



Grid ACADEMY

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Smart Grid

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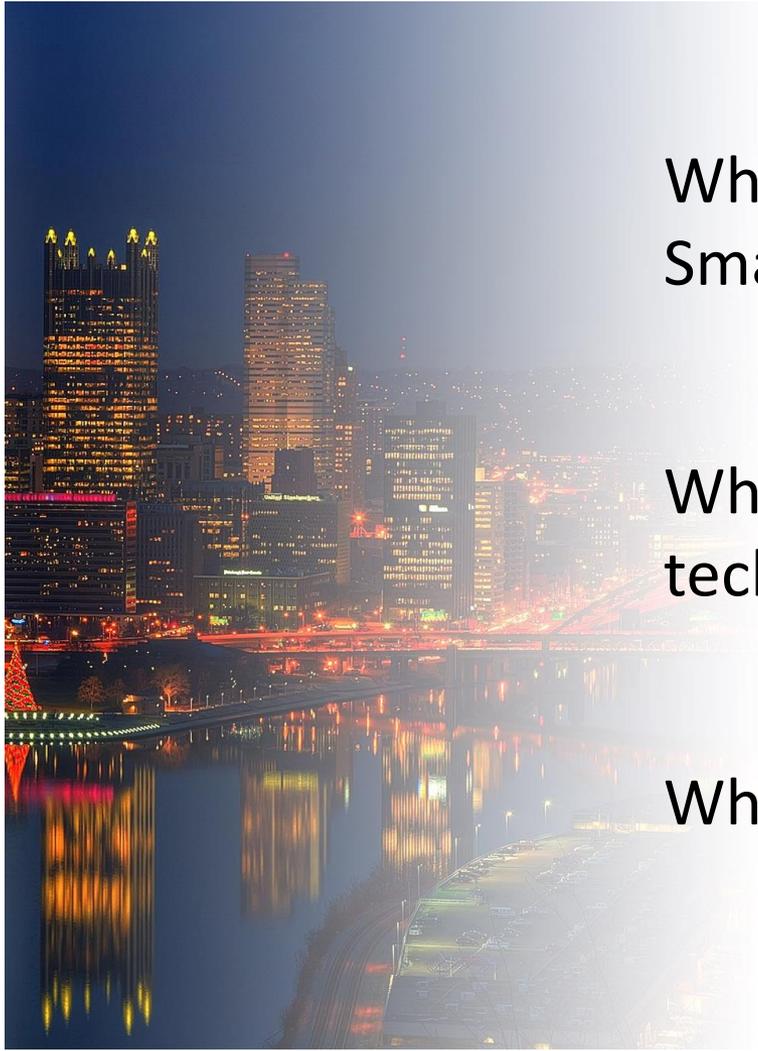
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What we will cover

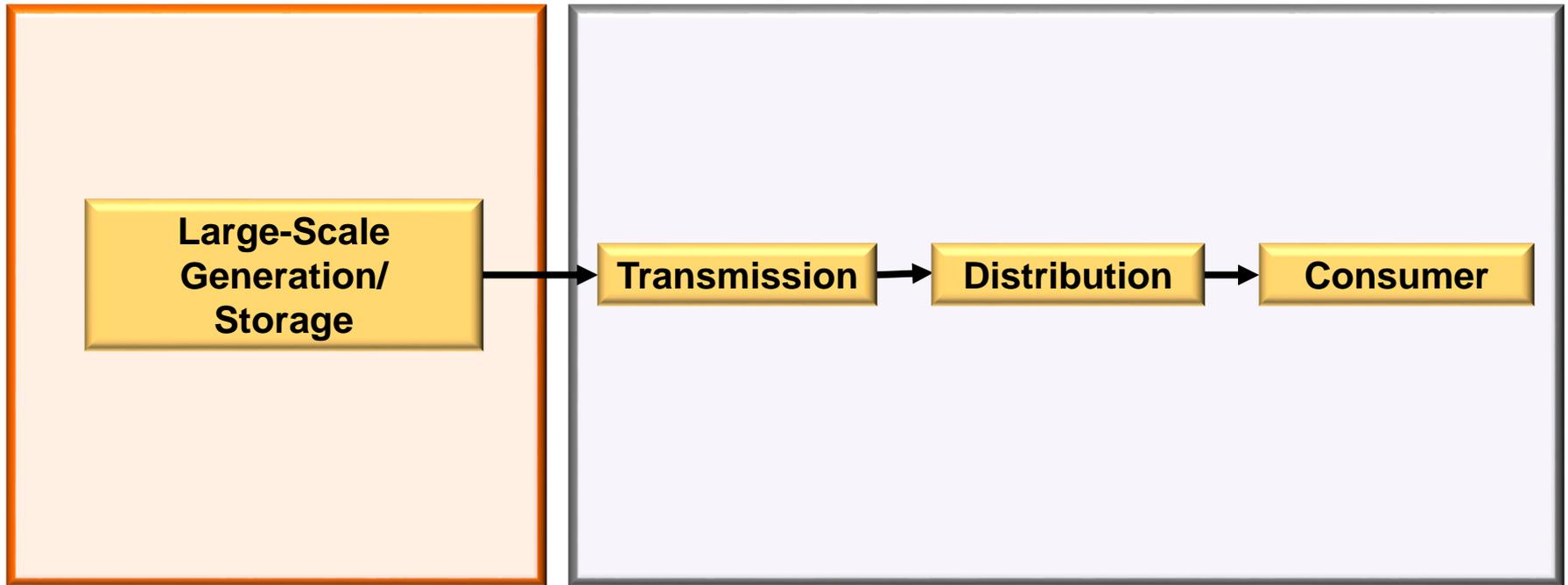


What's the difference between a Smart Grid and a modern grid?

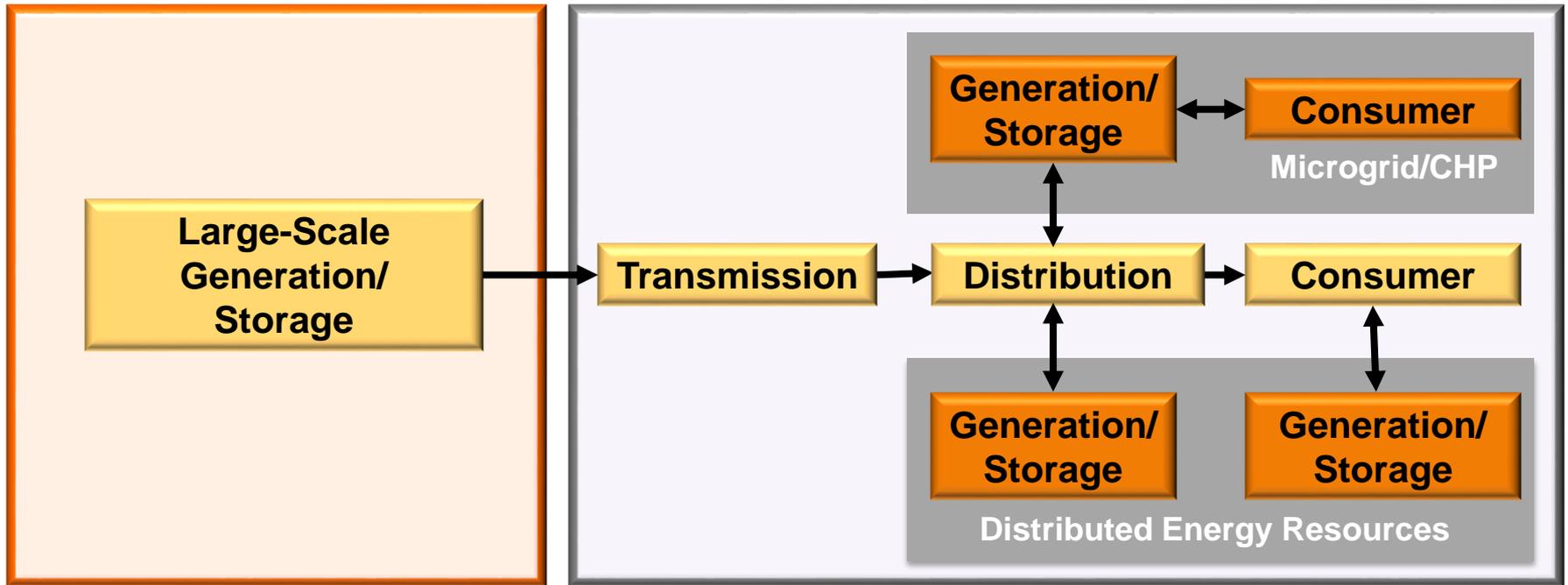
What are the applications, technologies, benefits, and metrics?

What are the challenges?

Basic structure of electric power systems today



The modern system will have changes in all of these elements, some more than others

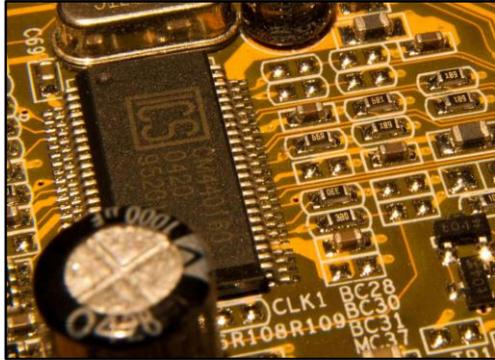


The Smart Grid will...



1. Enable active participation by consumers
2. Accommodate all generation and storage options
3. Enable new products, services, and markets
4. Provide power quality for the digital economy
5. Optimize asset utilization and operate efficiently
6. Anticipate & respond to system disturbances (self-heal)
7. Operate resiliently against attack and natural disaster

The Modern Grid includes Smart Grid enhancements and more



**Attributes
of Smart Grid**

*Senses
Protects
Controls*



**Enhanced
Functionality**

*Generation
Storage
Load*



Modern Grid



A Smart Grid allows for a number of significant changes

Passive consumers

Active consumers

One-way flow of power and comm.

Two-way flow of power and communication

Central generation

Flexible mix of central and distributed

Passive asset control

Active asset control

Radial system

Networked and integrated system

Fixed rates

Dynamic pricing

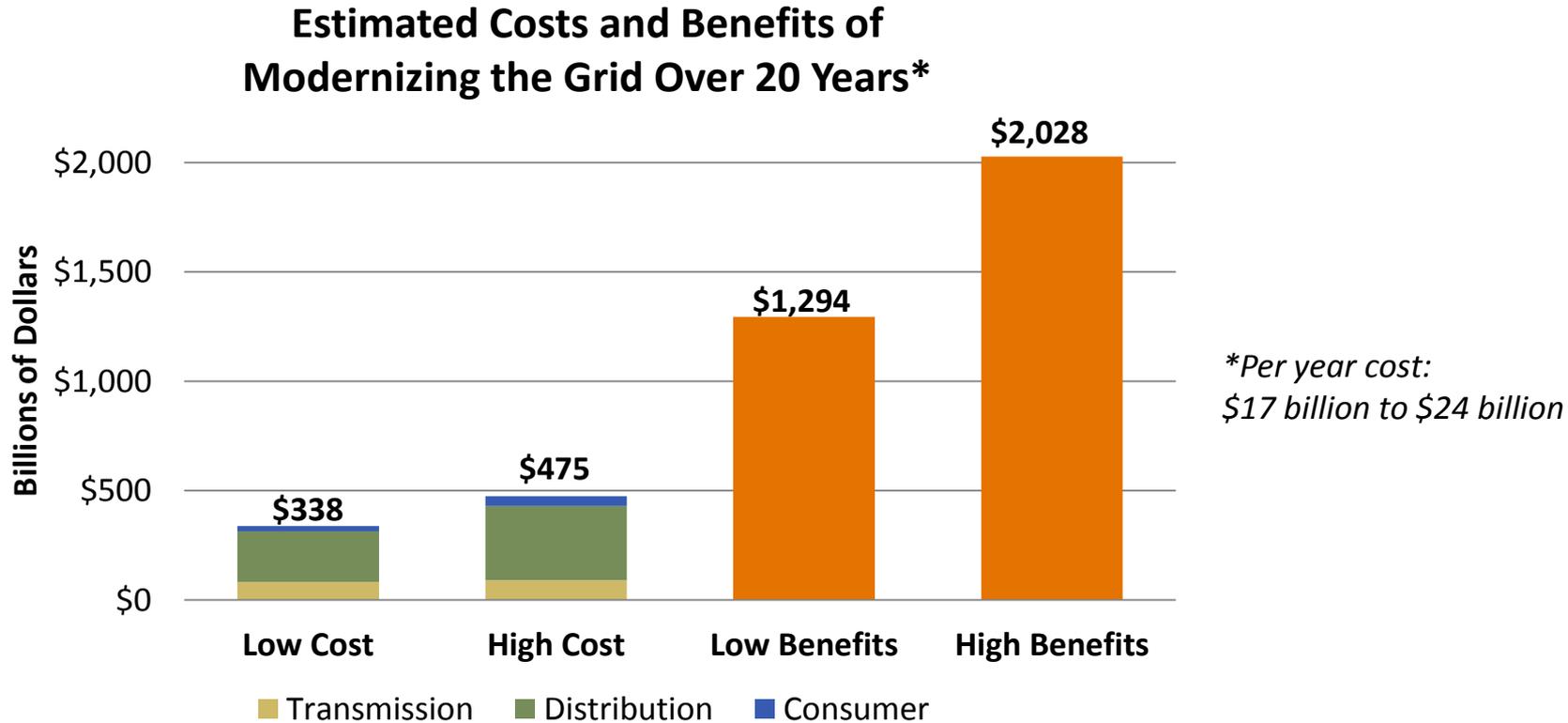
Separate transmission & distribution

Interactive transmission & distribution

Few ties to other infrastructures

Potential to transform transportation sector

There is a significant cost to modernizing the grid but estimates suggest the benefits outweigh the costs

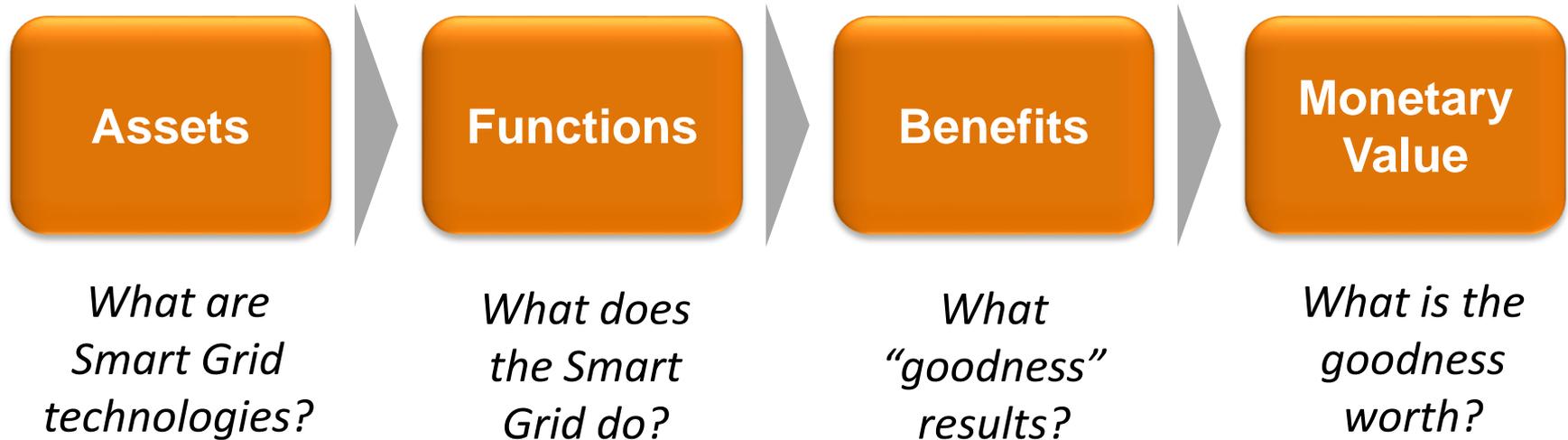


Overall benefit-to-cost ratio of 2.8 to 6.0

Sources: EPRI, 2011 and EPRI Report: http://www.smartgridinformation.info/pdf/3272_doc_1.pdf

Applications, Technologies, Benefits, and Metrics

Relationships between Smart Grid technologies and the benefits that they provide



Example: Condition-Based Transformer Maintenance



Example

Assets

Real-time transformer condition sensors

Functions

Monitor performance and condition of transformer

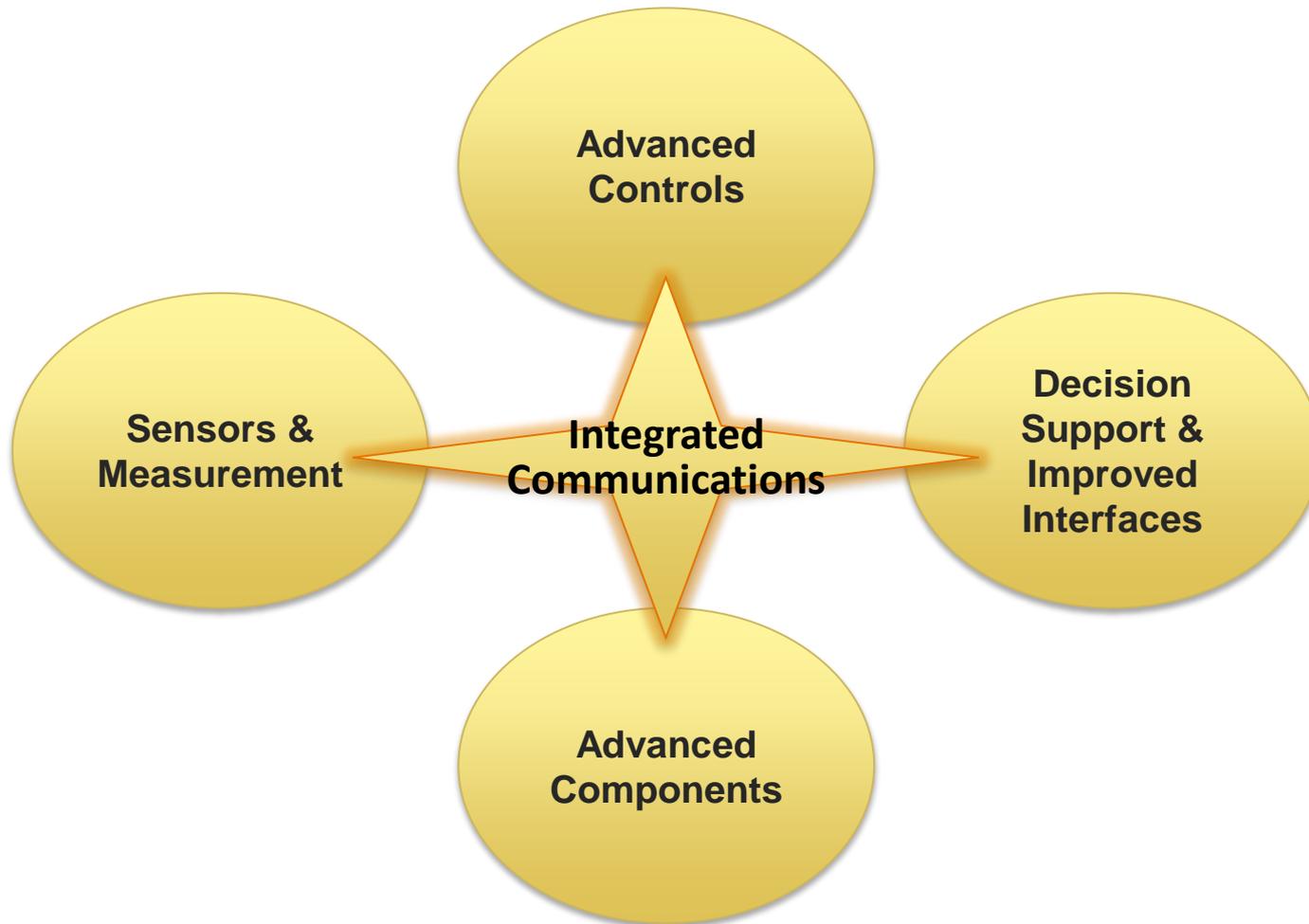
Benefits

Proactive maintenance prior to equipment failure

Monetary Value

\$100,000

Smart Grid technologies fall into five basic categories

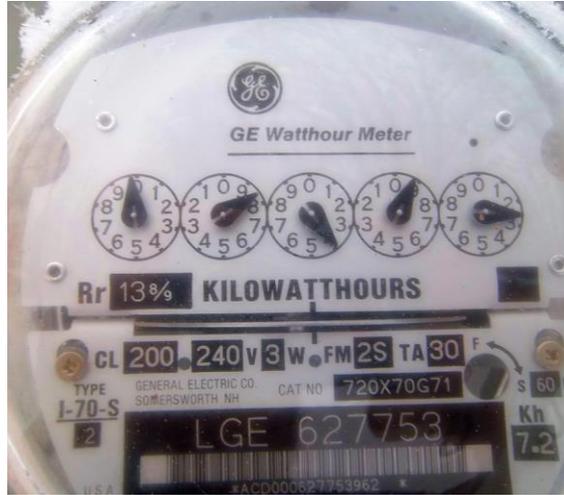


The benefits of a Smart Grid can vary for different groups



Utilities

What's in it for my
shareholders?



Consumers

What's in it for **me**?



Society

What's in it for **us**?

The Smart Grid should have quantifiable measurements of performance



Challenges to a Modern Grid

Top **technical** challenges to a modern grid



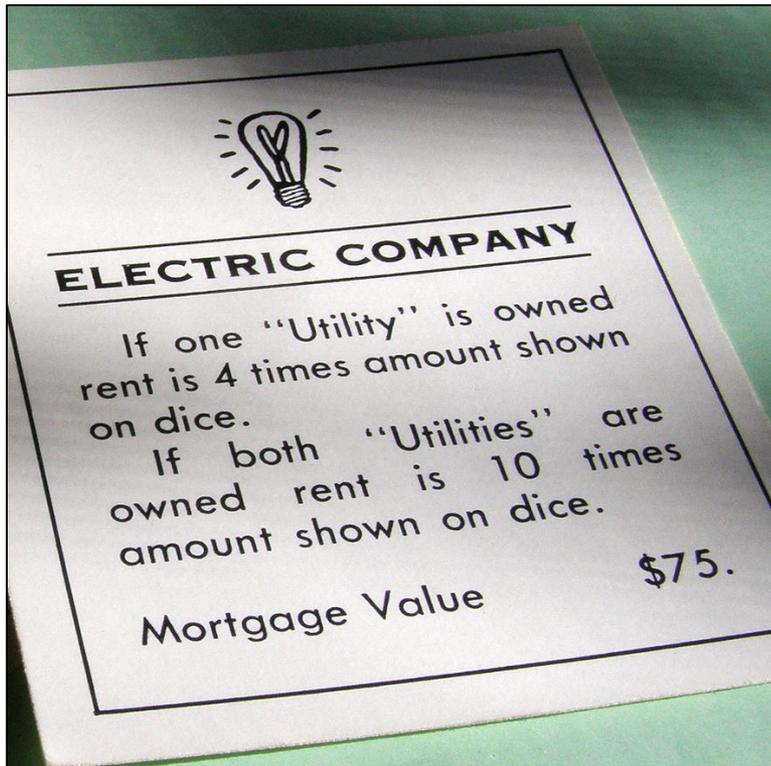
Two-way communications

Data management

Integration of legacy equipment

Interoperability and cyber security standards

Top **regulatory** issues facing a modern grid

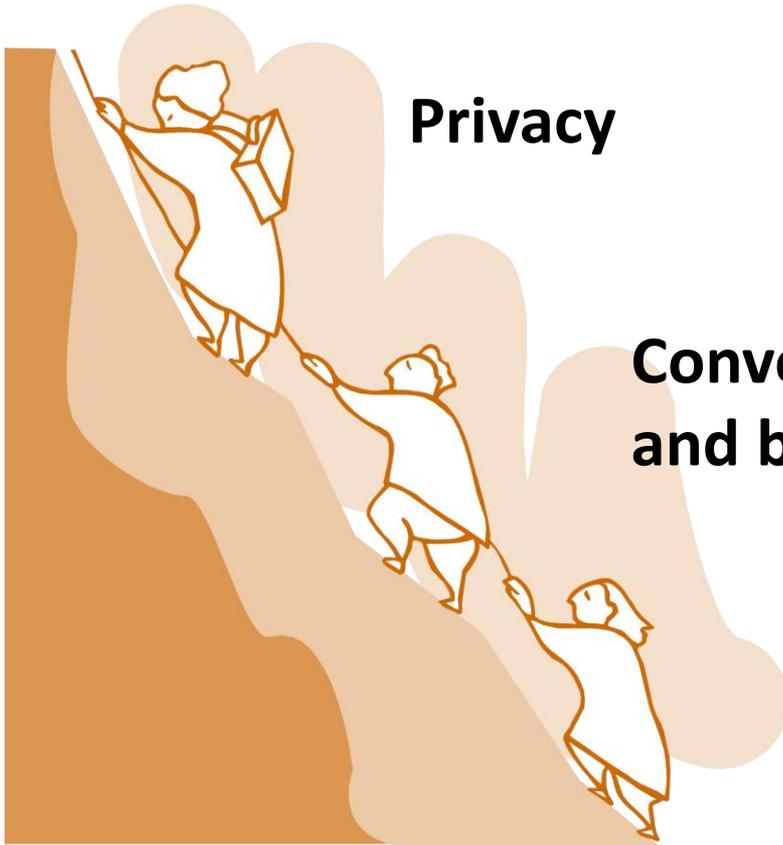


Used and useful & least cost

Recovery of investment cost

Dynamic pricing

Customers' concerns



Privacy

**Convenience, comfort,
and benefits**

Understanding

SMART

is the alternative to

BIG.

Let's Talk

Basic structure of breakout sessions

