



**National Town Meeting  
Washington, D.C.  
Integration of Smart Grid Capabilities**

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# ALABAMA POWER

## Distribution Energy Efficiency Program (DEEP)

- DEEP (Distribution Energy Efficiency Program):
  - GOAL - maximize the efficiency (minimize losses) of distribution circuits while providing a load management option
  - Implement strategies from research projects:
    - DROP – Distribution Regulation Option Program
    - EPRI Green Circuits Research Project



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## Distribution Energy Efficiency Program (DEEP)

### ➤ What is DROP?

- Conservation Voltage Reduction (CVR)
- REDUCES Voltage to LOWER Demand and REDUCE losses (Up to 130 MWs at peak)
- REDUCES system VAR requirements (180 - 400 MVARs at Peak)
- Voltage level at regulator adjusted by end-of-line voltage
- Cheap alternative to conventional generation resources (\$10/kW)
- No carbon or emission offsets needed





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## Distribution Energy Efficiency Program (DEEP)

### ➤ EPRI Green Circuits Research Program

- Goal: Determine energy efficiency gains using different technologies and the cost/benefit ratios of each
- APC approach:
  - Volt/VAR control on two feeders
  - Urban Feeder improvements (Blue Lake feeder):
    - Installed modern LTC controller on power transformer
    - Implemented DAY ON-DAY OFF voltage scheme to capture results
    - DAY ON – lower voltage utilizing Line Drop Compensation
    - Optimized VAR flows
      - Removed 1 of 2 fixed capacitor banks
      - Installed 3 switched capacitor banks



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## Distribution Energy Efficiency Program (DEEP)

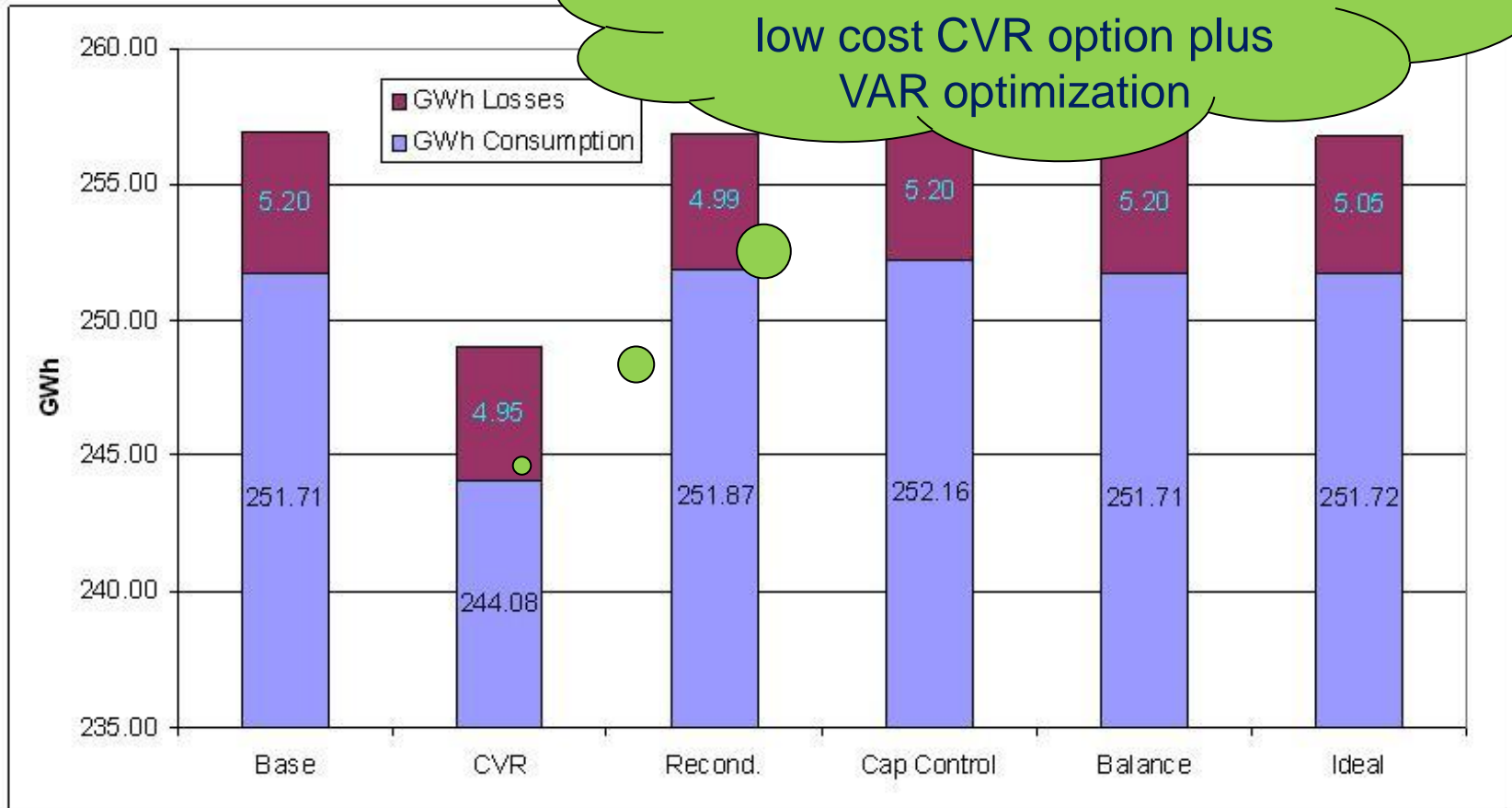
- EPRI Green Circuits Research Program (cont.)
  - APC approach (cont.):
    - Rural Feeder improvements (Cane Creek feeder):
      - Installed modern regulator controllers on feeder-head regulators and 3 sets of line regulators
      - Implemented DAY ON-DAY OFF voltage scheme to capture results
      - DAY ON – lower voltage utilizing Line Drop Compensation
      - Balanced amp flows on each phase
      - Optimized VAR flows
        - Removed 4 of 5 fixed capacitor banks
        - Installed 2 switched capacitor banks
    - Data Gathered
      - Hourly AMI readings for each customer
      - 15 minute SCADA readings



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## Distribution Energy Efficiency Program (DEEP)

Green Circuit Options for Blue Lake: APC chose the low cost CVR option plus VAR optimization

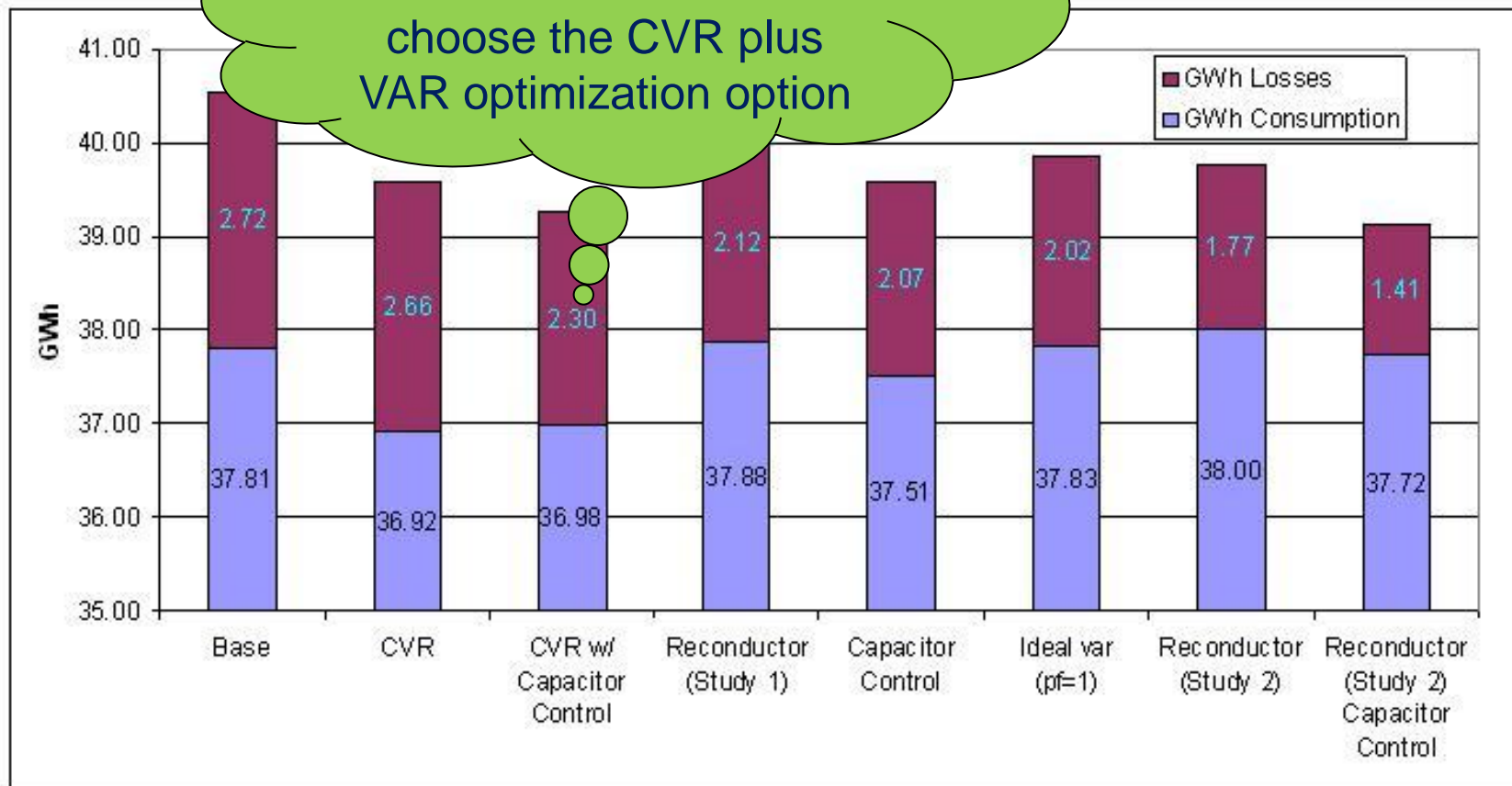




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## Distribution Energy Efficiency Program (DEEP)

Green Circuit options for Cane Creek: APC choose the CVR plus VAR optimization option

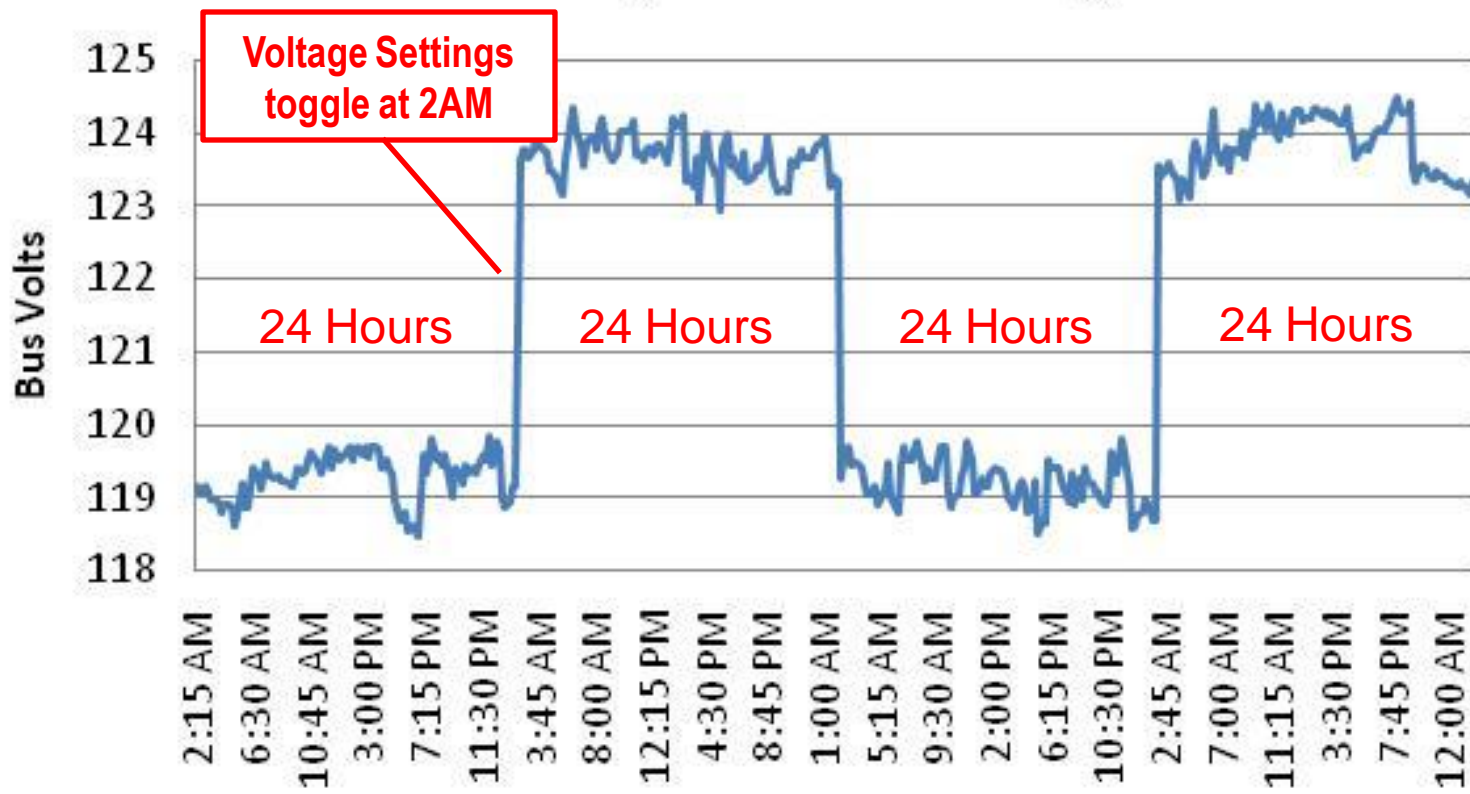




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## Distribution Energy Efficiency Program (DEEP)

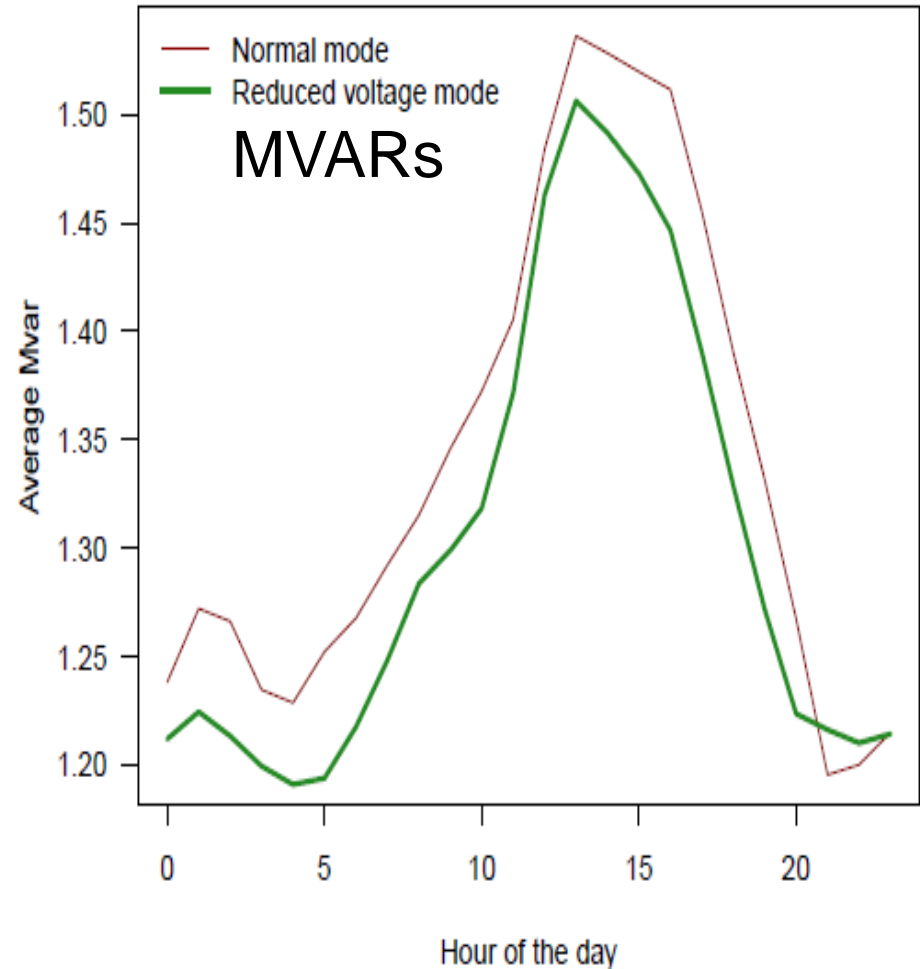
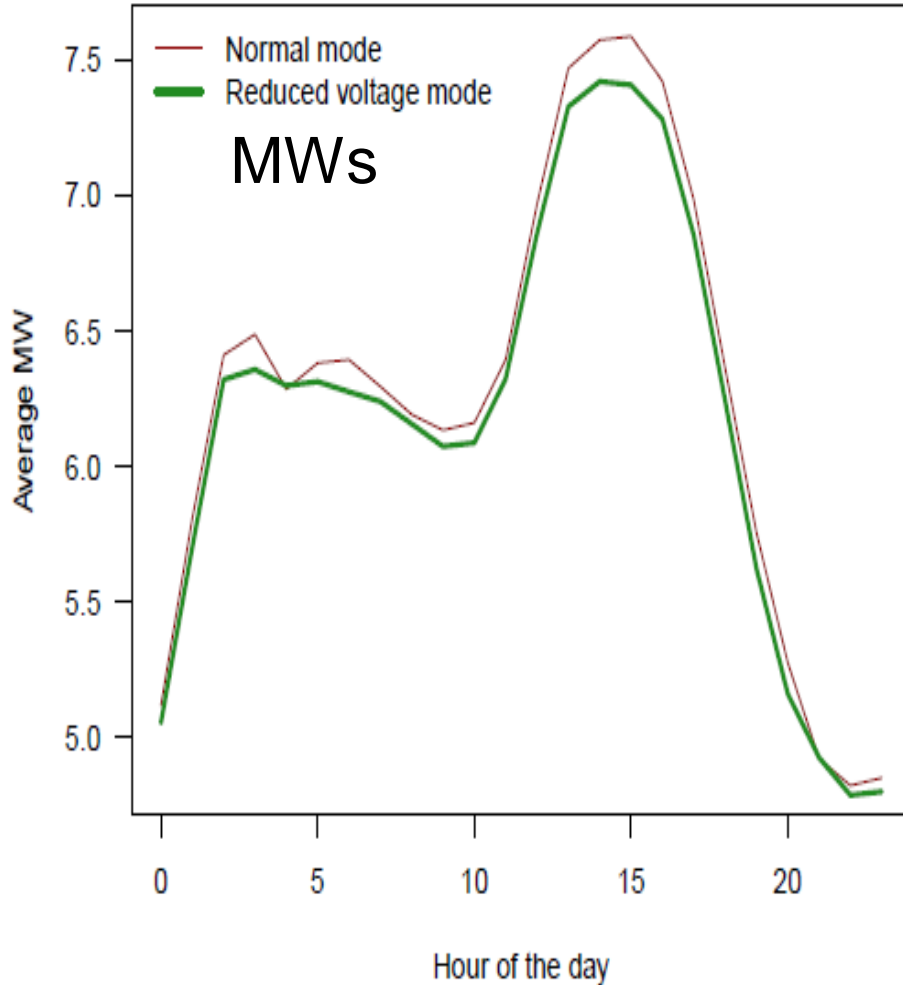
### Blue Lake DAY ON/DAY OFF Voltage Profile





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## Distribution Energy Efficiency Program (DEEP)

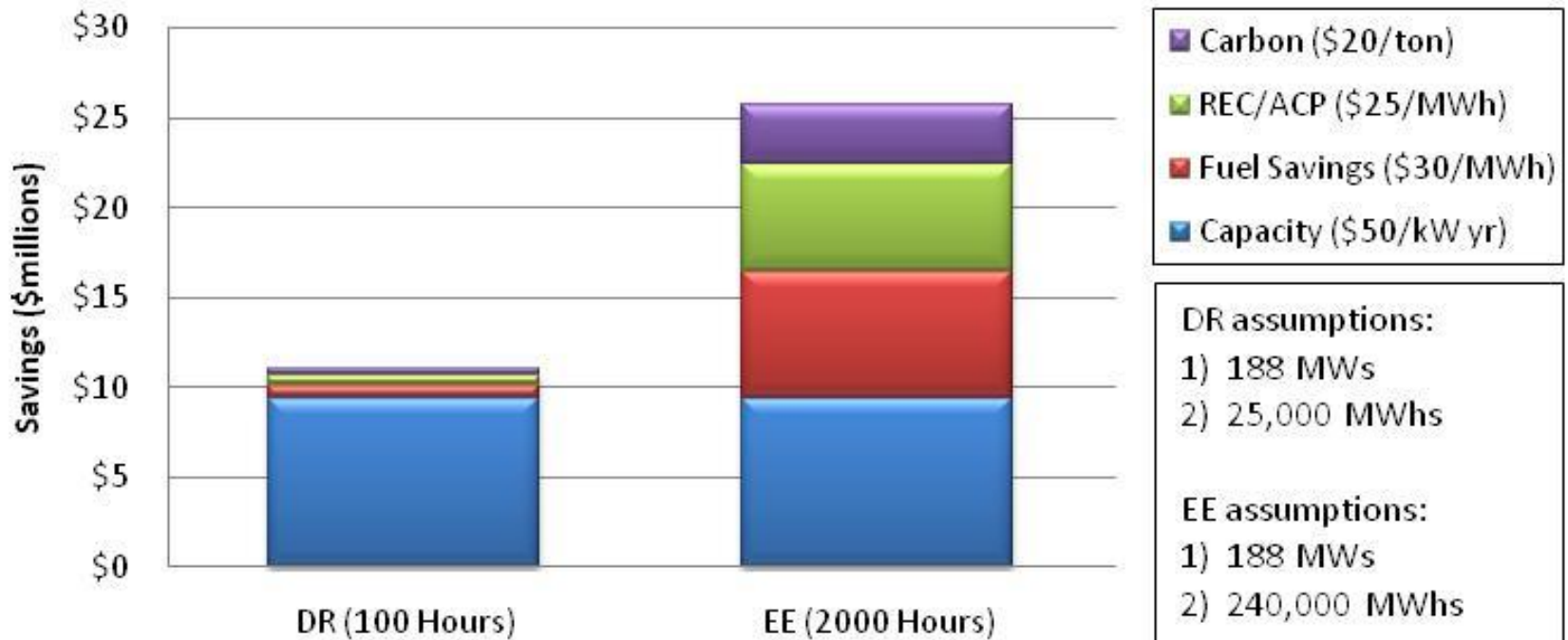


\* CVR has long term effects; NOT just at a peak.



# Distribution Energy Efficiency Program (DEEP – with RES and Carbon)

## Potential Savings of DROP and DEEP used as a DR or EE Program (2013)





# Distribution Energy Efficiency and Demand Response Programs

- Combined DROP and DEEP benefits:
  - Inclusion into the APC Integrated Resource Plan (IRP)
  - Capital Savings for 188 MWs:
    - Peaking CT(\$122M) vs. DSO(\$13M) = **\$109M saving**
    - Int. Loaded CC(\$150M) vs. DSO(\$13M) = **\$137M saving**

DSO Program	Installed Cost per kW (2013 \$'s)	Total kW's (2013)	Total Project Cost
DEEP	\$200	58,000	\$11,600,000
DROP	\$10	130,000	\$1,300,000
	Totals	188,000	\$12,900,000
Peaking CT	\$650	188,000	\$122,200,000
Int. Loaded CC	\$800	188,000	\$150,400,000

Note: Demand Response portion of DEEP within SGIG project.



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## Distribution Energy Efficiency Program (DEEP)

### ➤ Smart Grid Investment Benefits Re-cap

- Reduce system losses
  - Decrease demand on present Generation Fleet
    - Lower Fuel Costs
    - Reduce peak
  - Lower emissions
  - Decrease substation and feeder overloading
  - Defer capital projects (plants, subs, etc.)
- Provide additional Demand Response capabilities
- Reduce non-compliance penalties for not meeting pending emission and renewable standards
- One of the more cost effective energy efficiency options