

# Building Energy Simulation - Calibration

University of Maryland, College Park  
Mechanical Engineering Departments  
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# Model Calibration

- Coefficient of variation of the root mean square error CV(RMSE)  
*How good does my model do at predicting data?*

$$CV(RMSE) = 100 * \frac{\sqrt{\frac{\sum_i^n (y_i - \hat{y}_i)^2}{n-p}}}{\bar{y}}$$

- Normal mean bias error (NMBE)

*Does my model tend to over or underestimate actual use?*

$$NMBE = 100 * \frac{\sum^n (y_i - \hat{y}_i)}{(n-p) * \bar{y}}$$

$y_i$  = utility data predicted data for period  $i$

$\hat{y}_i$  = simulation-predicted data for period  $i$

$\bar{y}$  = mean of utility data

$n$  = # of data periods (12 months  $\rightarrow$   $n=12$ )

$p$  = # parameters in baseline model ( $p=1$ )



# Model Calibration

Calibration requirements:

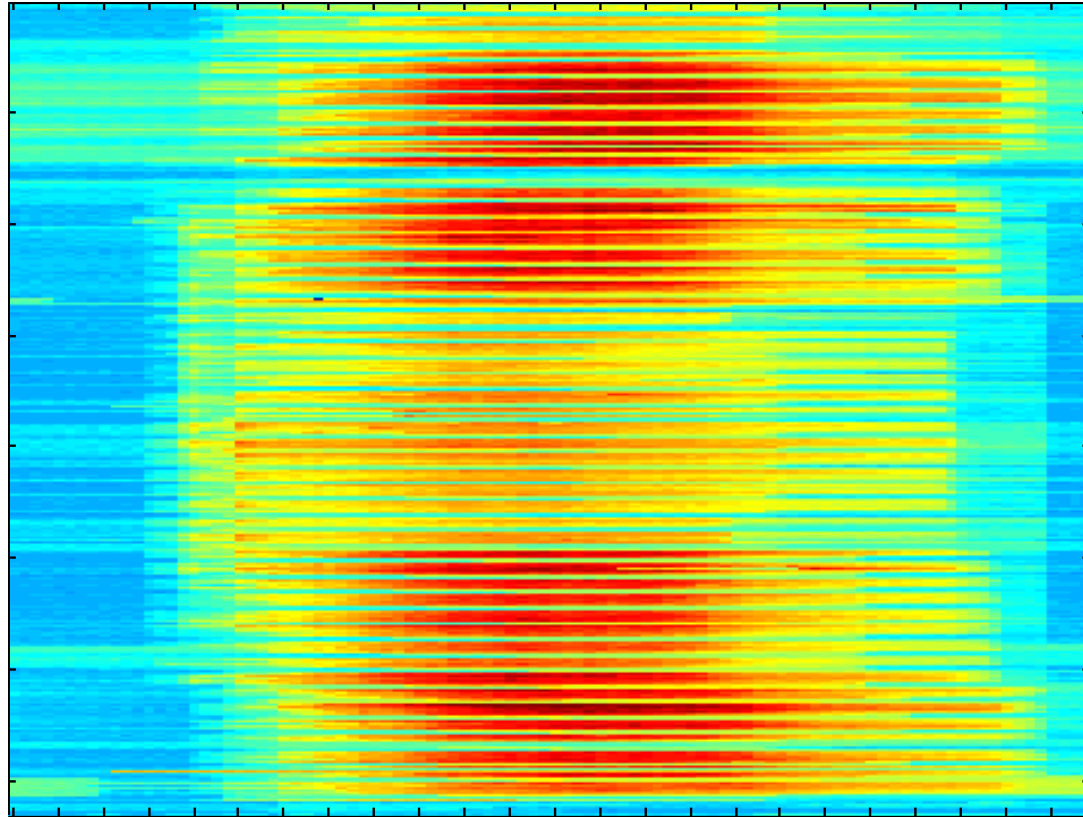
<b>Statistic</b>	<b>Monthly</b>	<b>Hourly</b>
<b><i>CV(RMSE)</i></b>	<b><i>15%</i></b>	<b><i>30%</i></b>
<b><i>NMBE</i></b>	<b><i>5%</i></b>	<b><i>10%</i></b>



# Model Calibration

Data on ELMS:

- 15 min elec
- 1 hr steam
- .csv and .mat



Credit: Ryan Mazurick

