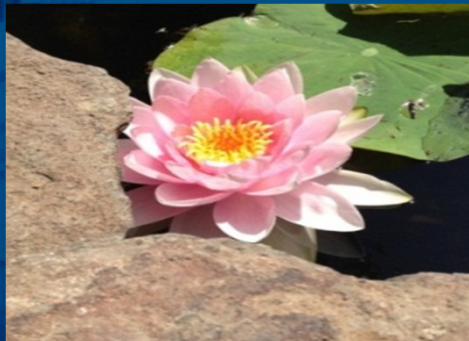


# The Customer-Side Benefits of Smart Meters



**PRESENTED TO**  
Smart Meter Symposium  
The Sheraton Hotel  
Hong Kong

**PRESENTED BY**  
Ahmad Faruqui, Ph.D.

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THE **Brattle** GROUP

# Introduction

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**Smart meters provide a wide-range of operational and customer-side benefits**

**We focus on quantifying customer-side benefits in this presentation**

**Smart meters enable the provision of a new generation of demand response and energy efficiency programs and also the smart charging of electric vehicles**

**We demonstrate these benefits by carrying out a case study of a mid-sized American state**

**This is followed by a discussion of the current status of dynamic pricing programs in the US and a sample of other countries**

# We Quantify the Net Benefits Using the *iGrid* Model

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The *iGrid* model measures three main categories of net benefits enabled by AMI

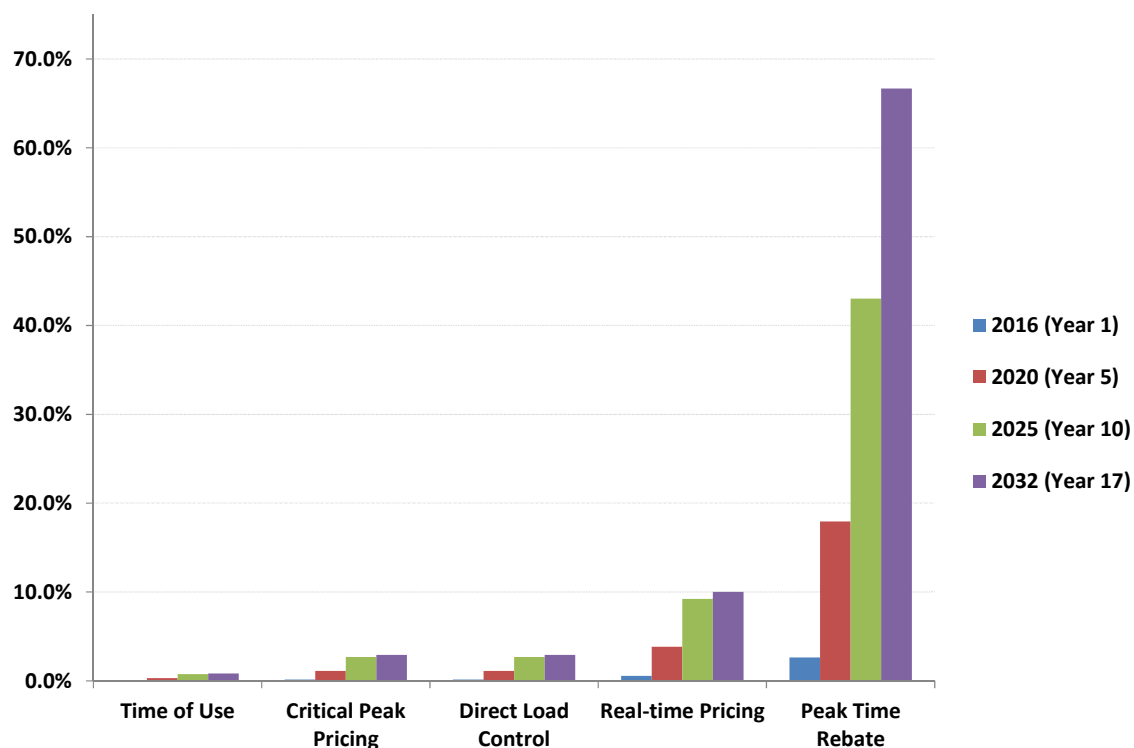
- Demand response (DR)
- Energy efficiency (EE)
- Plug-in electric vehicles (PEV)

In each category, we quantify the net benefits arising from avoided capacity costs, avoided energy costs, avoided carbon costs, and avoided gasoline costs

*iGrid* has been used to quantify the net societal benefits of AMI in several American states

# Our Illustrative Scenario Assumes Full AMI Deployment and Opt-Out Dynamic Pricing

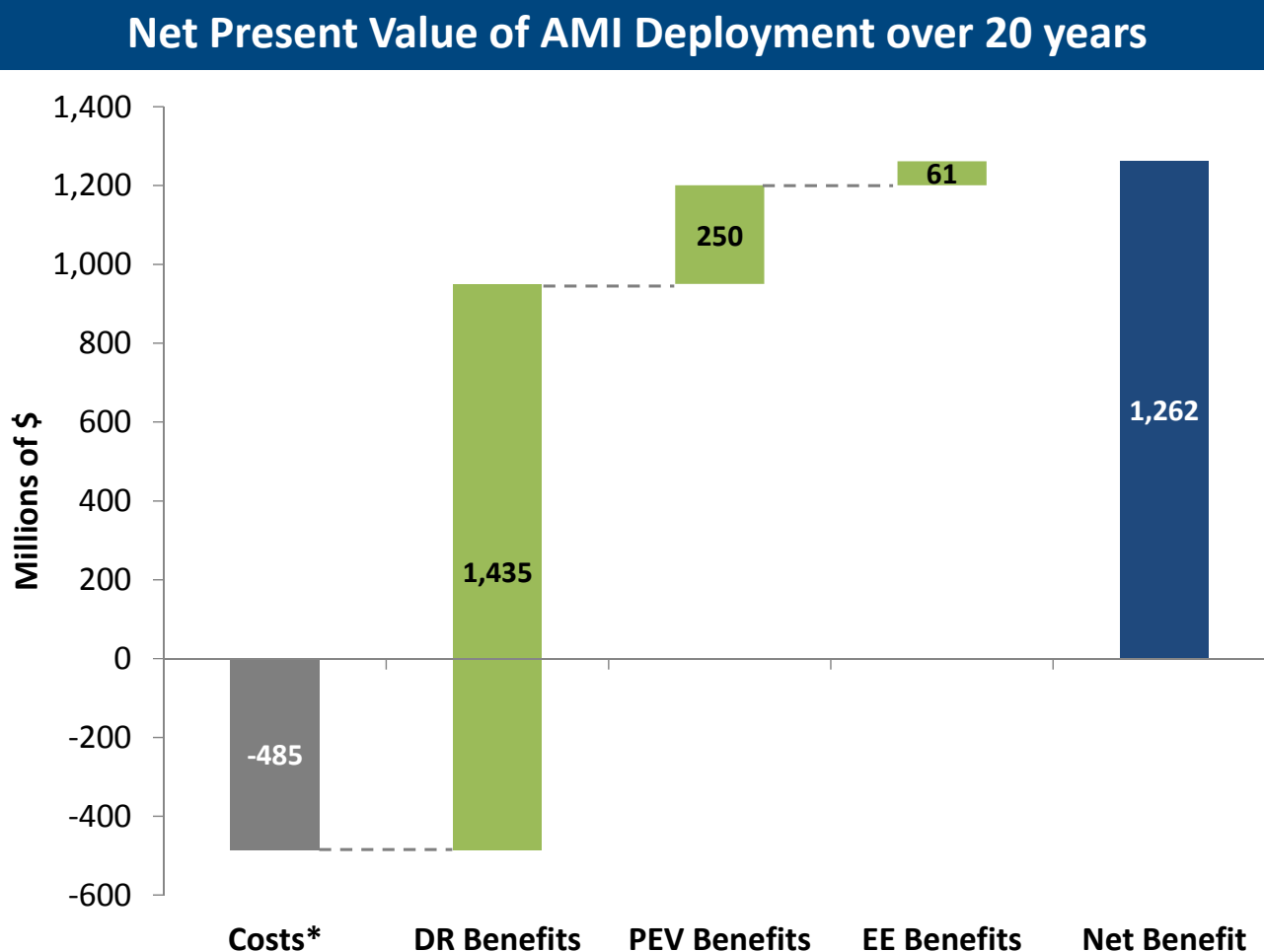
## Residential Participation by Program



## Key Assumptions (Illustrative)

- 100% AMI deployment reached over 15 years
- PTR is assumed to be offered on an opt-out basis, reaching nearly 70% enrollment by 2032
- Some customers who opt out of the PTR enroll in a variety of other pricing and non-pricing programs (17% choose not to enroll in any DR option)
- A portion of participants in pricing programs are assumed to be equipped with “enabling technologies”
- Similar assumptions are used for C&I customers
- The AMI rollout is also assumed to encourage an incremental increase in PEV adoption

# A Full AMI Rollout with Opt-Out Dynamic Pricing Can Potentially Yield Over \$1.2 Billion in Net Societal Benefits



*\* AMI costs are assumed to be net of operational savings*

# Smart meters enable smart pricing – US survey

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## Arizona

- Over two decades, APS has enrolled 51% of its customers on a voluntary TOU rate and the SRP has enrolled about 30% of its customers on a voluntary TOU rate
- In both cases, the TOU rate appeals to large consumers who avoid the upper tier of an inclining block rate by going with TOU

## California

- PG&E has enrolled nearly 120,000 customers on an opt-in CPP program of which a third are low income customers
- SCE is offering PTR on an opt-in basis and more than 2 million customers have signed on
- SDG&E is offering PTR on an opt-out basis to 1.2 million customers
- SMUD plans to roll out TOU pricing to all its half million customers in four years as the default rate

# US survey (concluded)

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## Illinois

- Both the investor-owned utilities, ComEd and Ameren, have enrolled about 25,000 customers on RTP in Illinois
- A new state law calls for opt-in PTR to be offered statewide

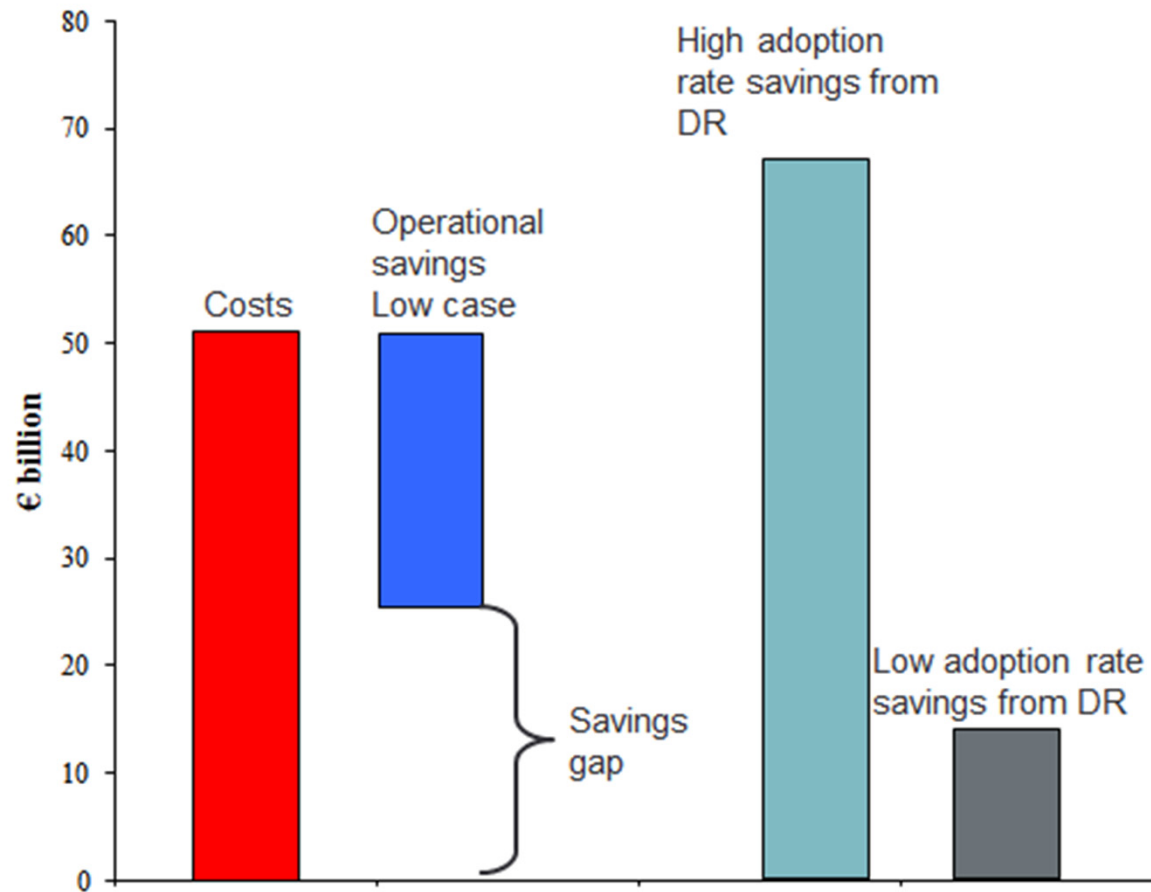
## Mid-Atlantic Region

- BGE and PHI are rolling out PTR to 2 million customers in Delaware and Maryland
- PJM is allowing price-responsive demand to be bid into its multi-state capacity markets, as AMI and dynamic pricing are rolled out in its footprint of 51 million customers
- PEPCO has proposed PTR in District of Columbia

## Oklahoma

- OG&E has 81,000 customers enrolled on VPP and/or TOU pricing
- In 2012, OG&E's VPP and TOU pricing programs cut demand by 135 MW

# In the EU, dynamic pricing could yield nearly €70 billion in net benefits





# International survey

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## Australia

- The Federal Government recently announced its support for a national rollout of smart meters in order to lower power bills
- The federal energy minister supports dynamic pricing
- A three-tier solution has been proposed by the Australia Energy Market Commission for dynamic pricing applied to transmission and distribution rates
  - Mandatory for customers that use twice as much as the average residential customer
  - Opt-in for low income and other vulnerable customers
  - Opt-out for everyone else

# International survey (continued)

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## Canada (Ontario)

- 4.2 million (90%) residential and small business customers are on TOU rates under a regulated retail pricing plan
- All customers have the option of switching over to retail providers
- Significant consumer education has been provided at the grassroots level
- Smart Grid Canada found that 72% of people in Ontario said they had changed their behavior because of TOU

## France

- Électricité de France has offered residential customers CPP across France through the tempo tariff since 1996
- Roughly 400,000 customers have enrolled in the rate

## International survey (continued)

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### Great Britain

- Consumer Focus found ~75% of consumers on TOU tariff are satisfied
- Most popular TOU tariff is the Economy 7 tariff, where consumers are charged a lower price for seven consecutive hours overnight

### Ireland

- The Commission for Energy Regulation is assessing the pros and cons of mandating TOU tariffs and intends to publish its findings by the end of this year

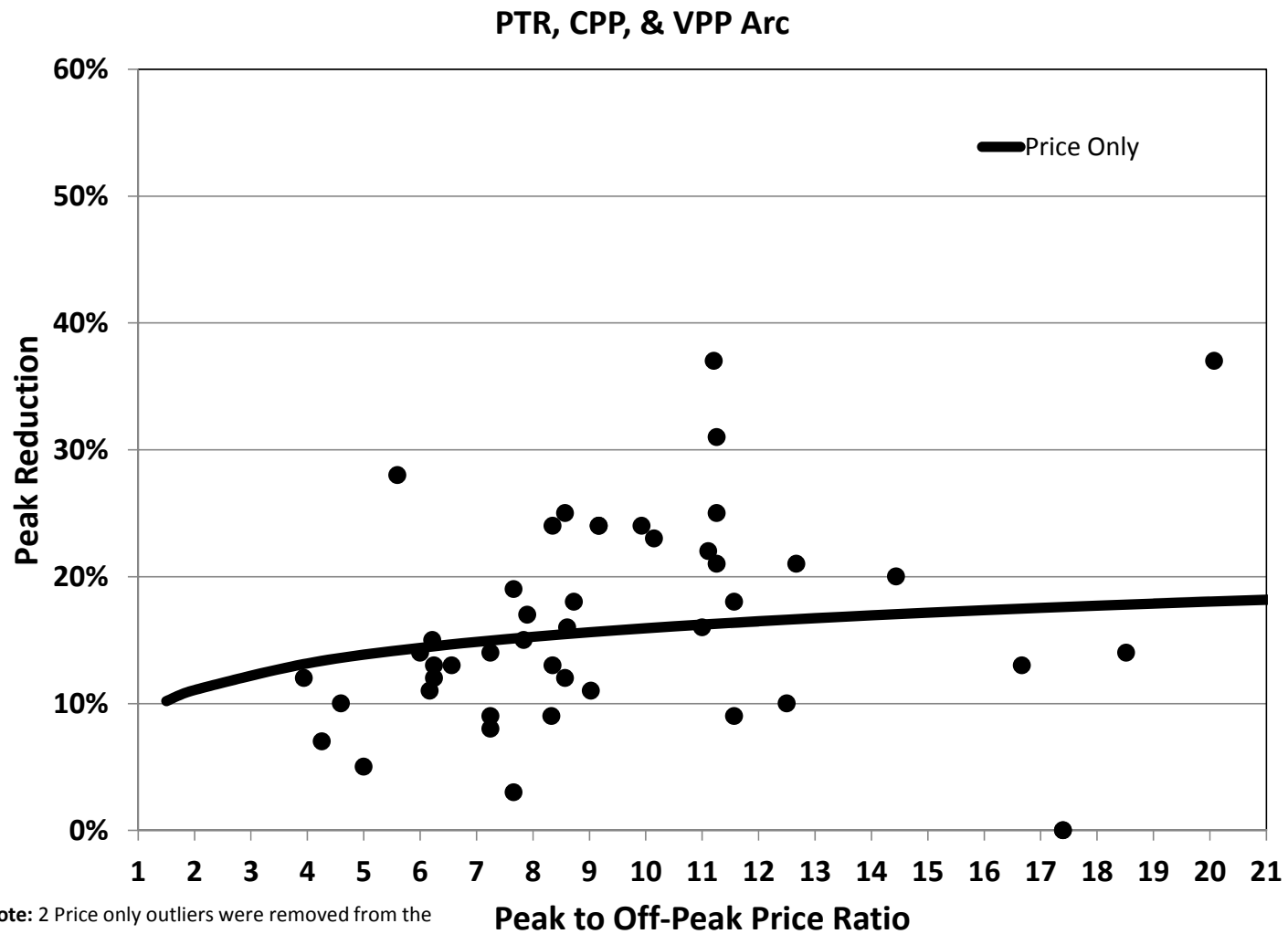
# International survey (concluded)

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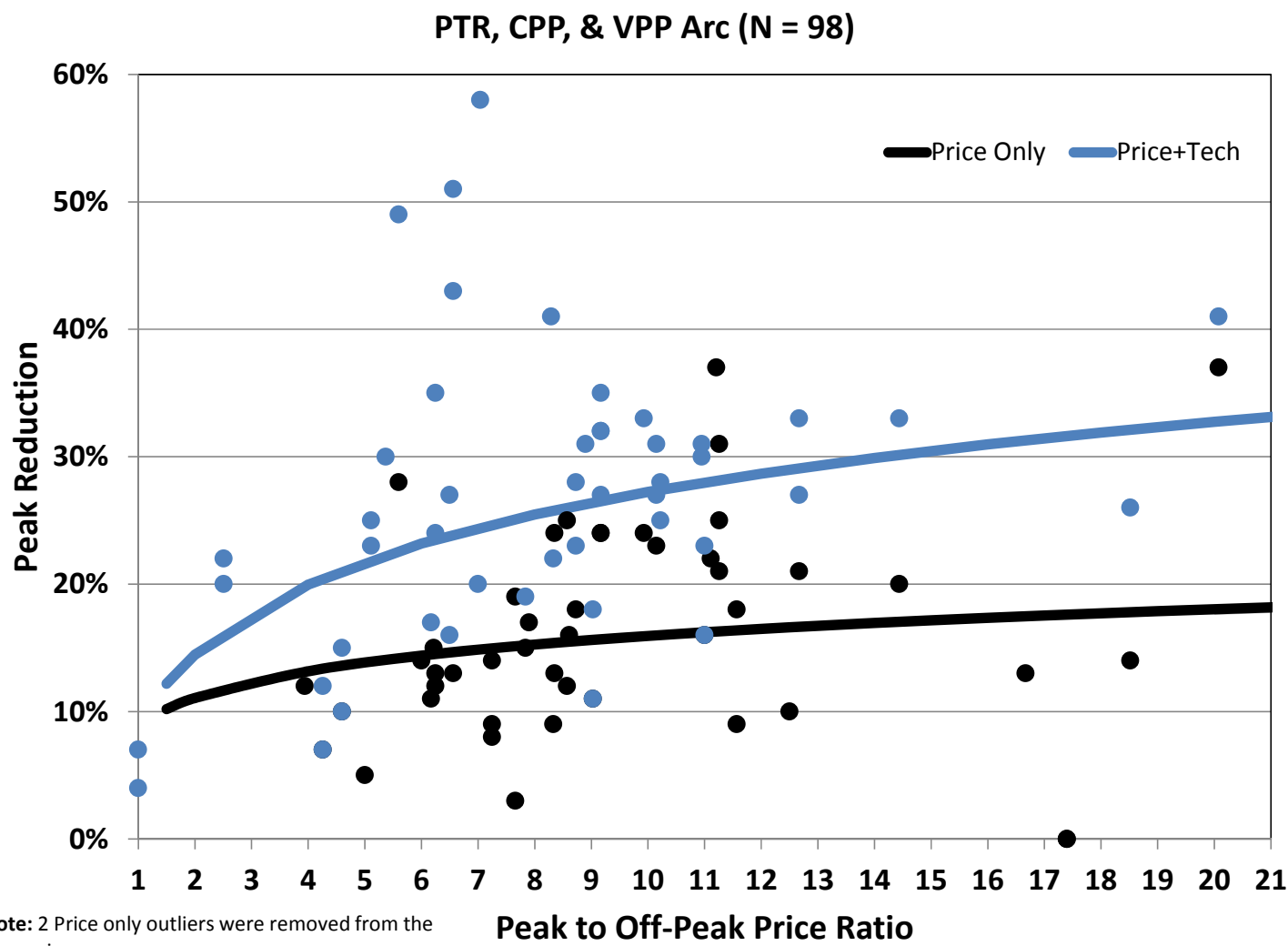
## Italy

- The world's largest deployment of TOU rates is in Italy
- Currently, 23 million residential customers of 29 million residential customers are on the default TOU program
- More than half of these customers have shifted consumption patterns in the first year
- The overall customer savings were € 2.54 million in the first year
- Impacts would have been greater with a stronger price signal

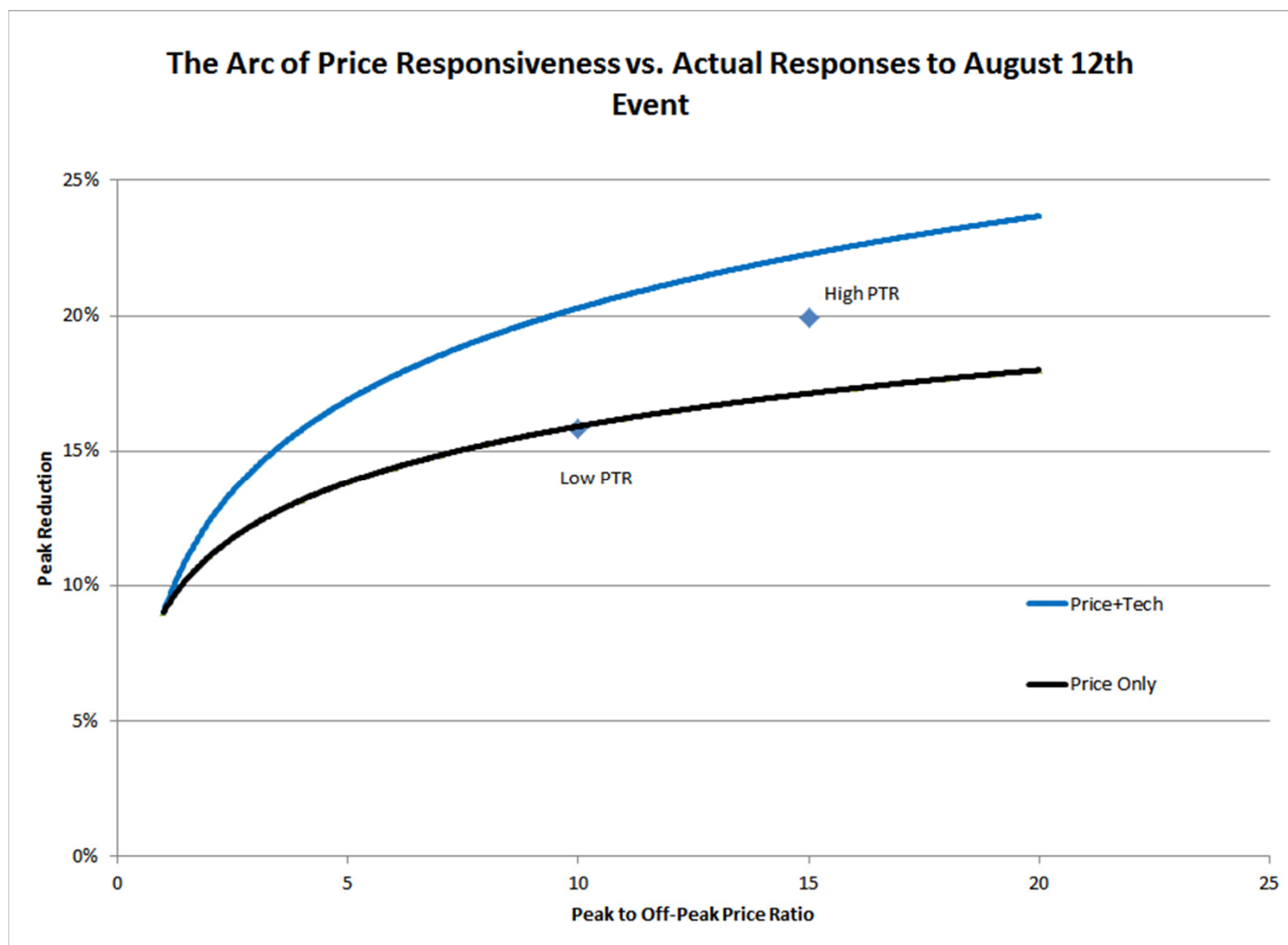
# Customer response to dynamic pricing is quite consistent across 7 countries



# Enabling technology significantly enhances the customer response



# New results from Hong Kong are consistent with the international experience



# Conclusions

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**Smart meters are being deployed throughout the globe**

**Pilots are being carried out to determine the range of customer-benefits that can be provided by smart meters**

**The results generally have been quite encouraging and many regions are proceeding with full-scale deployment of customer-side programs**



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Dr. Faruqui is an economist who specializes in smart grid strategies involving the consumer. His expertise includes demand forecasting, innovative rate design, energy efficiency, demand response, advanced metering infrastructure, technology assessment, and cost-benefit analysis. He has managed the design and evaluation of large-scale dynamic pricing experiments in California, Connecticut, Florida, Illinois, Maryland and Michigan and is currently leading a project to evaluate the effect of time-of-use rates in Ontario. He also co-authored a guide on how to evaluate smart grid demonstration projects and led a team of consultants that developed demand response potential estimates on a state-by-state basis for the Federal Energy Regulatory Commission (FERC) in 2009. His research on the efficient use of energy has been cited in *The Economist*, *The New York Times*, *USA Today* and *The Wall Street Journal*. He has appeared on Fox News and National Public Radio. Dr. Faruqui is the author, co-author or editor of four books and more than 150 articles, papers and reports. He has taught economics at San Jose State University, the University of California at Davis and the University of Karachi.

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