

# M&V for Residential DR in Energy and Capacity Markets

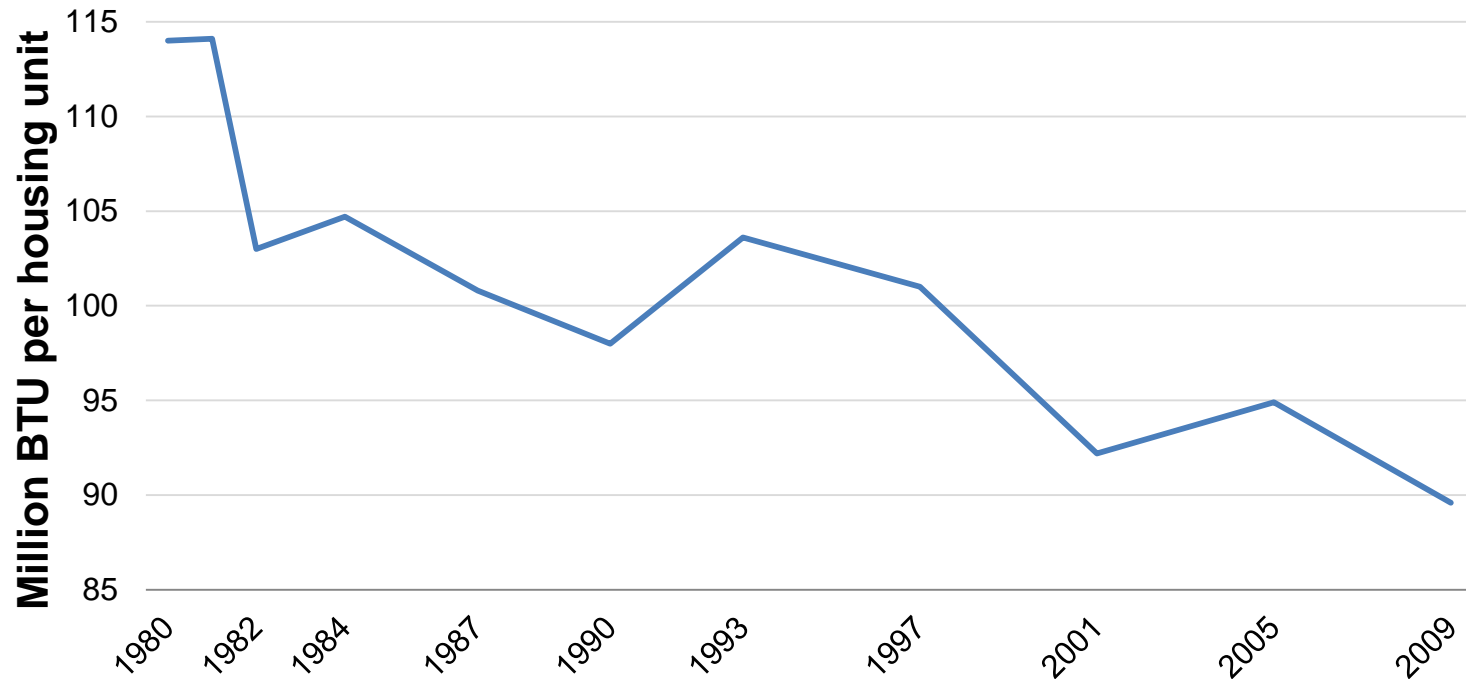
March 19, 2014

- Past
  - Direct load control (DLC)
  - Legacy DLC using radio controlled switches, one way communication, no AMI
  - All programs run by EDC
- Future
  - DLC (adaptive algorithm), thermostat controlled, behavioral programs
  - AMI
  - LSE and third party CSP participation
  - Dynamic management of customers that should be cycled

- **Interval metered**
  - M&V based on actual meter data
  - Must pass CBL test (like non-residential DR)
- **Non-interval metered**
  - M&V based on load research study using historic data
    - Deemed savings report – available for all PJM members
    - Load research study submitted by CSP
  - Switch operability study
- **Sub-sampled**
  - M&V based on actual meter data from a sample of customers

- **Outdated**
  - completed in March 2007 with data from 2001 – 2005
  - AC's are substantially more efficient, usage patterns change
- **Geographically limited**
  - Data from BGE, PSEG, JCPL
  - Footprint has substantially increased
  - Potentially settling DR in Chicago and Kentucky with data from NJ & MD
- **Assumptions may no longer be appropriate (new capacity products)**
  - Only used during design conditions
  - Focused on one specific hour
  - Impact of multi-day events

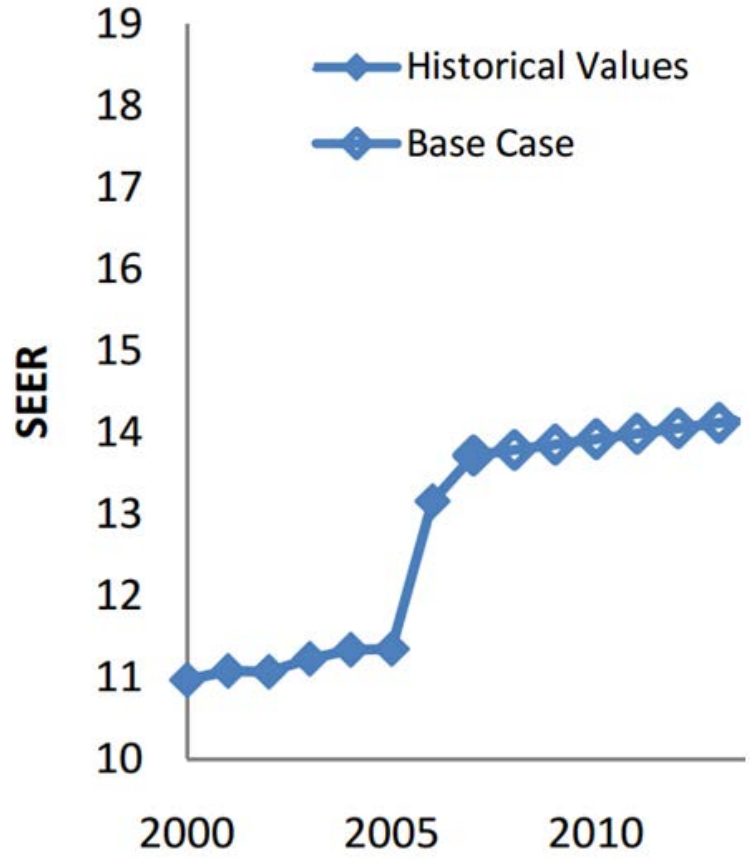
## Average energy consumption per home



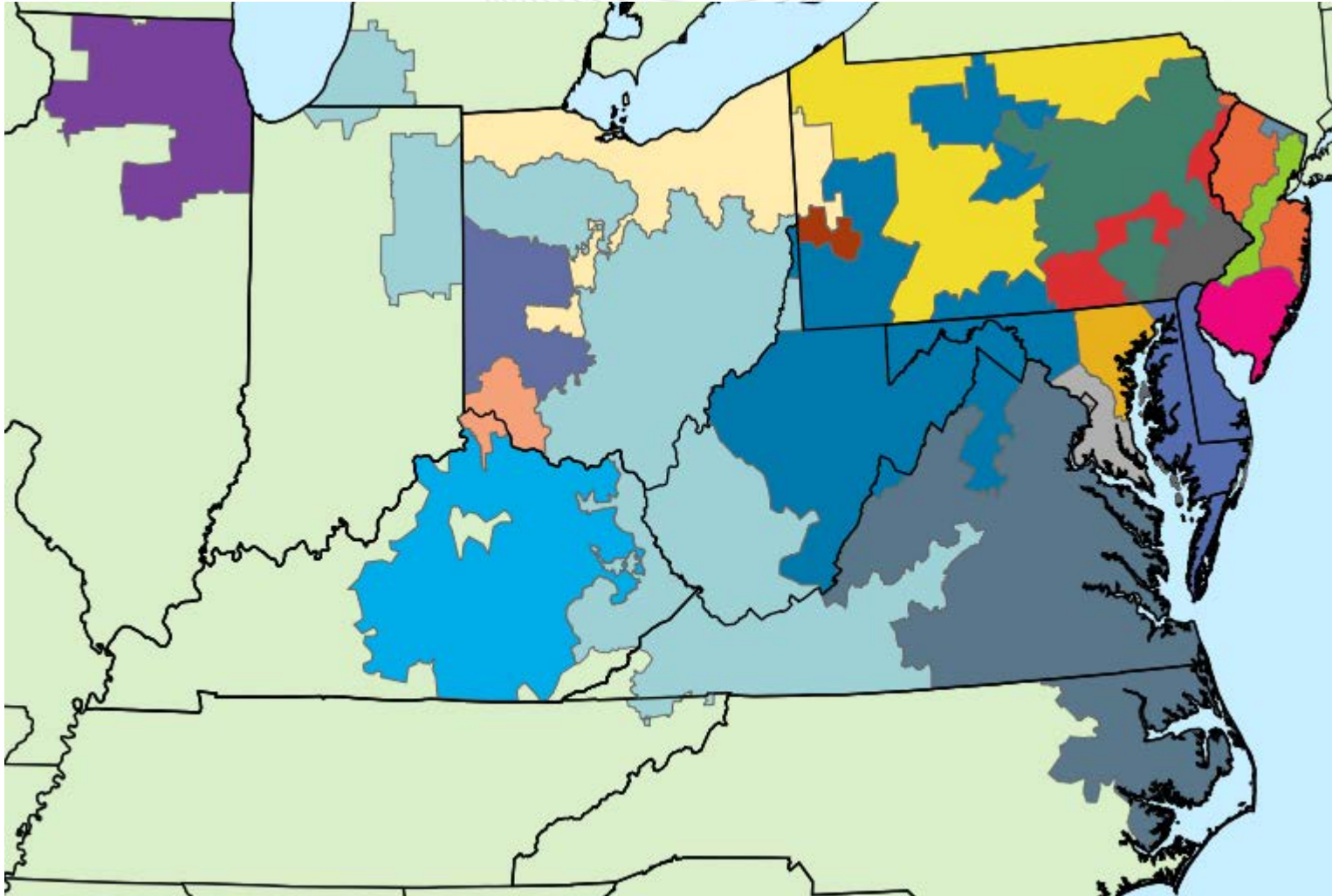
Source: EIA Residential Energy Consumption Survey 2009 — Release date: June 6, 2012

# Air conditioner efficiency dramatically increased since 2005

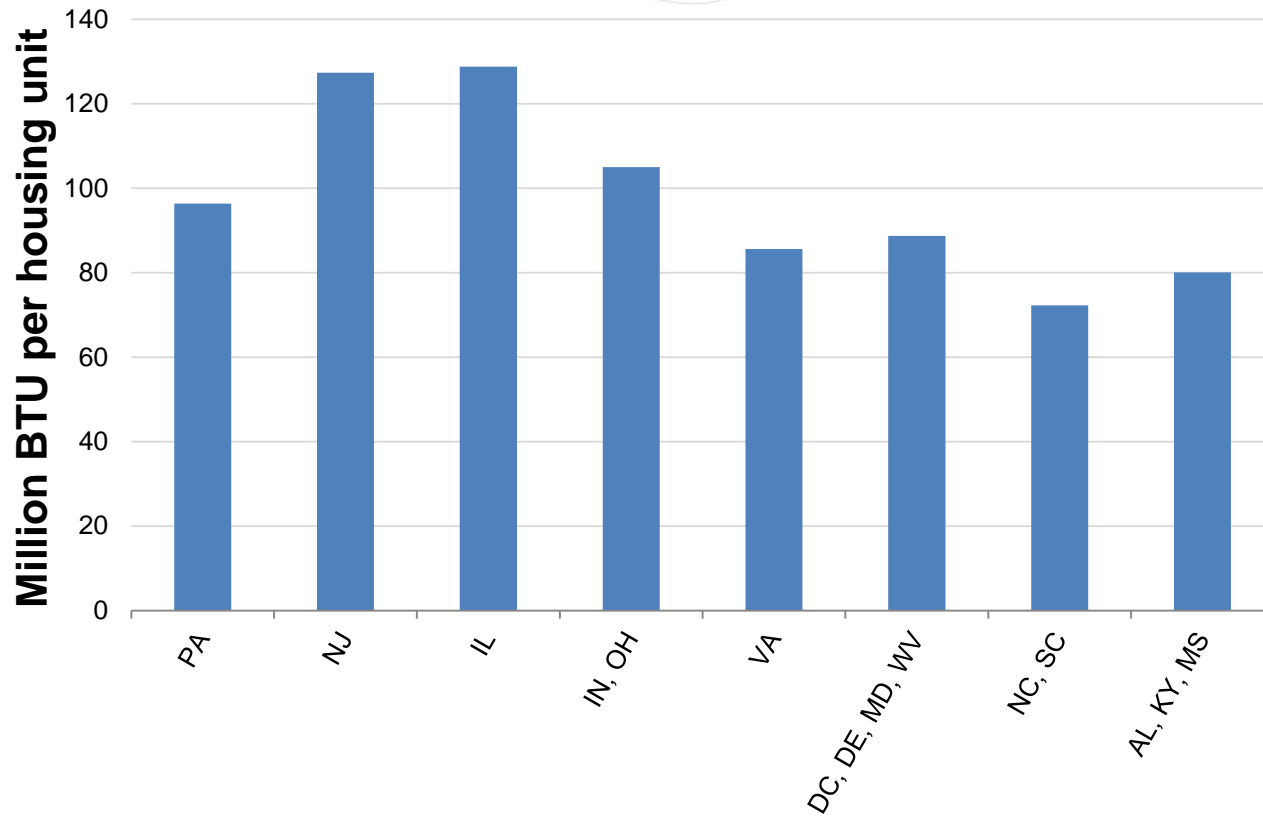
SEER – measure of AC efficiency. Higher is more efficient.



Source: Robert De Kleine, "Life Cycle Optimization of Residential Air Conditioner Replacement" University of Michigan, Report No. CSS09-12, December 2009



Average home energy consumption for selected states, 2009





- Cumbersome process to evaluate and administer
- Inconsistent methodology and detail across studies
- Quality and accuracy is not always transparent
- Valid for too long of a time period (5 years)
- Questions regarding optionality of results
  - If I do and don't like results can I just use my older results.

- Residential DR is growing
- ~1100 MW
- ~1.2 million customers
- 16 programs
  - 2 CSPs
  - 9 IOUs
  - 5 Muni/Co-ops
- 18 zones
- 13 states + DC

# Residential participation by M&V method

	<b>% MW</b>	<b>%Customers</b>	<b>% Programs</b>
<b>Deemed Savings</b>	19%	30%	44%
<b>Load Research</b>	11%	8%	13%
<b>Dynamic Sample</b>	12%	13%	25%
<b>Interval Meter</b>	58%	49%	19%

- Accurate and consistent methodology
- Flexible structure which will allow different retail programs
- Technology agnostic
  - Ability to handle a variety of means to accomplish the load reductions
- Effective administration for all parties
  - Scalable process for a growing resource

- Customer churn
- Transition from legacy program/technology to new program/technology during DY
- Third party CSP participation & administration of customer participation to avoid double counting
- Sub-zonal events
- Economic participation in energy market and associated LSE changes