

# Integrated Resource Plan

TVA'S ENVIRONMENTAL AND ENERGY FUTURE

Energy Efficiency / Demand Response  
Potential in the Valley

December 10-11, 2009





# Estimates of Energy Efficiency / Demand Response Potential

**Many varied estimates of energy efficiency and demand response have been developed over the past few years. Assessing these analyses requires consideration of definition, region included, and assumptions used.**

- ◆ Definitions of energy efficiency / demand response potential:
  - Technical potential – the maximum penetration of a technology, which is considered unachievable and represents the upper limit of penetration
  - Economic potential – the penetration of a technology in the marketplace based on purely economic criteria (for the customer) with current pricing and energy savings estimates applied
  - Program (realistic) potential – the penetration of a technology assumed to be applicable for new promotional programs for a technology, tempered by technical, economic, and participation estimates
    - Terminologies, definitions, and methodologies vary slightly in estimating these potentials
    - Assumes consumers make rational financial decisions
    - Utility costs/benefits not addressed
  
- ◆ Estimates are sensitive to changes in regional factors such as:
  - Customer class diversity
  - Rate structures
  - Customer density
  
- ◆ Consideration of assumptions related to:
  - Equipment / appliance saturations
  - Customer adoption
  - Definition of potential



# Energy Efficiency / Demand Response Long-Term Potential in the Valley

The following table summarizes recent estimates of demand and energy reduction potential at the national, regional, and Valley level.

Study	National	South	Valley (2030)
<b>Peak Demand Reductions</b>			
EPRI	218 GW (EEDR) <sup>1</sup>	--	7 GW
FERC	188 GW (DR) <sup>4</sup>	32 GW (DR) <sup>4</sup>	--
TVA	--	--	10 GW <sup>5</sup>
<b>Energy Reductions</b>			
EPRI	473 TWh <sup>2</sup>	90 TWh <sup>3</sup>	15.5 TWh
Georgia Tech	--	242 TWh <sup>6</sup>	--
McKinsey	1,080 TWh	498 TWh	--

- 1) Maximum achievable potential demand reduction of non-coincident summer peak in 2030 from contributions of both energy efficiency and demand response measures.
- 2) Economic Potential Energy Savings in 2020 relative to DOE's Annual Energy Outlook 2008 Reference Case
- 3) Realistic achievable potential energy savings for US South census region in 2020
- 4) Demand Response Potential for US and East South Central Census division (2019)
- 5) Maximum Technical Potential for the Valley, EEDR Potential
- 6) Meta-Review of Efficiency Potential Studies and Their Implications for the South (2020 result)

1,000 kWh = 1MWh; 1 million kWh = 1 GWh; 1 billion kWh = 1 TWh  
 EEDR = Energy Efficiency and Demand Response  
 DR = Demand Response

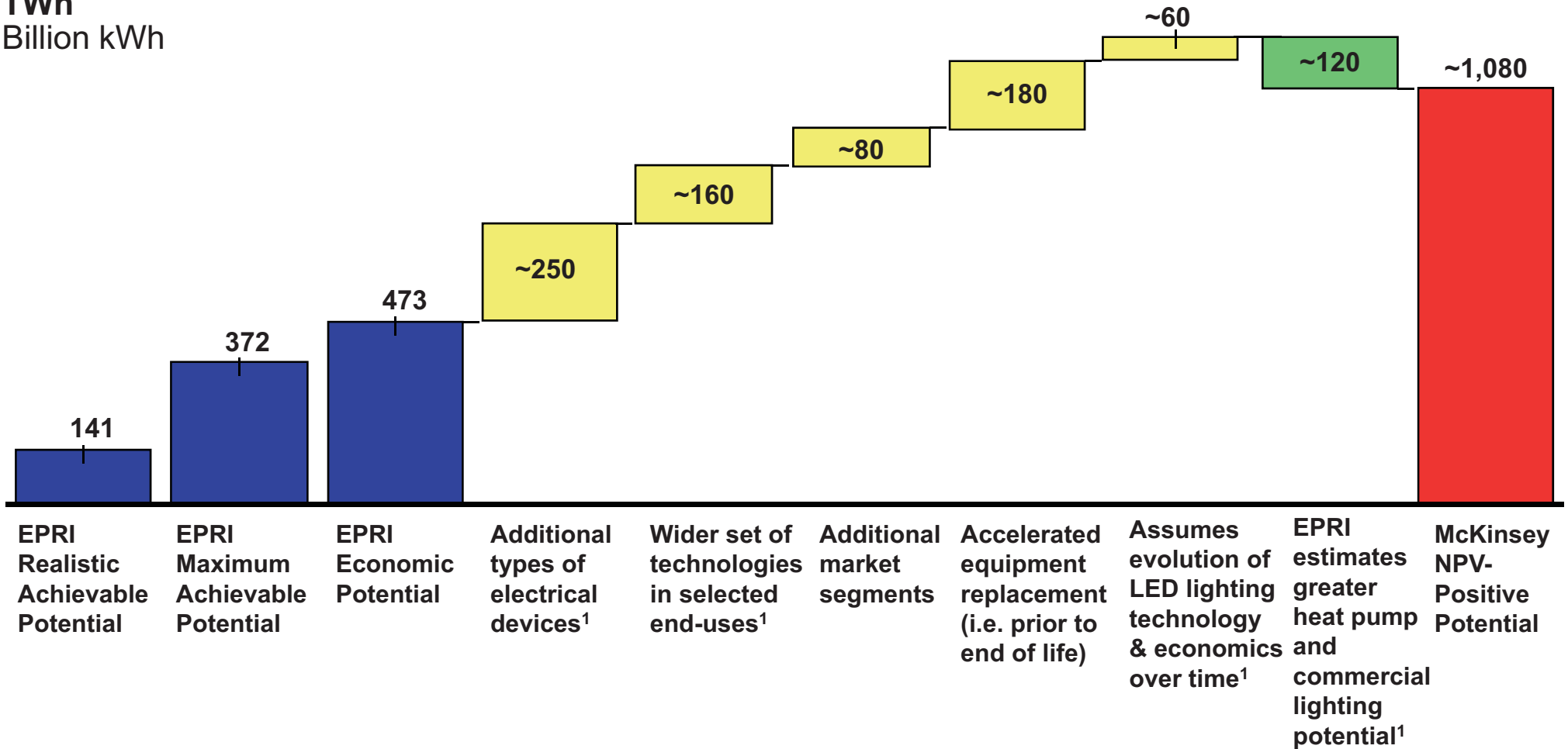
**Based on a cooperative effort with EPRI, TVA believes that the maximum realistic potential for the Valley is 7,000 MW and 15,500 annual GWh by 2030.**



# Comparison of EPRI and McKinsey Energy Efficiency Potential Values for 2020

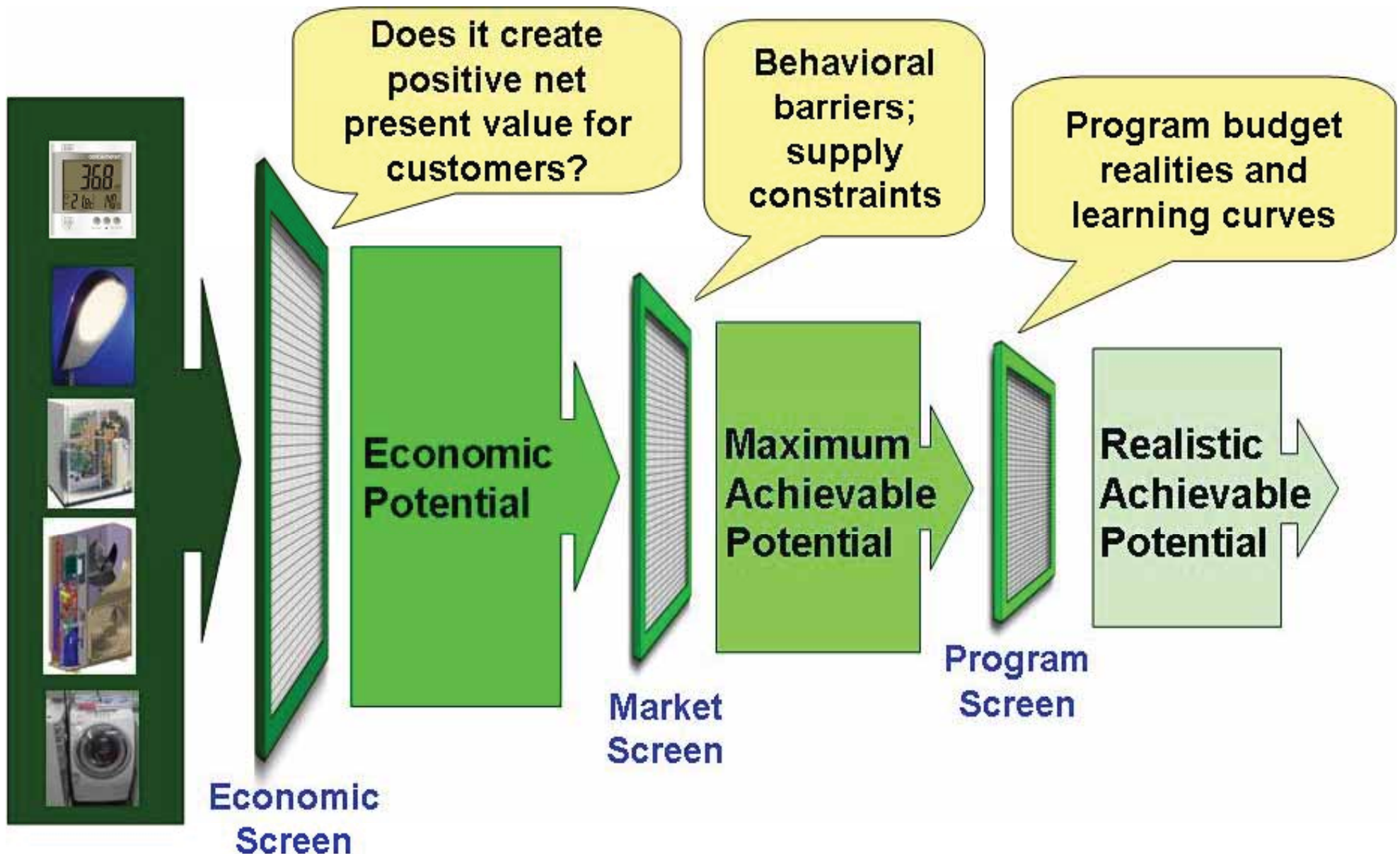
## 2020 Electricity Energy Efficiency Potential (Relative to AEO 2008 Reference Case)

TWh  
Billion kWh



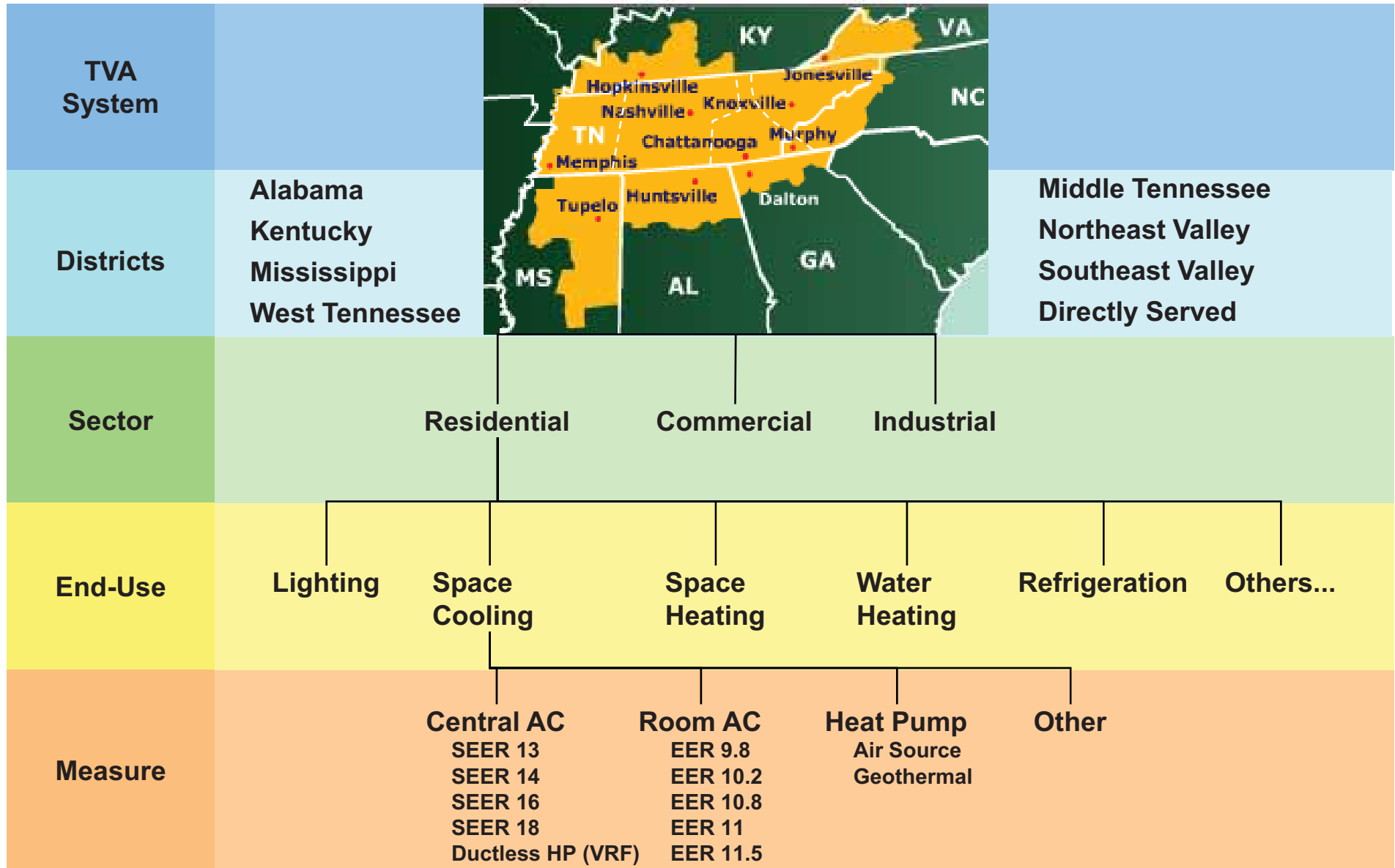
<sup>1</sup> Includes small differences in technology performance and cost assumptions, discount rates, and electricity rates between the two reports

# TVA End-use Measure Analysis



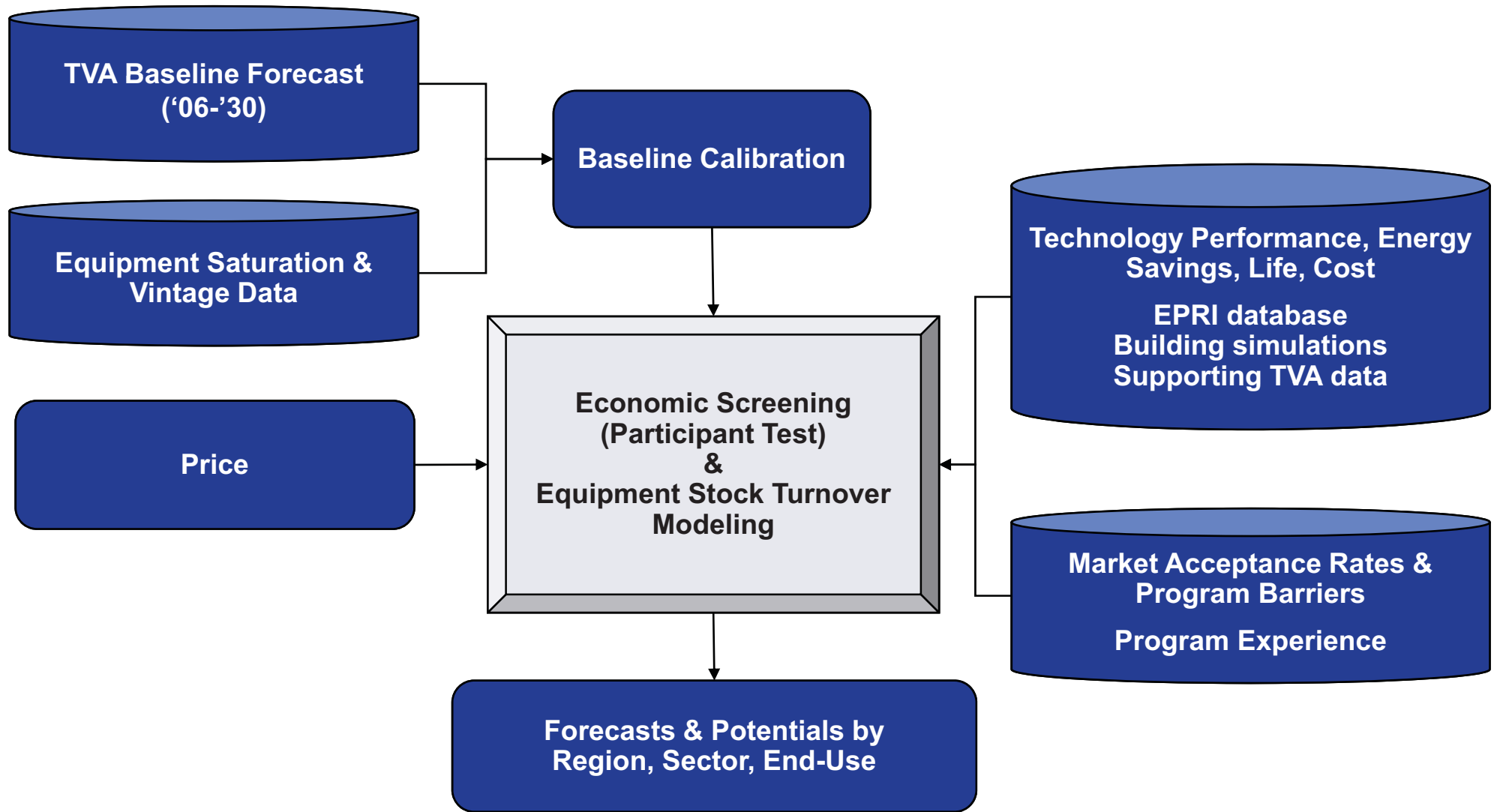


# Segmentation of Analysis – by District, Sector, End-use and Measure





# Overall Approach follows the EPRI National Study



The tables below detail the maximum realistic potential MW and GWh reductions in the Valley by 2030.

### Potential Summer Peak MW Reductions

Sector	2010	2015	2020	2025	2030
Residential (DR)	254	525	702	743	784
Commercial (DR)	262	451	673	792	1,052
Industrial* (DR)	664	1,150	1,665	2,156	2,905
EE Contribution (all classes)	104	417	913	1,457	2,281
Total TVA	1,284	2,543	3,953	5,148	7,022

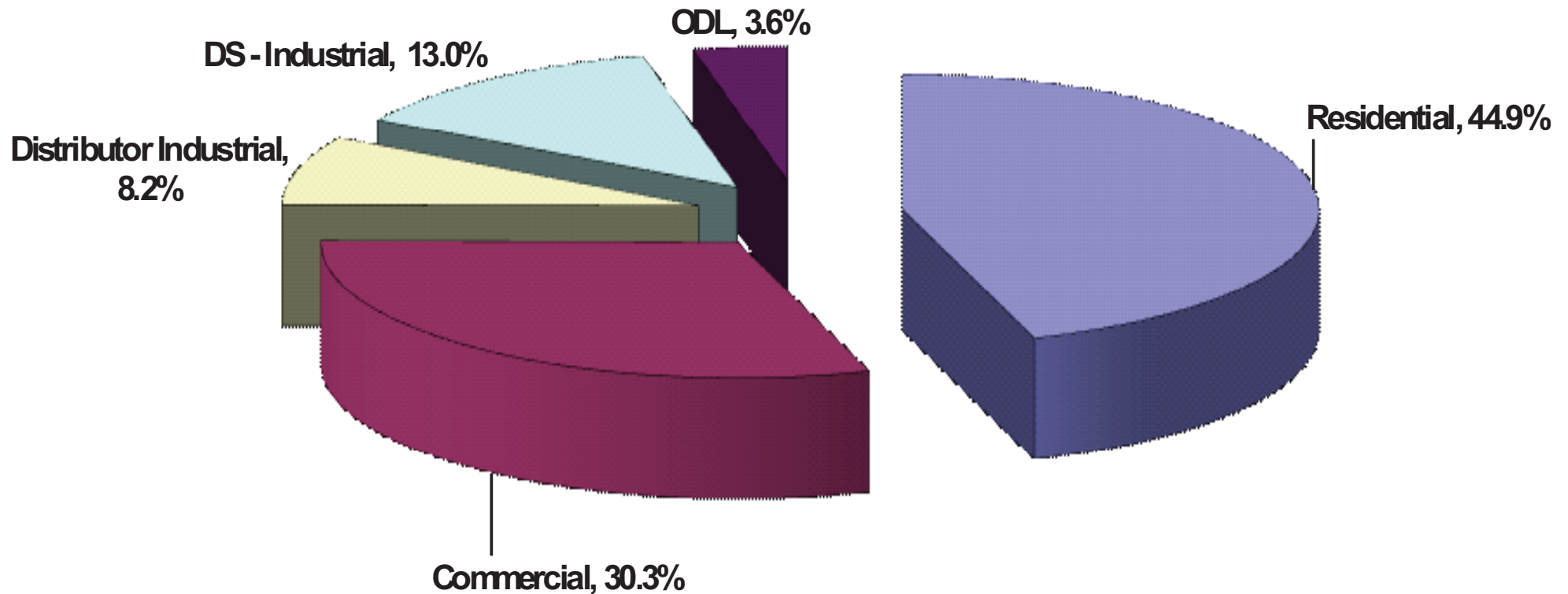
\* Distributor & DS Industrial

### Potential Annual GWh Reductions

Sector	2010	2015	2020	2025	2030
Residential	872	1,993	2,424	3,444	4,530
Commercial	59	2,889	4,606	7,349	8,446
Distributor Industrial	13	133	453	680	831
Direct-Served Industrial	58	221	484	847	1,310
Outdoor Lighting	61	138	214	291	367
Total TVA	1,064	5,373	8,181	12,611	15,483

The following figure illustrates the share of energy efficiency potential by customer class

Class Shares of Energy Efficiency Potential (GWh) in 2030



- ◆ Residential and commercial customer classes represent 75% of potential annual GWh reductions in 2030
- ◆ Industrial classes (direct-served and distributor industrial) represent 21%



## Results (Cont'd)

The following table summarizes potential for annual GWh reductions in the Valley in 2030 by energy efficiency measures.

**Measure Ranking of Efficiency Potential in 2030**

Rank	Efficiency Measure	Efficiency Potential (GWh)
1	Commercial Lighting	950
2	Residential H/P	946
3	Residential Central A/C	724
4	Residential Water Heaters	646
5	Residential Refrigerators	640
6	Commercial A/C	492
7	Commercial Chillers	464
8	LED for Street Lights	367
9	Commercial Personal Computers	295
10	Commercial Computer Monitors	283