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# Advanced Metering and Energy Information Systems

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ACEEE Market Transformation, 2009

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New Buildings Institute

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# Advanced Metering and Basic EIS

- Advanced Metering and Basic EIS Definitions
- Costs
- How Does an EIS make a difference
- Research and Market Transformation

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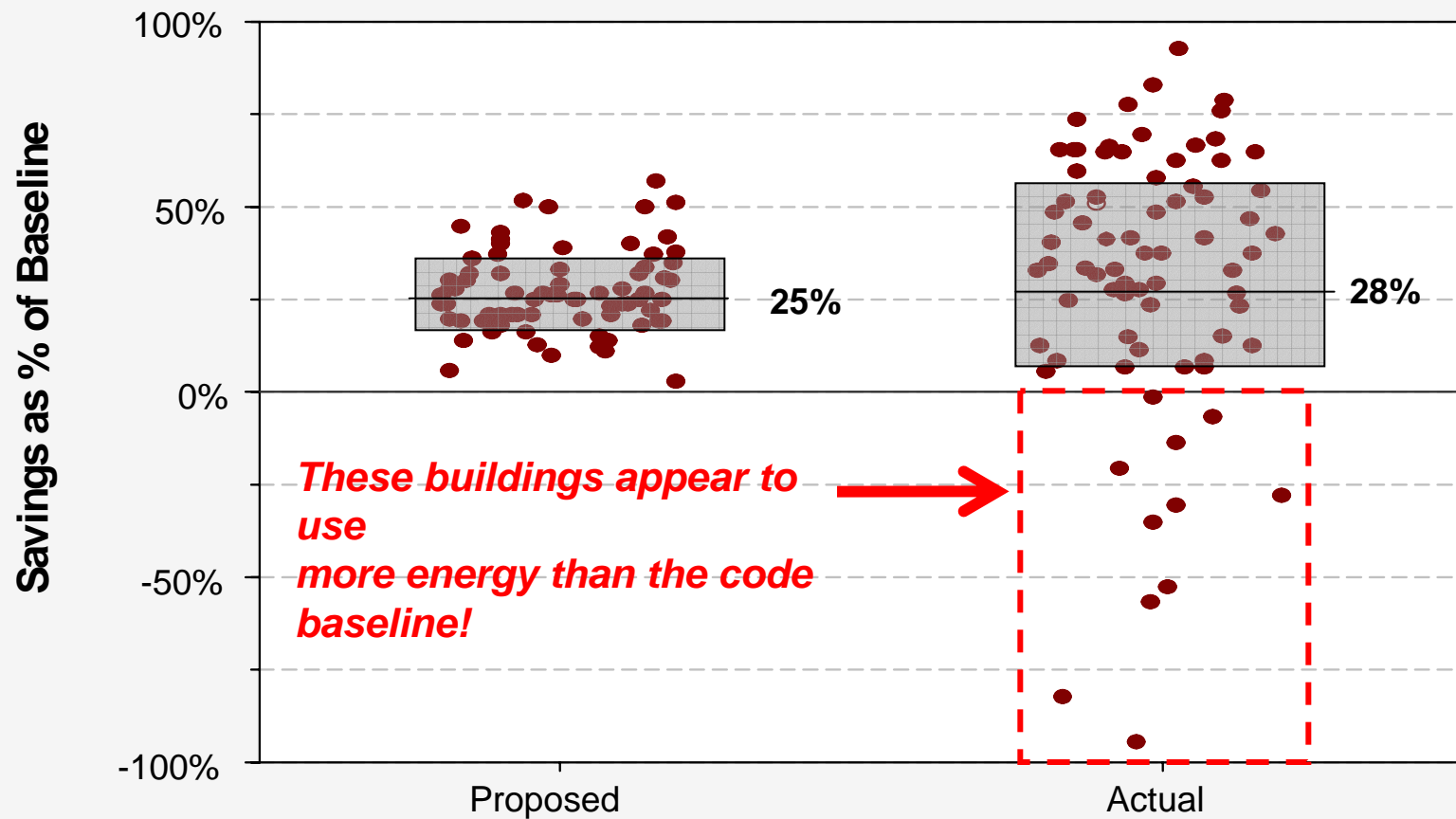
# NBI - Roles

- Best practices for small to medium commercial buildings
  - Core Performance Guide
  - Advanced Lighting Guidelines
  - Building codes analysis
- Measured performance focus
  - Measured performance study, 2007

# NBI - Advanced Metering Motivations

- Persistence in Efficiency
  - Permanent monitoring systems to increase the effectiveness of retrocommissioning
- Evidentiary Design Data
  - Modeled performance is not always an indicator of future results
  - Collecting bills is labor intensive
- Advanced Building Performance Metrics
  - Performance based building programs and codes?
  - Advanced benchmarking

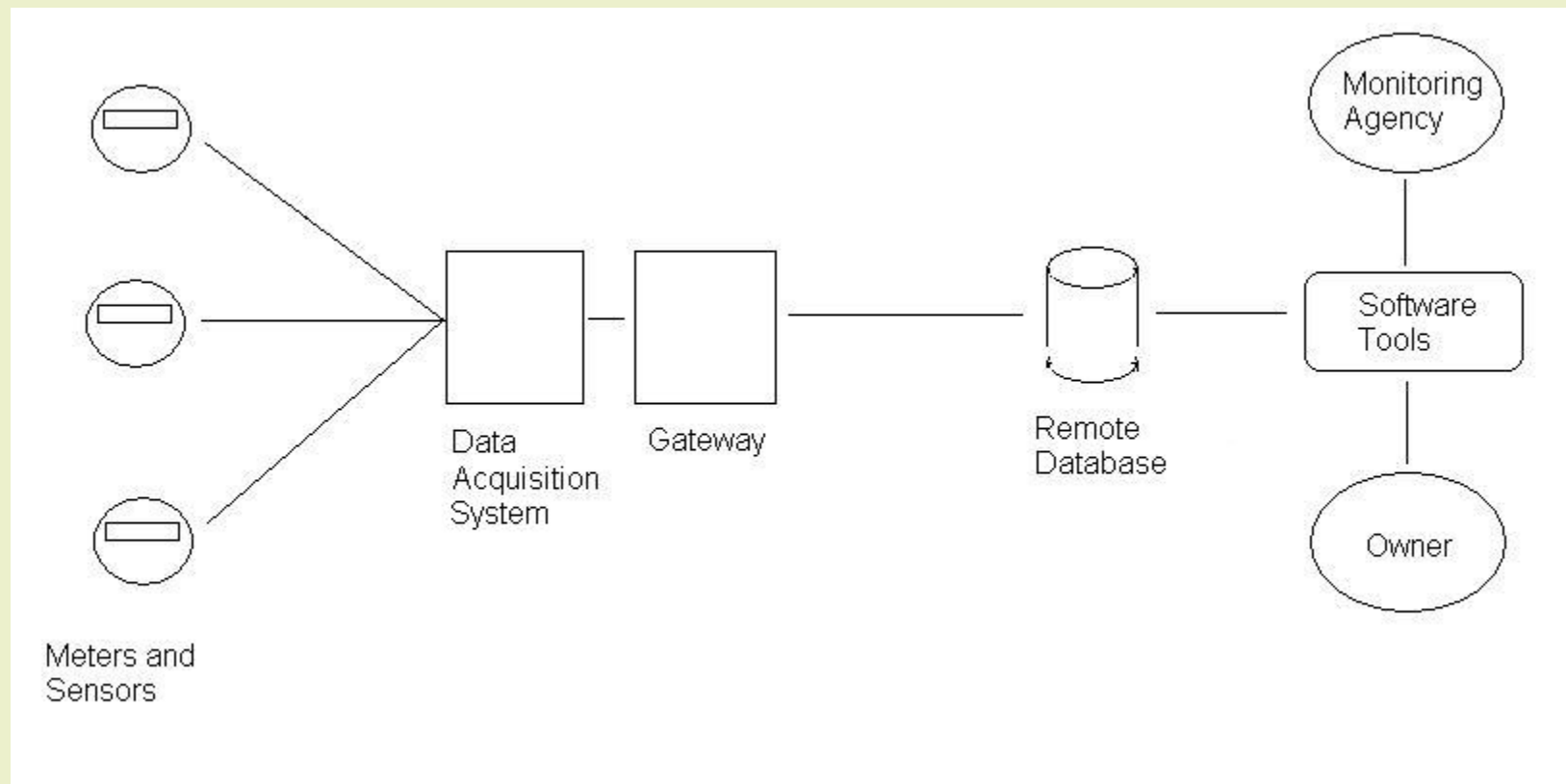
# Measured Performance Study, 2007



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# Energy Information System



# Basic Energy Information System

- Basic EIS
  - Advanced Meter(s)
  - Optional additional meters and sensors
  - DAS/Gateway
  - Software Tools
- Integration Platform - Middleware
  - Building Automation System (BAS) Interface
    - Software
    - Hardware - Sometimes

# Advanced Meters – Energy Management

## Meter that reports, or can be interrogated, at frequent intervals

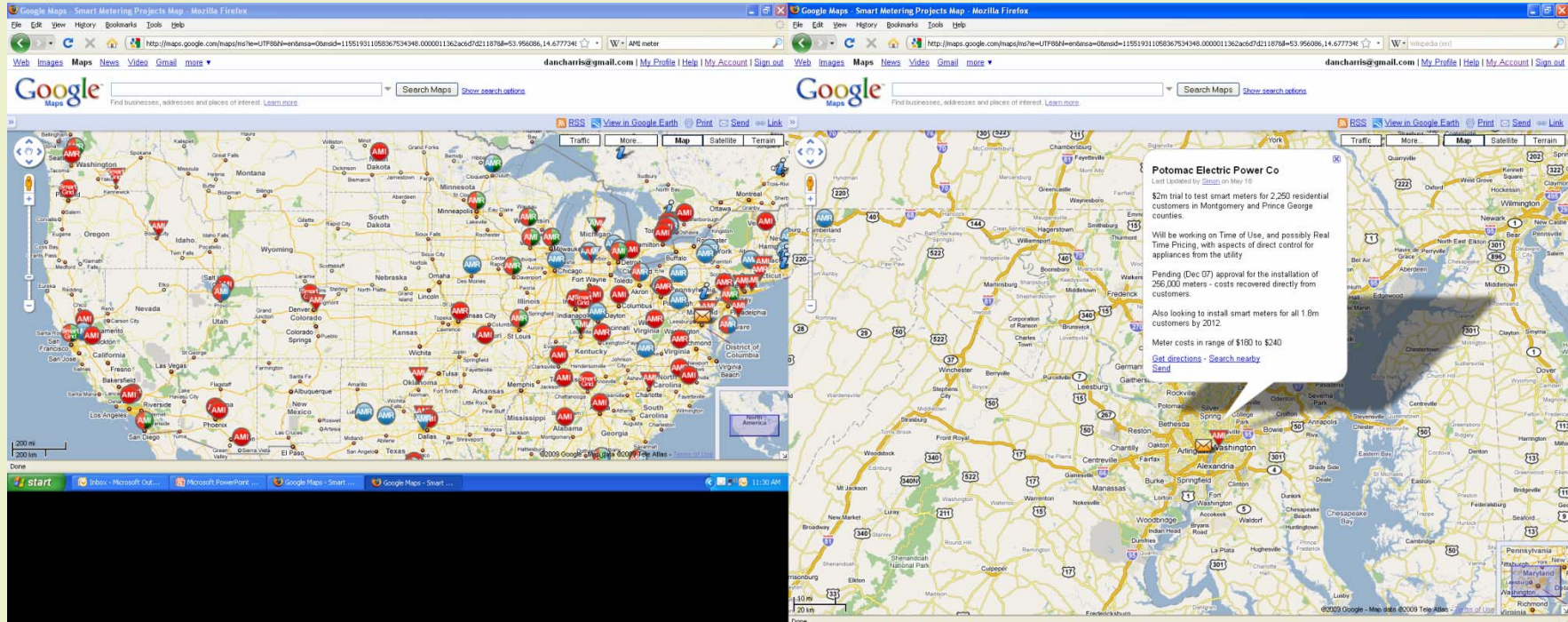
### ■ Utility-Installed

- AMI/AMR Meters
  - 4.2% of non-residential are AMI\*
  - Some states already require for minimum kW
  - Issues:
    - Getting data can be difficult
    - Sometimes monthly charge
    - Both Gas/Electric?

### ■ Owner-Installed

- Off-the-Shelf
  - Many available options
  - Installation cost variable
- Utility Upgrade
  - Pulse output

# Where is AMI/AMR?



# Owner-Installed Advanced Meter Cost

Type	Cost (\$)	Installation (hours)	Total (\$)
Electric	350 - 750	4	~ 800
Natural Gas	200 – 500	4 – 8	~ 950
Gas Dial Reader	200	1	~ 275
Utility Pulse Output	0 – 2000 +	-	est. 1000

# Owner-Installed Basic EIS Costs

## ■ Data Acquisition System

- Wired
  - Direct wiring
  - Data cable
- Wireless
  - Wireless mesh
  - Point-to-point

## ■ Gateway

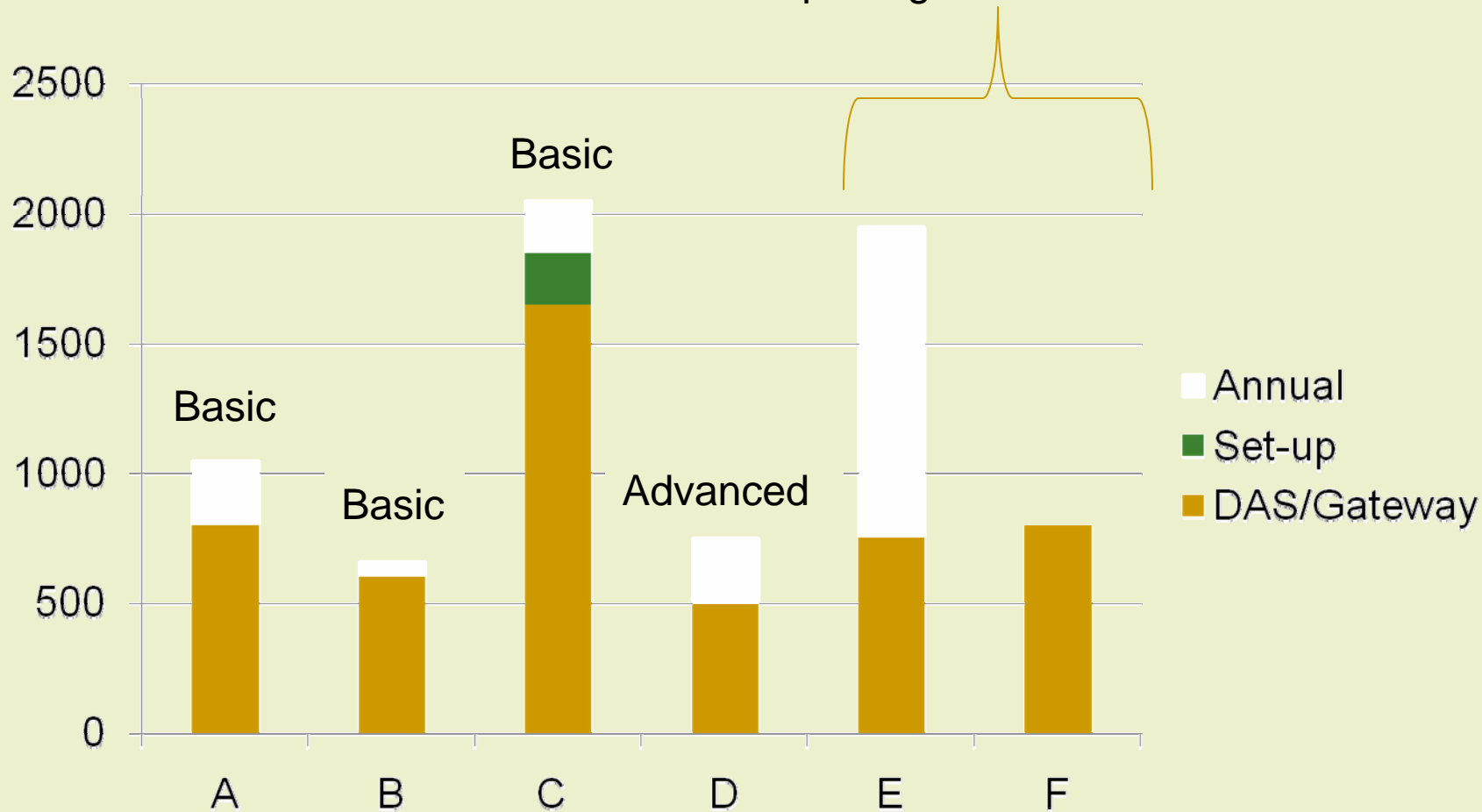
- Wired
  - Phone
  - LAN
- Wireless
  - Wi-Fi
  - Cellular
  - Wi-Max

# Software

- Various Sophistication Levels
  - Basic
    - Download data
    - View time series
  - Advanced
    - Baselineing
    - Benchmarking – Energy Star and Internal Portfolio
    - Weather normalization
    - Time-series visualization tools
- Free with purchase

# Basic EIS DAS/Gateway

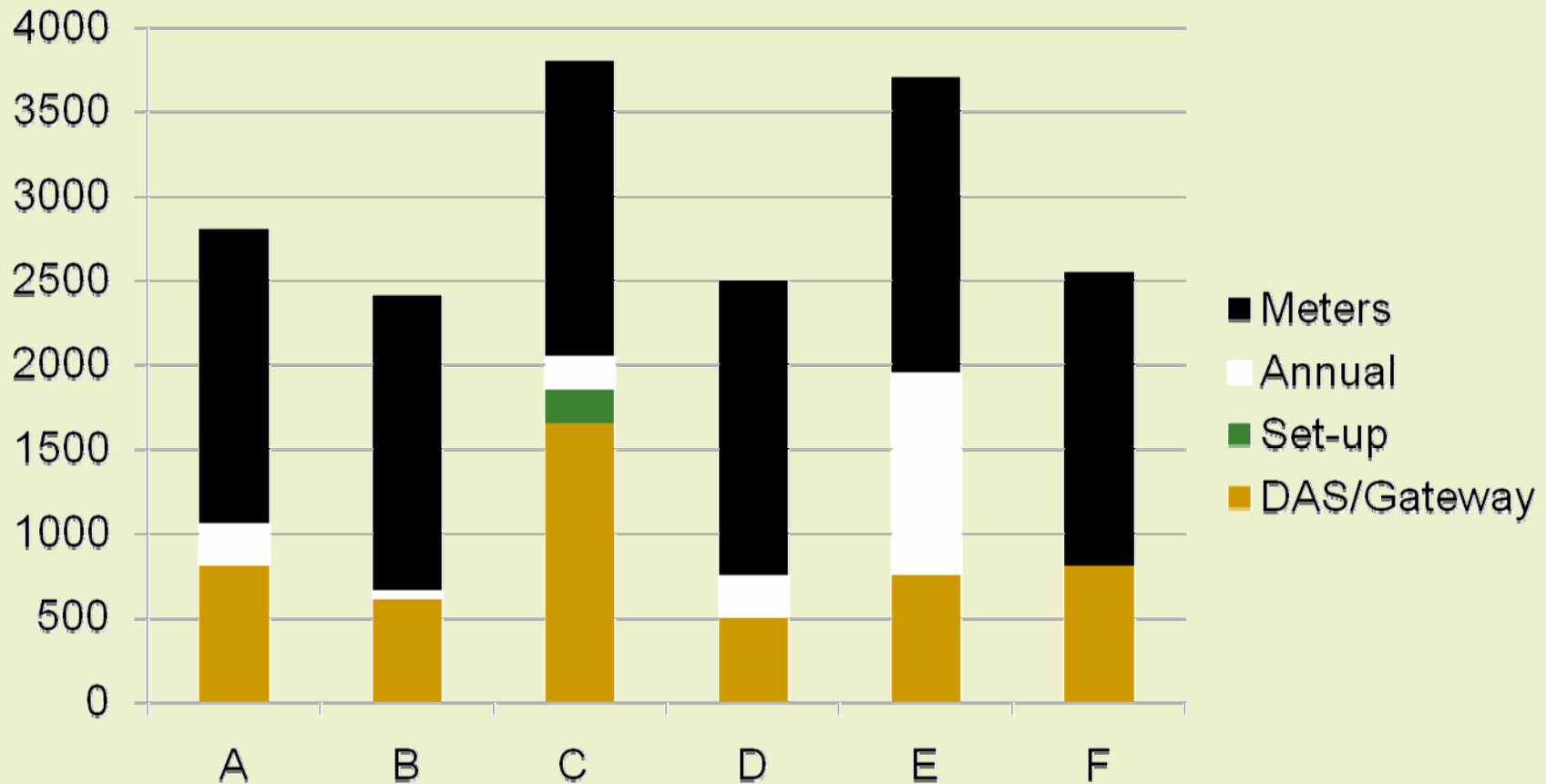
With Service Monitoring and Reporting



# Total Basic EIS Cost (Hardware Only)

\$2500 - 4000

\$11 billion – \$17.6 billion



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# Where is EIS?

- Larger buildings
  - Studies show Monitoring Based Commissioning – Continuous Commissioning improve persistence.
- Smaller buildings
  - Utility territories with AMI/AMR and web portal
  - Chains - Retail, hospitality, government
  - Government Buildings
    - Mandated by state & federal legislation “...where practicable”
    - Annual energy spend at least \$40,000

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# Why have an EIS?

## Emerging Motivations

- Automated benchmarking EPA Portfolio Manager
- Energy Star Benchmarking Requirements
  - California AB1103
- USGBC measured performance
  - Announced without details
- Voluntary carbon tracking
- Demand response participation

# NBI Research

## ■ Uses of Basic EIS

- Automated Inverse modeling – enhanced Baselineing
  - Reverse simulation using knowledge of major building system types
- Isolating Core and Shell and system loads
  - 4 commercial pilots new construction in Seattle
- Programmatic evaluation
  - Packaged efficiency measures with Basic EIS in 20 – 40 pilot projects
  - Tenant vs. owner feedback

# Future Directions

## ■ Policy

- Building program incorporation of measured performance via automated data collection (EIS)
  - USGBC et al.
- California AB1103 style benchmarking requirements

## ■ Research

- Need to address smaller buildings
  - Small – Display and FDD
  - Medium – Basic EIS with system load normalization
  - Large – Integration Platform – Energy Monitoring and Reporting

# Thanks

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