



Energy

National Research Programmes 70 and 71

Project

Market environment of hydropower



Computer models for profitable hydropower

Computer models for profitable hydropower

The Swiss hydropower industry has had to accept a decline in market prices for its electricity over recent years. This research project has now investigated whether and how the electricity producers will in future still be able to earn money.

1	2	3	4	5	6
9132	13962	8396	9951		
3864	5688	2930	3850		
	6206	1910	3332		
	18569	4242	8587		12939
	10855	2514	5034		7748
	3857	954	1918		2872
	853	203	428		658
	299203	66383	124056		183710
	265069	58470	108089		159493
	34134	7913	15967		24217

For hydropower plants to generate profits in the free market, precise calculations are required. *Source:* Adobe Stock/handlar





At a glance

- Wholesale prices for electricity on the European market have fallen and will presumably remain low over the coming years. This situation makes it difficult for hydropower operators to operate profitably.
- This research work shows that there is no simple means of generating significant profits. However, with smart production planning it should at least be possible to maintain the level of recent years.
- The main factor for the future profitability of Swiss hydropower is the development of the central European electricity market – and this falls outside the sphere of influence of Swiss companies and politicians to a large extent.

The once profitable business of Swiss hydropower operators has become difficult. The installation of numerous wind and solar energy parks has led to a decline in wholesale prices on the European market. However, due to the expansion of new renewables, in particular, hydropower is required as a stabilising element in the electricity grid. Nevertheless, the difficult market environment is unlikely to change over the coming years – electricity producers will therefore need to adjust to this situation over an extended period. How can the electricity companies nevertheless operate on a profitable basis? The researchers looked at this question in this project.

How it would have been possible to generate profits

The researchers initially analysed the historical development of daily energy prices between 2011 and 2015. In conducting their work, it became clear that revenues have fallen significantly over the years – by 20 % for large dams and even by as much as 30 % for small-scale hydropower plants. This shows that not all power plant categories are equally affected by the fluctuating and falling prices. In general, large plants can perform better. This is because they have large storage capacities that allow them to dam water and to first use it for electricity production when this becomes interesting from an economic perspective. However, the investigation clearly shows that the earnings of all power plant operators have declined.

Using a computer model with realistic assumptions, the scientists then calculated what the earnings would have looked like in the past if the operators had sold their electricity on the so-called balancing energy market. The balancing energy market aims to quickly balance out electricity fluctuations in the grid either by curbing or increasing production. According to the simulation, this strategy would have allowed proceeds to be increased by 4 % to 13 % despite the difficult market conditions. The researchers point out, however, that only a fraction of all Swiss hydropower producers can generate these profits as the market for balancing energy in Switzerland is small.

Future development scenarios

Based on these findings, the researchers then developed various future market development scenarios up to 2030. Coal and gas prices, the cost of CO₂ certificates as well as the corresponding prices on the balancing energy market were incorporated in the scenarios.

Profit opportunities on the balancing energy market are set to diminish in future. This is because an increase in the number of involved market participants will see prices fall – by 7 % to 16 % according to the researchers' calculations. Greenhouse gas and CO₂ certificate prices will also have a major influence. Overall, however, the researchers believe there are opportunities for hydropower plants to also generate profits in future with smart planning and flexible production. They then confirmed this result in two case studies with hydropower plants in Valais and Ticino. This demonstrates that the general findings are representative for the Swiss hydropower sector.

Nevertheless, business will not be easy. And the research work shows that there is no single solution that can be applied to all hydropower plants in equal measure – the local conditions of each individual installation must always be considered. The hydropower plant operators are therefore called upon to proceed accordingly. According to the researchers, the results of the project – publicly accessible models and price curves – are helpful here, especially for smaller operators that are unable to afford sophisticated scenario calculations themselves.



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Produkte aus diesem Projekt



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