Yes, we should build more large dams

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This opinion piece comments the March 2014 paper "Should we build more large dams? The actual costs of hydropower megaproject development" by Atif Ansar and colleagues published in Energy Policy. The main message of the Ansar et al. paper is against the construction of large hydropower dams, particularly in developing countries:

> *Policymakers, particularly in developing countries, are advised to prefer agile energy alternatives that can be built over shorter time horizons to energy megaprojects.*

Based on a statistical analysis, the authors demonstrate that…

> *… cost and schedule estimates of large dams are severely and systematically biased below their actual values...*

Contrariwise to this statement, one could produce a long list of hydropower dams that were built as planned, time and moneywise. However, this wouldn´t disprove the author´s statistical findings. Actually, most people in the dam building business would agree that the designs of complex construction works tend to be optimistic, even without reading the paper. Because overtime and over cost is more the rule than the exception, the authors produce a predictor, based on real cases, aimed at improving cost estimation and at providing better budgets and schedules. As the authors explain,

> *… this predictor serves to "correct" the systematically biased ex-ante cost and schedule estimates by adjusting them upwards by the average cost or schedule overrun*.

It is true that the predictor would help to prepare more precise budgets and schedules. But it would be useless for selecting among different alternatives of energy generation. The problem with the paper is not in the analysis of the data but in the recommendation addressed to policymakers to avoid building hydropower dams:

> *The outside view suggests that in most countries large hydropower dams will be too costly in absolute terms and take too long to build to deliver a positive risk-adjusted return… Energy alternatives that rely on fewer site- specific characteristics such as unfavorable geology are preferable.*

What would be these agile energy alternatives? One could guess that smaller hydropower, wind power and off the shelf thermal solutions would fit their non-

enunciated prescription of “good alternatives”. However, the implementation of these alternatives would also be cursed with overtime and over cost, although perhaps less intense. The authors confess that their research didn´t cover this angle:

> *A comprehensive global data set that can create such transparency on risk profiles of energy alternatives does not yet exist.*
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> *[…] the problems of cost and schedule overrun are not unique to large hydropower dams. Preliminary research suggests that other large-scale power projects using nuclear, thermal, or wind production technologies face similar issues*.

When similar analyses become available, perhaps it will be fair to compare different alternatives through the lens of the “corrected” ex-ante view. Meanwhile, it would be unfair to compare the data of a proposed hydropower dam already corrected by a predictor of cost and schedule overrun with the corresponding data for alternatives not submitted to a similar procedure.

The deviation between planned and actual construction costs and times is of course relevant, but it is not the only feature to take into account in the decision-making process. There is an analogy to what happens when one buys, for example, a new automobile: the actual performance of the selected vehicle may be inferior to what had been advertised, but it could still be the best pick.

Among the other features of large hydropower plants that should be considered, one could list: (i) creation of jobs; (ii) multiple uses of water resources, such as water supply, flood and drought control, navigation, irrigation and tourism; (iii) negligible emission of greenhouse gases; (iv) local externalities, in general negative (but not all!), such as resettlement of the local inhabitants and disruption of the environment at the dam site; (v) cost (in general it is the most economical source of electricity, even taking into account eventual delays).

The bi-national Itaipu hydropower plan (Brazil and Paraguay) was built close to schedule, from 1974 to 1984. However, the actual cost surpassed the original budget. Does it mean that Itaipu was an error? Of course not! First because despite the over cost during construction, the unit cost of energy is very reasonable, around U$ 40/MWh. Second, because it produces an enormous quantity of electricity that otherwise would have been produced by another source, most likely by a set of thermal plants. In 2013 alone, Itaipu´s output was 98.6 million MWh. The same quantity of energy produced by thermal plants would release 88 or 39 million tons of CO2 to the atmosphere, depending on the choice of the primary source of energy, coal or natural gas respectively. Third, because Itaipu, since its inauguration has been paying royalties to the Brazilian and Paraguayan Governments, in equal parts. The lump sum is almost U$ 5 billion.

More recent experience in Brazil also indicates the merits of large hydropower plants. Starting in 2007, the Government organized auctions to grant to Special Purpose Enterprises - SPE (with the participation of Government firms but controlled by private firms) the right to build and explore three large hydropower dam projects in the Amazon River Basin. Two of them located in the Madeira River (Santo Antonio – 3580 MW and Jirau – 3750 MW) and one in the Xingu River (Belo Monte – 11233 MW). The winners got long term (30 years) power purchase agreements with the distribution companies. The winner of the bidding process would be the one offering to sell a stable energy supply for the lowest price.

The competing process resulted in prices roughly 2/3 of the best competing alternatives, including small hydro and wind power. Of course, construction delays have occurred, mostly caused by anti-dam groups. However, resulting costs were allocated to the SPEs, controlled by private companies, not to the consumers.

Based on more than 30 years dealing with the development of water and power policies in Brazil, I suggest that policymakers in developing countries shouldn´t follow the recommendation of Ansar et al to avoid large hydropower projects. As explained by IHA (2014), "the benefits of hydropower have not been mentioned in the study, which thus presents an unbalanced picture of the economic value versus the investment risks of this important technology".

References

Ansar, A., et al., Should we build more large dams? The actual costs of hydropower megaproject development. Energy Policy (2014), http://dx.doi.org/10.1016/j.enpol.2013.10.069.

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Biography

Jerson Kelman is an engineer and Ph.D. in water resources. He advises graduate students at the Federal University of Rio de Janeiro. He was the president of two Brazilian governmental authorities – on water and on electric energy – and the CEO of two Brazilian power companies (Light and Enersul). Kelman is or was a member of several boards: Brazilian Sustainable Development Foundation; Energy Councils of Industry; ABENGOA International Advisory Board, UNESCO Institute for Water Education in the Netherlands; and three Brazilian Councils - Energy, Environment and Water Resources. In 2003, he received the King Hassan II Great World Water Prize.