I. Smart Grid penetration
   - Data
   - Resistance
     - Cost / Privacy / Health concerns

II. Dynamic Pricing
   - Varieties
   - Pilots
   - Tariffs

III. Barriers to Adoption
   - Legal / Political
   - Behavioral

IV. Conclusions

Smart Grid: Barriers to Dynamic Pricing

David Spence

Searle Center Conference on Energy Regulation
November 13, 2014

THE KAY BAILEY HUTCHISON CENTER FOR ENERGY, LAW, AND BUSINESS
THE UNIVERSITY OF TEXAS AT AUSTIN

Market Penetration

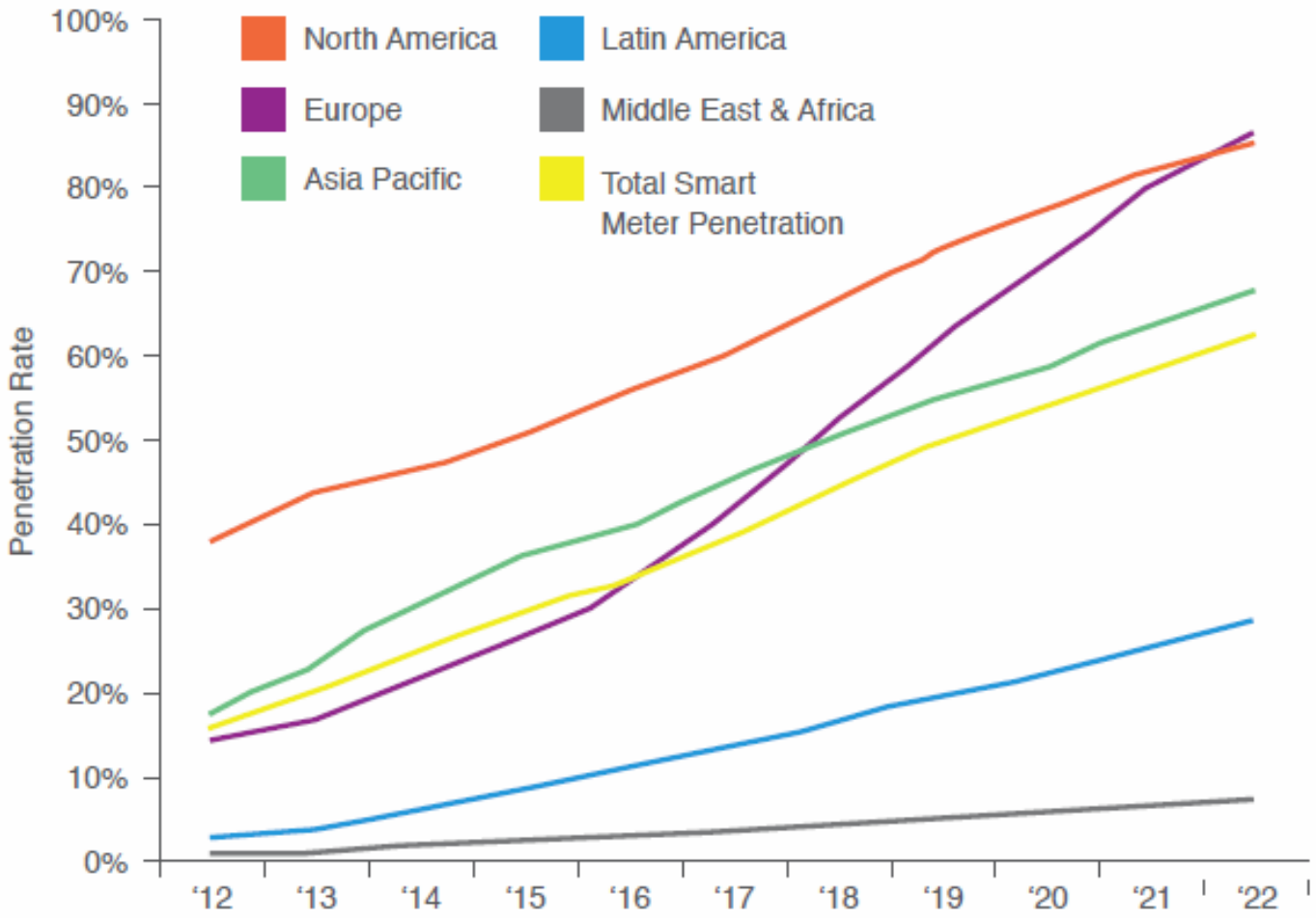
2009-12 incentives

> 50 million installed now

Very high penetration in some states

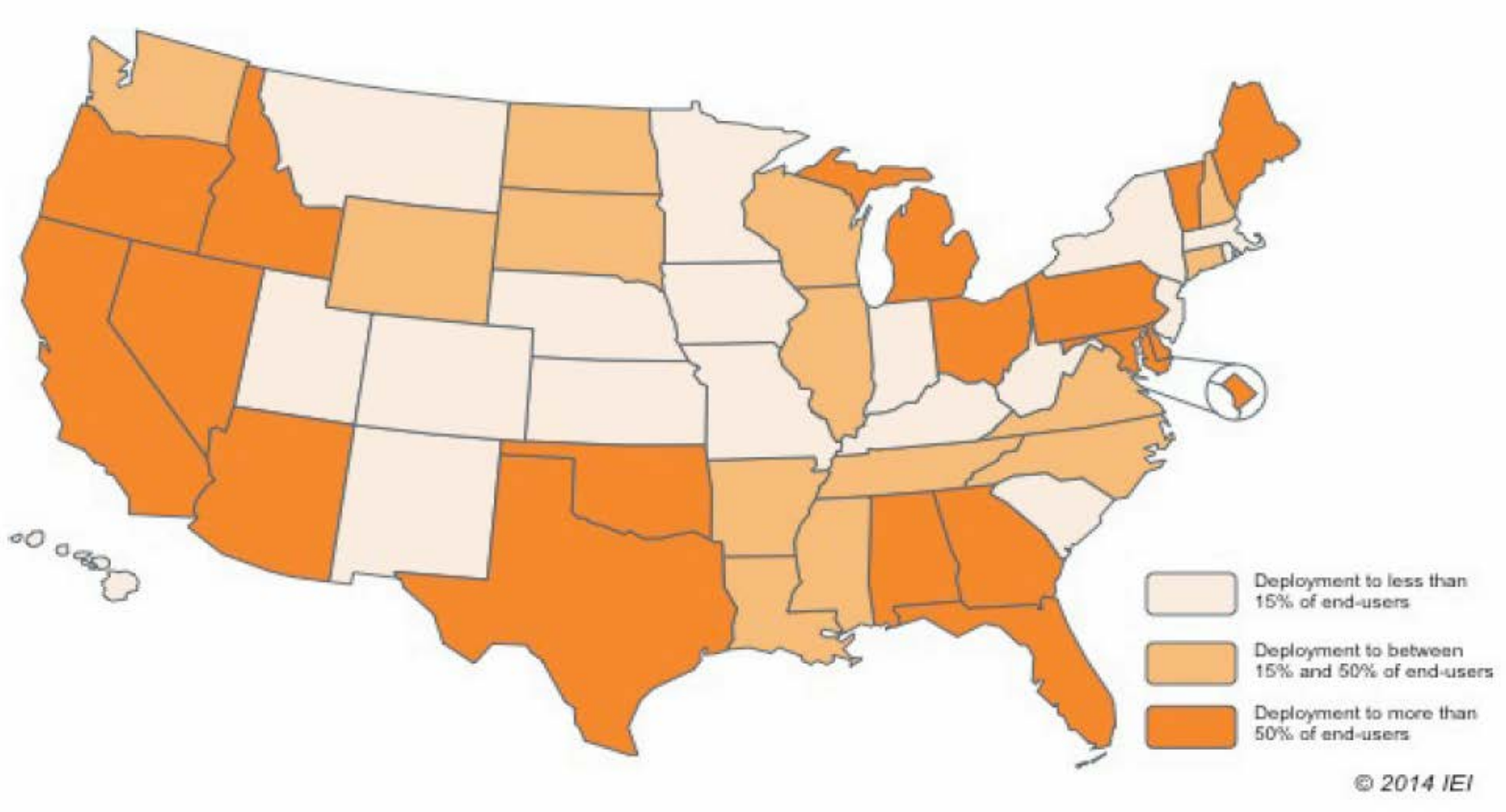
Resistance
- Who pays
- Privacy
- Health

Smart Meter Penetration Rate of All Electric Meters by Region, World Markets: 2012 - 2022

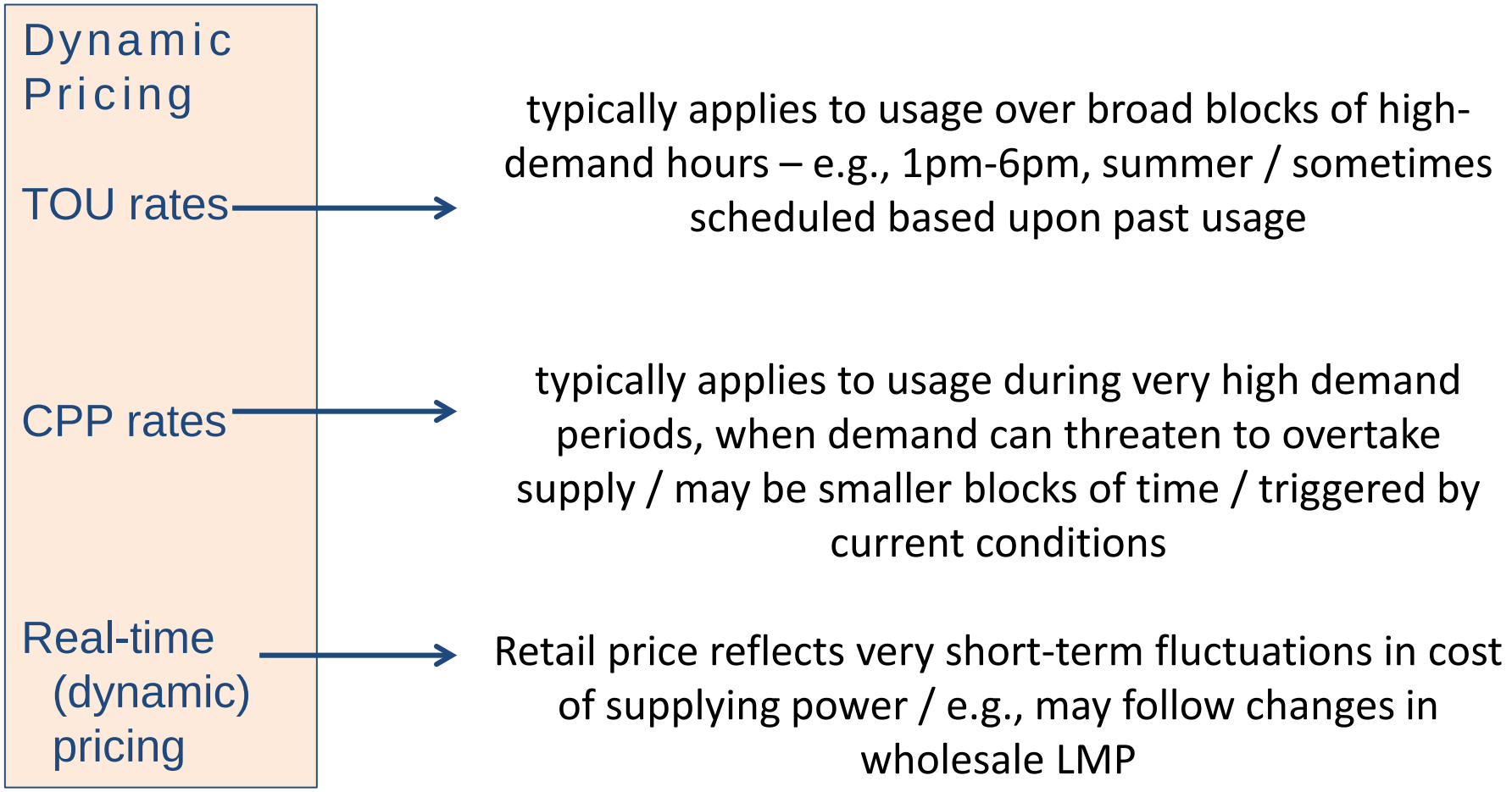


(Source: Navigant Research)

Market Penetration



Source: Inst. for Electric Innovation, 2014


Dynamic Pricing
TOU rates
typically applies to usage over broad blocks of high-demand hours – e.g., 1pm-6pm, summer / sometimes scheduled based upon past usage
CPP rates
typically applies to usage during very high demand periods, when demand can threaten to overtake supply / may be smaller blocks of time / triggered by current conditions
Real-time (dynamic) pricing
Retail price reflects very short-term fluctuations in cost of supplying power / e.g., may follow changes in wholesale LMP

Dynamic Pricing

Experiments suggest opportunities for peak shaving

Critiques of experiments

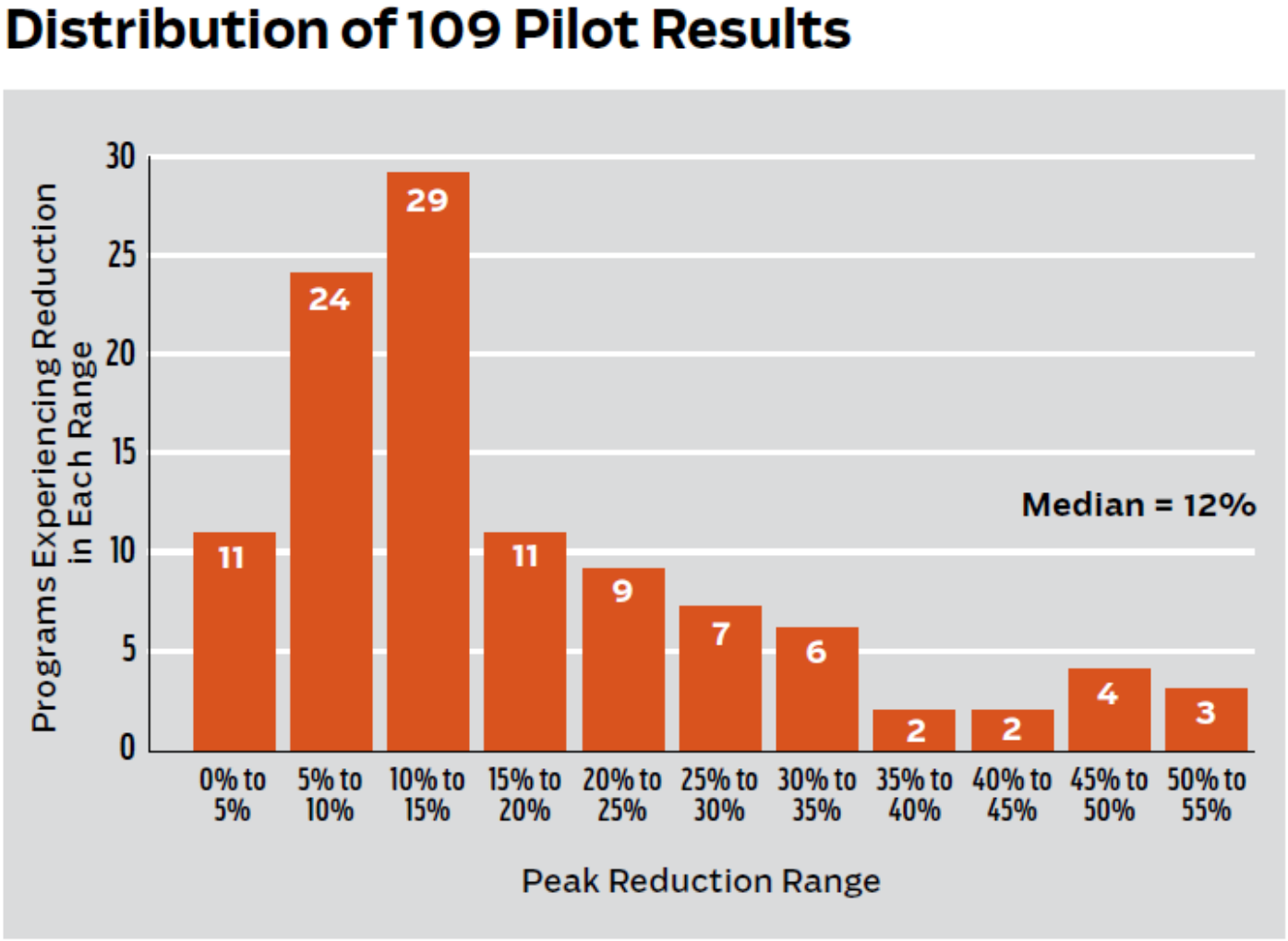


FIGURE SOURCE: Faruqui, 2011

Dynamic Pricing's 'discontents'

TOU rates → Most common form of variable rate / > 8 million customers participate in some form of TOU rate / Ontario experience

CPP rates → CA: for big 3, commercial customers must opt out of CPP / Some CPP tariffs here and there

Real-time (dynamic) pricing → IL: Utilities must offer RTP tariff; ComEd's experience with residential RTP / CMP announced tariff

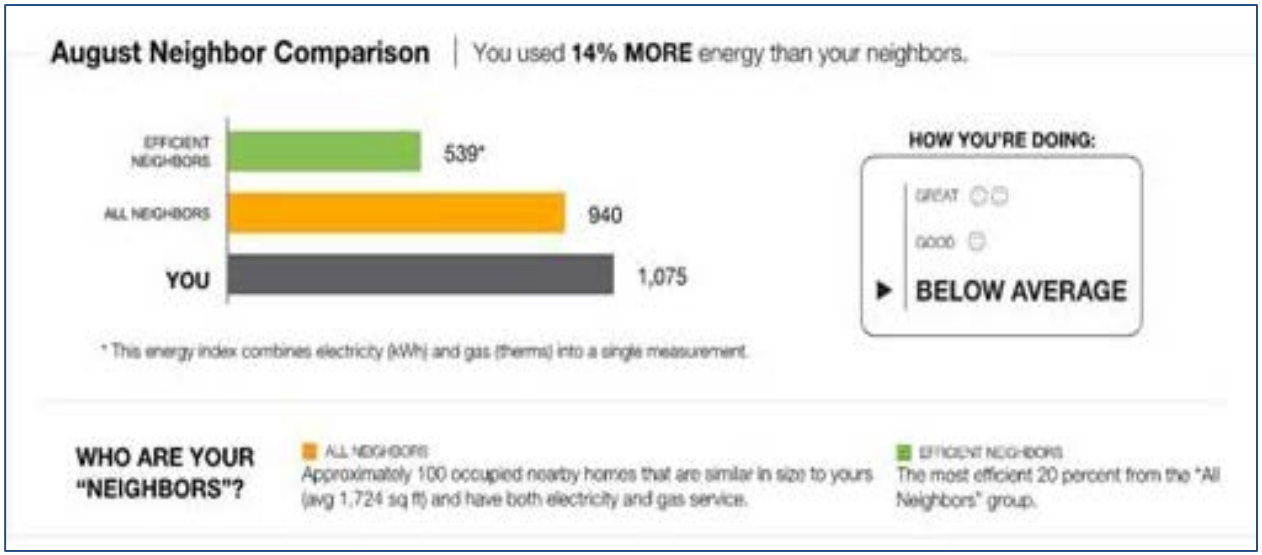
Dynamic Pricing: Why so few tariffs offered?

Theories:

- Misguided public policy concerns prevent offering of tariffs
- Customers with most at stake are not peaky, and to the extent they are, they will take advantage of dynamic prices
- The stakes for peaky consumers are too low relative to the transactions costs (Pecan Street)
- Give it time. Eventually most of us will embrace dynamic pricing (perhaps through Enernoc-style aggregation).

Behavioral Interventions

OPOWER



Ayres et al. (2010)

Issues:

- **Size of effect? Durability?**
- **Consumer heterogeneity**
- **Can nudges coexist with price signals?**

Conclusions (crystal ball?)

- Fairness concerns seem overstated; problems are tractable
- Transaction costs vs. stakes problems seem real for residential customers, and suggest two ways forward:
  - Dynamic retail pricing with nearly costless automated response (utility control or pre-programmed meter) or third-party control focused on critical peaks, and/or
  - Low-cost behavioral responses to peaks