

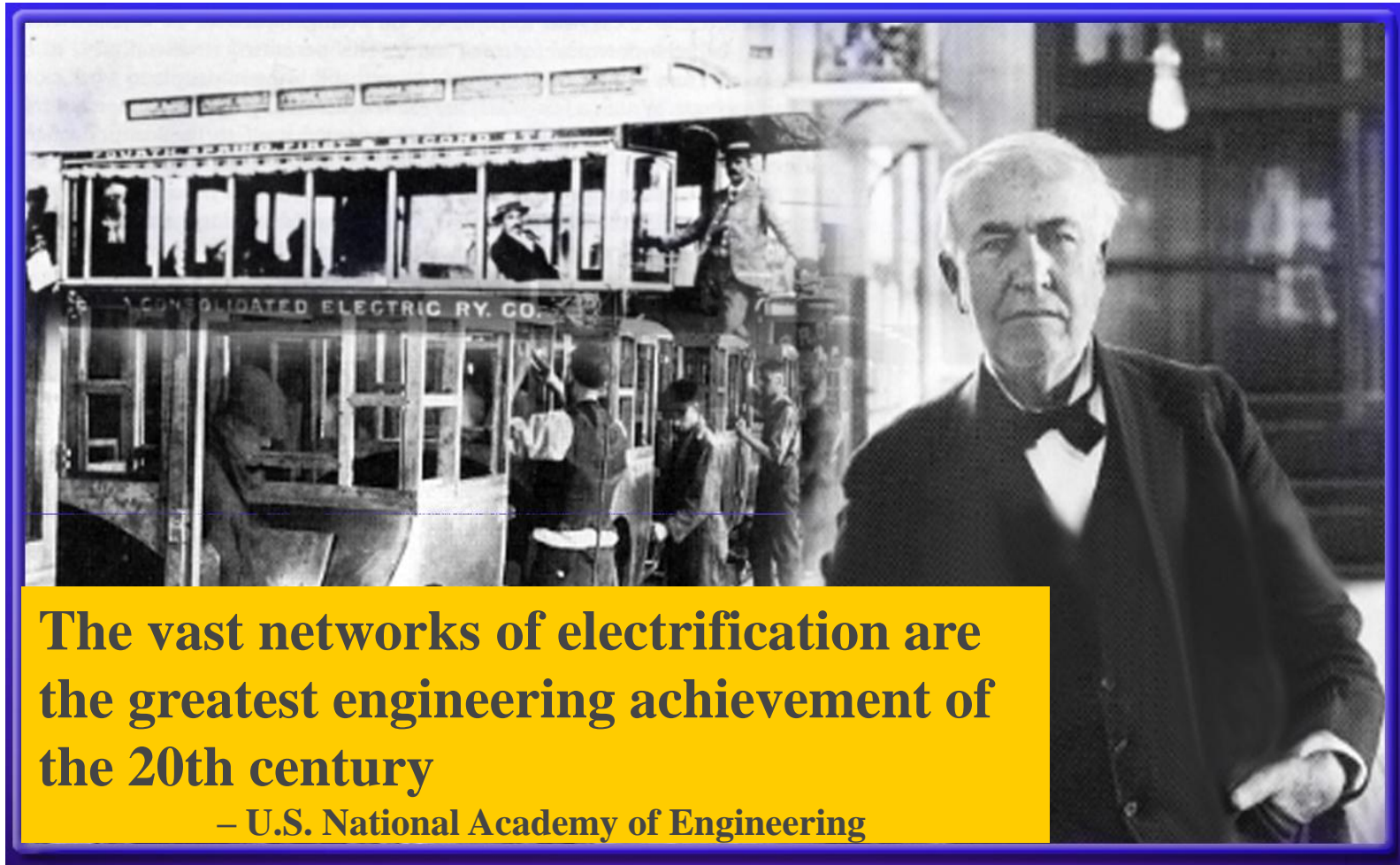
Perfect Power: How the Microgrid Revolution will unleash, more efficient, cleaner power

Kurt Yeager

www.galvinpower.org

**Midwest Energy Solutions Conference
Chicago, Illinois
January 14, 2010**

Transforming Society



**The vast networks of electrification are
the greatest engineering achievement of
the 20th century**

– U.S. National Academy of Engineering

GOAL

“The perfect power system will ensure absolute and universal availability of energy in the quantity and quality necessary to meet every consumer’s needs. It is a system that never fails.

Bob Galvin

“If I asked people what they wanted, they said faster horses”

Henry Ford

How can the Smart Grid Improve Competitiveness and Create Jobs?

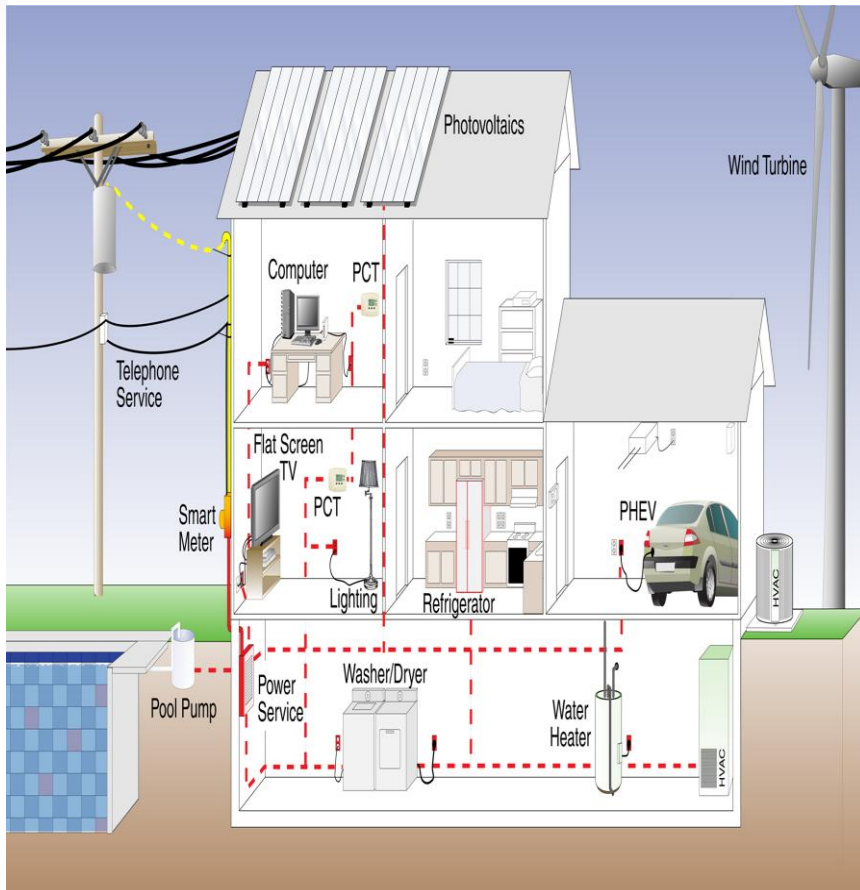
- **Enable residents to manage costs**
 - Avoid higher priced peak electricity
 - Protect residents from rising fuel and new capacity costs
 - Leverage off-peak electricity through dynamic pricing
 - Generate revenue by providing ancillary services to the system operator
- **Enable municipalities and utilities to increase service reliability**
 - Improve safety and reduced economic losses
 - Eliminate hidden reliability costs and attract 21st Century jobs
- **Enable municipalities and utilities to improve the environment**
 - Provide residents access to lower carbon generation sources
 - Enable municipalities to improve competitive value, esthetics and increase the overall value of real estate

Key Findings







- **Consumer-convenient “killer applications” are emerging and new players are entering**
- **Both the commercial and residential markets will become web-enabled and consumer controlled**
- **Widespread real-time energy management will significantly improve efficiency and reliability**
- **The electricity industry is transitioning to a demand-driven, dynamic-priced business**

New technology opportunities abound

Set it, and forget it homes



Hyper-Efficient Technologies

 Heat Pumps	<u>Residential</u>  Ductless Cooling	 Appliances
 VFC Cooling	<u>Commercial</u>  VFC Cooling	 Data Centers

Unlocking Smart Grid Benefits Requires

- **Intelligent Technology**
- **Intelligent Policy**
- **Empowered Consumers**

INTELLIGENCE = the ability to understand and deal successfully with new situations

SMART GRID POLICY IMPLICATIONS

- **A Smart Grid is a *transactive* network, seamlessly connecting producers and consumers**
- **Price-responsive end-use devices enable autonomous consumer control: *empowerment***
- **A Smart Grid requires looking beyond the regulated monopoly business model**
 - **Remove barriers to competitive retail services**
 - **Remove barriers to non-utility technology investments**

The result significantly increases both consumer and producer benefits

For Example

DEMAND RESPONSE based on consumer empowerment could save utilities as much as \$100 Billion by 2030

(Rand Corp.)

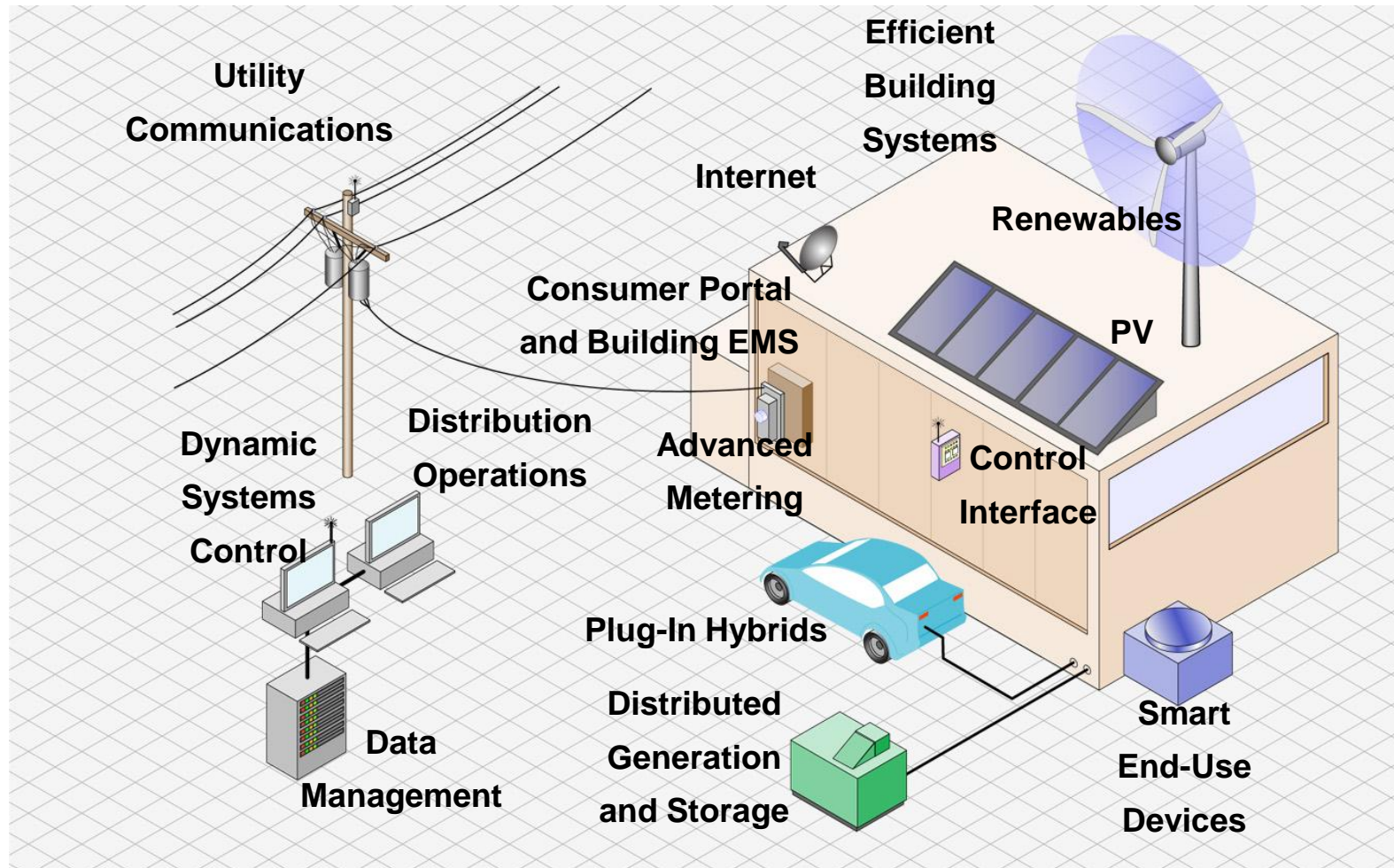
Reaching the Tipping Point (~ 2012)

- **Building intelligence in over half of new commercial building**
- **Home automation systems are a staple offering**
- **Active DR programs are widely used**
- **> 40% of aggregate load is AMI served**
- **Grid interoperability is broadly (85%) activated**

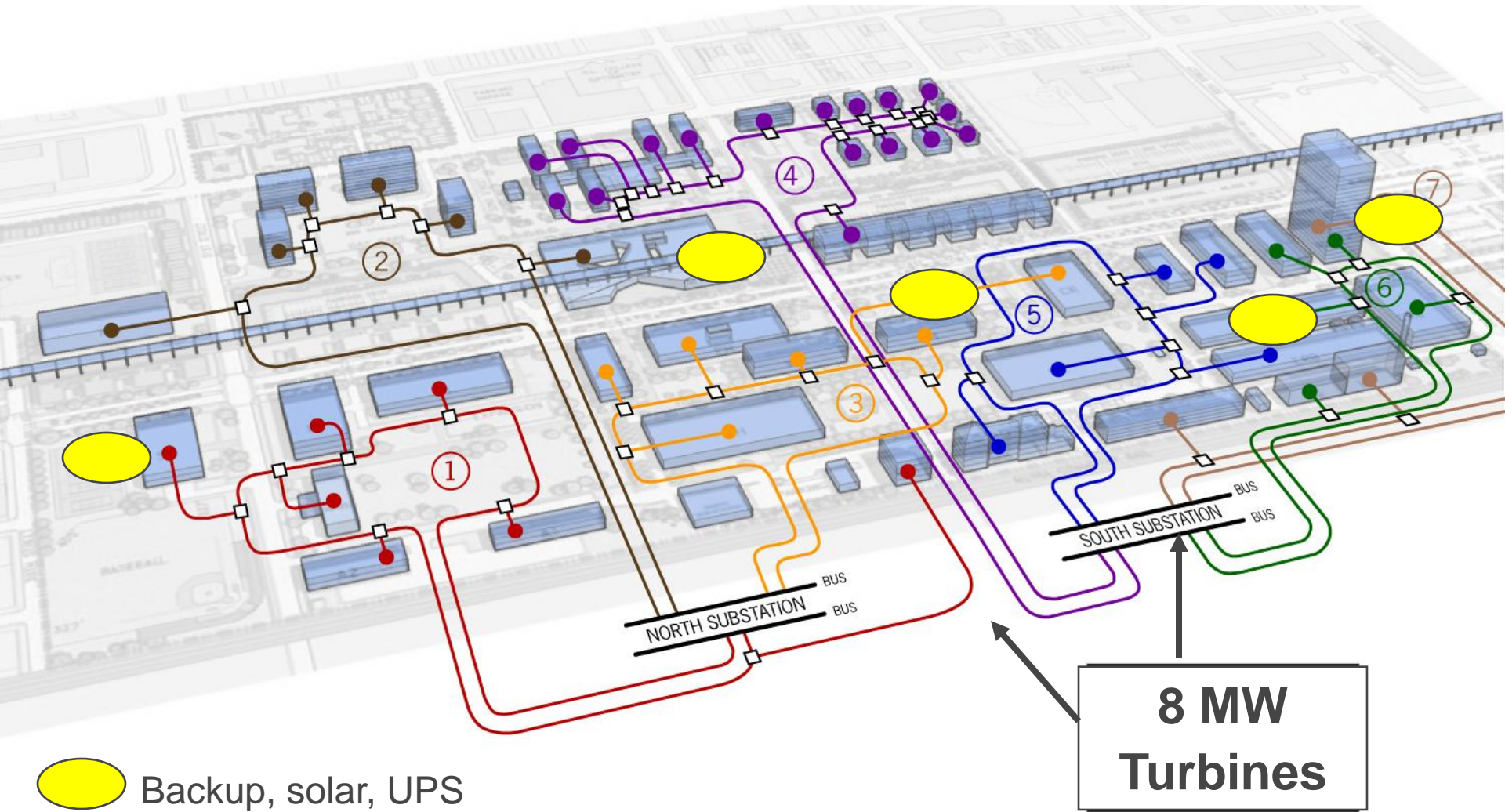
The Role of the Microgrid

- **Optimize distribution performance and service value**
- **Seamlessly integrate electricity supply and demand**
- **Convert buildings from Power Pigs to Power Plants**
- **Provide the most user-friendly consumer empowerment**
- **Open the door to entrepreneurial innovation**
- **Enable local green enterprise zones**

The Micro Grid & Its Role in Helping Meet These Challenges



IIT Perfect Power Microgrid



Meet Sad Socket



You'd be sad, too, if you had to power digital-age businesses on 1950s technology

Innovate or Evaporate

Embrace

Disruptive

Technology

Principles of a New Electricity Constitution

- **Provide all Consumers with Time-of-Use Electricity Rates & Incentives**
- **Require Fundamentally Higher Distribution Reliability Standards**
- **Compensate Utilities Based on their Reliability, Efficiency and Customer Service Quality**
- **Eliminate Regulated Monopoly Restrictions On Intelligent Microgrids and Distributed Generation**
- **Establish Truly Competitive Retail Electricity Service Markets**

HOW THE MICRO GRID REVOLUTION WILL UNLEASH CLEANER,
GREENER AND MORE ABUNDANT ENERGY

PERFECT POWER

TOP COMPANIES
& TECHNOLOGIES
TO WATCH

**ROBERT GALVIN
AND KURT YEAGER**
WITH JAY STULLER