

Reading the sky: how forecasting makes renewable energy more reliable

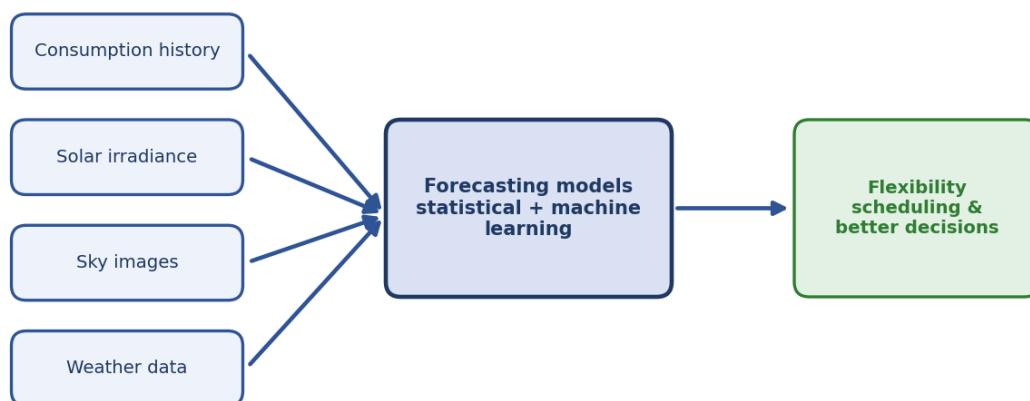
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Solar and wind power share a defining feature: they depend on the weather. A passing cloud can cut a solar panel's output in seconds; a lull in the wind can do the same for a turbine. For a grid that increasingly relies on these sources, the ability to anticipate such changes is enormously valuable. This is why forecasting is a key part of the FlexCHES project.

Accurate short-term forecasting allows the system to plan ahead — to decide how to use stored energy, which flexibility services to offer, and how to manage distributed resources most effectively. FlexCHES develops forecasting tools that predict both renewable generation and energy consumption, drawing on weather data and patterns of consumer behaviour.

To do this, the project explores a range of techniques, from established statistical methods to modern machine-learning approaches such as neural networks. Different methods suit different tasks, and the aim is to strike the best balance between accuracy and speed. Clustering techniques help group similar patterns — distinguishing, for example, the behaviour of households from that of electric-vehicle charging — so that predictions can be tailored. Particular attention is paid to flexible appliances such as heat pumps, which can store energy in thermal form and act as part of the storage system.

Forecasting: turning weather and behaviour into flexibility





One of the more striking elements of the FlexCHES approach is its work on a cost-effective "sky camera." Predicting solar output is difficult because cloud movement is hard to model, even with satellite imagery. Existing solutions are often expensive or imprecise. FlexCHES investigates affordable, open technologies — combining local sky images, weather measurements and solar-irradiance data gathered near the storage nodes — to improve short-term solar forecasting at a fraction of the usual cost.

For an energy system increasingly built on sun and wind, forecasting is fast becoming as important as generation itself. By improving the accuracy of short-term predictions — and by making the tools affordable through low-cost sky imaging — FlexCHES helps operators schedule storage and flexibility with confidence, reducing wasted renewable energy and squeezing more value from every kilowatt-hour.

Better forecasting has a direct effect on flexibility. The more accurately the system can predict generation and demand, the better it can schedule resources, reduce wasted energy and increase the value it delivers. In a renewable-powered future, knowing what is coming next is one of the most useful things a smart energy system can do — and FlexCHES is working to make that knowledge both accurate and affordable.

References and further reading

- [FlexCHES project — CORDIS, European Commission](#)
- [International Energy Agency \(IEA\)](#)
- [EU initiatives for smart energy systems — European Commission](#)



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