Impact of simulation time-resolution on the matching of PV production and household electric demand

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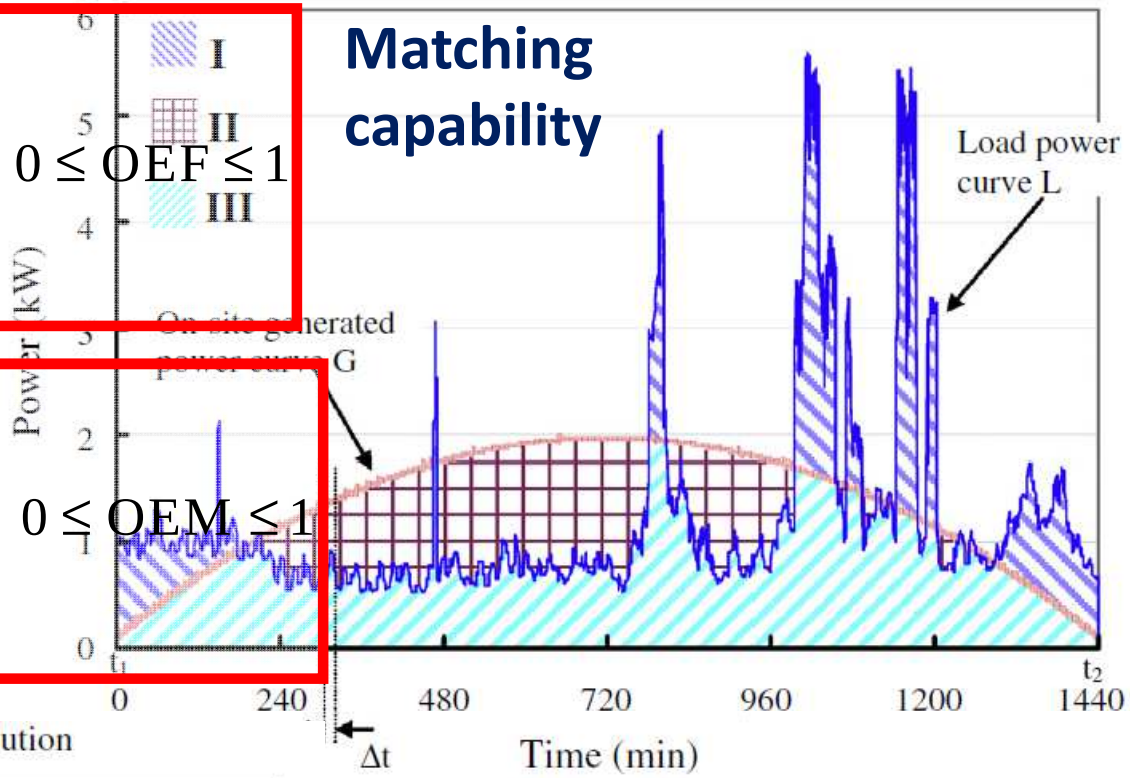
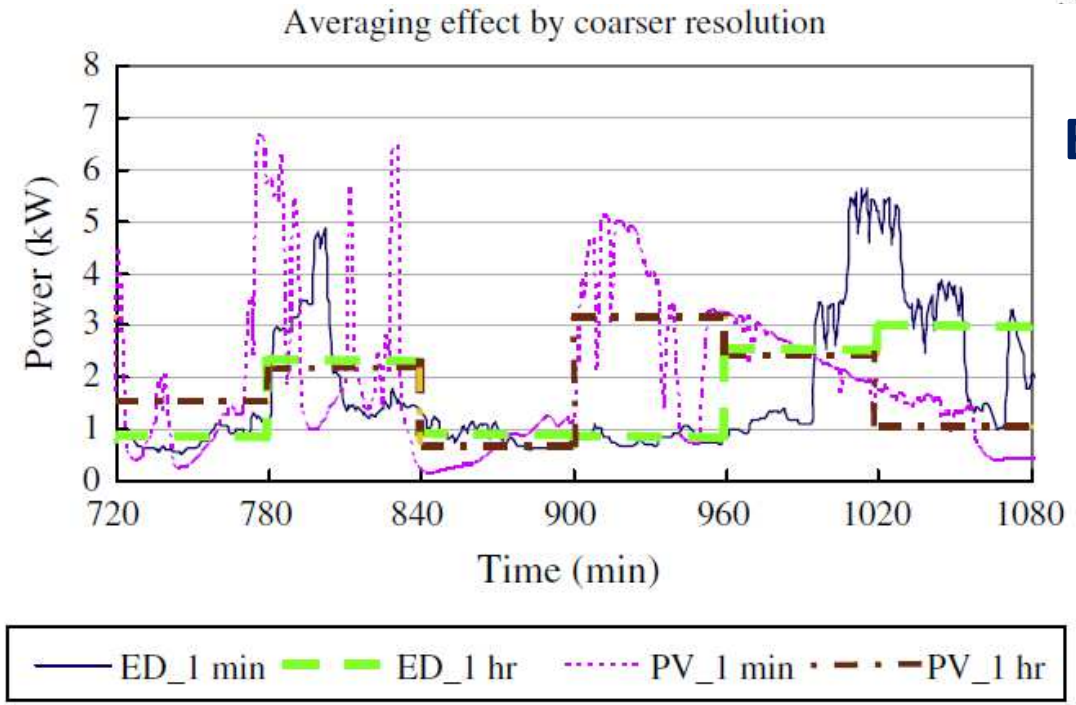
$$OEF = \frac{\sum_{i=t_1}^{t_2} \text{Min}[G(i); L(i)]\Delta t}{\sum_{i=t_1}^{t_2} L(i)\Delta t} \quad ; \quad 0 \le OEF \le 1$$

$$OEM = \frac{\sum_{i=t_1}^{t_2} \text{Min}[G(i); L(i)]\Delta t}{\sum_{i=t_1}^{t_2} G(i)\Delta t} \quad ; \quad 0 \le OEM \le 1$$

Matching capability

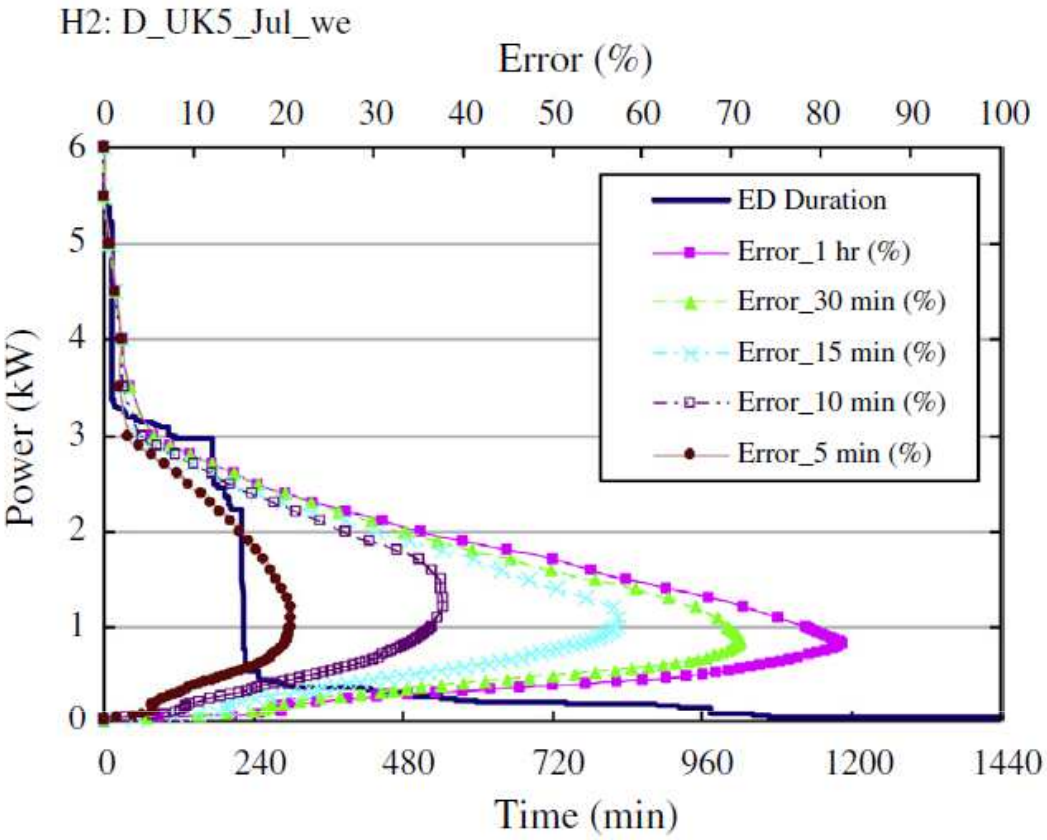




Error due to coarser resolution

$$e_{OEF} = \frac{OEFe\,|_{\Delta t} - OEFe\,|_{1\ min}}{OEFe\,|_{1\ min}}$$

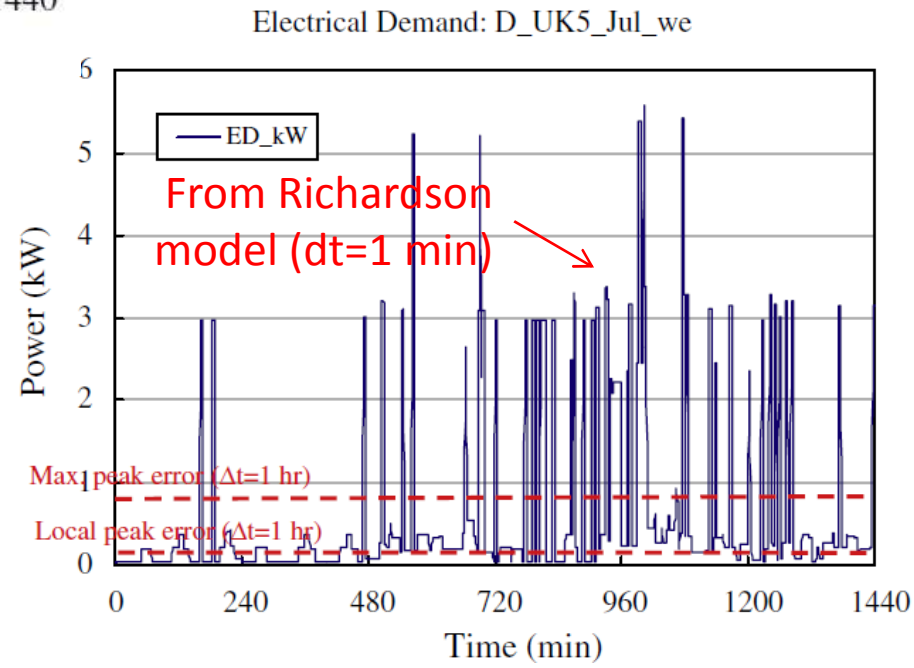
$$e_{OEM} = \frac{OEMe\,|_{\Delta t} - OEMe\,|_{1\ min}}{OEMe\,|_{1\ min}}$$



Representative research results

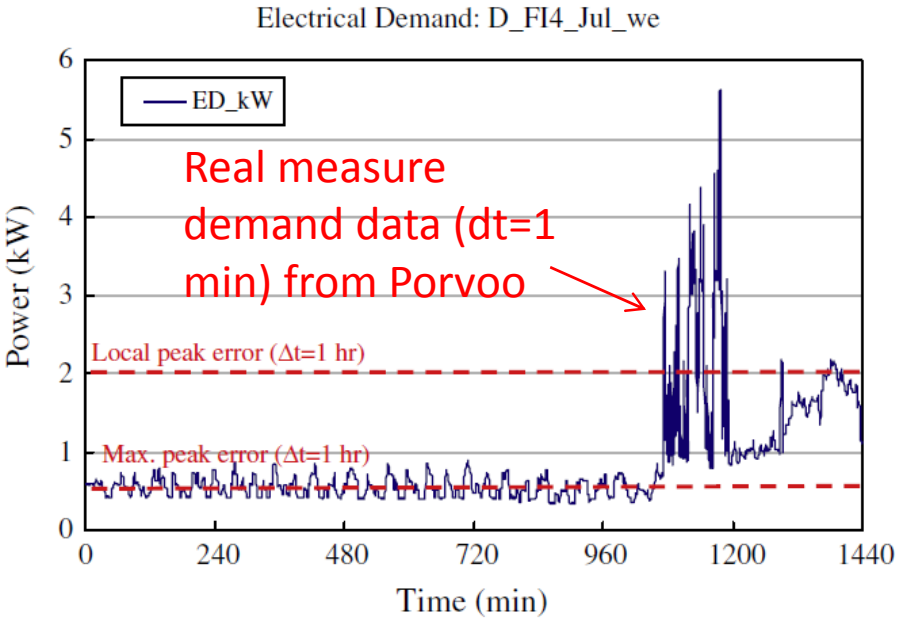
Hypothetical constant generation unit (HCGU), for the better understanding of the latter PV generation

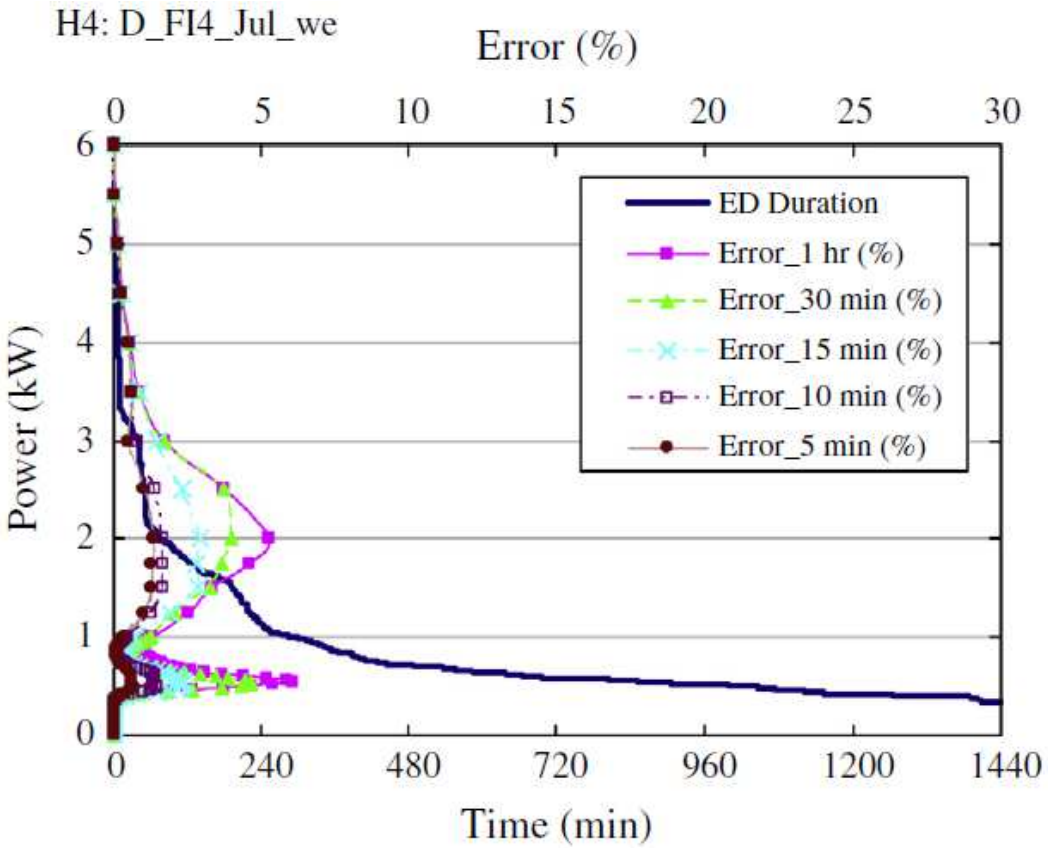
- ✓ Larger error is expected when the time-resolution is coarser



- ✓ When the generation curve frequently crosses the intermittent long sharp spikes in the demand profile, large errors are more likely to occur with coarser resolutions.
- ✓ The long sharp spikes are mostly sensitive to the averaging effect of coarser resolutions.

- The continuous sawteeth of the demand profile between the magnitudes of 0 and 2 kW represents the fluctuated base-load of the house, which is resulting from the devices such as a cycled refrigerator and a freezer.

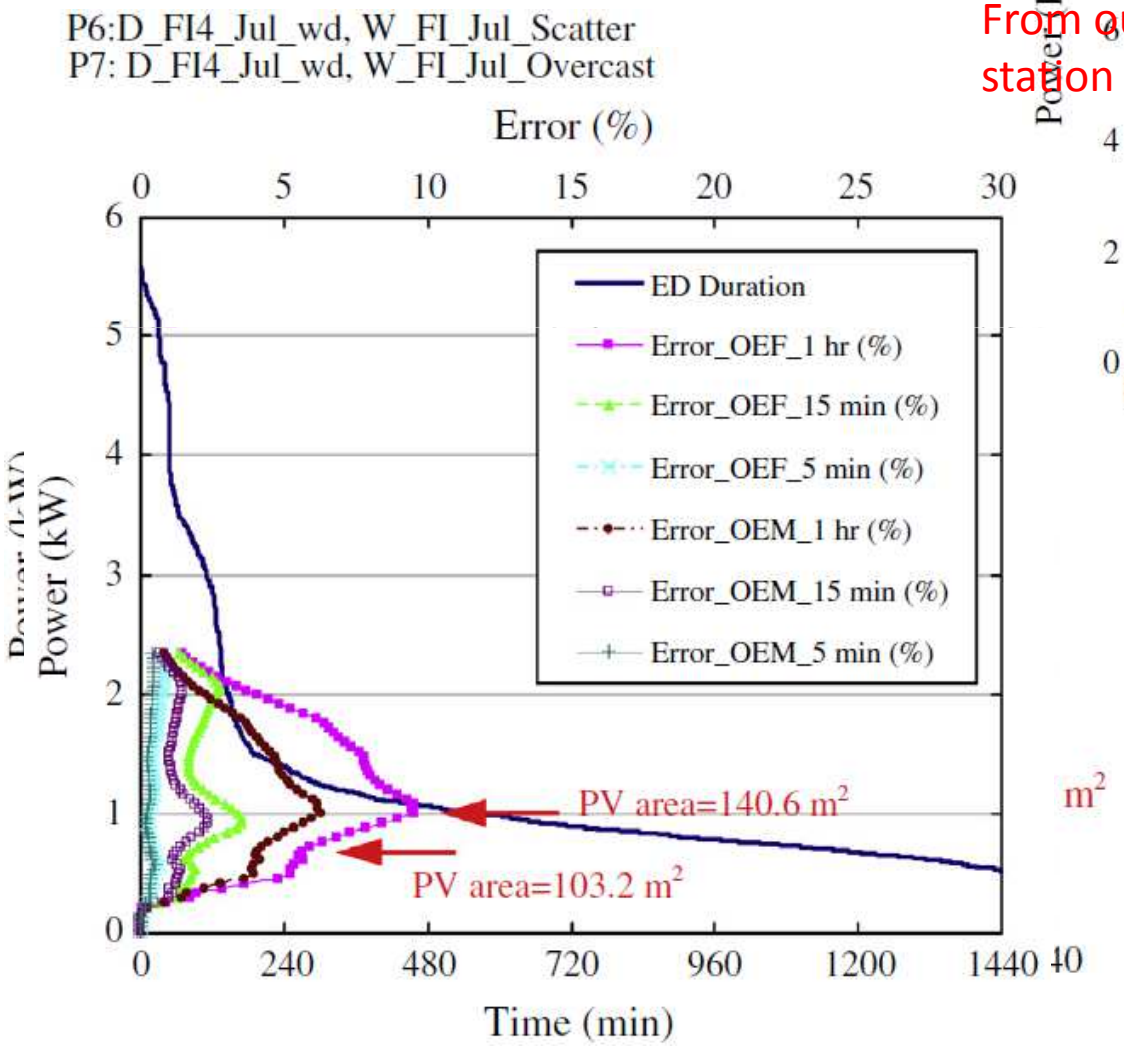


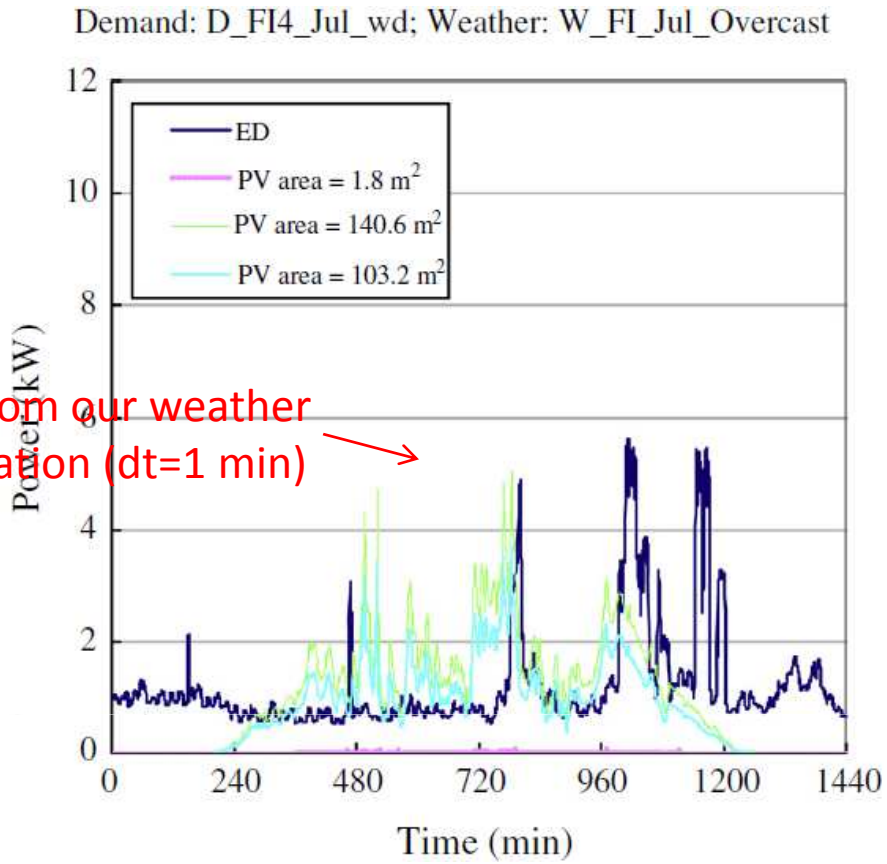


- When the generation curve frequently crosses these sawteeth, the local error peaks will more likely appear with coarser resolutions, because the sawteeth are also sensitive to the averaging effect.

The sky conditions are also a significant factor

- ✓ Noticeable peak errors will more likely occur under a scattered cloud condition than when there is either a clear sky or overcast conditio





From our weather station (dt=1 min)

- ✓ The PV generation under the scattered cloud condition is rather fluctuated, which means that it will be much more sensitive to the averaging effect caused by a coarser resolution, resulting in a higher possibility of noticeable errors than with other sky conditions.

Thank you very much for your attention.

Any questions?

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