



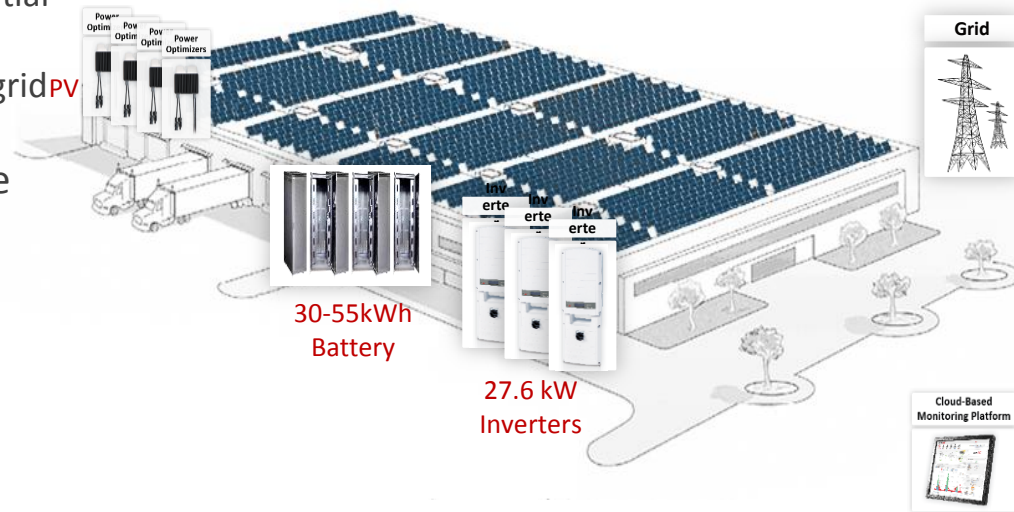
# Commercial Storage

Presented by:

3/28/2017

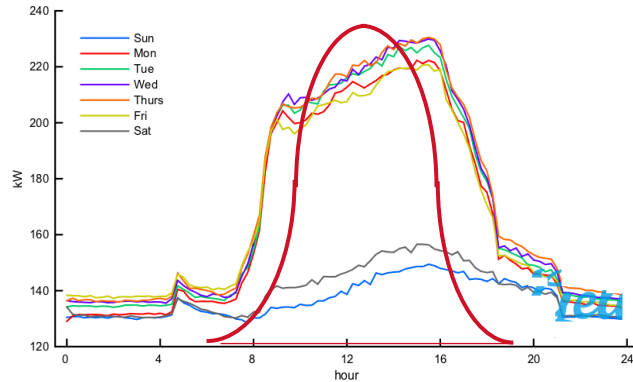
# Commercial StorEdge

- Increasing financial motivation to adopt storage because of:
  - High demand charges, which make peak shaving valuable
  - Time-of-use rates and demand response opportunities not typically available to residential customers
  - The ability to generate revenue from offering grid<sup>PV</sup> services
  - Incentives that reduce the net cost of the battery system
- Commercial storage can be used for:
  - Backup power
  - Load shifting
  - Peak shaving
  - Frequency controlled



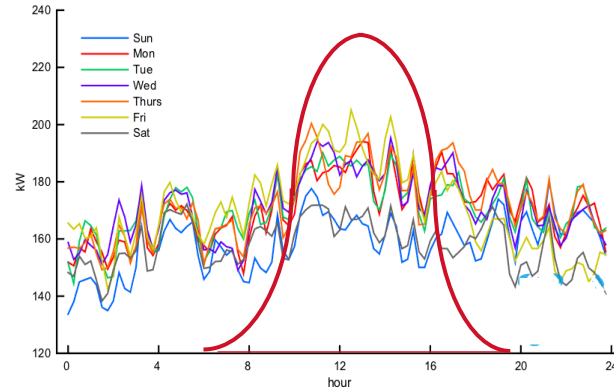
# Office vs. Factory Consumption

Office building



- Office building requires a much higher load during normal working hours than off-peak

Factory



- Factory's load is spread more equally over the entire 24-hour day
- Has higher variability

# Applications for Commercial Storage

	Application	Description
End customer	MCS/TOU	<ul style="list-style-type: none"><li>• Shifting PV to use in the evening (office building example above)</li><li>• Time of Use arbitrage</li><li>• C=0.25-0.5</li></ul>
	Demand Charge Management (Peak Shaving)	<ul style="list-style-type: none"><li>• Avoid charges based on peak energy demand (factory example above)</li><li>• Measured over a small time window (<u>typically 15-30 minutes</u>)</li><li>• Typical costs 30-120€/kW</li><li>• <b>Loss of one day can result in lost ROI for full year</b></li><li>• <b>C=~1</b></li></ul>
	Micro-grid (backup)	<ul style="list-style-type: none"><li>• Sometimes is the main motivation</li><li>• Sometimes provides additional use case for customers that install storage</li><li>• <b>Not phase balanced</b></li><li>• <b>Generator in parallel</b></li><li>• C=0.25-0.5</li></ul>

	Application	Description
Energy provider	Demand Response	<ul style="list-style-type: none"><li>• “Dynamic TOU” – utility notifies on high tariff few hours in advance</li></ul> Or <ul style="list-style-type: none"><li>• Export stored energy to the grid in response to the grid command</li><li>• <b>15min resolutions – hours in advance</b></li><li>• <b>C&gt;1</b></li><li>• Typical incentives – 30-90€/kW-available/year</li></ul>
	Frequency Regulation	<ul style="list-style-type: none"><li>• Energy storage respond and balance fluctuations in AC current in a matter of seconds</li><li>• <b>Reaction times – seconds</b></li><li>• <b>C&gt;1</b></li></ul>



# THANK YOU!



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**Cautionary Note Regarding Market Data & Industry Forecasts**

This power point presentation contains market data and industry forecasts from certain third-party sources. This information is based on industry surveys and the preparer's expertise in the industry and there can be no assurance that any such market data is accurate or that any such industry forecasts will be achieved. Although we have not independently verified the accuracy of such market data and industry forecasts, we believe that the market data is reliable and that the industry forecasts are reasonable.