Special Focus Edition on Renewable Energy

Towards a European Innovation Council

An opinion piece by **Professor Eicke Weber**.

The global transformation of our energy system towards efficient use of finally 100% renewable energy is a revolutionary process, whose impact on science, technology and the economy as a whole can hardly be over-estimated. It is fuelled by the need to replace limited fossil and nuclear energy resources by virtually unlimited sources available from harvesting renewable energy such as solar, wind and bio-energy. This transformation requires a wide range of application-oriented research that might be well served by the establishment of an European Innovation Council, as suggested by the Commissioner for Research, Innovation and Science Carlos Moedas.

In recent years, this unavoidable, slow process, part of the huge task of the global transformation to sustainability, has been accelerated by two seemingly unrelated forces: on the one side, the detailed analysis of the International Panel on Climate Change IPCC lead to the COP-21 agreement, signed now by more than 175 states, on a global road map to drastically limit CO2-emissions, in order to create a chance to prevent catastrophic global climate change. On the other hand, the unexpectedly rapid reduction of the cost of electricity produced from renewable sources, especially solar photovoltaics (PV) and wind, resulted in a rapidly increasing market for these technologies. Just this March an International Workshop on ‚PV Going to the Terawatt Level' in Freiburg, Germany, was organized by the Global Alliance of Solar Energy Research Institutes GA-SERI. It highlighted that global photovoltaics will grow within the next decade from the current Gigawatt level into the Terawatt level, requiring to double global PV production capacity within the next five years, from currently 60 GW/yr to 100-120 GW/yr by 2021. Electricity auctions in Germany already yielded offers for PV electricity for prices near 7ct/kWh, and translating this result from Germany with only 800-1.000 hrs of effective sunshine per year to countries with 2.000, even 2.500hrs shows where we are already today. In line with this, just recently PV electricity was offered in an auction in Dubai for 3 ct/kWh, an unprecedented number!

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This rapid expansion of volatile renewable energy has to be accommodated by an increasingly complex smart grid, well prepared to react rapidly to changes of feeding-in of electricity, caused by clouds or the volatile character of wind. Integration of storage will be important, and it is very beneficial that the prices for modern batteries are following a similar price experience curve as that for PV. It is very encouraging to learn that in Germany, with now 35% of renewable energy in its electricity grid, the 'System Average Interruption Duration Index' SAIDI was cut in half in the last 10 years, when the fraction of volatile renewable energy in the grid doubled!

This observation shows that technology development allows to actually increase the security, the resilience of the power grid against unexpected changes: incorporation of large amounts of volatile electricity forces to equip the grid with independent operation, intelligent nodes, that direct oversupply of electricity as well as take care for local electricity shortages. The resulting grid is better and behaves more reliably than a grid that only distributes the power of thermal plants running around the clock, with little need for provisions for sudden changes of supply or demand.

In all, the on-going fundamental transformation of our global energy system to a system finally based on 100% renewable energy is a formidable challenge for science and technology on many levels, from the improvement of efficiency at even lower cost of solar and wind power systems, to issues of grid management, development and incorporation of low-cost storage systems, transformation of the mobility sector, and increasing the energy efficiency of production and the housing sector, to name the most important ones.

The need for an European Innovation Council

In all of these fields, further improvements, and even breakthroughs are expected in research, especially application-oriented research for implementation in the market. This brings me to a second topic of this opinion piece: how can we support applied research as effectively as we do this in fundamental research? I would like to discuss here especially the situation in Europe, however, our fundamental considerations are of general relevance. We do have very good tools for the support of fundamental research. In the EU, the flagship for this is the European Research Council ERC. The ERC has in its 10 years of history developed into a formidable power for selecting and supporting the best research proposals through Europe, independent on the research topic and the location of the proposer's institution. Grant awardees experience a substantial boost to their careers, which may accelerate by obtaining e.g. a tenured faculty position.

However, a key criterion in selecting ERC awards is the scientific quality of the proposer, that usually has to be evidenced by an impressive publication record, including high-impact publications, good citation record, if possible even a high ‚Hirsch-index', indicating many high-impact publications. Whereas all of these factors are a valid measure for scientific quality, they have little to do with innovative application-oriented research. Therefore, application-oriented research only rarely is funded through the ERC mechanism, although in principle ERC is open to all project proposals.

To remedy this situation, the best approach will be to use the ERC success story to copy its key characteristics into a new institution, fittingly to be called a **European Innovation Council EIC**, which shall strive to attain a similarly high reputation and impact in the field of application-oriented research.

The first key feature to be copied from ERC is the fundamental openness to all topics: it is not important from which field a suggested research originates.

Next, typical grant proposals are to originate from single-investigators or small groups, not from large cooperation, and should typically be in the € 1-3 Mio range for 2-3 years of duration. Industry contact at the proposal stage might be useful, but not required.

There should be no regional considerations employed, regional balance should not be considered in the award process.

In addition to criteria valid for both, ERC and EIC project proposals such as the scientific quality, creativity, and innovativeness of the proposals, there should be one central new criterion for ERC grants: the likelihood of the proposed research to result in a product, that might within a 2-5 year time range find acceptance in the market. Whereas ERC grants generally address technology readiness levels (TRL) from 1 to 4, EIC grants should address projects with TRLs ranging from 4-7, so that introduction into the market not long after finishing an EIC project has a realistic probability.

With this kind of guideline, EIC grants should develop a similarly good reputation as ERC grants, but in the case of EIC with special interest for investors, rather than for hiring institutions, as in the case of ERC.

As a matter of fact, being selected for an EIC grant should alert investors that the project proposal might be very attractive for investment after finishing the 2-3 years of research work funded by the EIC grant. A successful EIC grantee should have good chances to use other EU mechanisms ready to provide support for start-up companies, such as the Knowledge and Innovation Communities KICs of the European Institute of Innovation and Technology EIT.

With these features it can be well expected that the creation of an EIC might – after a ramp-up phase from 2017 to 2020 - result in an institution of similar size and budget as the ERC. Actually, it can be expected that quite a few ERC grant projects might continue to transfer the findings into practical applications with the help of EIC, followed by support of the resulting start-up company through EIT. In this way, the EIC may close an important gap between the existing institutions ERC and EIT in the European Innovation chain.

The upcoming mid-term review of Horizon 2020 in 2017 might actually offer an excellent opportunity to start the EIC, with a modest budget first, that may be limited to just one range of research topics such as energy research, an area which in the coming years will be especially in need of innovative applied research, as described above.

It is very heartening that creation of an EIC has found widespread support by member institutions of EUREC, of EARTO and other important stakeholder organisations. Commissioner for Research, Innovation and Science Carlos Moedas is a strong supporter of this project that has the potential to improve European competitiveness by helping to bridge the ‚valley of death' between excellent research and the market place.

Initial results of the European Commission's public consultation on the EIC were released on May 4th[1]. The EC is expected to present a paper to the Competitiveness Council of May 26th -27th[2] setting out its views on the EIC for the first time.

Prof. Eicke R. Weber

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1 https://ec.europa.eu/research/eic/index.cfm
2 http://www.consilium.europa.eu/en/meetings/compet/2016/05/26-27/