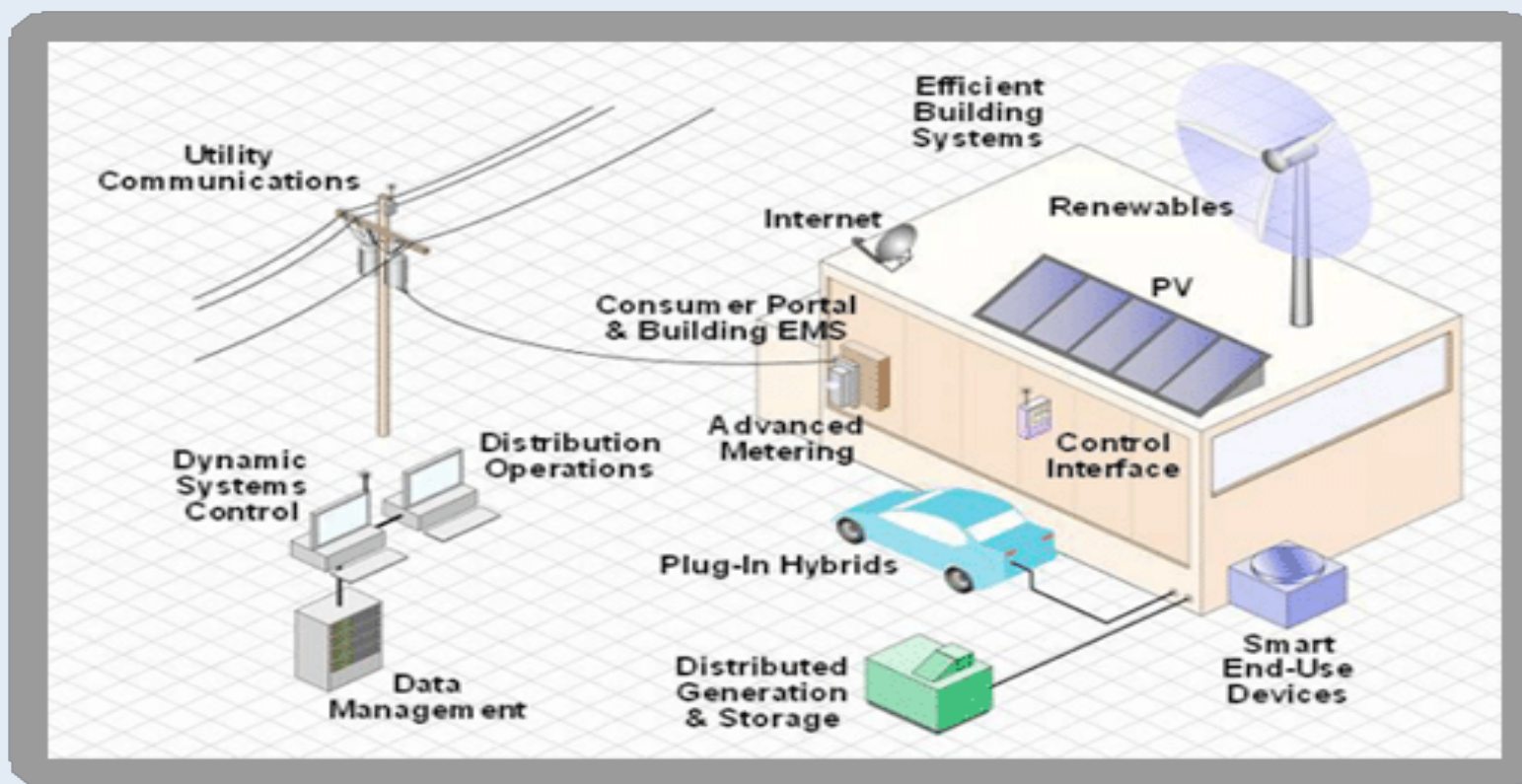




Grid Modernization Building the Future

John Caldwell
Director of Economics
Edison Electric Institute

A Vision of the Modernized Electrical Grid



New Customer Relationships

Better Customer Energy Control

New Market Participants

New Businesses / Strategic Partnerships

Expanded Opportunities on the Customer Side of the Meter

Why Is The Existing Grid “Intellectually Challenged”?

Limited situational awareness

- Outage monitoring—relies on customers calling
- Inability to remotely identify developing T&D problems



Limited system self-healing capabilities

Limited communications ability

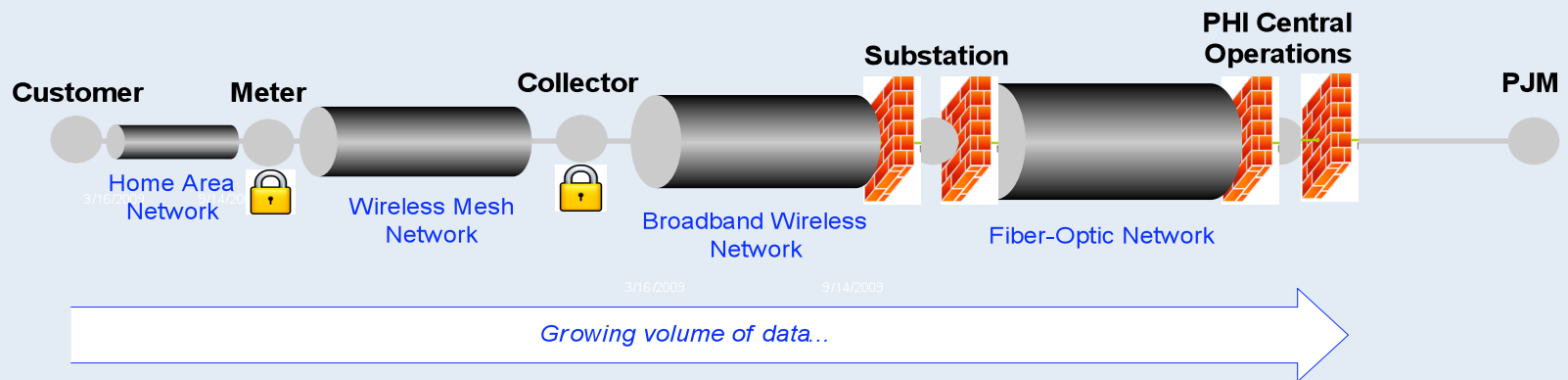
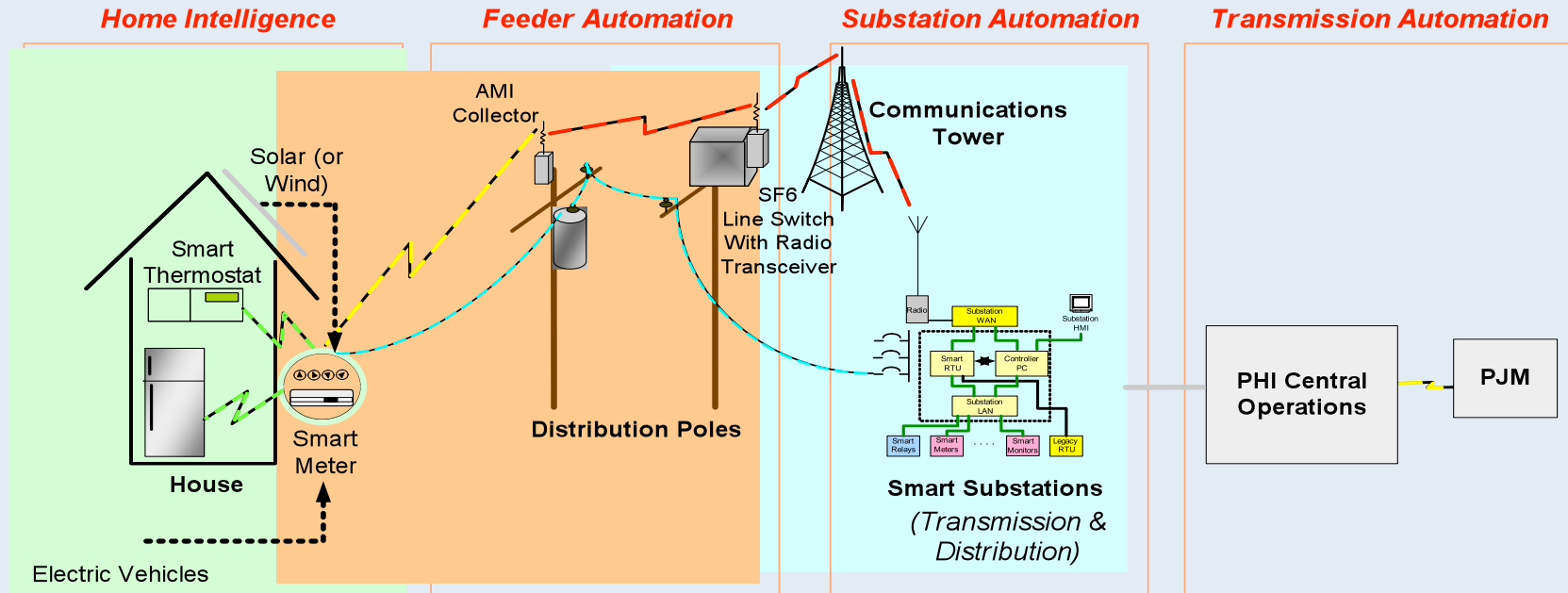
- With customers—to share information on price and energy usage
- With the supply system – to effectively manage increasingly decentralized power sources (e.g., wind, solar, distributed generation)

Why Do We Need A “Smarter” Grid?

- It will **offset new infrastructure investment** needs, while **increasing the productivity** of existing infrastructure
- It will **support climate policy** objectives through demand response and the easier integration of renewable fuels
- A smarter grid will enable utilities to:
 - **Empower customers** to control and optimize their energy usage
 - Rely on greater amounts of **distributed generation**, including wind, solar, etc.
 - Use **electricity as a fuel for vehicles**
 - Enhance the **reliability** and **efficiency** of the power grid
 - Provide the framework and foundation for **future economic growth**

What Are the Components of a Modernized Grid?

Here is One Utility's (PEPCO's) Vision ...



3/16/2009

9/14/2009

5 Critical Questions About Grid Modernization

1. How do I get from **here to there**?
2. Who will (or should) **bear the risk**?
3. How do I **measure** (and **demonstrate**) **benefits**?
4. Who are the **other players**?
5. How will this **change my** way of doing **business**?
 - a) Who will be my customers/competitors?
 - b) Where will my earnings come from?

How Will Grid Modernization Be Implemented?

The PHI Plan

1. Installation of intelligent devices infrastructure.
2. Installation of communications infrastructure.
3. Integration and standardization of information technology applications.
4. Development of new data display and analysis capabilities.
5. Development of capability to optimize distribution network performance in real time and make operational decisions based upon near real time information.

Source: Kuberski, McGregor, and Stewart, "PHI's Plans for Smart Grid".
(Intelligent Utility Webcast, February 17, 2010)

The Case for Grid Modernization: Not All Regulators Are Convinced

Approved

- Portland General Electric AMI (5/2008)
- Duke Energy Ohio Infrastructure Modernization (5/2010)
- Oklahoma Gas and Electric Smart Meters (7/2009)
- Texas – New Mexico Power AMI (7/2011)

Conditional

- Idaho Power AMI (2/2009)
- Pacific Gas and Electric (3/2009)
- American Electric Power Smart Grid Pilot (3/2009)
- New York – Smart Grid Initiatives of 6 Utilities (7/2009)
- Baltimore Gas and Electric AMI (8/2010)

Rejected

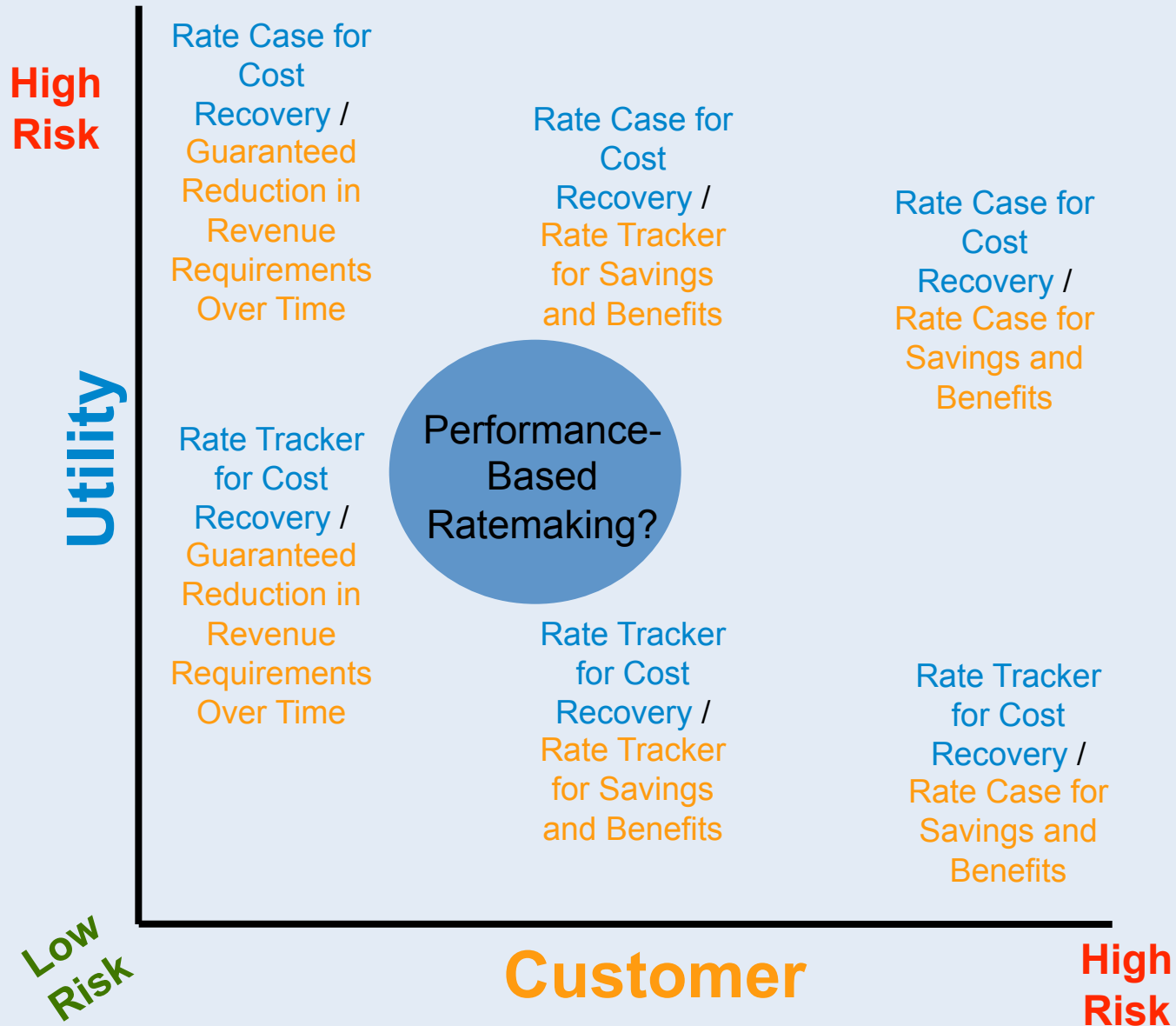
- Hawaiian Electric Company Inc. Smart Meter Pilot (7/2010)
- Duke Energy Indiana Smart Meters (11/2009)
- Commonwealth Edison Alternative Rate Plan for Smart Grid Funding (5/2011)

The Regulator's Perspective

Three Questions That Will (Probably) Be Asked

1. Sounds wonderful – but will it **“put bread on the table”**? (Will it produce tangible benefits or savings to the ratepayer?)
2. Are we **“shooting craps”**?
 - a) How probable is it that the benefits stream will occur?
 - b) Are the benefits contingent on some other activities (e.g., demand response)?
3. Will the **“check be in the mail”**? (How will the benefits be realized by the ratepayer?)
 - a) Will they be passed through automatically in a rate tracker?
 - b) Will they not be passed through until the next rate case?

Who Bears the Risk?



The Business Case Challenge



Rigorous
and
Defensible

- Costs are Specific
- Benefits are:
 - Trackable,
 - Measurable
 - Verifiable
- Projections are Reasonable
- Risks are Accounted For

Broad
and
Inclusive

- All Benefits
 - Ratepayer
 - Societal
 - Platform
- Must Take “Long View”
- Potential Transformational Impacts Considered

Example: AMI Business Case

Consumer Perspective

Benefits

- Peak/Off-Peak Pricing
 - Change in Consumer Surplus
 - Deferred Generation Capacity
- Reduced O&M
 - Meter Reading
 - Call and Billing Centers
 - Outage Response
 - Energy Theft / Meter Errors
- Enhanced Receivables Recovery

Costs

- Peak/Off-Peak Pricing
 - Marketing / Public Awareness Costs
 - Administrative Costs
- Capital Costs for New Meters
- O&M for New Meters
- Billing / Customer Information Systems Upgrade

Incremental expenditures and savings are tracked by year, and converted into net present value. Length of study period should correspond with service life of principal assets.

The “Players” in Grid Modernization (And What They Are Playing For)

Residential / Small Business Customers

- Simplicity
- Reliable Service
- Low, Stable Rates

Large Business Customers

- Control over Service/Pricing
- “One-on-One” Customer Support

Regulators/Legislators

- Effective Execution of Stewardship Role
- Positive Appraisal from Constituents

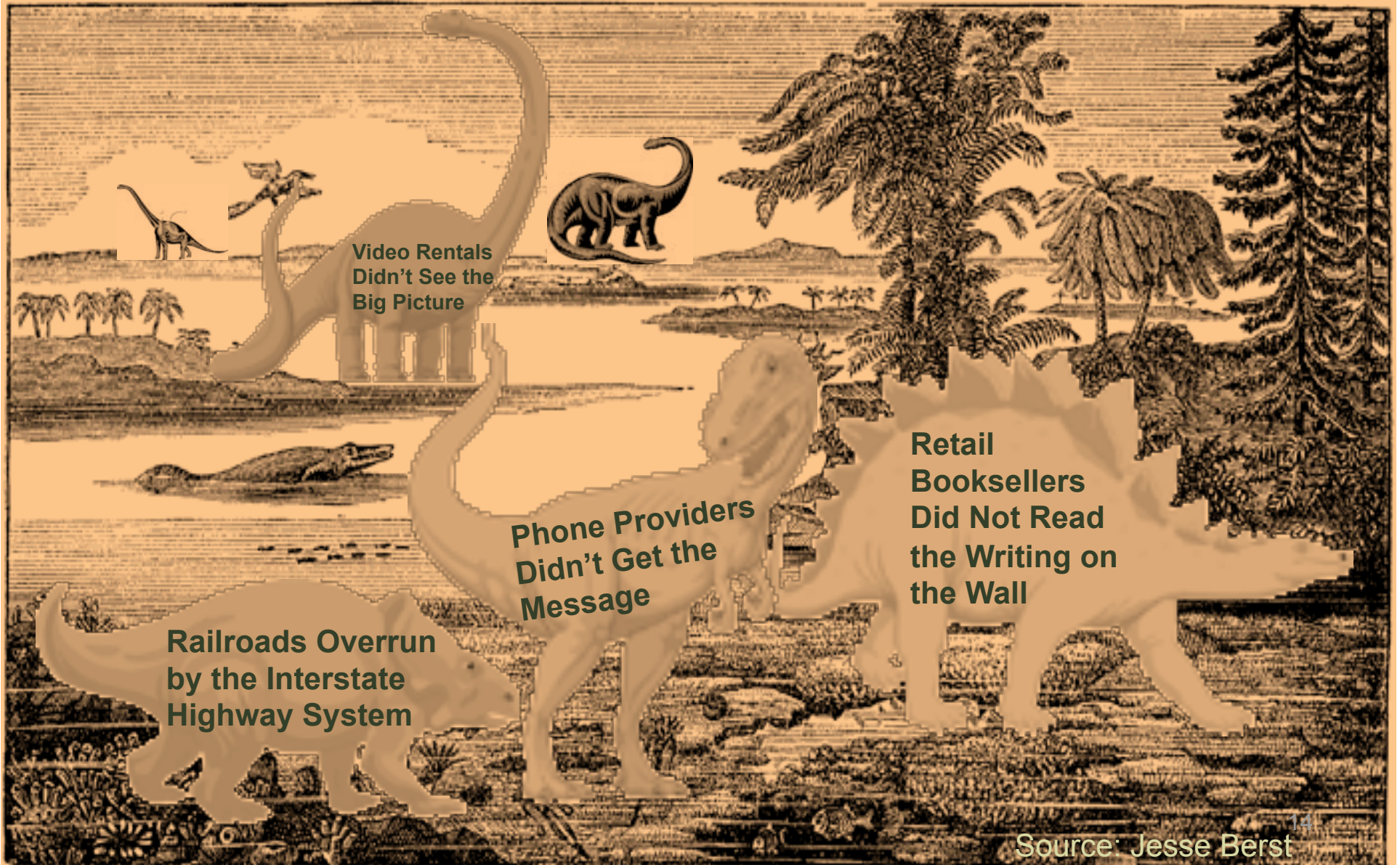
Regulated Utilities

- Timely and Reasonable Rate Relief for SG Investments
- New Earnings Opportunities
 - Through Incentive Regulation
 - In Unregulated Sector

Entrepreneurs

- Suitable Risk-Adjusted Returns on Investment
- Access to Revenue Stream in Regulated Sector, or New Sources of Revenue

Industrial Transformation: The Road to Evolution . . . Or Extinction?



Technological Innovation Brings Opportunities: The Case of Amazon.com



The Energy Industry in a Post-Recession Economy

- **Energy Efficiency** will Be a Predominant Social Goal
 - Supports Climate Policy Objectives
 - Reduces Household and Business Energy Costs
- **Technological Innovation** will Become the New Panacea (As Deregulation was 20 Years Ago) for Meeting our Energy Needs at Affordable Prices
 - Natural Gas: Extracting Supply from Unconventional Sources and Developing New End Uses
 - Electricity: **Grid Modernization**
- But the **Structural Weaknesses** in Our Economy will Persist for Years, Presenting Substantial Challenges to Revenue Growth in the Industry

Thank You!

Questions?

John Caldwell
202-508-5175
jcaldwell@eei.org