

(US\$553 million) a year because grid operators must compensate utility firms for adjustments to their inputs. They can also lead to needless carbon dioxide emissions if grid operators generate extra power that ends up being wasted. “It is quite a concern that renewable energy here is expanding so fast without a proper database for accurate power forecast,” says Renate Hagedorn, a meteorologist with the German weather service in Offenbach.

### EYE OF THE STORM

Standard weather models predict the strength and arrival times of storms and weather fronts in a given region. But they cannot, for example, predict wind strength at the hub of a turbine, which determines the amount of power the turbine will produce. The €7-million EWeLiNE project, a collaboration that includes three major grid operators — 50Hertz, Amprion and TenneT — and that is funded by the federal ministry for economic affairs and energy, set out in 2012 to provide load forecasts that are specific to the needs of grid operators.

Most wind turbines are equipped with devices that measure the wind speeds at their hubs, and some solar panels contain sensors for sunlight intensity. EWeLiNE combines these data with other atmospheric observations — from ground-based weather stations, radar and satellites — and sophisticated computer

models predict power generation over the next 48 hours or so. The team checks these power forecasts against what actually materializes, and machine learning then improves the predictive models.

The EWeLiNE researchers began testing their system using solar-panel and wind-turbine data from across Germany last month. Eventually, the idea is for grid operators to use the power

**“Operators need to have a better idea of how much wind and solar power to expect at any given time.”**

plans to have real-time transmission capabilities for most of the wind and solar facilities in Germany.

There are signs that the approach will work. The National Center for Atmospheric Research (NCAR) in Boulder, Colorado, started on a similar system in 2009, and it is now operational in eight US states. At Xcel Energy, the utility firm with the highest total wind capacity in the United States, the number of forecasting errors has dropped since 2009, saving customers some US\$60 million

forecast to guide these requests. But very few wind and solar facilities are set up to transmit the data in real time, so the results cannot yet be used to adjust how much power is produced. In two years, EWeLiNE

and reducing annual CO<sub>2</sub> emissions from fossil-reserve power generation by more than a quarter of a million tonnes per year, says Drake Bartlett, a renewable-energy analyst with the firm who is based in Denver, Colorado.

“Germany has some very good modellers who are already doing a nice job without the real-time data that we have,” says Sue Haupt, who oversees weather-system research at NCAR. “Once they get access to that data I am sure it’ll be used to great effect.”

EWeLiNE cannot simply use the NCAR system because weather models and the algorithms that convert weather predictions into power forecasts differ between the United States and Germany. ■

### CORRECTIONS

The News story ‘Academics across Europe join ‘Brexit’ debate’ (*Nature* **530**, 15; 2016) should have made it clear that Brexit would mean that the United Kingdom would have to renegotiate access to ITER but that it wouldn’t necessarily go to the back of the queue. And the News story ‘Zika raises wider birth-defect issue’ (*Nature* **535**, 17; 2016) wrongly said that Stanley Plotkin has retired, he is still working at the University of Pennsylvania in Philadelphia.