



*Silicon Valley Leadership  
Group—2009 Energy  
Summit*

The Mega Trends  
in Energy: What  
They Mean for a  
Sustainable  
Energy Future

Mark Gabriel

**R·W·BECK**

**Mind Powered:** Insight with Impact.

# 10 Myths About Energy

1. U.S. has a 3<sup>rd</sup> world Grid
2. Hydrogen is the answer
3. Electricity and natural gas are expensive
4. Renewables and energy efficiency can supplant coal and nuclear
5. Natural gas is the answer to global warming
6. Demand has disappeared and will not return
7. The Dakotas/Nevada are the answer
8. California is well positioned for the future
9. The cap and trade bill will pass this year
10. Storage, while the answer, remains difficult

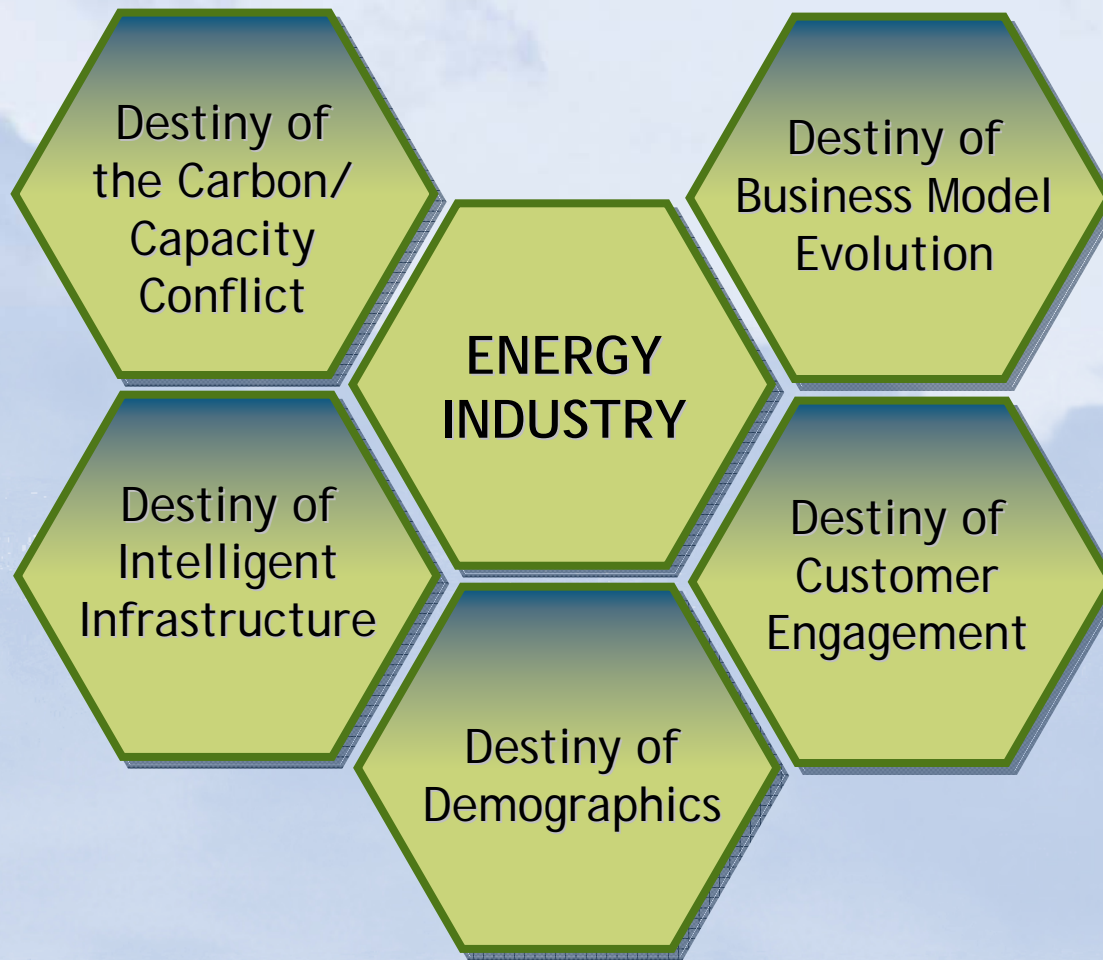
# 10 Truths about Energy

1. All the energy that there ever will be exists today
2. Demand is increasing across the globe
3. Technology will make a difference
4. Electric and gas rates will rise significantly
5. Transmission must be expanded
6. We need new baseload capacity
7. There will be generation shortages across the U.S.
8. Business will adapt to these new realities
9. Renewables create significant challenges
10. The inconvenient truth: we need all forms of energy in the in the fuel mix

# What is a Megatrend?

- A megatrend is occurring regardless of efforts to change its outcome
- No amount of personal, corporate, or governmental “will” or “desire” can prevent it from happening
- Megatrends can be nudged in certain directions, but cannot be stopped or altered in any major way

# Five Megatrend Destinies Universally Impact the Energy Industry and Society



# The Destiny of Carbon Constraints/ Capacity Conflict



**NEWS FLASH!**  
All is fine,  
demand has  
gone away!

- Demand for new power sources will outstrip capacity - the 50,000 MW challenge
- Demand for clean energy will outstrip the capacity
- Public perception contrasts with the reality of the system
- Renewables are being viewed across the country as an answer
- NERC report shows majority of regions will be capacity short within the next five years
- Waxman-Markey the \$146-\$3,500 per family question

# Facing the Future

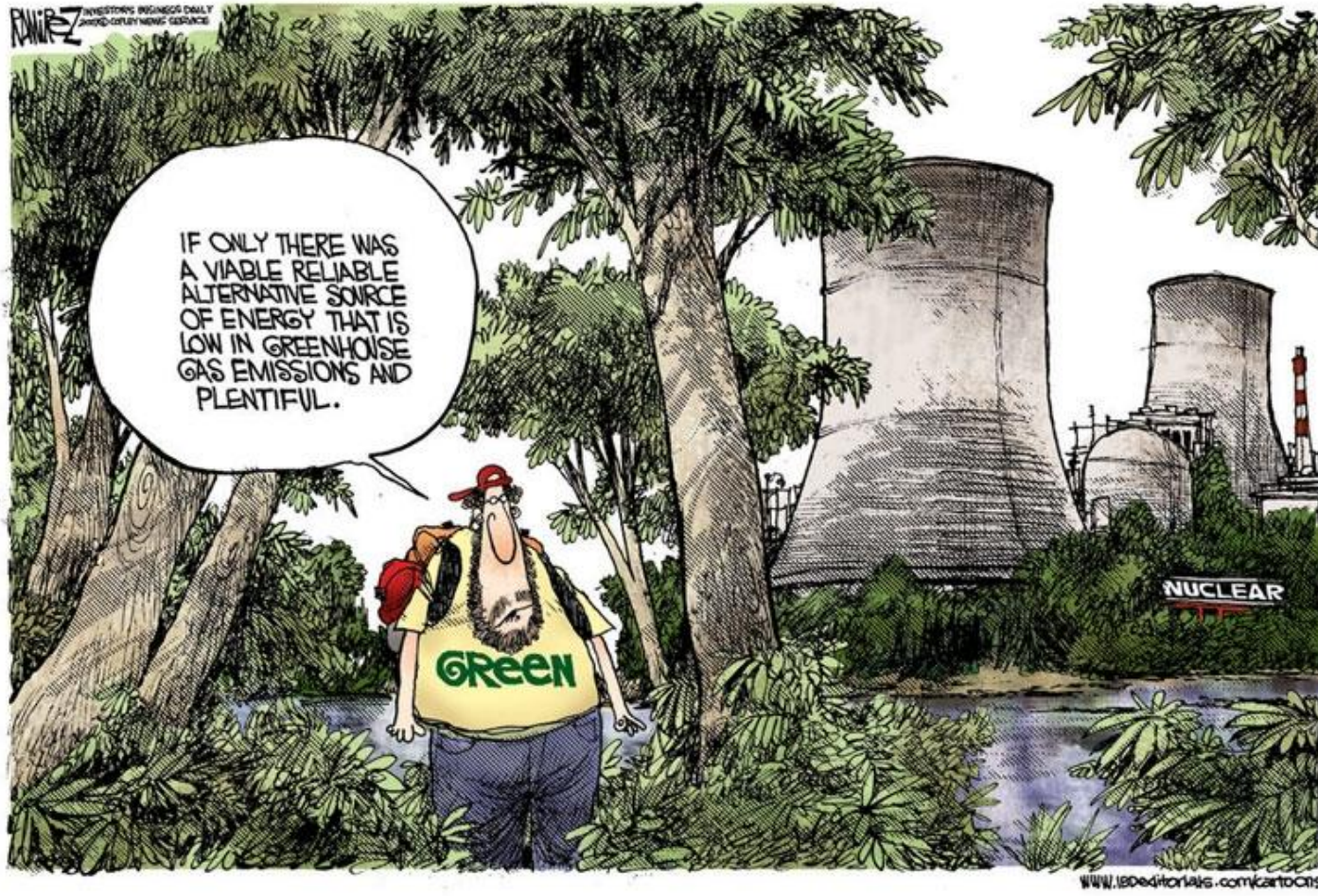
“There will be a large creation and re-distribution of shareholder value in the transition to a low carbon economy.”

- Tom Delay, CEO, The Carbon Trust

“It is important that we avoid outcomes at the extremes of the policy debate, and move forward instead with solutions that make common sense and achieve a balance of our environmental, energy and economic needs.”

- David Ratcliffe, CEO, Southern Company

# Even Simple Answers are Often Ignored



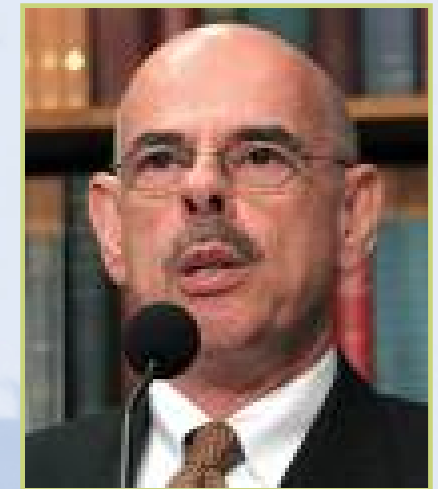


# American Clean Energy and Security Act (ACES)

- 20% renewables by 2020 (8% from energy efficiency)
- Transmission must facilitate renewables and zero emissions energy
- All states must have a plan for peak load reduction through smart grid and DR
- All smart grid plans must support PHEVs
- Infrastructure **MUST** support PHEV individual customer identification regardless of plug in location
- Creates a carbon Storage Research Corporation
- Regulates green house gases by Congress, not the EPA



Congressman Markey



Congressman Waxman



# Renewables, Promise and Promises



*Today's performance will not be enough to satisfy the demands of the public.*

- Distribution will become frontline
  - Demand Response/Energy Efficiency
  - PQ/Power Reliability
  - Conservation Voltage Regulation
  - Distributed Generation
- Three key drivers of renewables:
  - Environmental (Carbon) constraints
  - Fluctuating coal, oil and natural gas prices
  - Inability to build thermal generation or nuclear in time
  - Green guilt

# We Have Been Here Before...

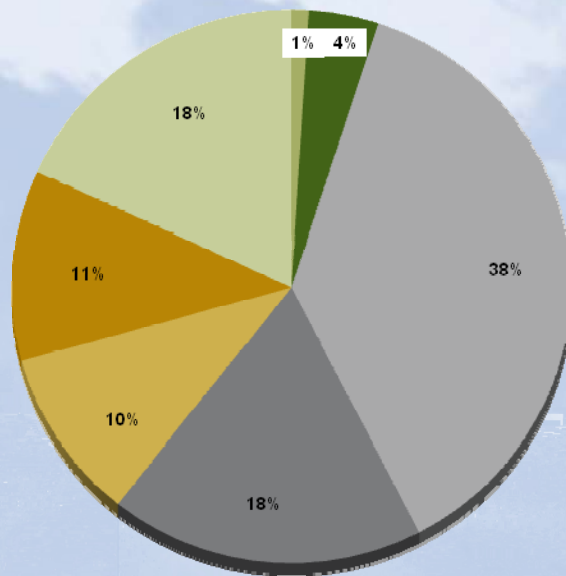


- 5,000 turbines in the Altamont Pass
  - 576 MW name plate/125 MW
  - Considered obsolete and not working
  - Built after 1970s energy crisis
- U.S. 2008:
  - 5,329 MW of wind built
  - 920 MW coal
  - Re-examination of Energy Efficiency

# Renewable Energy

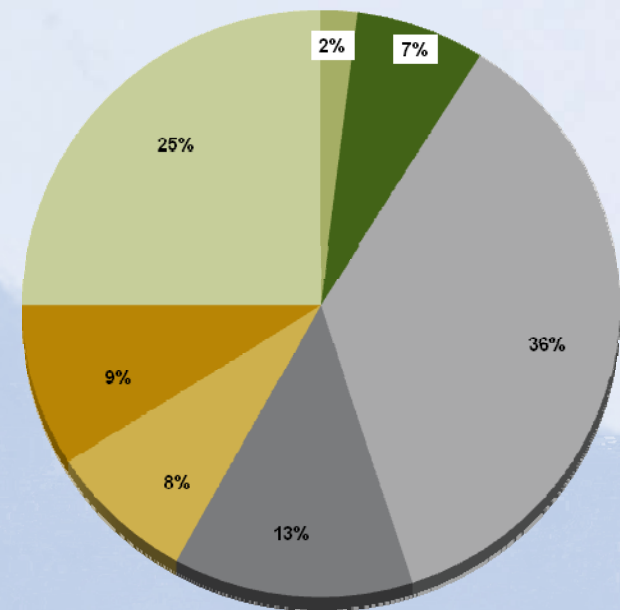
Customers perceive a higher level of "green" than exists

Commercial



Base: All Commercial respondents= 400

Residential



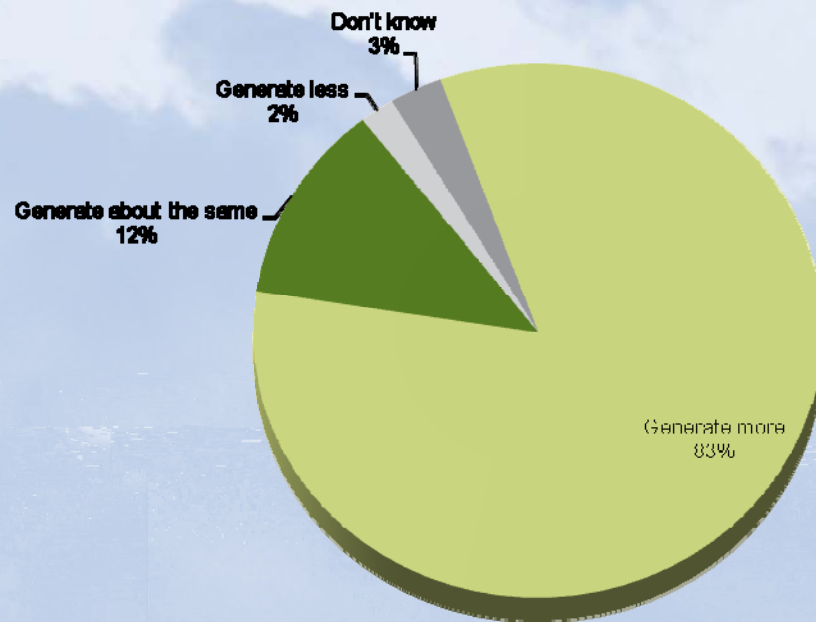
Base: All Residential respondents= 402

Well over half of the customers think the Utilities already obtains at least five percent of its generation from renewable sources.

# Renewable Energy

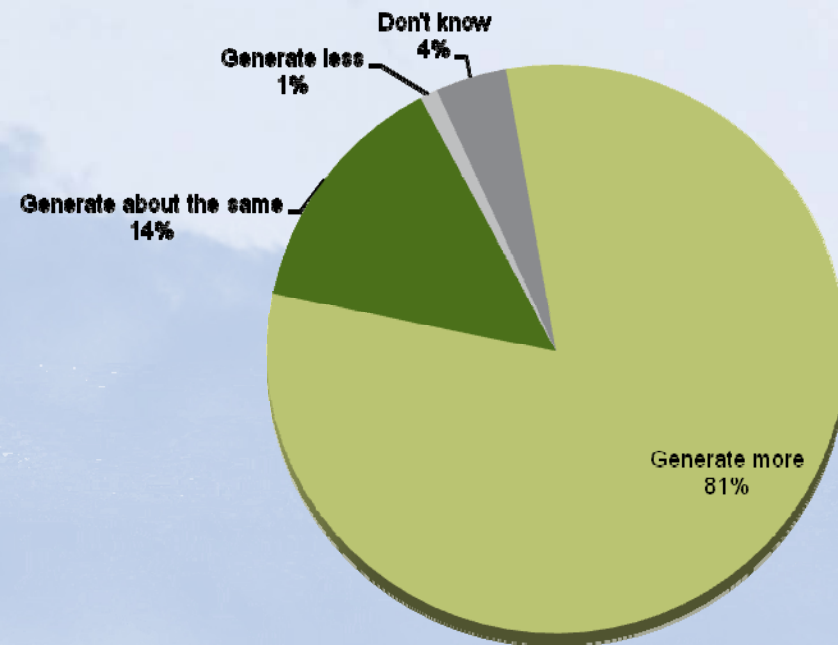
Customers express a clear desire for even more renewables

Commercial



Base: All Commercial respondents= 400

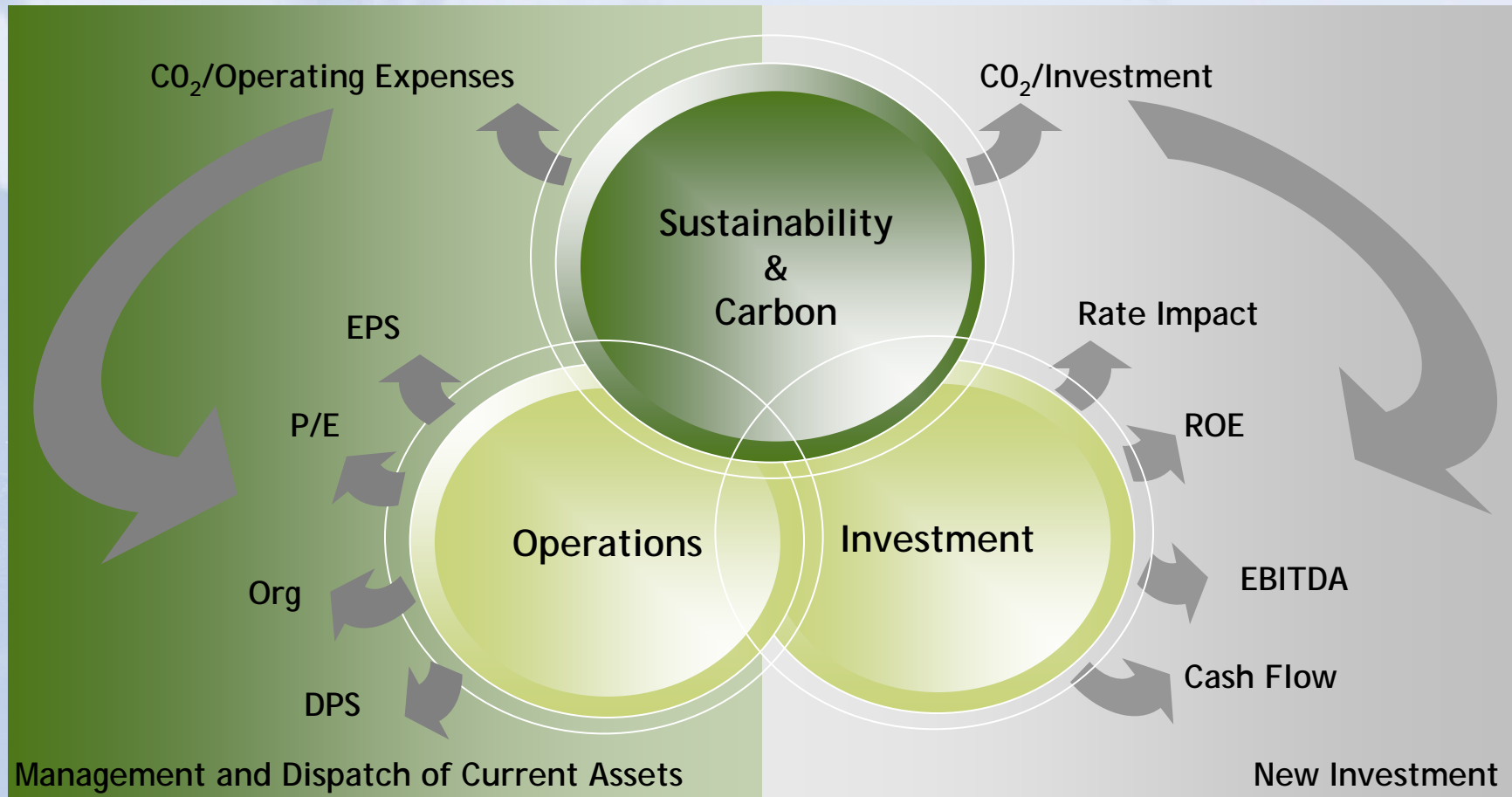
Residential



Base: All Residential respondents= 402

In the absence of cost implications, the current trend in high levels of interest in renewable sources of energy appears to be strong.

# Megatrend Factors Require a New Business View us all



# Shining light on solar

## Potential short-term solar DE savings

- Energy production and loss reduction
- Reduced fuel and power costs
- Lower bills for customers

## Potential long-term solar DE savings

- Capacity savings for generation
- Deferral of construction project
- Minimal capacity savings for distribution unless targeted

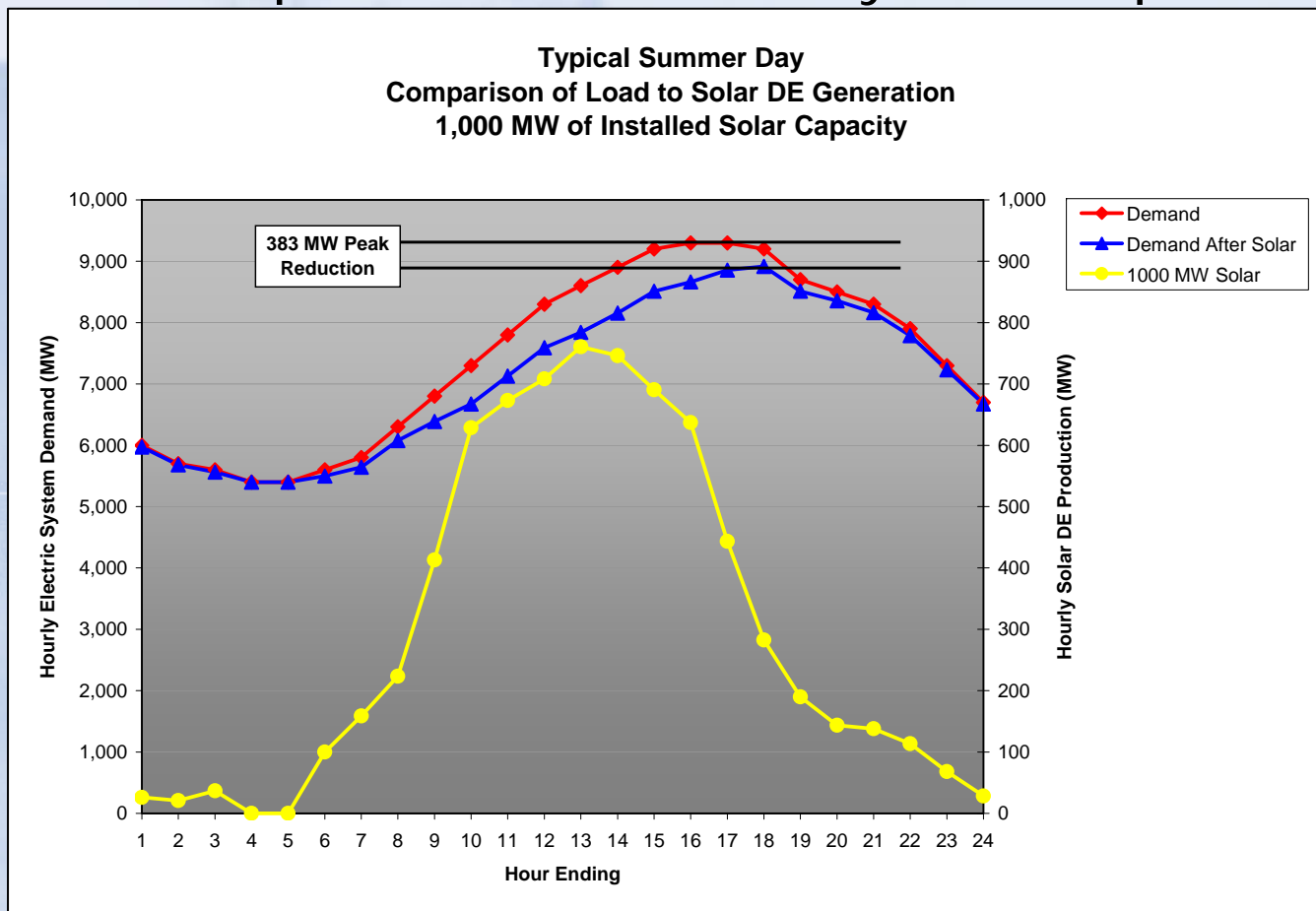
## To achieve long-term savings

- Deployment must start now
- Develop targeted incentive programs and market strategies



# Impacts of Solar on Energy and Capacity Planning

## Example of Solar DE Hourly Load Impacts





# Solar Boom: Opportunities and Challenges

- Significant expansion in capacity...and demand
- 1 MW=5 acres of land
- Reliability remains an issue
- Storage remains the answer



# The Destiny of Intelligent Infrastructure

- Billions will be spent in next five years around the world in Transmission and Distribution and energy efficiency
- Fundamental investments are needed
- Critical need to understand dynamic effects of linking communications, computing and energy



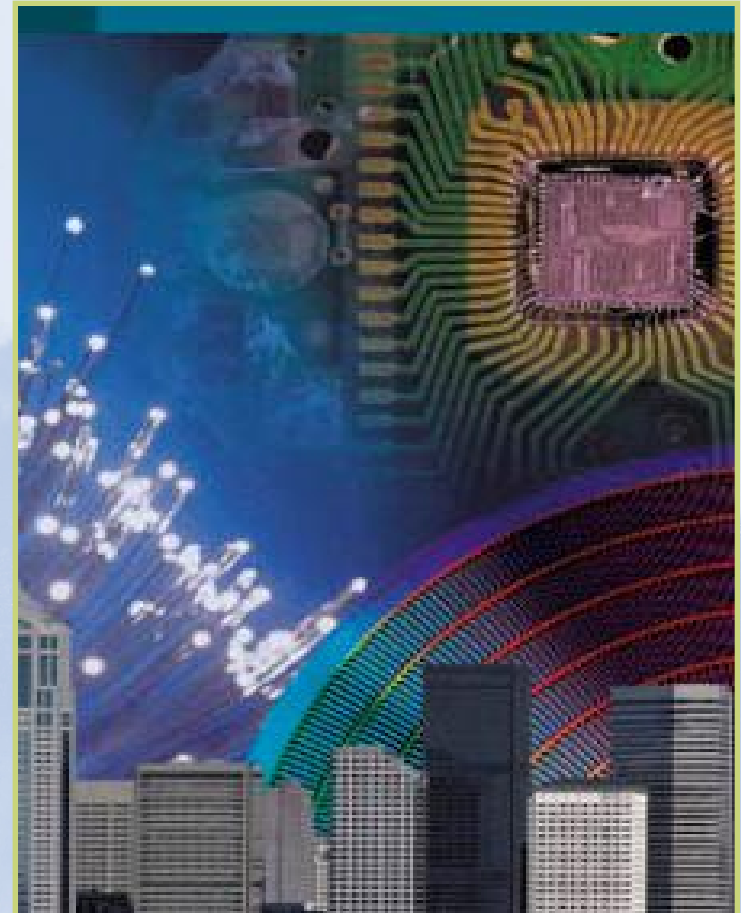
# The Demand for Reliability is Increasing

- A vital part of many industries and critical processes
  - Electric Power
  - Communications
  - Manufacturing
  - Transportation
  - Healthcare
- Power, communications, and computing are all converging
  - Interconnection makes the entire system as sensitive as the most sensitive component



# Demand Response as an Alternative

- Not all load control is created equal
- Long-term value of DR is dependent on being controllable, measurable, verifiable and predictable
- Tools and technology are critical factors in the permanent recognition of DR on par with supply side resources
- Business creativity is key



# The Destiny of Customer Engagement

- Customers are clamoring for the focus on renewables
- Public will demand the Burger King model of “have it your way”
- Systems to manage customer interaction will be required in new and challenging ways



# There is a Major Sea Change in Consumer Thinking

- Global climate change is on everyone's minds
  - It is not about science, it is about belief
- Economic downturn is reflecting a new mood
  - Gasoline prices rise and electricity consumption goes down



# Customers Get Creative Around Energy Supplies and Suppliers



# PHEVs impacts and questions

- The next big thing or...
  - Major changes in consumer behavior
  - Technical hurdles
  - 1,000,000 by 2015?
  - V 2 G or G 2 V?





# The “Carborexic Movement”

- Family of four unplugging refrigerator using it as an “icebox” with frozen water bottles
- Keeping the house at 52 degrees—in winter!
- Using a single plastic bag for a year
- Trying to keep energy use at 10% of national average

# Key is Engaging Customers in New and Different Ways

**Customer Preferences to CPP & DR Events** Back

Peak Pricing Event	Thermostat	Lighting	Audio / Video	Spa / Pool	Water Heater	Power to Grid
<input checked="" type="checkbox"/> <b>HIGH:</b> > 50c/kWh	+6° Cool, -4° Heat	Table lamp	ALL TV's OFF	-6°	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> <b>MEDIUM:</b> > 30c/kWh	+3° Cool, -2° Heat	Walk paths	TV backlight = Low	4°	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> <b>NORMAL</b> 12 c/kWh	Normal Program	Normal Accent	TV backlight = High	Norm	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> <b>OFF PEAK</b> 9 c/kWh	-1° Cool, +1° Heat	Normal Accent	Normal	+1°	<input type="checkbox"/>	<input type="checkbox"/>
<b>Emergency Event</b>						
<input type="checkbox"/> <b>STAGE 1</b>	TSTAT OFF	MOST OFF	TV Activity Timer	OFF	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> <b>STAGE 2</b>	No Over-Ride	ALL OFF	ALL TV's OFF	OFF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

# Carbon as a Marketing Tool

## **In the Bahamas, Paradise Without Guilt**

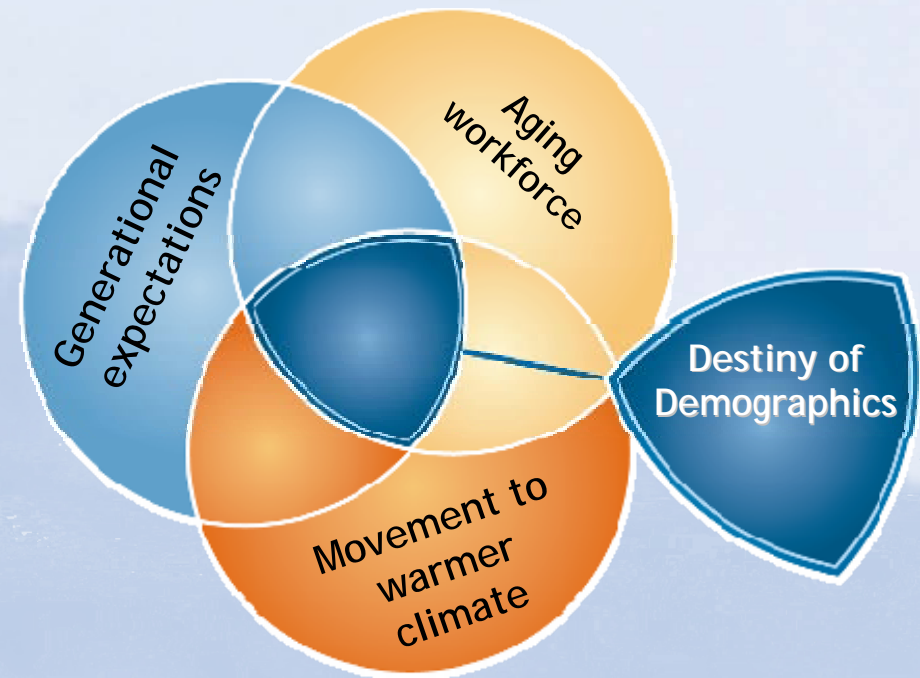


Richard Branson and Leonardo DiCaprio are involved in carbon-neutral resort proposals in the Virgin Islands and Belize, and a resort in the Maldives is undergoing a kind of carbon-neutral retrofit.



# The Destiny of Demographics

- 30% of all science and engineering degrees are held by people over 50; average age of a lineman is approaching 48
- Expectations of service and needs for service is expanding
- Movement to warmer climates drives needs



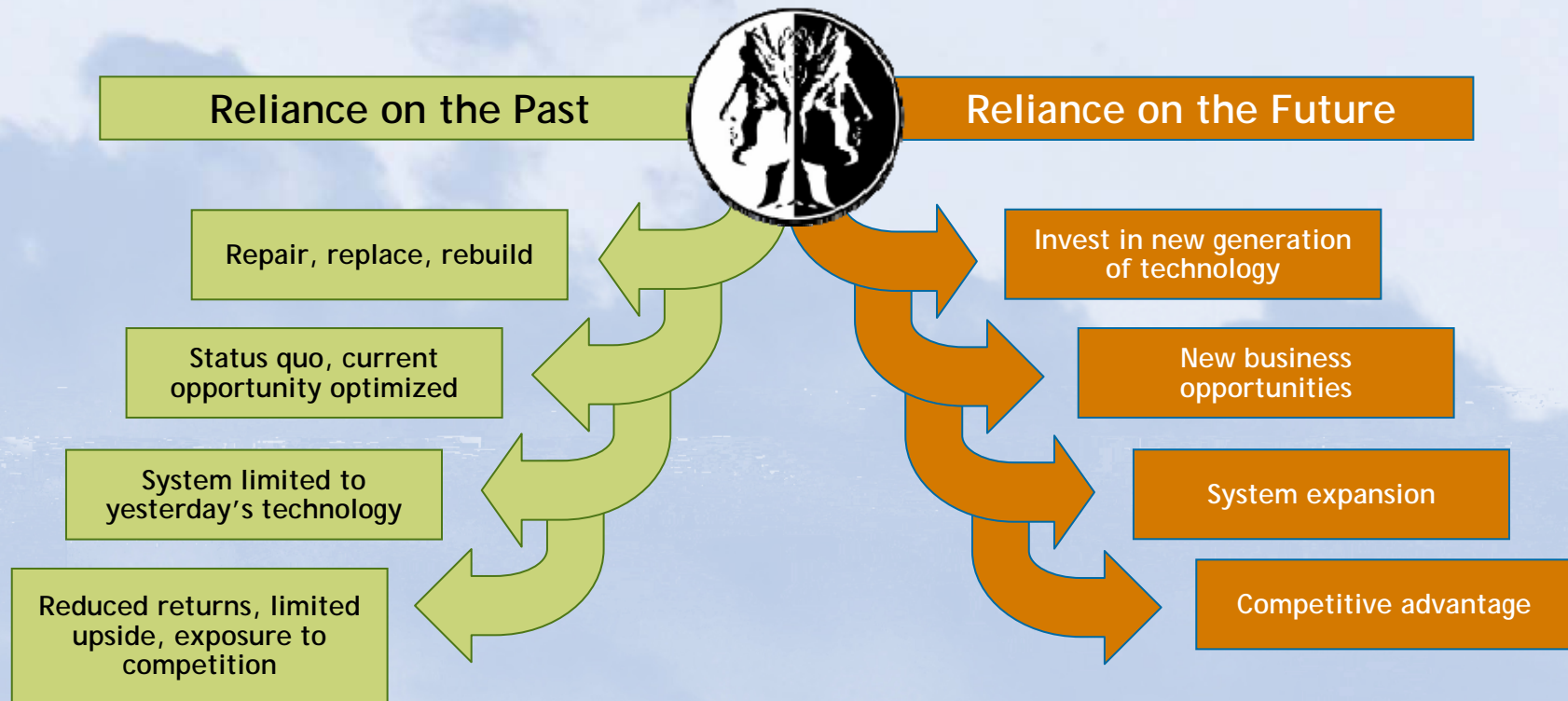
# The Destiny of Business Model Evolution

- M&A, asset divestitures and realignments will continue through the next decade
- Huge increases in the cost of generation and infrastructure will require new partnerships across
- Customers will demand new engagements with the industry
- Financial community will drive many of the changes
- Regulators and governments will potentially act in a reactive, an uninformed fashion



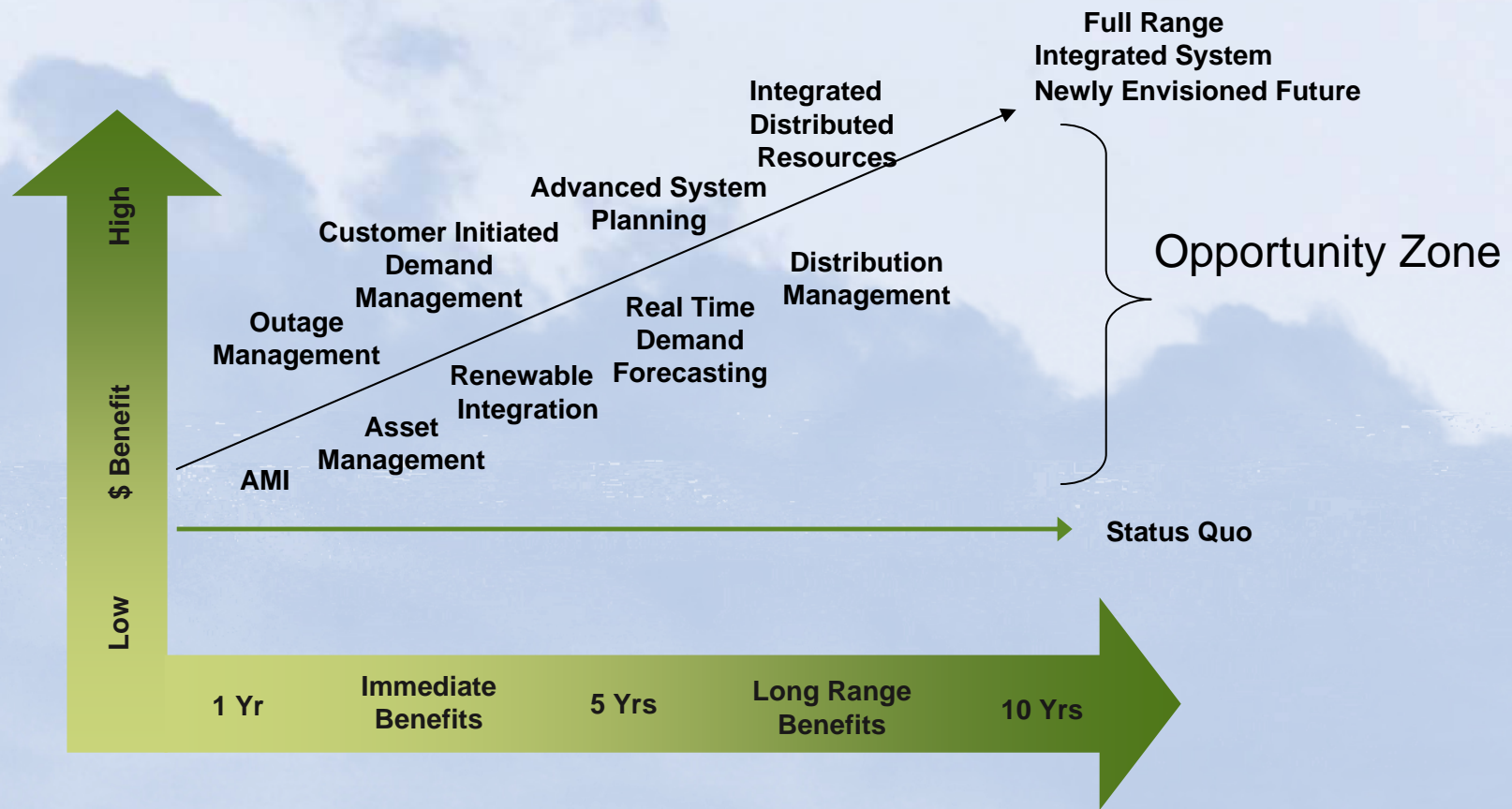
# The Janus Conundrum: Looking Back or Looking Forward

## Choice of Capital Investment



® Mark A. Gabriel, *Visions for a Sustainable Energy Future*

# The Challenge: Developing a Technology Roadmap



# 10 Ideas About the Future

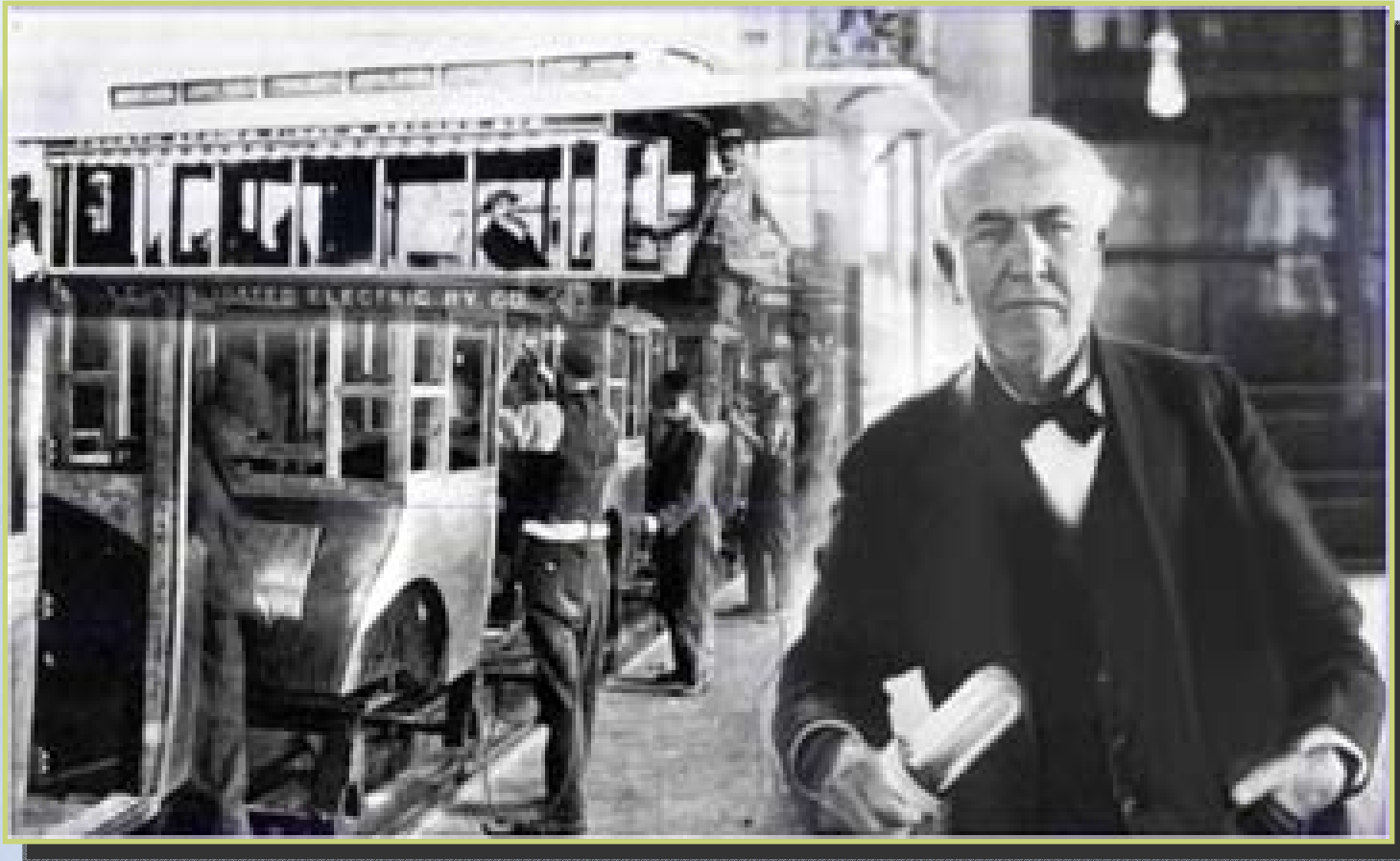
1. We must stop waiting for the perfect solution and perfect technology and support utilities in making investments
2. Customers want to be engaged regardless of utility economic logic.
3. We must invest in infrastructure with no regrets: it may be costly in the short run but will pay off in the long run.
4. Renewables are best backed by active demand response and load control.
5. We need to speak about these issues in ways our mothers can understand



## 10 Ideas About the Future (cont.)

6. Demand response and load management must be known, controllable and measureable.
7. Embrace and promote the change to keep it in your hands.
8. Recognize the drivers of energy efficiency and demand response go beyond energy savings (SQRA).
9. Seek unusual opportunities.
10. Recognize the megatrends and use them to your advantage.

“The Best Way to Predict the Future is to Invent It”



# Questions?

Mark Gabriel  
*Senior Vice President & Principal*  
916.614.8250  
mgabriel@rwbeck.com



**Mind Powered:** Insight with Impact.

