For Mark re: Myth Four - Batteries and storage) - **What appears to be the best way for energy storage? Large storage at the production source or micro-storage at point of use (e.g. home batteries, EV-to-grid?). There was a recent study out of DTU about EV-to-grid systems that looked promising. Will that catch on?**

A: (Mark): It's likely that there will be a mix of different storage technologies at different places in the system. E.g. batteries have very fast response, but are very expensive for storage of more than several hours, while pumped hydro has slower response but is much cheaper than batteries for storage of several days, weeks and months.

Q: Is hydrogen going to play a role in the future?

A: (Mark): It's unclear to me at present, because of the low efficiency of hydrogen production at present. However, some kind of renewable liquid or gaseous fuel

Q: How is TOU (Time of Use) going to contribute for the integration of renewable energy to the national grid?

A: (Charlie): To the extent TOU rates are a proxy for production costs, they should be replaced by real-time prices eventually. Once loads see the real system price, including many hours of zero or negative prices, this will create significant additional flexibility for the balancing of renewables.

Q: How much energy do you need to store for winter season in a country like Germany and where are you going to store it?

A: (Mark): For seasonal storage in a country like Germany, hydro, compressed air and power-to-gas are options.

Q: **As a researcher in renewable energy, I am 100% agree with your approaches on all myths. However, when we look into the topic from the point of political, social, juristical, and economical aspects, I see many challenges. Do you have similar opinions? If you do, please explain how to overcome these and what are the interdisciplinary studies have been done and should be done?**

A: Answered by Charlie, Tyler and Mark starting at min 47 of the recording.

Q: We have seen that climate has been changing, conditions have been changing and many other related issues have been changing. How will the investments be made if all the conditions, on which the investment designed, changes before the ROI (Return of Investment) time of investment ends?

A: (Mark): This is a problem for all energy technologies. At least, solar and wind generators can be built and installed rapidly, so they can operate for years or decades before longer term climate changes (e.g. a shift in a zone of high wind) take effect.

Q: The grid is stabilized by high inertia rotating generators (governors/active power control) and voltage control (reactive power control) in conventional power sources. The penetration of renewable in grid is destabilizing. Please elaborate, how this penetration is a problem?

A: (Mark): In a large-scale 100% renewable electricity system that does not have many high-inertia rotating generators, frequency has to be stabilized in different ways. These include: demand response, modified inverters that produce the required fixed grid frequency, power electronics to provide 'synthetic inertia', synchronous condensers, improved transmission links between regions, operating wind and solar PV farms so that they can increase output at critical times. In addition, in 100% renewable electricity systems there will be some dispatchable renewables (hydro, CST, OCGT) with rotating generators.

Q: I have worked on standalone PV system, and found the problem in storage. The battery lost its service life in 3 years only (lead acid). Is there is any other battery technology which is giving high service life in solar application?

A: (Charlie): The lithium ion battery is the battery of choice today. It is difficult to get reliable service life date, but the added cost of energy in some current solar-storage PPAs in the US can be as low as $6/MWH above the solar-only quote, but it does include a subsidy.