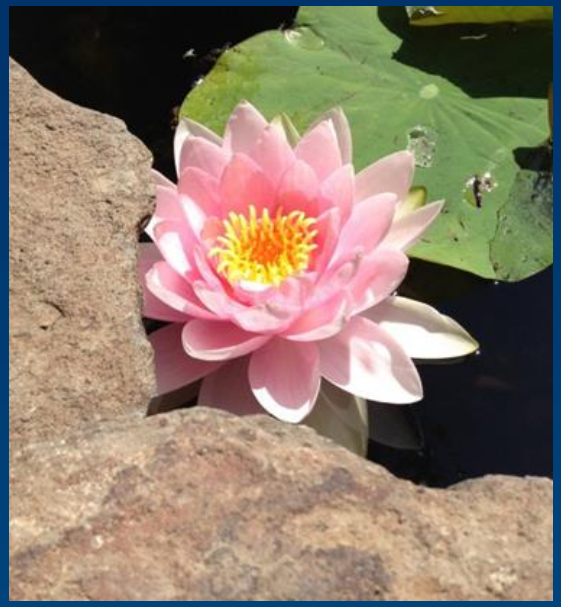
Strategies for surviving sub-one percent growth and the emergence of the energy services utility



2014 UEC Summit
Coeur d'Alene, Idaho

Ahmad Faruqui , Ph.D.

June 24, 2014

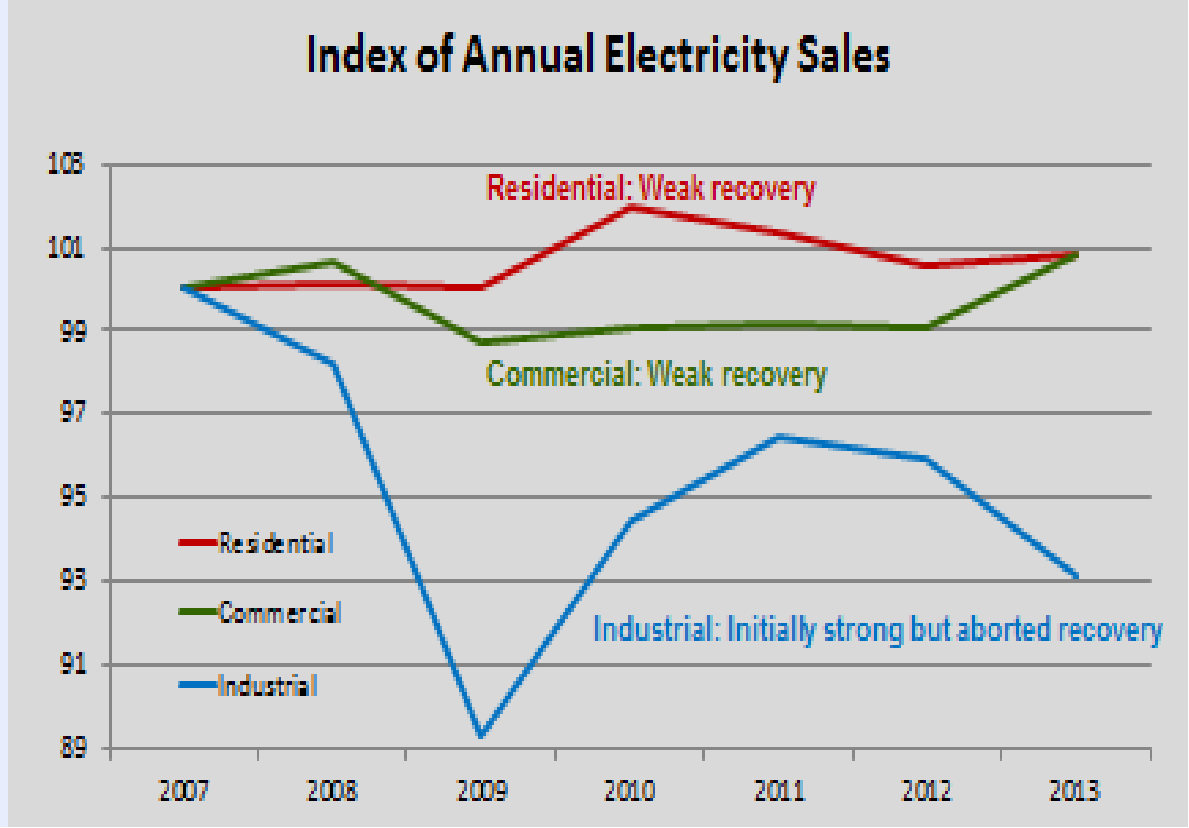
THE Brattle GROUP

Normal electricity growth has not resumed four years after the Great Recession ended

- According to Dr. John Caldwell of the Edison Electric Institute, normal growth usually resumes within five months after the recession ends; the longest it has ever taken has been twelve months

- The EIA's May 2014 Short-Term Energy Outlook (STEO) projects that electric retail sales will grow by 2.3% in 2014 and 0.0% in 2015; in the residential sector, the corresponding growth rates will be 3.1% and -1.5%

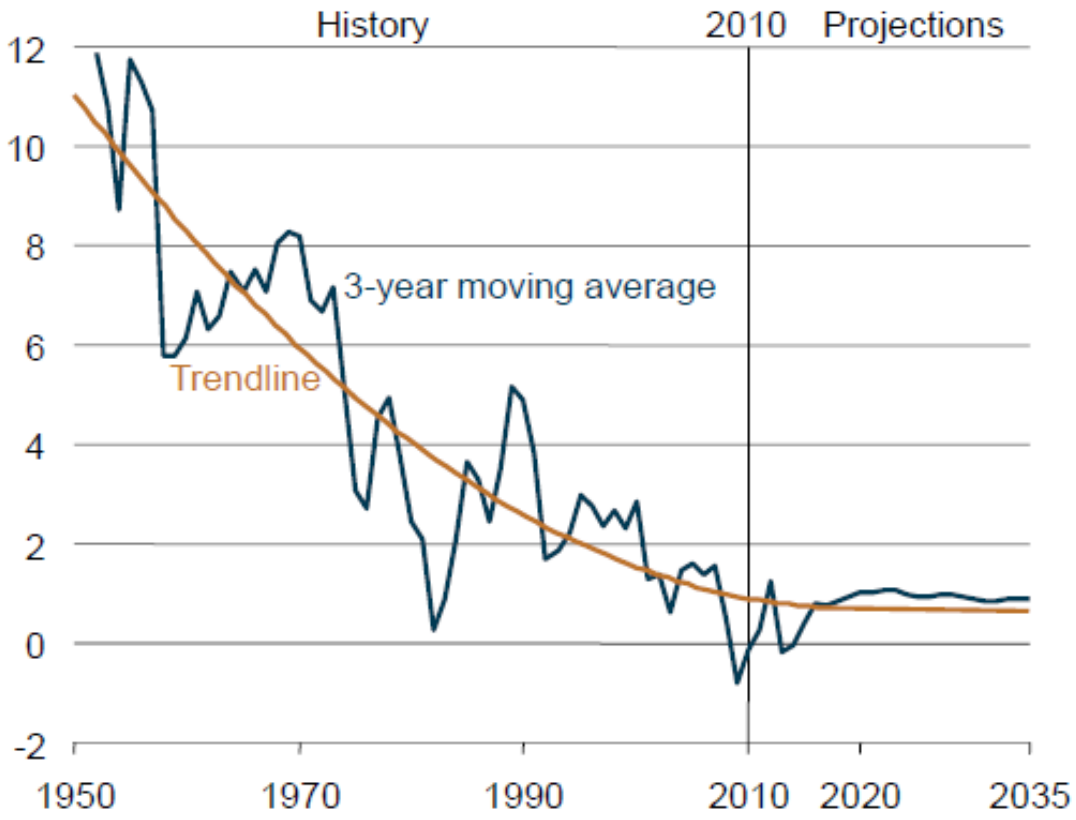
Electricity sales and the recovery



Sources: John Caldwell, EEI and the US Energy Information Administration

Of course, declining growth has been the norm and not the exception since 1950

U.S. Electricity Demand Growth, 1950-2035 (percent, 3-year moving average)



Source: EIA, 2012 Annual Energy Outlook

Three new forces have shaped the recent drop in growth

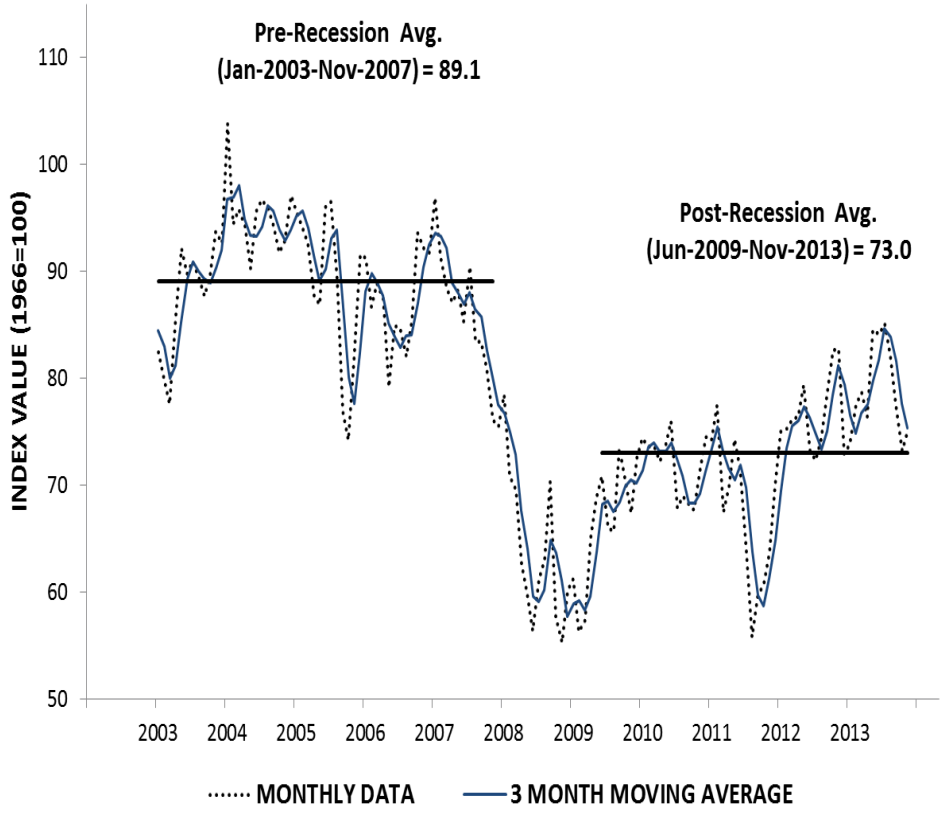
- First, consumer psychology has shifted as a new generation of consumers has arrived with new values and norms; new technologies are pushing them to explore the frontiers of energy efficiency on their own; and they are into belt-tightening, faced with continued economic uncertainty

- Second, utilities are stepping up their spending on energy efficiency programs, often prompted by energy efficiency standards and new legislation

- Third, states and federal governments are continuing to push ahead with aggressive enhancements to codes and standards

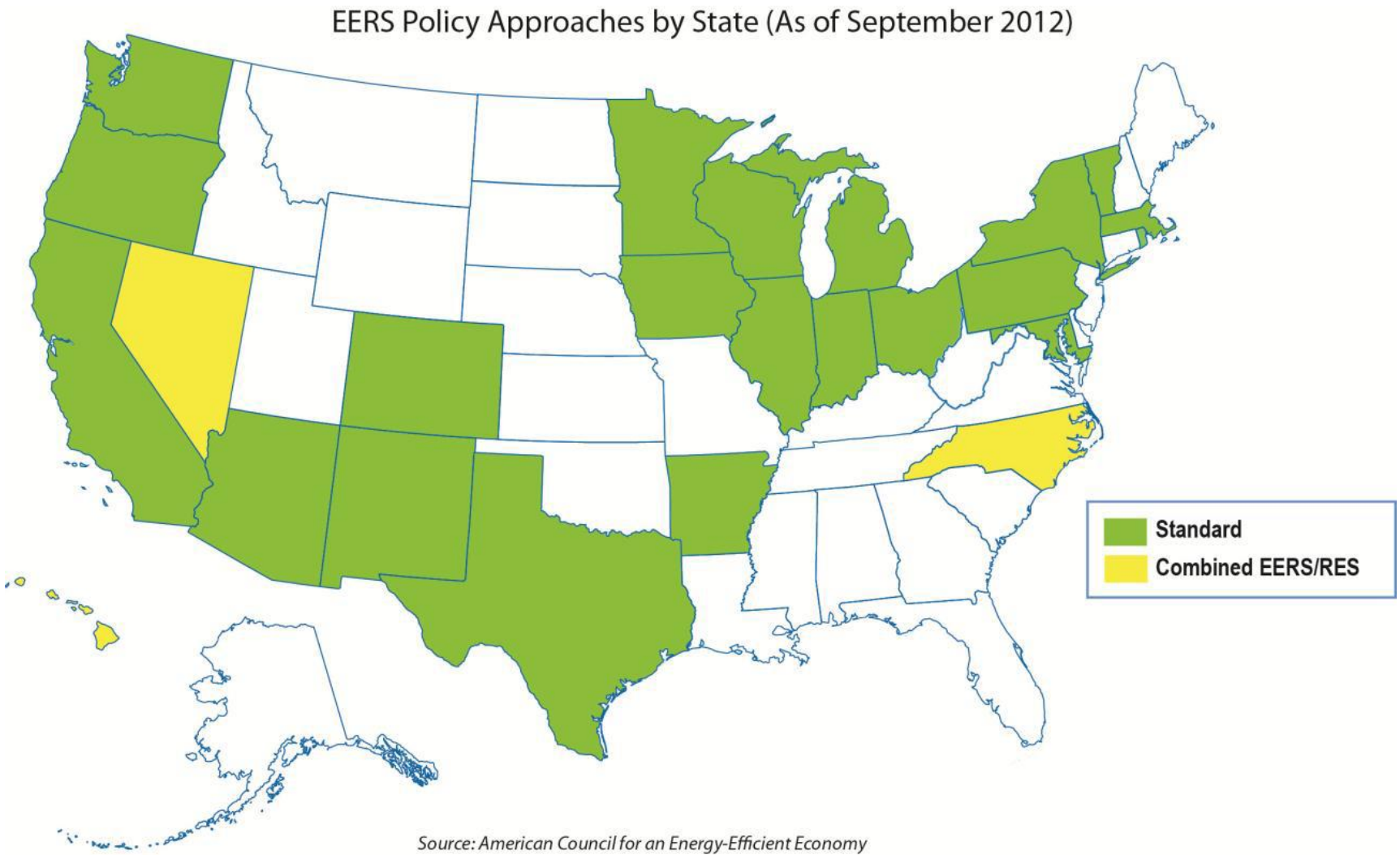
Consumer confidence continues to be a drag on consumer spending

Index of Consumer Sentiment – Recent Changes



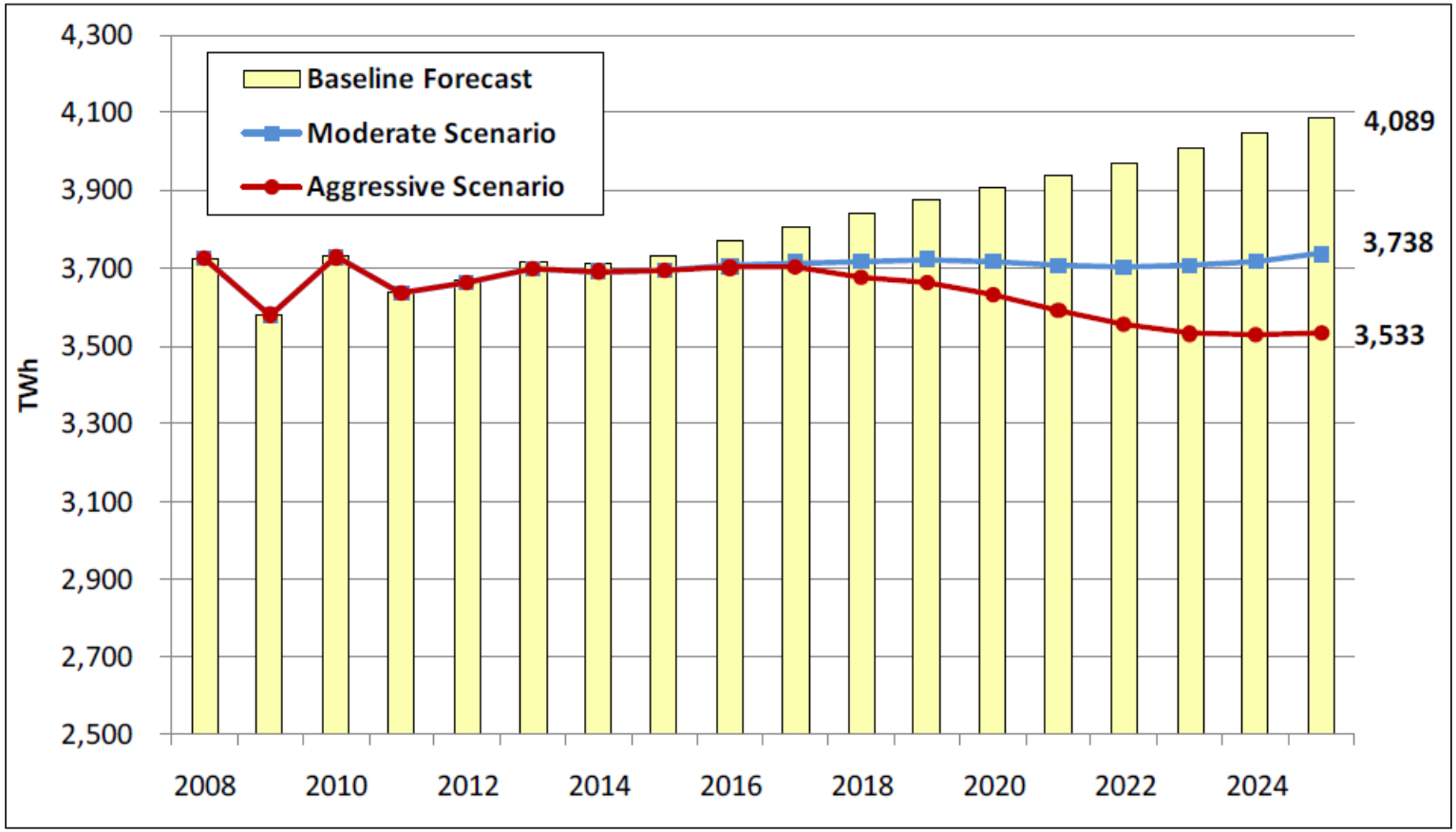
Source: University of Michigan. "Survey of Consumers." November 2013.
http://www.sca.isr.umich.edu/charts.php.

Several states have passed laws either requiring or promoting energy efficiency



New codes and standards could dramatically decrease baseline energy consumption

Impact of Codes and Standards on Total U.S. Electricity Consumption (TWh)



Source: IEE, Assessment of Electricity Savings Achievable through New Appliance/Equipment Efficiency Standards and Building Efficiency Codes (2010-2025)

Two more forces have appeared on the horizon

- The fourth force is distributed generation, led by the revolution in roof-top solar and supplemented by micro turbines
- Roof-top solar is approaching grid parity, capitalizing on heavy upfront cash subsidies and spurred on by net metering tariffs that over-compensate solar customers
- The leasing model pioneered by SolarCity is being copied rapidly by others
- The fourth force alone can eliminate load growth

Net metering enables distributed generation to expand

- In 2003, there were less than 7,000 U.S. customers on net metering
- By 2012, there were 297,000 (roughly half in California)
- That amounts to 0.2% of all U.S. residential customers
- In 2012, Hawaii had the highest share of residential customers on net metering (5%)

Sources:
EIA. "Residential Electricity Customers are Increasingly Taking Advantage of a Retail Rate Incentive for On-site Renewable Generation - Net Metering." Electricity Monthly Update. June 2013.
The International Energy Newsletter. "Net Metering: A Worrisome Trend." July 2012.

With distributed generation, net-zero energy homes become a reality

- In Austin, Texas, the Zero Energy Capable Homes program requires that new single-family homes be net-zero energy capable by 2015
- The largest community of net-zero homes in the U.S. is rising in West Village at UC Davis in California
- The California Energy Commission has called for all new residential construction to be zero net energy by 2020 and for all new commercial construction to be zero net energy by 2030

The fifth force is fuel switching

- The revolution in shale oil and gas is pushing fuel prices downwards
- The use of gas for commercial air conditioning and in industrial process is going to become economic, leading to significant inter-fuel substitution away from electricity in the commercial and industrial sector
- Gas-fired residential heat pumps may also begin making inroad into the home HVAC market

What are the options for electric utilities?

To deal with the five forces, utilities can pursue one of four strategies

1. Stay the course
2. Push electrification
3. Become a wires company
4. Become an energy services utility

First strategy – stay the course

The assumption is that growth will resume by itself; declining energy prices will herald an industrial revival and boost electricity sales

CERA's Larry Makovitch has put forward a provocative argument along these lines

- **http://www.powermag.com/issues/features/Expect-U-S-Electricity-Consumption-to-Increase_5634.html**

This is a very high risk strategy, as noted on the next slide

Second strategy – electrification

Push on plug-in electric vehicles and other plug loads

- http://www.economist.com/news/leaders/21578679-electric-car-stalls-race-be-green-wheels-future-not

Conduct research, development and demonstration of new industrial processes that are electricity-intensive

The results of this strategy will only payoff in the long run; they will provide very limited benefits in the near-term

- Efforts to boost electricity sales in the 1980s and 1990s have borne little fruit

Third strategy – the safe haven

Utilities can become a wires company, but many utilities are already wires companies

All wires companies face the risk of collecting insufficient revenue since the bulk of distribution charges are tied to sales and as sales growth slows down, they will not be able to cover their fixed costs

Fourth strategy- become an energy services (ES) utility

In contrast to a traditional energy utility, which sells electricity to customers, an ES utility sells customers end use services such as lighting, heating and cooling

Of course, the ES utility still has the task of delivering electricity like a traditional wires company, but the business proposition is fundamentally different

There is historical precedent for selling energy services

In 1881, Thomas Edison began selling energy services, charging customers a fixed amount per lamp

- The main competition came from gas lamps

A century later, Roger Sant published "Coming Markets for Energy Services" in the *Harvard Business Review,* 1980

- Sant proposed that utilities could sell energy services to compete with end-use equipment manufacturers, such as General Electric

Four decades later, Peter Fox-Penner coined the term, Energy Services Utility in *Smart Power,* Island Press, 2000

Energy service companies (ESCOs) first emerged in France

Since the 19th century, energy service contracts have existed in France where the idea of the ESCO was born

- The largest ESCOs in France operate as subsidiaries of the main utility companies, offering heating (chauffage) contracts
- These are long-term agreements that guarantee a certain performance level that is specific to metrics, such as temperature and humidity levels

ESCOs differ from ES utilities in that they do not necessarily have utility affiliation.

- ESCOs provide customers with energy efficiency services and receive a share of the energy savings

ESCOs success in the United States

The National Association of Energy Service Companies (NAESCO) now lists over 40 members including Honeywell, Siemens Industry, and Lockheed Martin

NAESCO reports that ESCOs have achieved $50 billion in verified energy savings since the 1990s

Some utilities sell energy services but are regulated on the sale of electricity

Utilities in many states such as California, Illinois and Maryland offer energy services to their customers under the umbrella of demand-side management programs – these programs are designed to bring the benefits of energy efficiency and demand response to the power system while allowing customers to lower their energy bills

In April 2014, the New York Department of Public Service released a new state energy plan that proposes to transform the state's utilities into platforms for selling energy services

The business proposition for the ES utility

The ES utility is incentivized to maximize customers' energy efficiency and makes money on how much efficiency it sells

Where wholesale markets exist, it can bid demand and energy savings from its customers into those markets

- It may sell a customer a fixed-price contract to light a 500 square foot workspace with 70 lumens/square foot
- The utility can diversify its offerings by charging different rates for different levels and types of service
- The utility can also take advantage of new technology trends and offer new energy services, such as electric vehicle charging

Services that can be offered by ES utilities include:

- Lighting
- Space Heating
- Space Cooling
- Water heating
- Water pumping
- Industrial machine drive
- Electric vehicle charging

The ES utility will need a new skillset

Unlike a traditional utility, the ES utility will not meet new demand by building more power plants

- Instead, it will need to understand its customers' need for end use energy services and their demand profiles and also understand the current and future offerings of competitors

It will need to invest in acquiring new operational and business skills in order to price and deliver its energy services

Tailoring energy service products to individuals with customer-level data is one area where the deployment of the smart grid, notably that of advanced metering infrastructure (AMI) can help

AMI will facilitate the transition from traditional utility to energy service utility

The AMI-enabled company will be able to provide a wide range of existing and new services effectively

- Energy efficiency
- Demand response
- Electric vehicle charging

To quantify the possibilities opened up the deployment of AMI, we present in the appendix the results of a case study of a medium sized utility operating in the Midwest

Conclusions

The slowdown in sales growth appears to be here to stay

Utilities will require new strategies and tactics to sustain themselves in the face of the protracted slowdown

Many business functions including sales forecasting, rate design and load market research will have to be reinvented

But ultimately utilities may need to reinvent themselves

Some will probably turn into energy services utilities

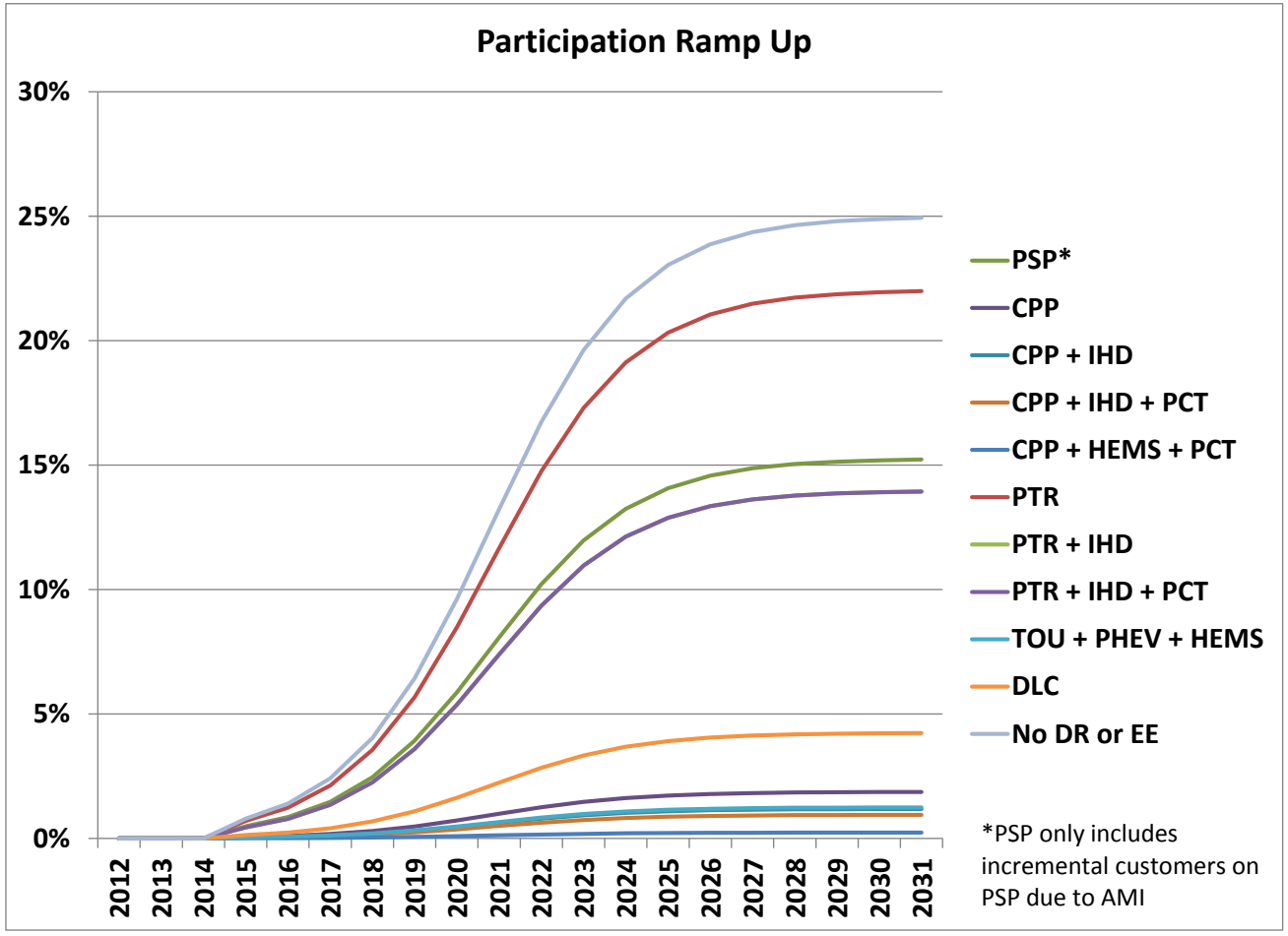
Appendix

A case study of how a medium-sized utility can use AMI to become an energy services company

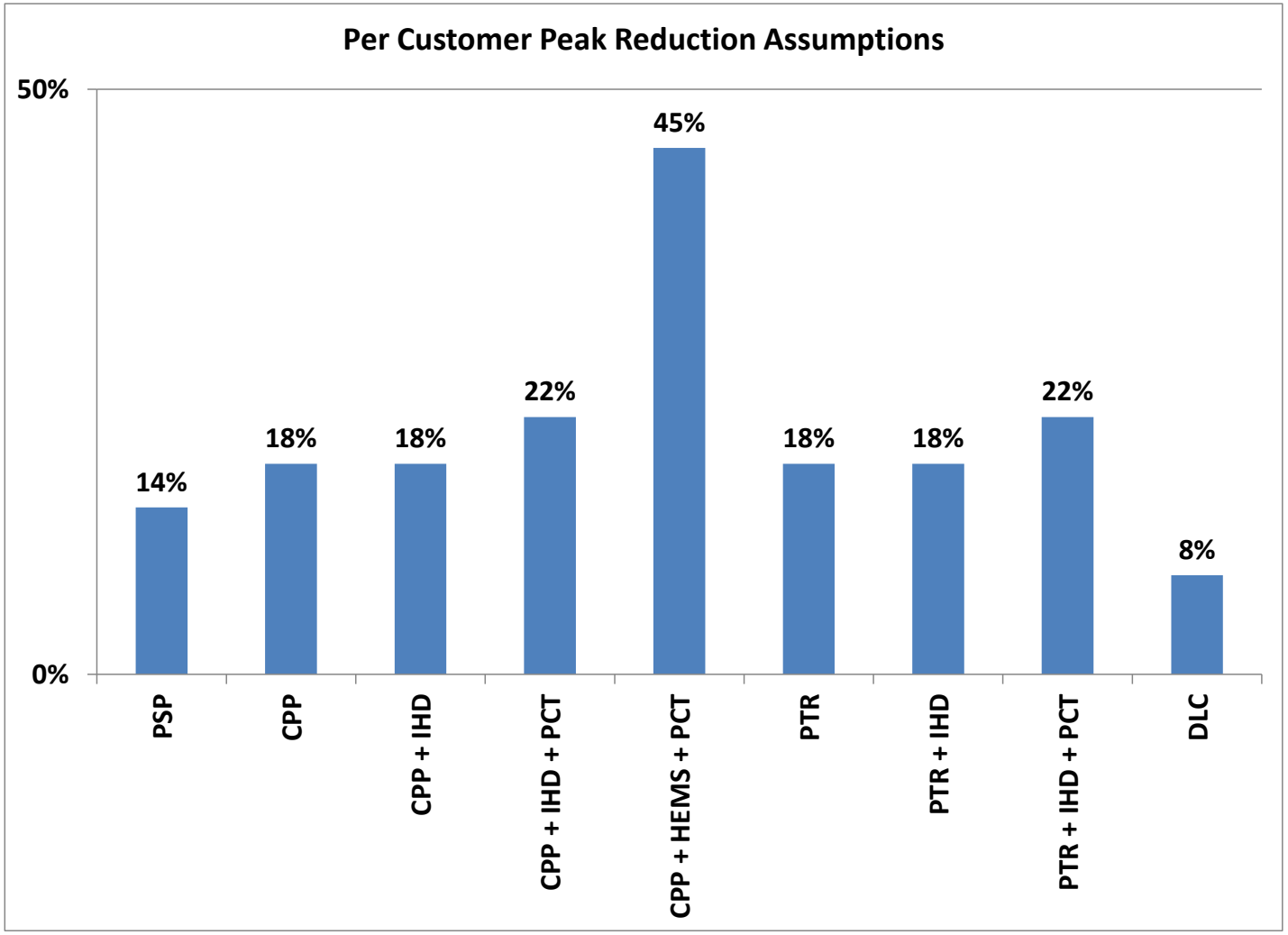
Ten programs could be offered by the AMI-enabled energy services utility

PTR	• Peak Time Rebate (PTR)
PTR + IHD	• PTR with In Home Display (IHD)
PTR + IHD + PCT	• PTR with IHD and Programmable Communicating Thermostat (PCT)
PSP	• Power Saving Pricing (A form of real time pricing)
DLC	• Direct Load Control
TOU + PHEV + HEMS	• Time of Use (TOU) rate with Home Energy Management System (HEMS) for electric vehicles
CPP	• Critical Peak Pricing (CPP)
CPP + IHD	• CPP with IHD
CPP + IHD + PCT	• CPP with IHD with PCT
CPP + HEMS + PCT	• CPP with HEMS and PCT

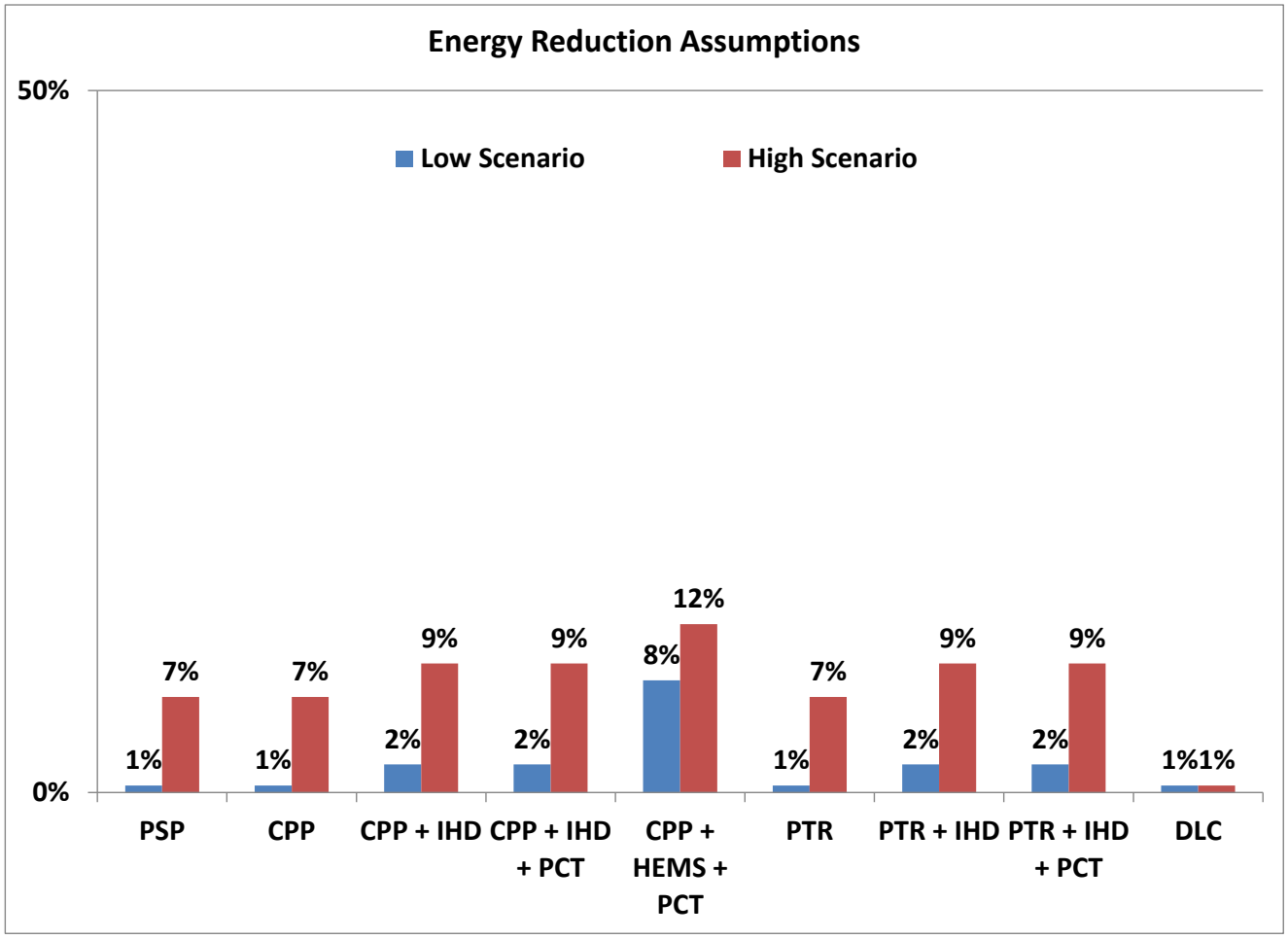
In the study, we assumed that participation ramp-up follows an S-shaped curve



We base the per customer peak reductions on Brattle's *Arc of Price Responsiveness*



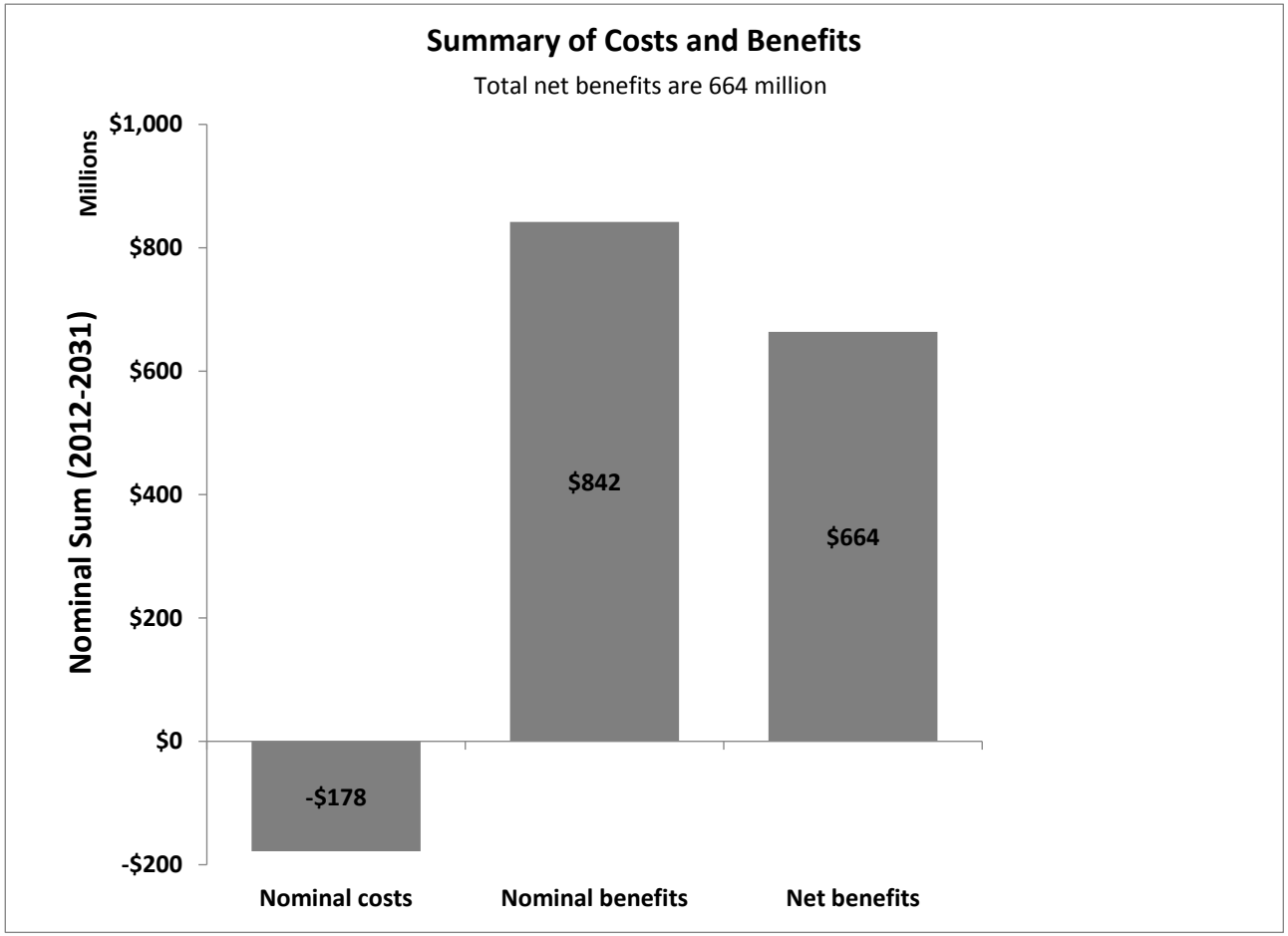
Energy reductions vary widely across studies, and we use a range for each option



We also make the following assumptions

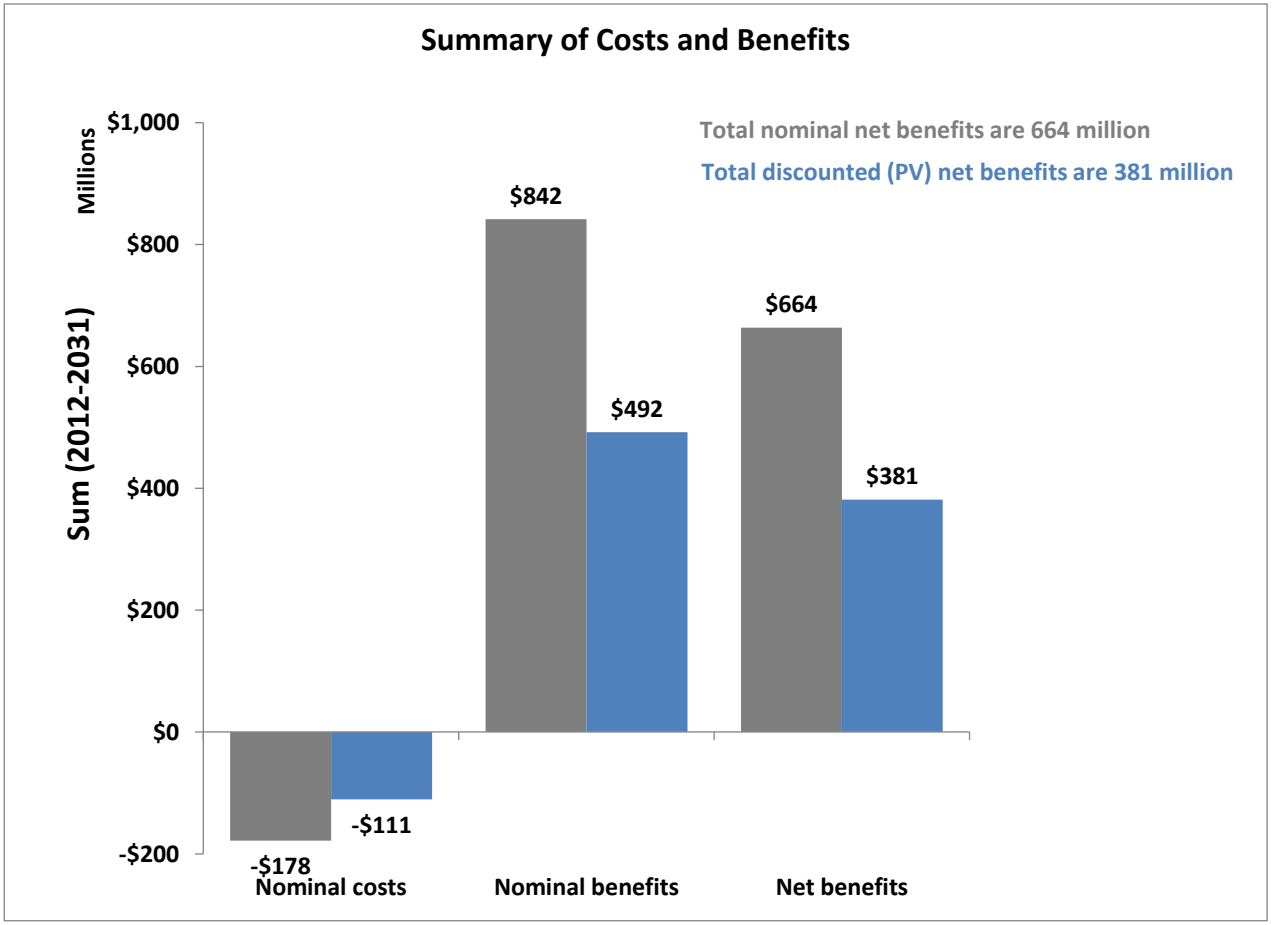
1. **Per customer impacts for non-residential customers**
   - We use assumptions derived empirically for the 2009 FERC report
   - 7% for price only and 14% for price plus technology
   - Applies to medium, large, and very large customers (in the FERC report, applies to customers greater than 200 kW)
2. **Costs per unit for non-residential customers**
   - ADR assumed to cost between $2,000 (low) and $3,000 (high) in this iteration

The nominal (undiscounted) net benefits are $664 million

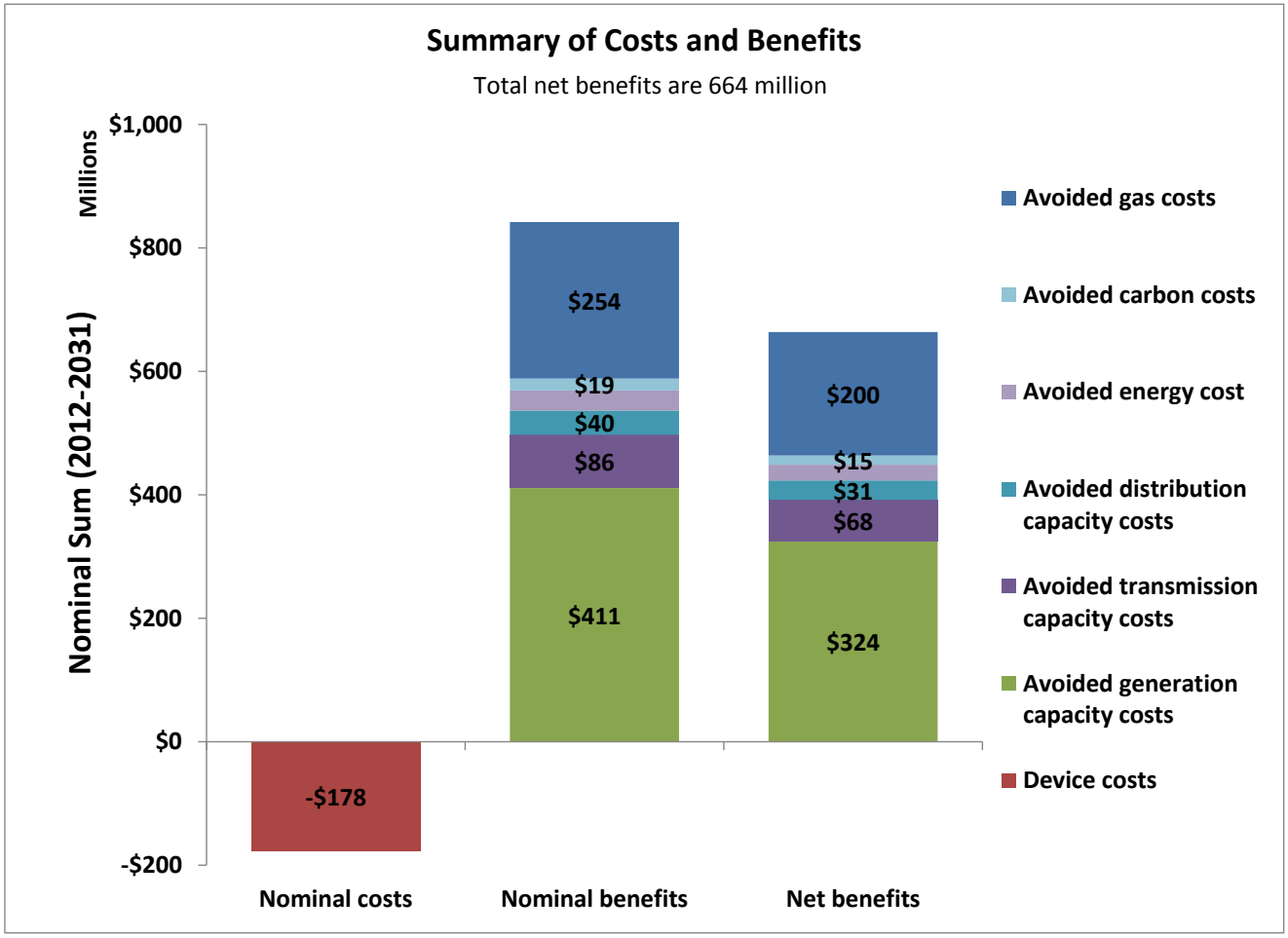


In present value, the net benefits are $381 million

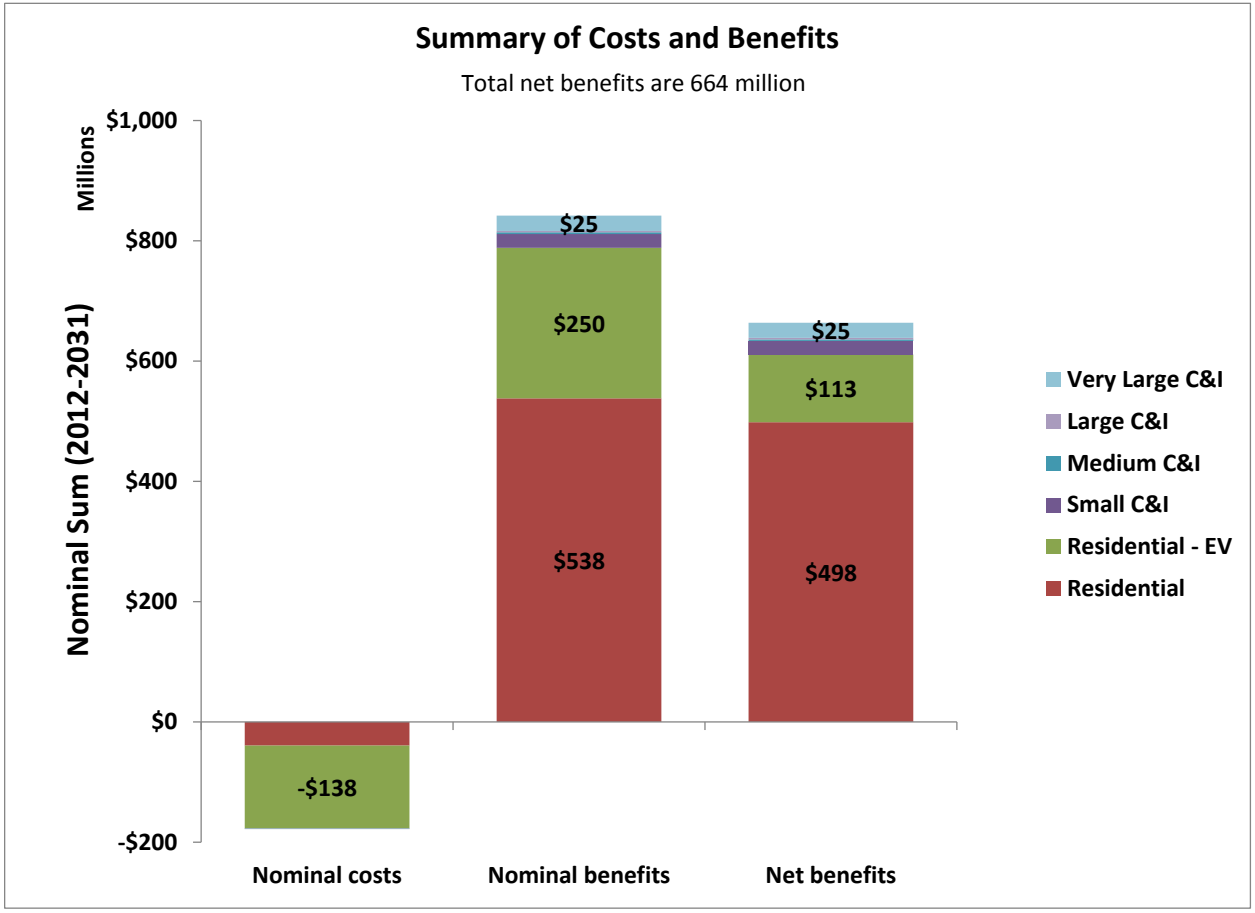
*For the remainder of this section, results are shown in nominal terms



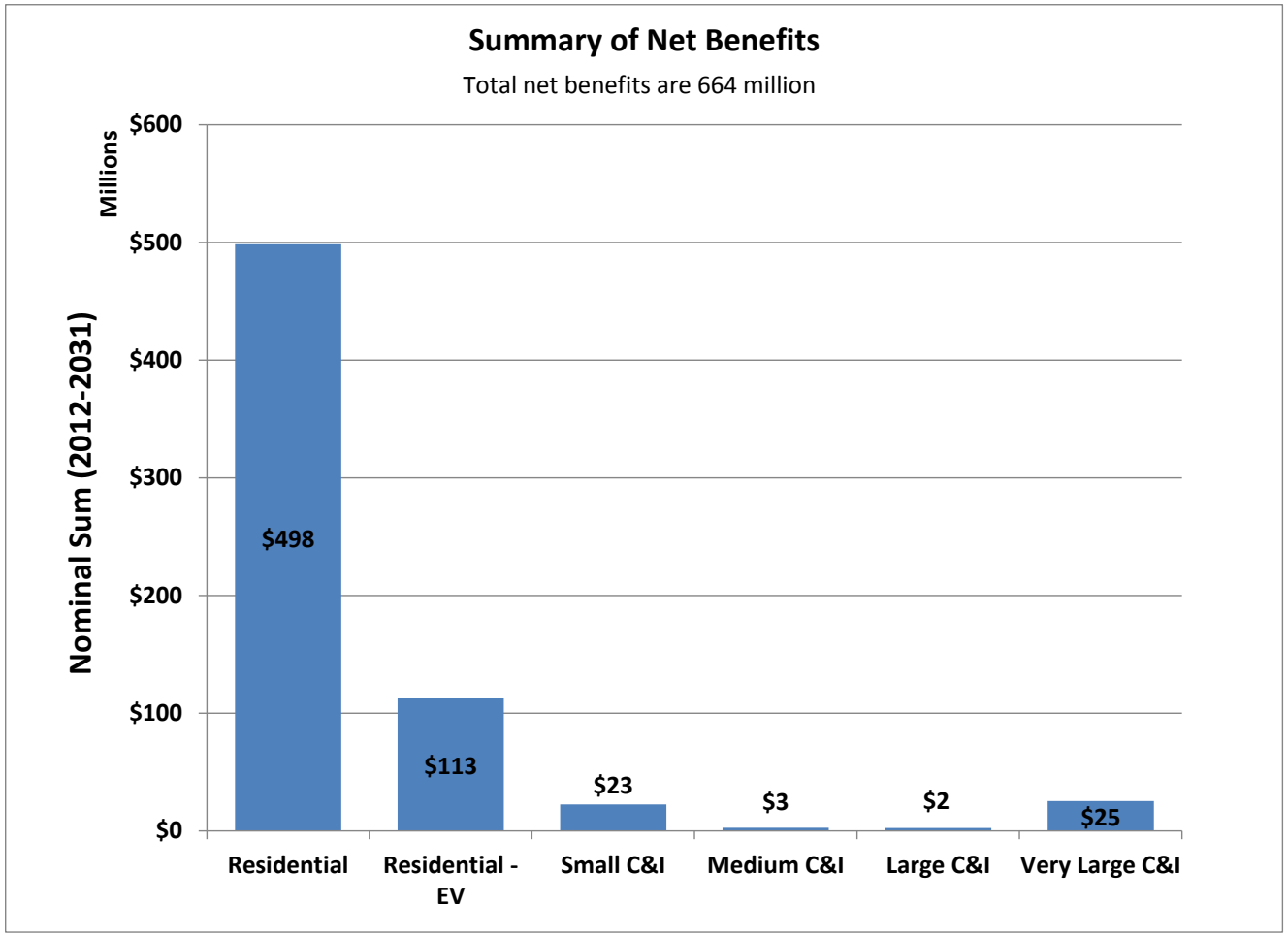
Avoided costs are dominated by avoided generation capacity costs and gasoline costs



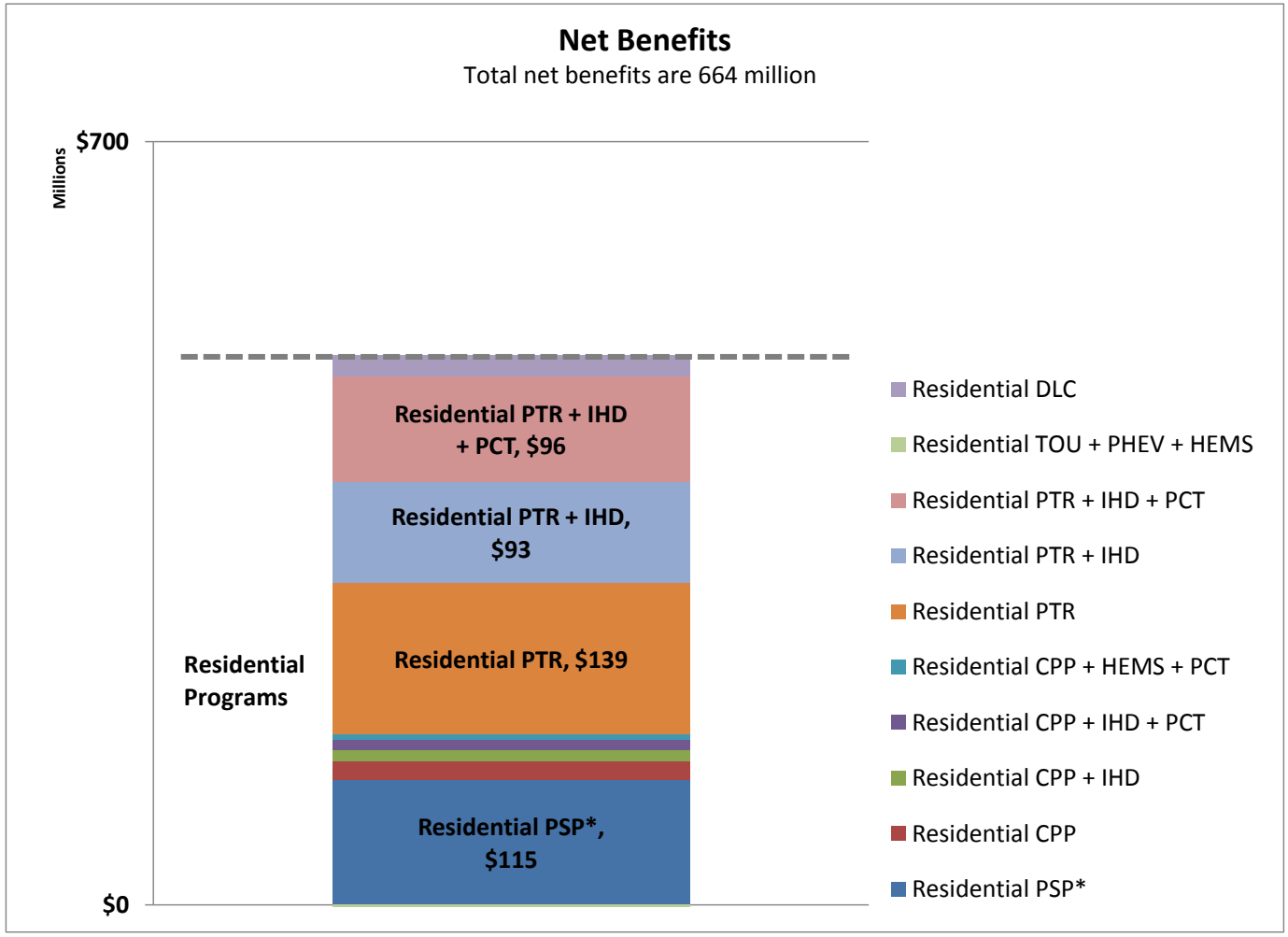
Most benefits come from residential DR and EE programs and electric vehicles (EVs)



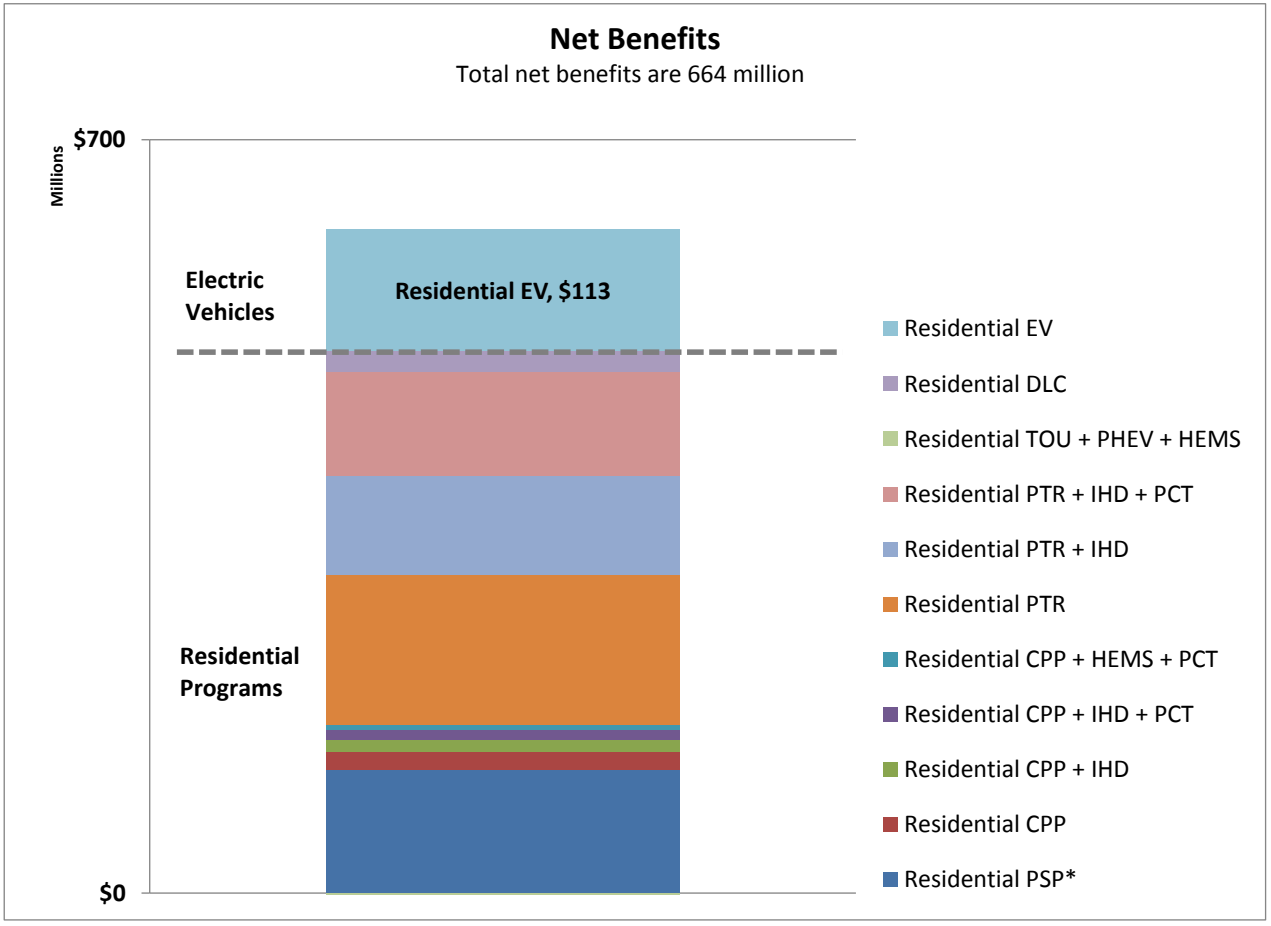
Almost $500 million of the net benefits come from residential DR and EE programs



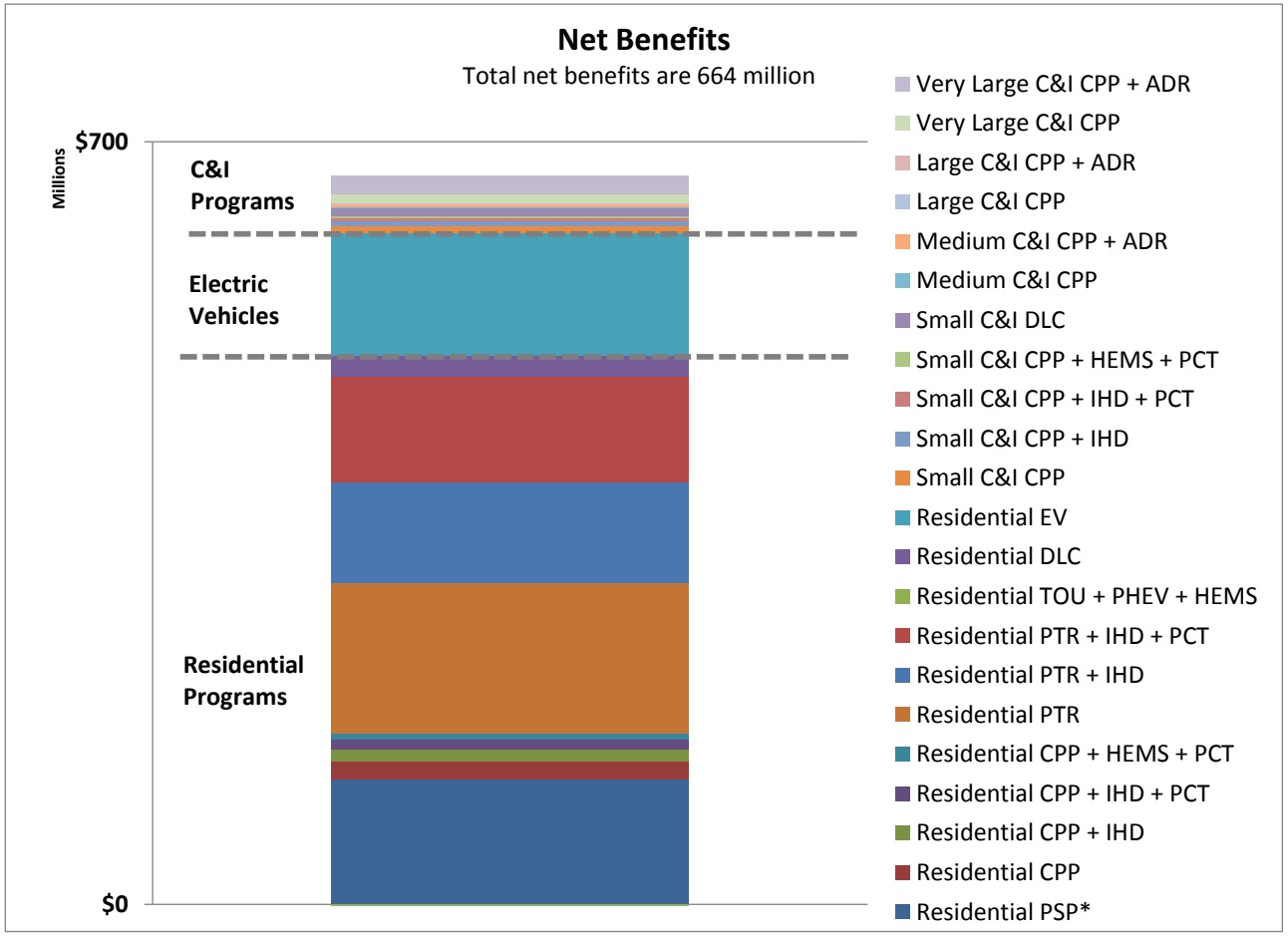
Of the $500 million in net benefits, most come from PTR and power saving pricing



Electric vehicles add another $113 million in net benefits



The non-residential DR and EE programs bring total net benefits up to $664



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