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Integrating DER

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Chief Engineer

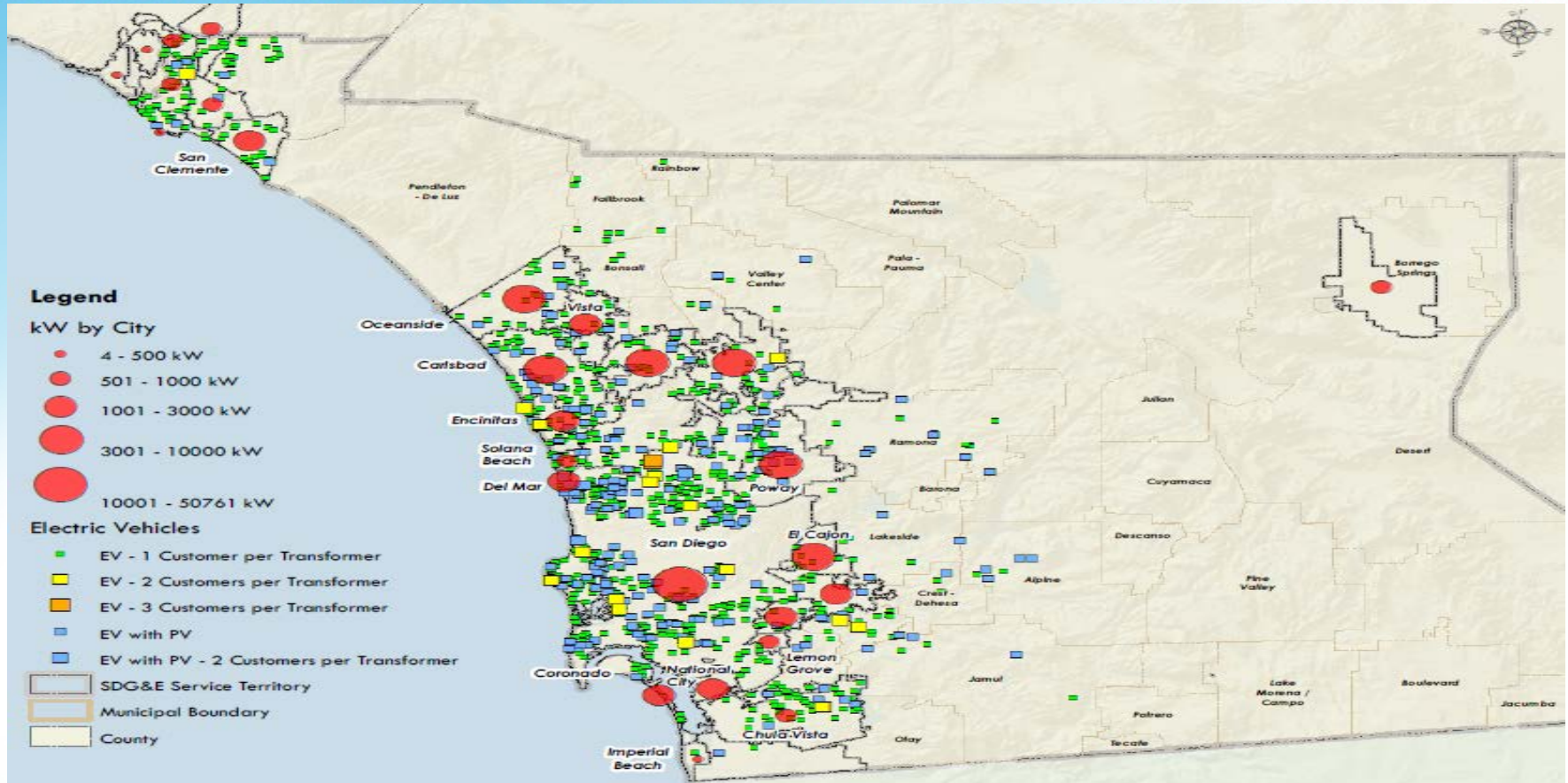


Smart Grid & Climate Change Summit
October 13, 2015

Integration of DER Solar & Electric Vehicle Customers



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SDG&E's Vision Consistent with State Policy Goals

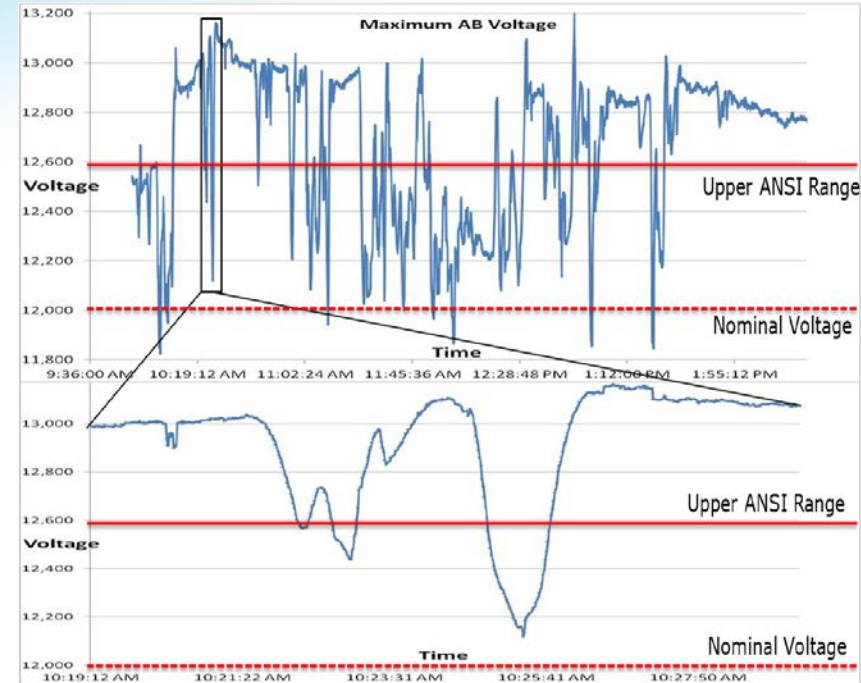
- **SDG&E supports the concept of “open access” for all types of DER and seeks to enable seamless integration of DERs while providing safe and reliable electric service across the distribution system contingent upon successful rate reform**
- The Distribution Resources Plan OIR (AB327) is intended to enable the widespread integration of DER in a cost effective manner while maintaining safety and reliability at the lowest cost to ratepayers
 - SDG&E supports anytime anywhere interconnection for Energy only DER
 - SDG&E supports the “right time, right size, right location, right certainty” approach to DER integration for cost effective grid alternatives (Capacity and Reliability) D.03-02-068
- Mass deployment of electric vehicles and electrification is critical to meeting state GHG goals
- Getting the rate structure right will enable and encourage “Plug and Play” DER

Solar PV Investment at SDG&E

- ~ 65,000 PV systems in SDG&E territory
- ~ 438 MW installed PV
- ~2,400 systems installed each month
- SDG&E invests ~\$2M/year to expedite NEM interconnections

Solar PV Distribution System Challenges

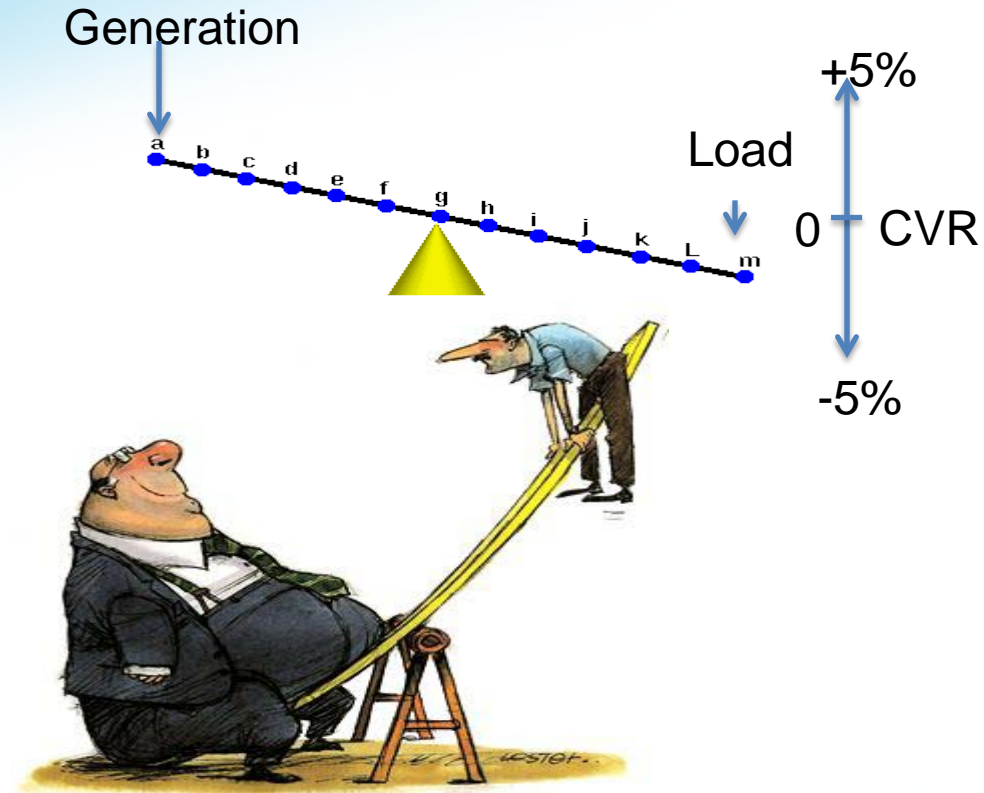
- **DER generation should have the same characteristics as traditional generation**
- Widespread PV penetration can lead to operational issues – Volt/VAR control, intermittency
- Smart inverters are a good first step
- Investment in Storage and EV can compliment PV



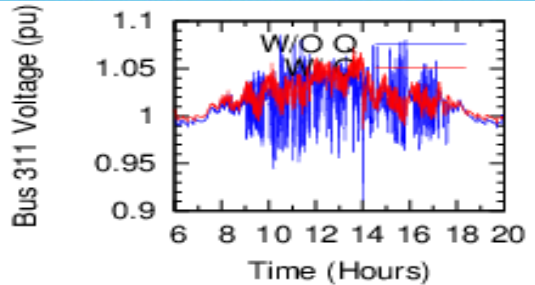
INTEGRATION OF DER

Factors Determining Impact

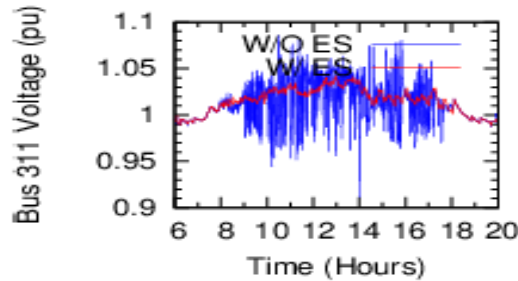
- **Location on the Circuit**
 - Near Substation vs End of Circuit
- **Circuit Rating**
 - 4 kV vs 12 kV
- **Type of Circuit**
 - Urban vs Rural
- **Circuit minimum loading**
 - High vs Low
- **Circuit X/R ratio at location**
 - High vs Low
- **Aggregate DG capacity**
 - Transmission issues
- **Voltage Regulation Equipment**



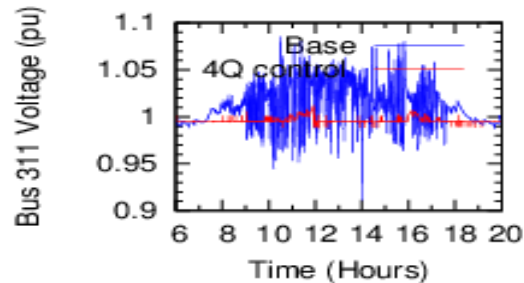
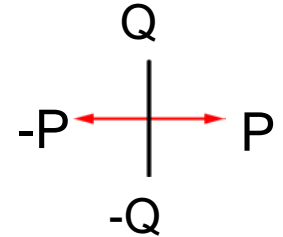
PV Intermittency Mitigation Based Upon Modeling with Smart Inverters



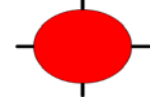
With and without dynamic VAr device



With and without energy storage



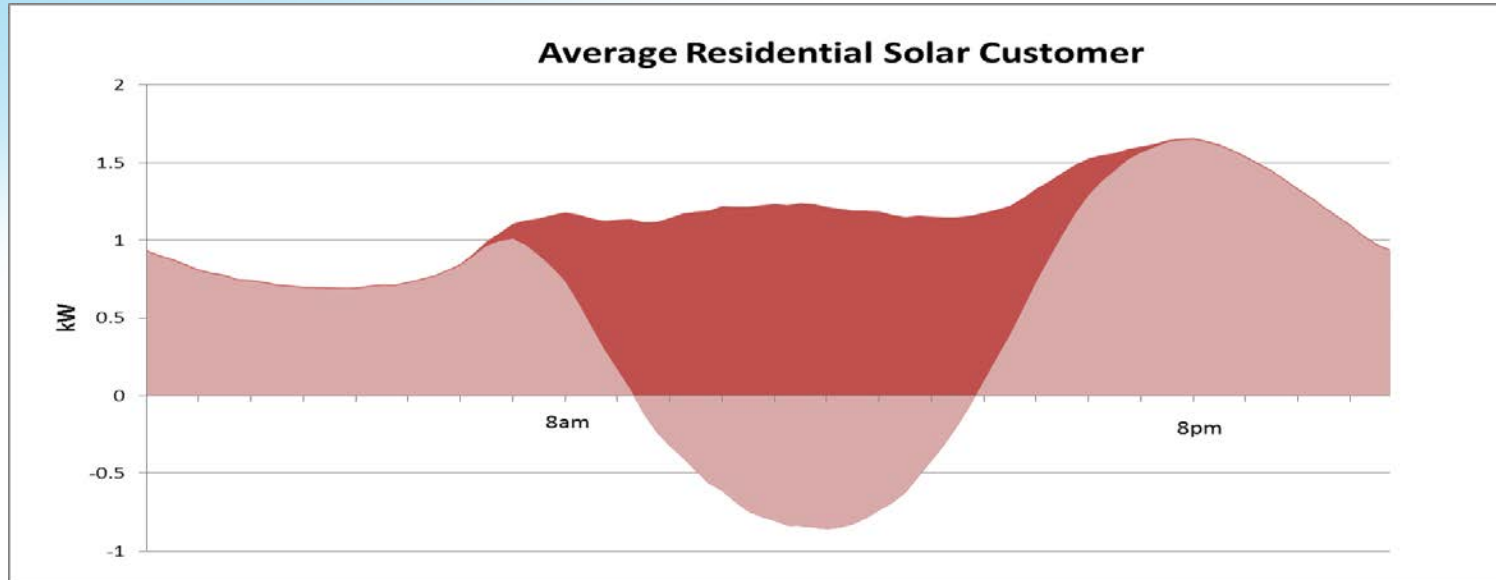
With and without storage and 4 quadrant control



Red = With Blue = Without

Solar PV Capacity Challenges

- Solar does not coincide with residential distribution system peaks
- Solar output curve does not match typical residential customer daily usage profile
- Opportunity for distribution and residential energy storage
- Commercial load profile is more aligned to solar output



Investing in Energy Storage

- Energy Storage can enhance the reliability and resiliency of the distribution system
 - Meet and manage residential peak demand
 - Smooth PV intermittency
 - Enable customer choice

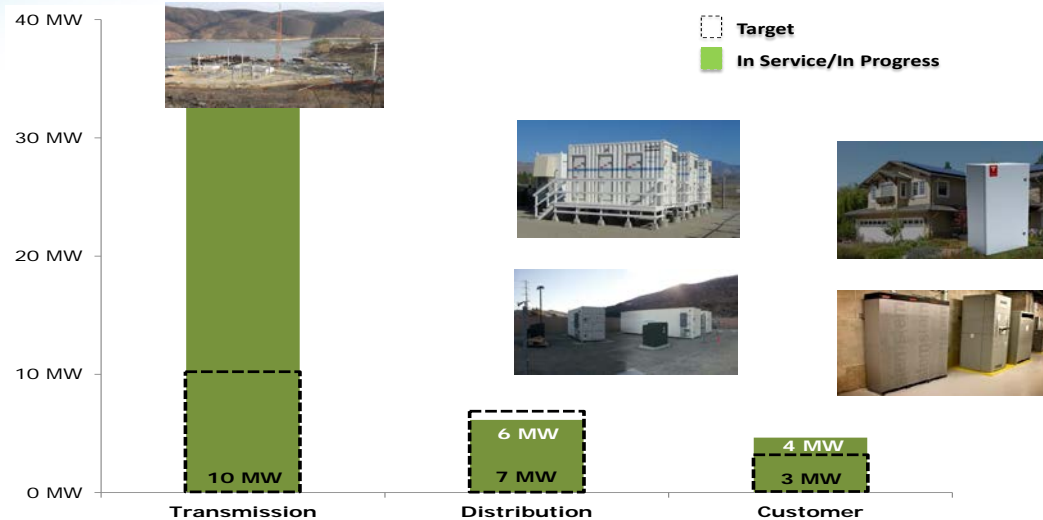
Target by 2020

165 MW

51MW

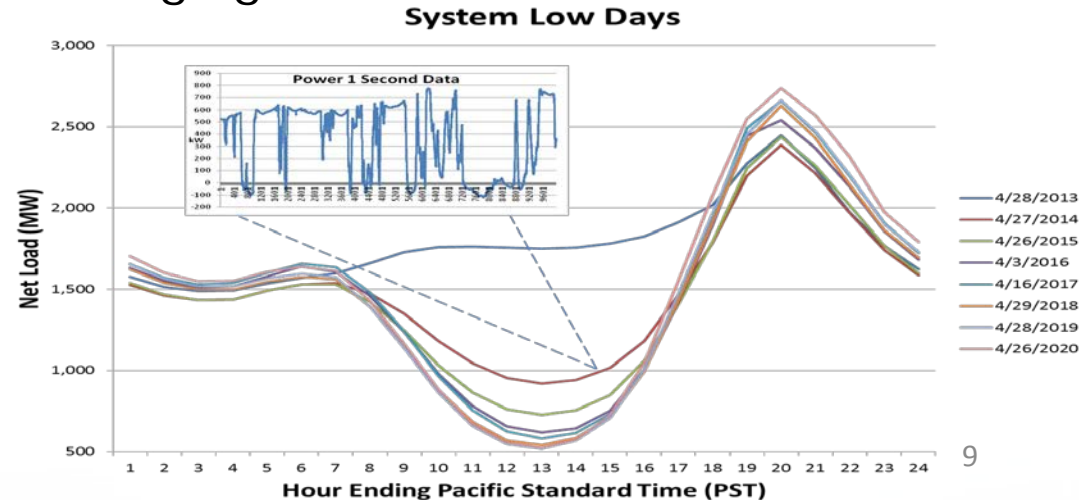
31%

0 MW



Investing in an “EV ready” Distribution System

- **Goal: Integrate as many EVs as possible with minimal impact and cost to the distribution system**
- Proactive management of EV charging can reduce on-peak charging and the need to build system or circuit capacity
 - VGI Pilot
- EV rates will incentivize efficient charging behavior
- Large potential for low cost charging in off-peak hours
- Potential elimination of the “duck curve” resulting from high PV penetration

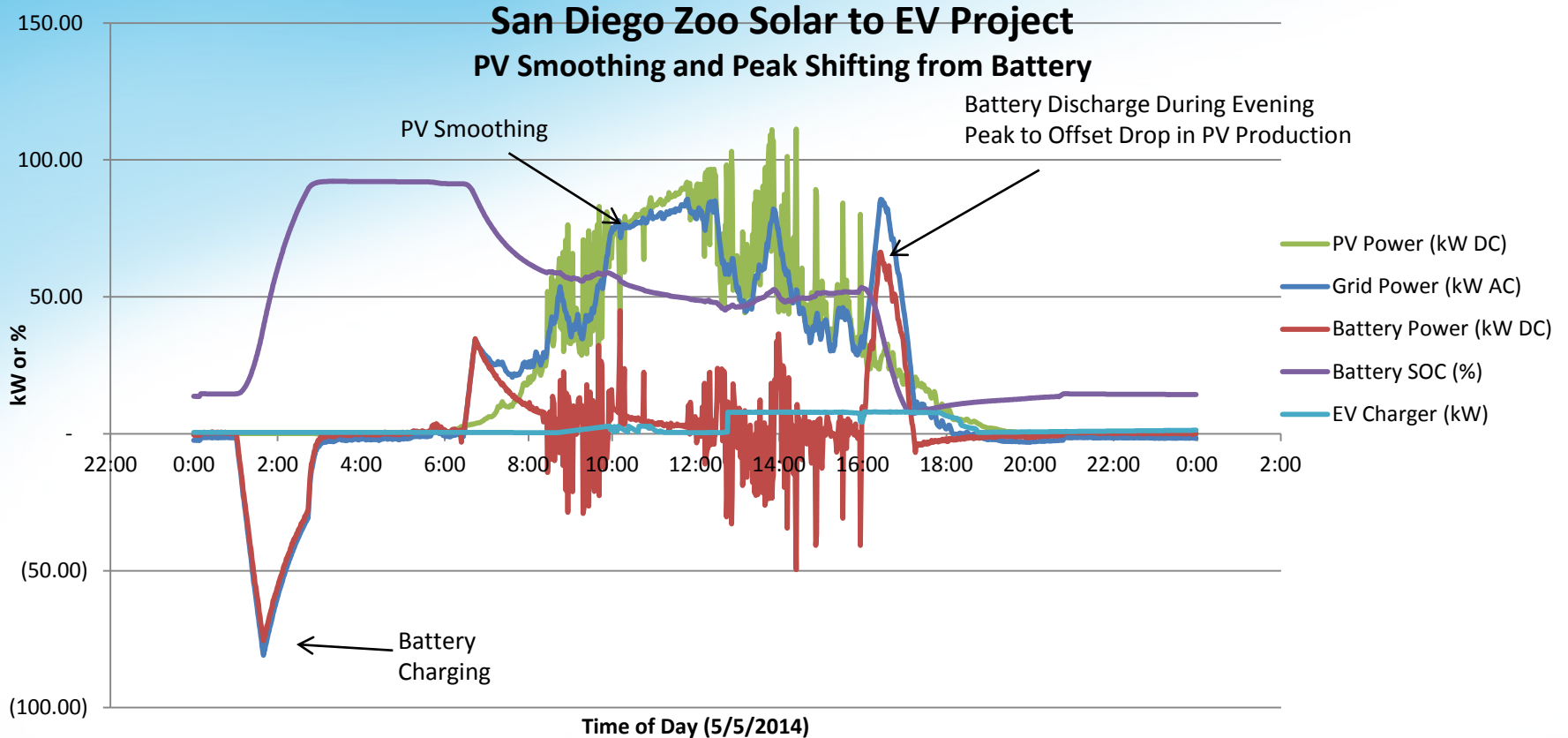


The Possible: PV, EVs and Storage

San Diego Zoo - May 5, 2014



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Borrego Springs Microgrid

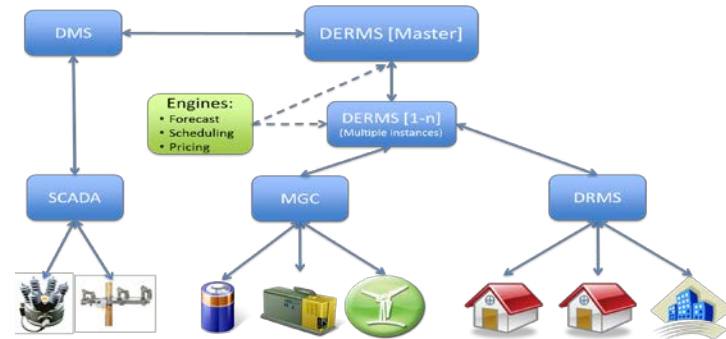
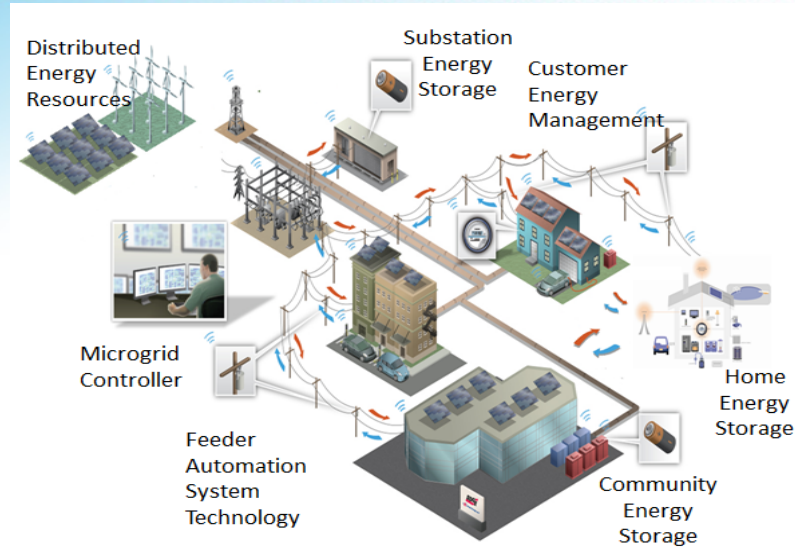


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The Distribution System of the Future

- Leverage existing systems: AMI - Advanced Metering Infrastructure
GIS - Geographic Information Systems & SCADA
- Implement new tools/systems: ADMS - Advanced Distribution Management System, DERMS - Distributed Energy Resource Management System
- Modelling: Advanced tools are necessary to plan, monitor, and control the distribution system of the future
- Rate Design: The proper rate structure will result in a more Plug and Play distribution system



Questions ?

Thank you.
Thomas Bialek
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PV Issues - Intermittency

PV Intermittency

