

## High-resolution Modeling Captured 4.5B€ in Costs

*Modeling in 5-minute Increments Delivers Greater Accuracy*



[Paul Deane](#) and [Fiac Gaffney](#) share insights on sub-hourly, high-resolution modelling. The research was led by Gaffney who ran simulations of future low-carbon and negative emissions of the EU power system.

### Situation

While working towards his PhD in 2012, Deane studied 5-minute to 60-minute [high-resolution unit commitment and dispatch modelling](#) in the Irish system. Since then, he and Gaffney revisited the problem from an EU perspective to determine how quickly it could run.

### Solution

While one methodology for running large annual simulations is to split it into monthly or weekly packets, solve with an overlap and then stitch the results back together ([Time Domain Partitioning](#)), PLEXOS can run the full model without splitting it.

With sub-hourly, high-resolution modelling, everything is faster: solvers and solving techniques have improved, the PLEXOS architecture has evolved and, of course, the cloud is now available for running operations.

At higher temporal resolution, constraints start to bind, that is, they are captured in the model and impact the objective function. Constraints like ramp rates, run-up profiles and shutdown profiles may not get captured fully in hourly modelling. A 400MW CCGT that can ramp at 30MW/min will not be picked up at hourly resolution but at 5 minutes it will. When a constraint is captured in linear programming it produces a shadow price. This is a useful metric, for example, to understand how much to pay for an extra unit of ramping.

### Results

High-resolution modelling is very important when it comes to understanding flexibility. The value of storage, power to gas (or X) and batteries are not adequately captured at hourly resolution. The results showed up to 100% increase in some battery usage in 5-minute results compared to traditional hourly results.

In addition, the results captured more systems costs: total annual system costs increased by 3%. While this may seem small, it **represents about 4.5B€ in annual costs for a system like the EU.**

### How to run sub-hourly, high resolution models:

1. Go to the interval setting.
2. Change the default ST resolution from 60-minute to 5-minute.
3. PLEXOS will do the rest.

Note that hourly renewable profiles in the model (such as wind and solar) will automatically downscale based on several available techniques.

**TIP:** Check the help files DataFile: Downscaling Method.

To learn more about power and water co-optimized models, visit: [energyexemplar.com](http://energyexemplar.com) or contact us at [info@energyexemplar.com](mailto:info@energyexemplar.com).