



# **Distributed Generation Infrastructure & Solutions**

***Kurt Yeager***  
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**[www.galvinpower.org](http://www.galvinpower.org)**

# Forward to Fundamentals

**Electricity is the engine of prosperity and quality of life**

**Electricity is a consumer service- based enterprise**

**Technology can relieve cost pressures through elevation of electricity service value**

**Realizing these opportunities requires transformation of the electricity infrastructure, policies and business model**



# White House 21<sup>st</sup> Century Grid Policy Framework

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- **Align market and utility incentives to accelerate Smart Grid investments**
- **Unlock the electricity sector innovation potential**
- **Empower consumers & enable informed decision-making**
- **Improve grid security and resilience**

**“America cannot build a 21<sup>st</sup> Century economy with a 20<sup>th</sup> Century electricity system.”**

# Utility Frustration

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**“It’s all about the customer today and we know very little; and we have no regulatory incentive.”**

**“Customer price transparency is the key with education and automation.”**

**“Our infrastructure and policies are legacies of the 1930s.”**

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

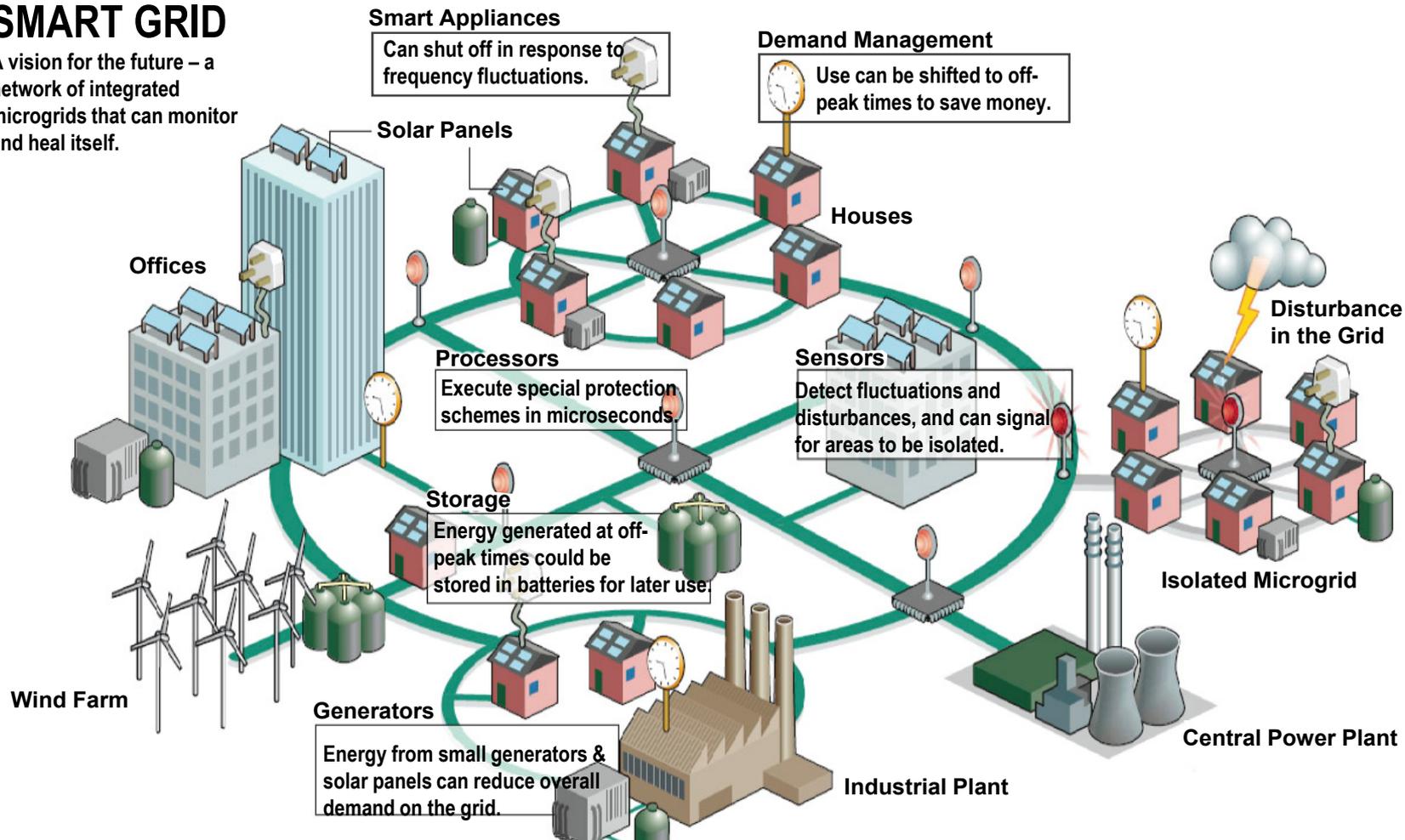
Henry Ford

# Enable the Future

## Integrate microgrids, diverse generation and storage resources into a smart self-healing grid system

### SMART GRID

A vision for the future – a network of integrated microgrids that can monitor and heal itself.



Source: Interview with Massoud Amin, "Upgrading the grid," *Nature*, vol. 454, pp. 570-573, 30 July 2008

# California's Existing Distribution Grids Can Accommodate Much More DG

- **12,000 MW of DG can be accommodated with minimal upgrades – PG&E can accommodate 4,500 MW**
- **Directly connect the DG into substations, many can easily accommodate higher penetration levels**
- **RE capacity in Germany and Spain equals 50% of annual peak demand with similar grid structures to CA**
- **Distribution Grid modernization will also enable:**
  - **Greater control**
  - **Greater localized power**
  - **Improved efficiency**
  - **Greater overall capacity**

# SMART GRID POLICY IMPLICATIONS

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

**The result significantly increases both consumer and producer benefits**

# Gaining Customer Acceptance

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- **ENGAGE** through dynamic rates, technology and education
- **MOTIVATE** through savings and automated control – “prices to devices”
- **DELIGHT** through easy, enjoyable, fulfilling experiences

# Intelligent Policy Recommendations

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- **Provide consumers with choice of access to transparent real-time electricity pricing.**
- **All customer-specific data belongs to the customer**
- **Establish strict distribution reliability and efficiency standards.**
- **Hold utilities publically accountable to specific system performance standards.**
- **Link utility earnings to service quality not quantity sales – performance-based rates.**

# Intelligent Policy Recommendations

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- **Expand net metering to include physical and virtual aggregation.**
- **Enable retail energy management service competition to incent entrepreneurial and utility innovation.**
- **Enable early adapters to easily demonstrate the benefits beyond doubt.**
- **Require absolute interoperability of smart grid components.**

# Perfect Power Seal of Approval

## LEED Model

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### Consumer Empowerment

- **Price Transparency; Service Supplier Choice; Interoperability/Cyber Security**

### Efficiency & Environment

- **Electricity Supply Efficiency; Emissions; Water Consumption**

### Reliability

- **Outage Duration & Frequency; Power Quality; Safety**

### **Cost**

- **Rates; O&M Costs; Outage Costs**

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