

Time for a second electricity market reform?

Lars Bergman

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The "Panel Project"

- The EFORIS "Panel Project" was a joint effort by a group of electricity market specialists from academia, industry and the TSO to analyze the need for a major reform of the Swedish and Nordic electricity market.
- The title of the final report, published in June this year, was "Time for a second electricity market reform?"
- In my presentation today I will not present the report but focus on some of the long term issues that we only briefly touched upon in our report.
- Yet the points of departure will be the same as in the Panel Project.

Four processes of change

1. The geographical extension of the electricity market is increasing, physically, institutionally and commercially
2. The power industry investments are increasingly driven by subsidies rather than regular market forces
3. The proportion of intermittent power in generation is rapidly increasing
4. Technological development, with digitalization and storage as key words. In addition scale economies and learning-by-doing are creating a new landscape of relative costs

The future electricity supply system

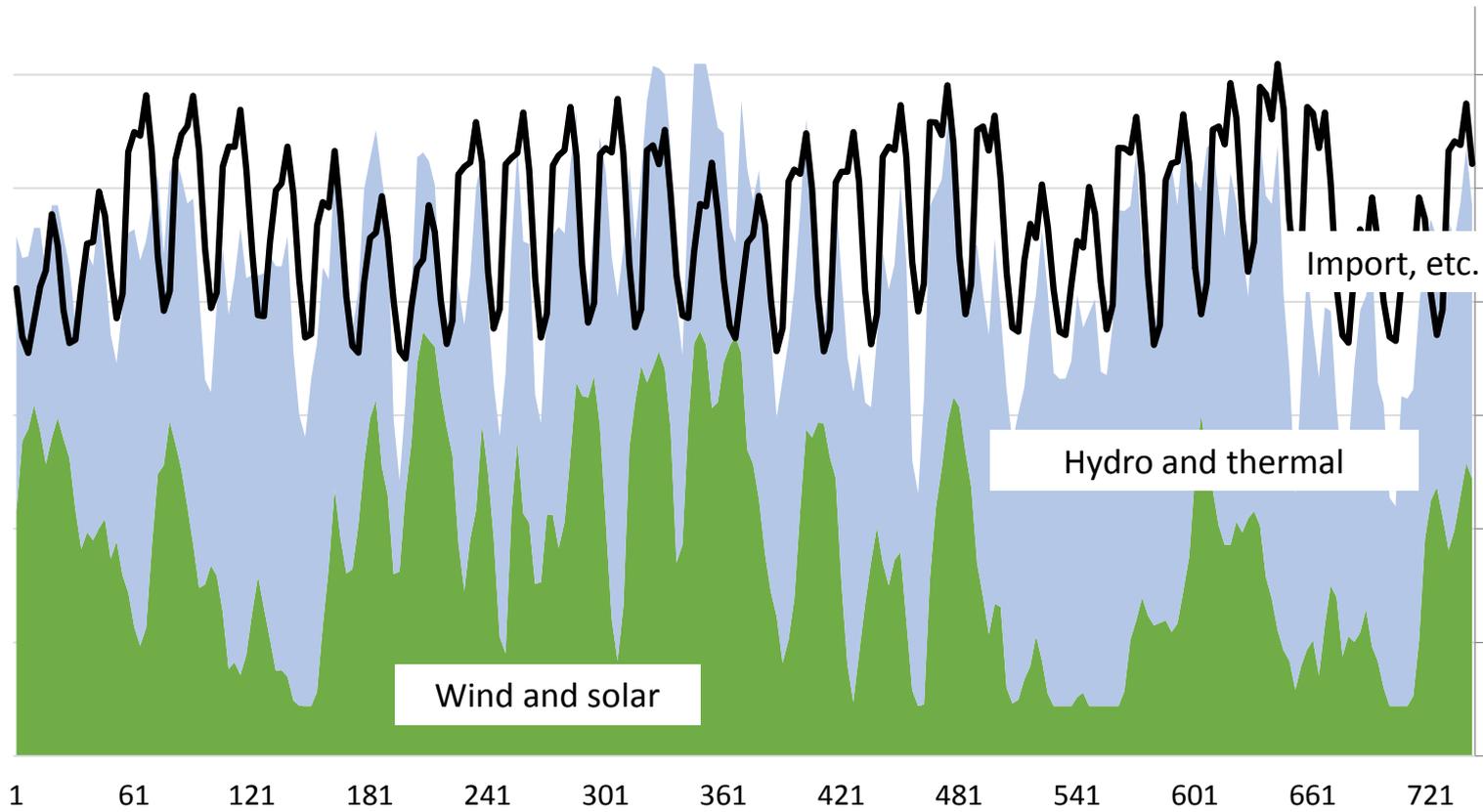
- As a result of these processes the electricity supply system, in Sweden and elsewhere, a couple of decades into the future will be different from the current system in at least two important ways:
 - There will be a significant proportion of wind power, but also solar power, with hourly output levels that are unpredictable until a few hours before "the" hour
 - The short-term variable costs in wind and solar power plants will be negligible
- A model simulation for the Swedish system leads to the following reasonably probable picture.

Projected Future Electricity Supply System in Sweden

	2016/2017		2040/2050	
	Installed capacity	Expected peak capacity	Installed capacity	Expected peak capacity
Hydro power	16 200	13 700	16 200	14 000
Nuclear power	9 100	8 200	0	0
Wind power	6 500	700	18 800	2 200
Thermal power	8 000	4 600	8 000	6 000
Solar power	0	0	12 000	0
Total capacity	39 800	27 200	55 000	22 200
Demand		27 400		30 000
Deficit to be covered by import, demand response and batteries		-200		-7 800

GW

30
25
20
15
10
5
0



Wind and solar

Hydro and thermal

Import, etc.

Hours during January

Other new features

- In the future the electricity supply system may also include:
 - Large-scale economically viable storage facilities
 - Digital equipment enabling consumers to actively participate in short-term trading of electricity, thus increasing the short-term price elasticity of electricity demand
 - New market players such as “prosumers” and aggregators

Long term consequences?

- In the 1990's, when major electricity market reforms were about to be implemented, the Harvard professor Bill Hogan said: "The lights will still be on. But everything else will change."
- I believe that the lights will continue to stay on, and that we will see changes in market design, regulation, business models and power industry structure. But far from everything will change.
- The key challenge is to see what really needs to be changed, and who is responsible for doing it.

The capacity adequacy issue

- Much of the discussion to date has focused on the capacity adequacy issue, i.e. whether the lights really will stay on.
- The key issue is whether the incentives to keep enough peak capacity are sufficient on "energy-only" markets (EOM:s).
- The concern reflects the fact that the provision of peak capacity on EOM:s is driven by economic incentives rather than regulations.
- Thus scarcity prices during periods when lack of capacity is threatening are expected to induce generators to invest in peak capacity.
- There is widespread concern that this mechanism will not work well enough, and that the risk of brown-outs and black-outs consequently will increase

Capacity mechanisms

- There is a vast literature on how regulation and “capacity mechanisms” can secure capacity adequacy.
- Less is written about the problems associated with capacity mechanisms, for instance the risk of costly overinvestment in peak capacity and the return to an increasingly regulated electricity market.
- The Panel argues for a “wait-and-see” strategy with respect to capacity mechanisms.
- That is, to closely monitor the development of peak capacity in relation to peak demand, and to be prepared to design a comprehensive capacity mechanism if such a mechanism turns out to be needed.

Reasons for waiting

- There were three main reasons for the “wait-and-see” strategy:
 - A strategic reserve (“effektreserven”), which in fact is a kind of capacity mechanism, is in place.
 - The TSO can and will implement relatively minor but suitable changes in current rules and regulations in order to make the system more fit to accommodate the intermittency problems associated with wind power.
 - It is quite likely that digitalization in combination with new storage possibilities and new types of supplier-consumer contracts will increase the short term flexibility of demand.

Beyond the capacity adequacy issue

- Although important in itself the capacity adequacy issue is just one aspect of a more fundamental issue, namely
 - *What is the appropriate design of a future, internationally connected, electricity market dominated by intermittent power such as wind and solar power?*
- So, what is an “appropriate” electricity market design?

Economics of electricity market design

- From a social point of view it is desirable that
 - the electricity that is consumed is produced at minimum cost, and that
 - the electricity prices faced by consumers are equal to the relevant marginal costs, and that
 - investments in new capacity are done at the "right" time and based on the "right" technologies.
- In the jargon of economists the electricity supply system should be both *statically* and *dynamically* efficient
- An "appropriate" electricity market design thus is one that fosters a *statically* and *dynamically* efficient electricity supply system

The role of markets

- Within the current energy-only market design organized markets (day-ahead, intra-day, real time) play a key role both to foster minimum-cost production and wholesale prices (approximately) equal to the relevant marginal costs, i.e. to foster static efficiency.
- Together with the related financial derivative markets they also play an important role in investment planning and the fostering of dynamic efficiency.
- Key properties of the current system is that prices are transparent, and that the regulatory framework is conducive to competition in generation.

Why do markets work?

- One key reason for this is that the non-zero short-term marginal costs in generation provide a simple and straightforward basis for hourly bids.
- Another is that producers can decide when and how much they are going to produce at individual plants.
- A third aspect is that the possibility of trading at transparent markets keep transaction costs low.

Bidding and the cost structure of wind and solar power

- Except for periods of scarcity the short-term marginal cost of power generation is equal to the variable cost of production in individual power plants.
- In thermal plants this is primarily fuel costs, and in hydro power plants it is the opportunity cost of water
- But in wind and solar power plants the variable costs are essentially zero.
- So, what will be the basis for bidding in a system dominated by wind and solar power?

Organized markets and alternatives

- The day-ahead market is the backbone of the current electricity market design and a key reason for the market to foster efficiency in electricity generation and consumption.
- It is not obvious to me that a day-ahead market can play that role in a system where variable costs are negligible and hourly output levels difficult to control.
- The alternative to trading electricity on organized markets is bilateral trade.
- But bilateral trade means lack of transparency about prices and (often) higher transaction costs.

Searching for an efficient electricity market design

- The key question appears to be how we can find an efficient electricity market design, suitable for an electricity supply system much different from what we have today.
- Fortunately, however, "we" don't have to bother that much. New market arrangements are most likely to emerge gradually as TSOs, producers, suppliers and other electricity market players work to design efficient institutions and practices for trading electricity
- Yet research and good policy analysis can support the process and contribute to good solutions

Need for an electricity market reform?

- By "reform" one usually means a revision of existing legislation and regulatory arrangements, with the government and the parliament as actors.
- In view of the challenges ahead the kind of reforms that are needed, and the task of politics, can be summarized in one sentence:
 - ***Make sure that existing rules and regulations do not prevent the development of new efficient electricity market arrangements, the entry of new players and continued efficient competition on the electricity market***

www.energiforsk.se

The screenshot shows a web browser window displaying the website www.energiforsk.se. The page features a navigation bar with the Energiforsk logo and menu items: Forskning, Rapportsök, Konferenser, Utlysningar, and SÖK. The main content area is titled "RAPPORT" and "Time for a Second Electricity Market Reform?".

The report text discusses the ongoing transformation of the Swedish electricity supply system and the need for a second market reform. It highlights the challenges posed by intermittent power from wind and solar, such as variable costs and unpredictable output, and the resulting concerns about the financial viability of conventional power plants. The report concludes that several minor changes to the rules and regulations of the electricity market are needed, while there is no immediate need for major changes.

However, it cannot be ruled out that some major changes of the electricity market design will have to be considered in the future. This would probably amount to replacing the current strategic reserve, "effektreserven", with an extended capacity mechanism, preferably a Nordic rather than a Swedish capacity mechanism.

On the right side of the page, there is a section titled "Ladda ner" (Download) with a download icon and the text: "Time for a Second Electricity Market Reform Energiforskrapport 2017-402 PDF 1,3 MB". Below this is a thumbnail image of the report cover, which features the title "TIME FOR A SECOND ELECTRICITY MARKET REFORM" and the Energiforsk logo.

At the bottom of the page, there is a section titled "Om rapporten" (About the report) and a "RAPPORTNUMMER" (Report number) field.

The browser's address bar shows the URL: <http://www.energiforsk.se/program/vimarknadens-funktion-och-roll-i-samhallet-efors/rapporter/time-for-a-second-electricity-market-reform-2017-402/>. The browser's taskbar at the bottom shows various application icons and the system clock indicating 12:38 on 2017-11-21.