

11-IEP-1H

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11-IEP-1G

DATE Jun 22 2011

RECD. Jun 29 2011

Distributed Generation Infrastructure & Solutions

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June 22, 2011

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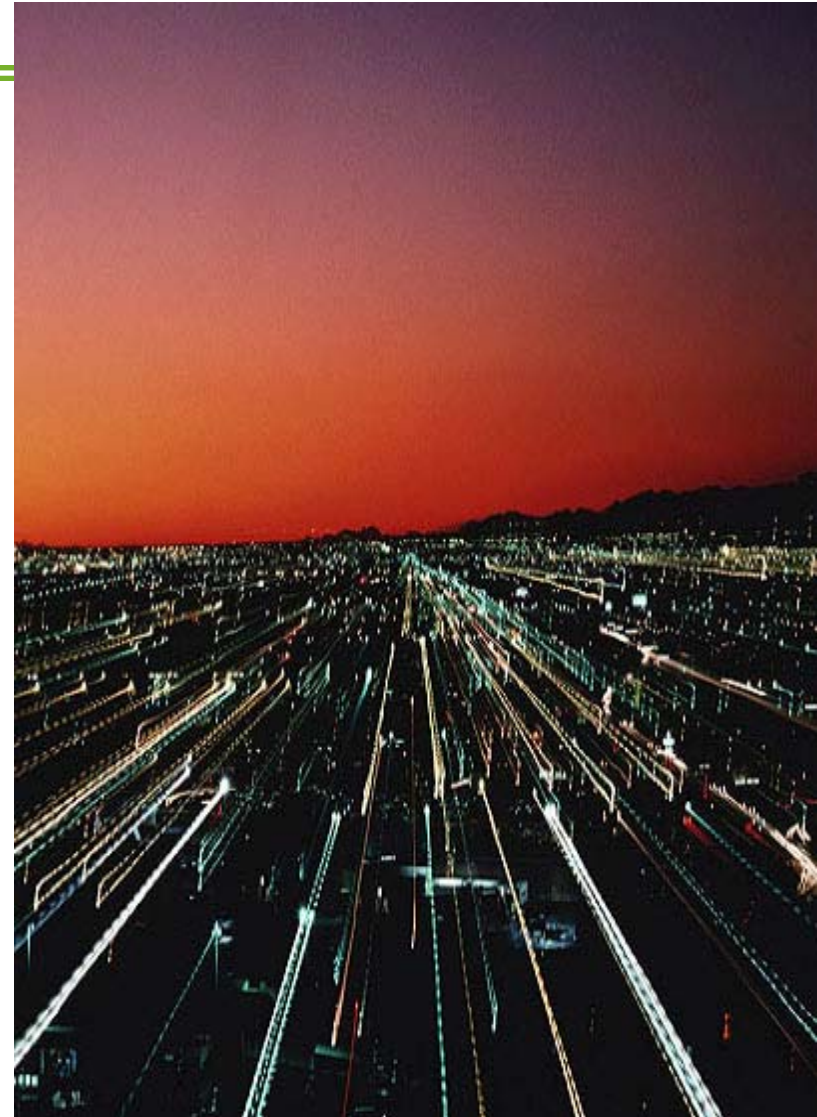
Forward to Fundamentals

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 21st Century Grid Policy Framework

- **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 21st Century economy with a 20th Century electricity system.”

Utility Frustration

“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”

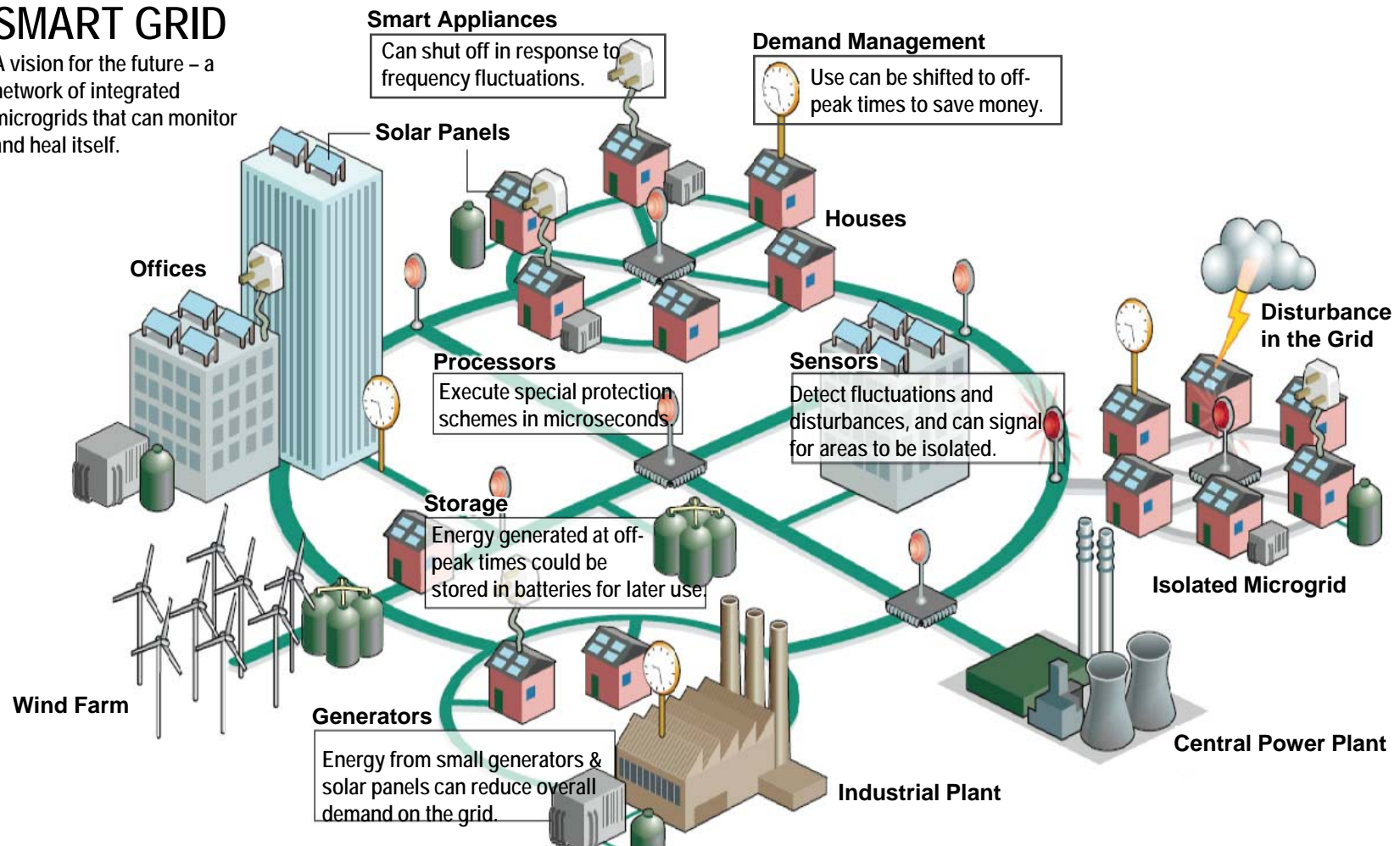
Henry Ford

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

- **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

- **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

- **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

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