



Virtual Power Plant as an Integral Part of DSM and Smart Grid Solutions

Clean Energy Expo Asia, Singapore

3rd November 2010



CPvT - A Smart Grid Solutions Company
(Group Company of vTrium Energy Singapore)

CPvT: What We Do?

- ▶ CPvT is a smart grid solutions company
- ▶ CPvT is working towards bringing innovative Energy Management Solutions to Asia including Singapore and India
- ▶ CPvT works with Utilities and property / facility owners / operators to identify, create and manage energy reduction assets that:
 - Create a fast and reliable “Negawatt” Generator for the utility
 - Reduce on-going energy costs and wasteful consumption



VPP DR: A new Approach to Demand Management

- ▶ Combination of technology and business relationships that enables utilities to reduce electricity consumption when needed in a pre-planned way
- ▶ Help utilities avoid / defer costs
- ▶ Holds the promise of significant economic, environmental, and social benefits
- ▶ May be compared to an airline offering an incentive (cash or a free ticket) to customers to get off an over-booked flight, or to take a later flight!

VPP DR in Action at the Facility Level

GRID STRESS → DR Call → Client Response



Managed reduction of assets and Processes



Turn off 1 of 4 elevators

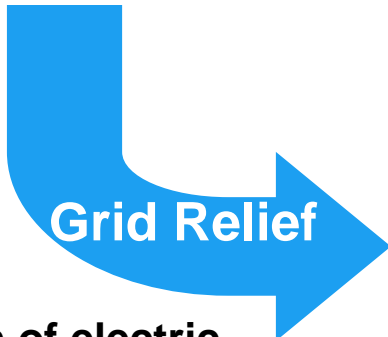


Implement global temperature re-sets

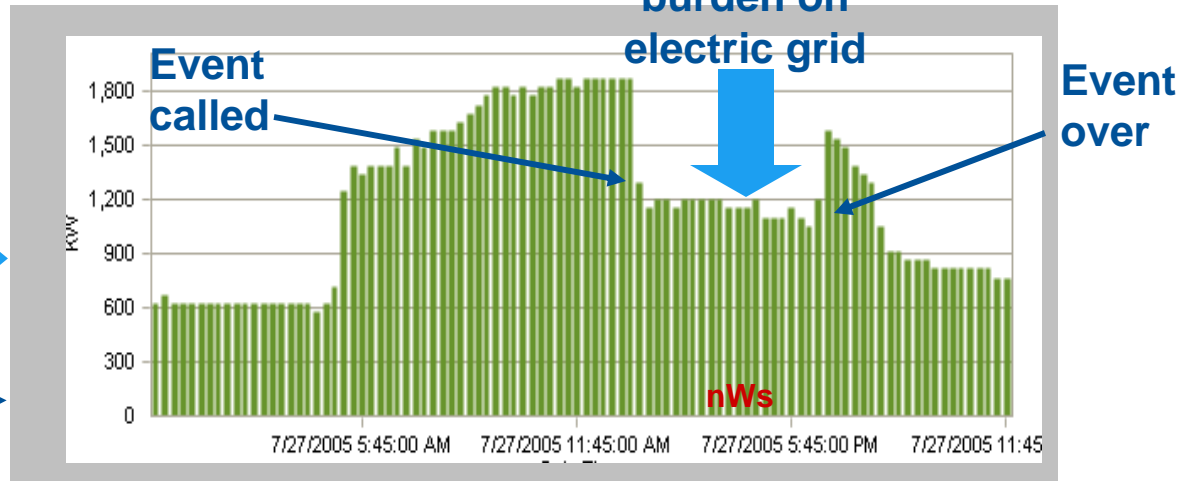


OR Turn on emergency generator

Client Reduces burden on electric grid

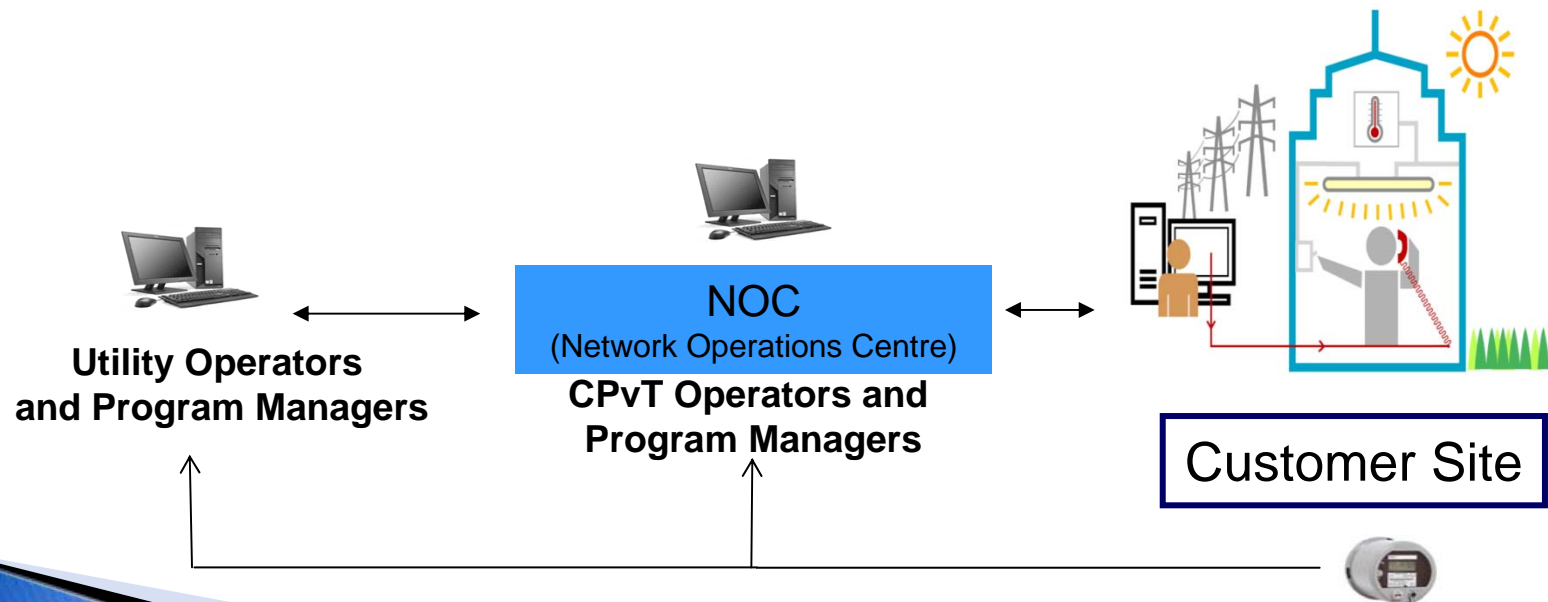


Graph of electric consumption at Site



VPP DR Operations – Sequence of Events

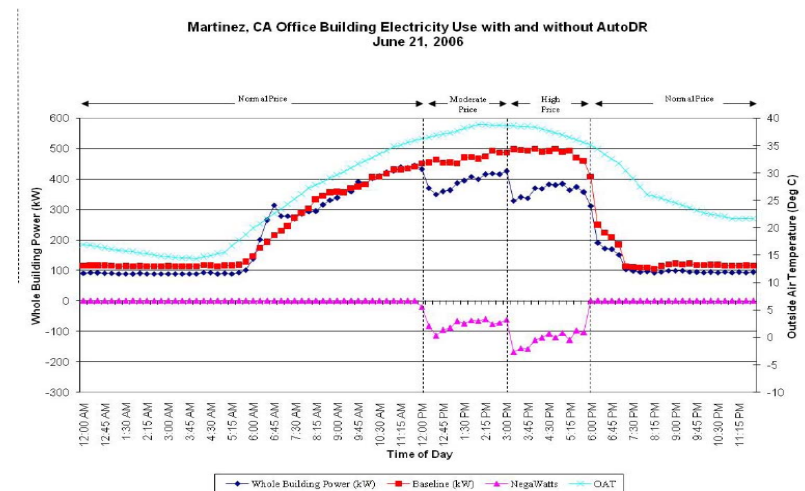
- The Utility has a grid crisis situation and notifies CPvT that it is calling the DR resource
- CPvT operations (7x24) notifies the participants to drop load or activates DLC
- Participants switch to backup generation or curtail to reduce load on grid
- Load is reduced until crisis passes (reserves levels return to normal / off-peak)
- Utility notifies CPvT and CPvT participants to reconnect to Grid
- Load on Grid is restored, backup generation run down (if activated)



Note: diagram meant to represent concepts only

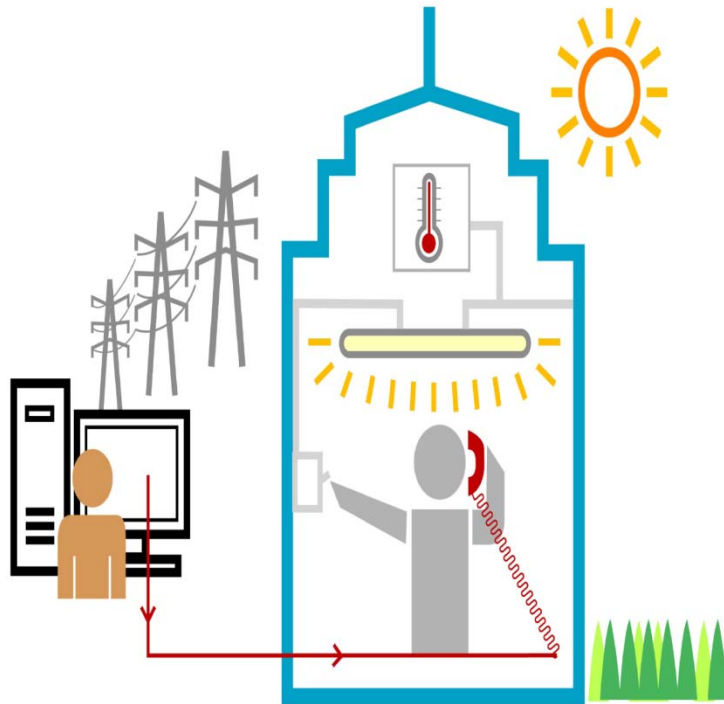
Example of a Facility Response to a Call

- The light blue line is the outside air temperature
- The brown line is the facility “Baseline” consumption – this is an estimated amount based on previous similar days of what the facility would have consumed if there was no demand response call
- The dark blue line is the actual metered consumption of the facility
- The purple line is the power saved by the curtailment of consumption by the facility when the call came – this is calculated as [power actually consumed minus baseline amount]

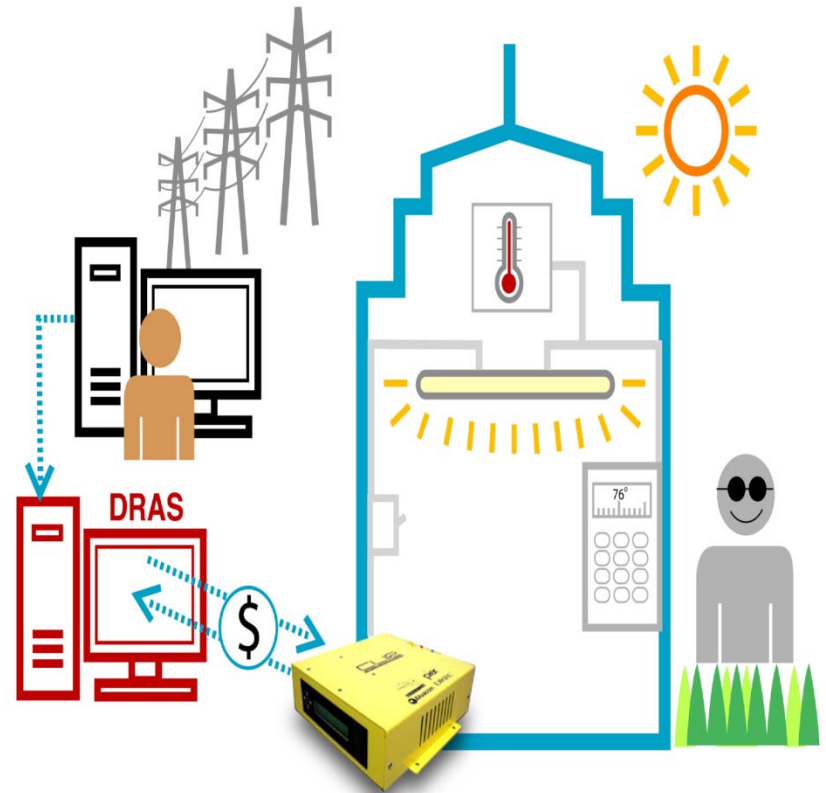


Direct Load Control (DLC) or Customer Action?

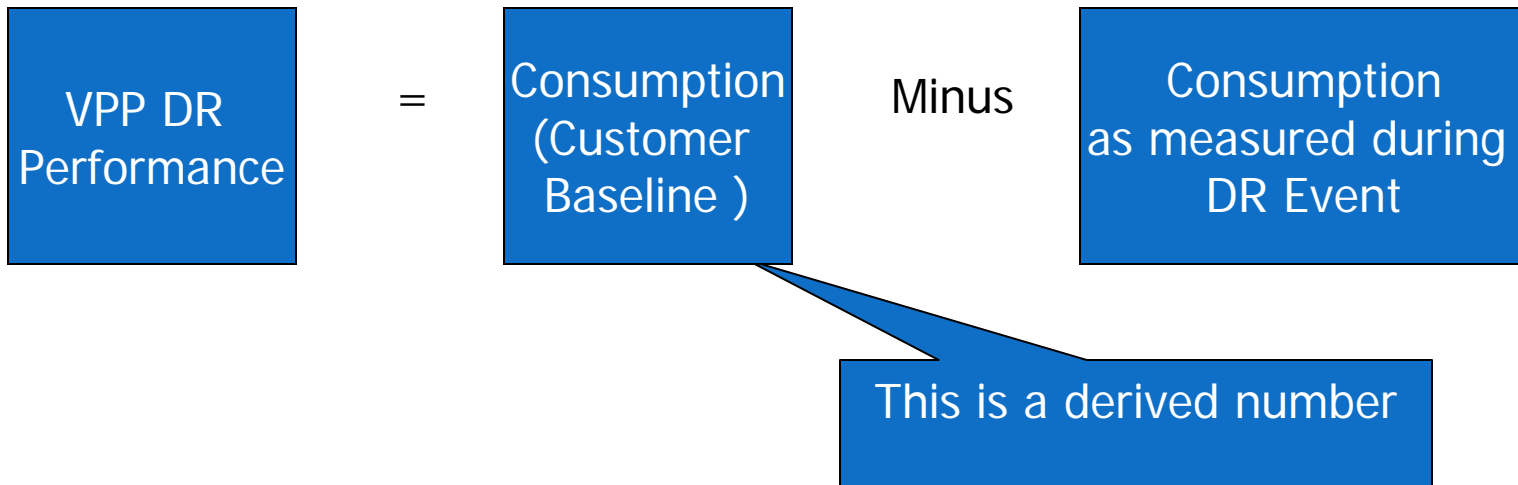
Manual Electric Load Reduction



Automated Electric Load Reduction



VPP DR : Measurement & Verification



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What is the Standard for Baseline?



1. Industry, Regulators and Academia has done immense work on baseline
2. Accepted versions are 10 in 10 Methodology or 3 in 10 Methodology

How is the Baseline calculated?



- Average of last ten or three similar days consumption depend upon the methodology selected
- DR event day/Holidays/abnormal days/data error days are excluded

Demand Response : Benefits

- ▶ Demonstrate that a VPP can provide all the benefits of a peaking power plant
- ▶ Fast to deploy
- ▶ Requires no additional T&D infrastructure
- ▶ Reduces system losses and pollution
- ▶ Help reduce dependence on imported fuel
- ▶ Drive waste reduction and energy efficiency for large power consumers reducing costs and improving their profitability
- ▶ Improve energy density in the nation
- ▶ Provide capacity reserve delaying the need to purchase additional base-load generation
- ▶ Help improve grid operation
- ▶ Negate or defer spending on T&D infrastructure

Conclusion

- ▶ DR Aggregator, Participating Customers and Load Serving Entity form integral part of a VPP DR solution.
- ▶ VPP DR program is another better form of DSM.
- ▶ Megawatt curtailment through VPP DR is dispatchable, measurable and verifiable.
- ▶ VPP's biggest benefit is peak load and emergency situations management thus leading to avoided new capacity cost.
- ▶ VPP DR eventually leads to energy efficiency, better energy density and reduction in carbon foot-print.



Thank You

Vijay Sirse, Director

CPvT Singapore

1 Fullerton Road, #2-01, One Fullerton
Singapore 049213

Email: vijay.sirse@vtriumenergy.com

Tel: +65 6832 5180, Fax: +65 6408 3801

Hp: +65 9669 1253