Big Data: The Human Perspective

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What is Big Data?

- No rigorous definition of Big Data
- Definitions typically include elements
  - Volume
  - Variety
  - Velocity
- *Human Face of Big Data* - Big Data is "the real time collection, analyses, and visualization of vast amounts of information."

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Utilities Investment in Big Data

WHO...

COMPANIES ARE SPENDING BIG ON BIG DATA

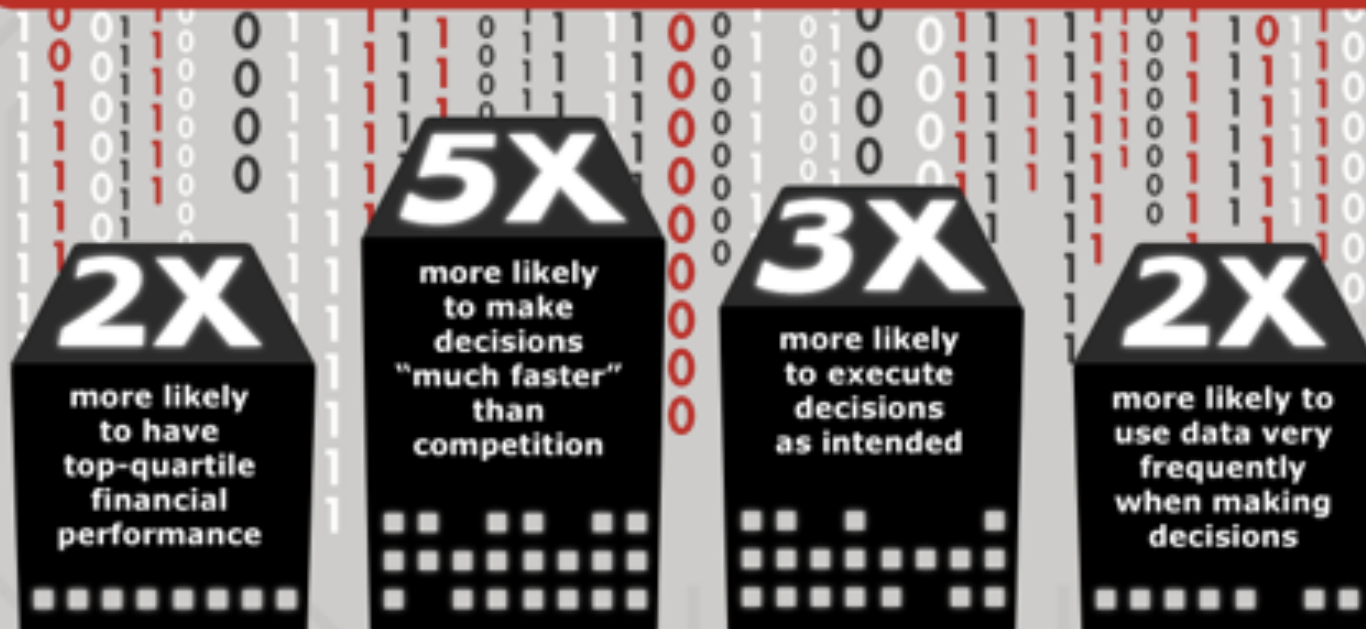|	FINANCIAL SERVICES	SOFTWARE/ INTERNET	GOVERNMENT	COMMS & MEDIA	ENERGY/ UTILITIES
IN 2015	$6.4B	$2.8B	$2.8B	$1.2B	$800M
ANNUAL GROWTH TO 2020	22%	26%	22%	40%	54%

Source: Forbes 10/29/2013
http://www.forbes.com/sites/baininsights/2013/10/29/infographic-the-who-why-and-how-of-big-data/

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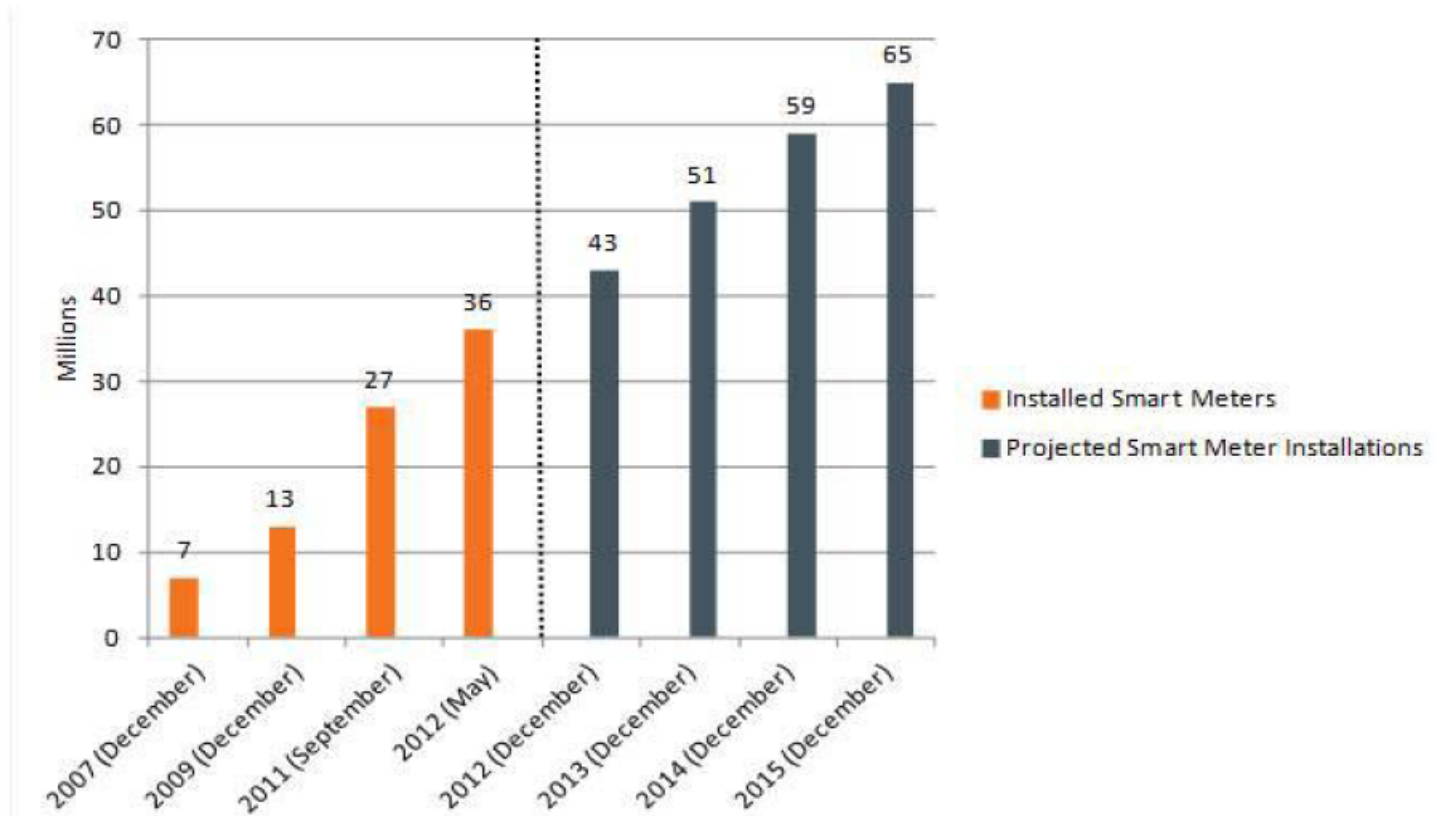Energy Market Innovations

Early Adopters of Big Data Analytics…

WHY…

THE COMPANIES THAT USE ANALYTICS BEST ARE…

2X more likely to have top-quartile financial performance

5X more likely to make decisions "much faster" than competition

3X more likely to execute decisions as intended

2X more likely to use data very frequently when making decisions
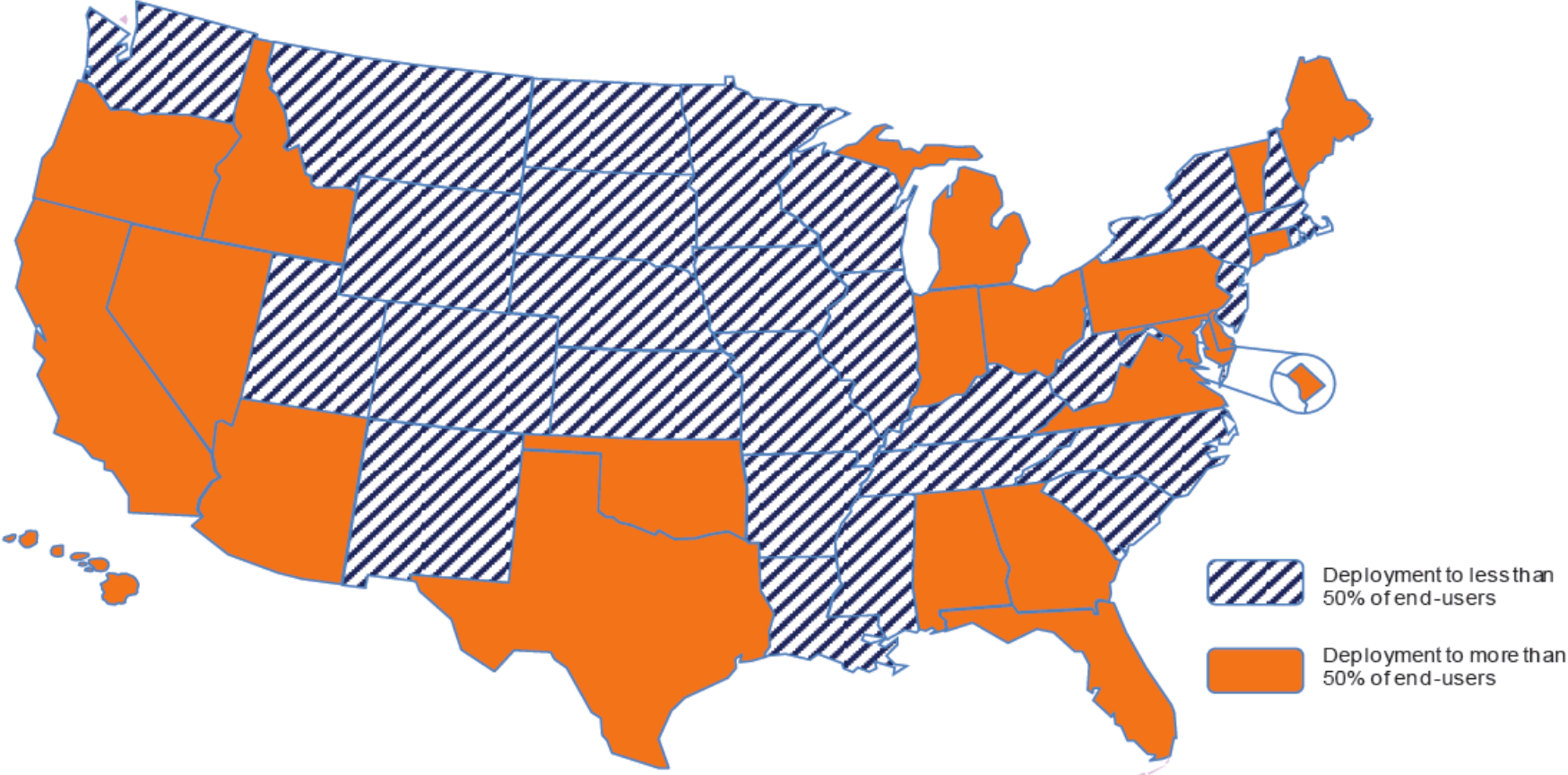
Source: Bain & Company, 2013

Smart Meter Installations in the US: 2007-2015 (millions)

Source: IEE, Utility Scale Smart Meter Deployment, Plans and Proposals, May 2012
www.edisonfoundation.net/iee/.../IEE_SmartMeterRollouts_0512.pdf

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Expected Smart Meter Deployments by State by 2015

Deployment to less than 50% of end-users

Deployment to more than 50% of end-users

Source: IEE, Utility Scale Smart Meter Deployment, Plans and Proposals, May 2012
www.edisonfoundation.net/iee/.../IEE_SmartMeterRollouts_0512.pdf

Big Data Promises

- Valuable new insights
- Continued surge in the collection, storage and reuse of personal data
- Size and scale of data collections increase as storage costs decrease and the power of analytic tools increase
- Creation of new products the expand markets and create jobs

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Potential Smart Grid Data Uses

Data use	Description
Outage Detection, Mapping, Restoration	Facilitative every aspect of outage response
Theft Detection	Pinpointing unauthorized or unmetered electricity draws
Remote Connect/Disconnect	e.g. Hook-up new residents remotely vs in-person visit
Asset Management	Monitoring of grid asset use to allow power to be dispatched efficiently and effectively
Price Event Notification	Facilitates the implementation of dynamic pricing schemes targeting peak load reduction
Power Quality Monitoring	More information allows for better understanding of available resources and better quality control.

Source: Elias Leek Quinn, 2009

Potential Smart Grid Data Uses

Data use	Description
Load Forecasting	Planning and preparing for loads in advance.
Efficiency Analysis & Investment	Pinpointing energy sinks within homes and businesses and directing efficiency strategies and investments
Home Efficiency Monitoring	Monitoring of appliance draw on an ongoing basis and notifying customers when appliances are underperforming.
Home Load Management through Web Portals and Software	Single-interface access provided to consumers allowing for electric bill and load history review.
Home Area Network Development	Integrated appliance networks that allow for joint and automated load management.

Source: Elias Leek Quinn, 2009

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Potential Smart Grid Data Uses

Data use	Description
Insurance Adjustment	Insurance companies could conceivably use the information to develop correlative relationships between, e.g., appliance uses or load profiles and health or driving risks, and set insurance premiums accordingly.
Marketing & Market Research	Information regarding market penetration and target market usage habits could be valuable to advertisers in numerous ways.
National Security & Law Enforcement	Officers and investigators could use information about electricity draw to pinpoint possible cite of various nefarious activities such as drug manufacture.

Source: Elias Leek Quinn, 2009

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Future Research Possibilities Using Smart Meter Data

- How much do customers shift usage in response to time-varying prices?

- How does it vary across income-levels or location?

- How does peak-time pricing compare to peak-time rebates for conservation?

- How do information devices (in-home displays, smart phone notification, etc) change responses?

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The Potential Dark Side of Big Data

- Potential of penalties based on propensities

- Misinterpreting Data

- Increases data privacy risks

- Changes the character of those privacy risks

Data Privacy

- Four Dimensions of Privacy:
  - Personal Information
  - Personal Privacy
  - Behavioral Privacy
  - Personal Communications Privacy

- Three Core Privacy Protection Strategies:
  - Individual Notice and Consent
  - Opting Out
  - Anonymization

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Federal Law

- Fourth Amendment?

- Stored Communications Act (SCA)?

- Computer Fraud and Abuse Act (CFAA)?

- Electronic Communications Privacy Act (ECPA)?

Source: 2012: Murrill, Liu, & Thompson, Smart Meter Data: Privacy and Cybersecurity

State Legislation

- 2012 =13 states considered 31 bills that address smart grid technology.

- 2012 = Seven states—California, Illinois, Maine, New Hampshire, Ohio, Oklahoma and Vermont—enacted legislation on the issue.

Source: National Conference of State Legislatures:
http://www.ncsl.org/research/energy/smart-grid-state-action-update.aspx

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State Legislation

- *Promoting Deployment*

  – Six states are considering or enacted laws to promote smart grid deployment: Illinois, Massachusetts, New Jersey, New York, Ohio and Vermont.

- *Allowing Customers to Opt-Out*

  – Seven states—California, Illinois, Maine, New Hampshire, Ohio, Oklahoma and Vermont—enacted legislation on the issue.

- *Cyber Security and Data Protection*

  – California, Maine, Ohio and Oklahoma enacted legislation to enhance customer data confidentiality, or to examine cyber security and privacy issues.

Source: National Conference of State Legislatures:
http://www.ncsl.org/research/energy/smart-grid-state-action-update.aspx

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Conclusions

- "Changes in the way we product and interact with information leads to changes in the rules we use to govern ourselves and in the values society needs to protect." Source: Mayer-Schonberger and Cukier, 2013

- <u>Call to Action</u> – Data Ethics and Privacy Concerns need to be a key topic for the Energy Industry: How do we both lead and support these conversations to balance privacy and innovation?

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Questions?

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