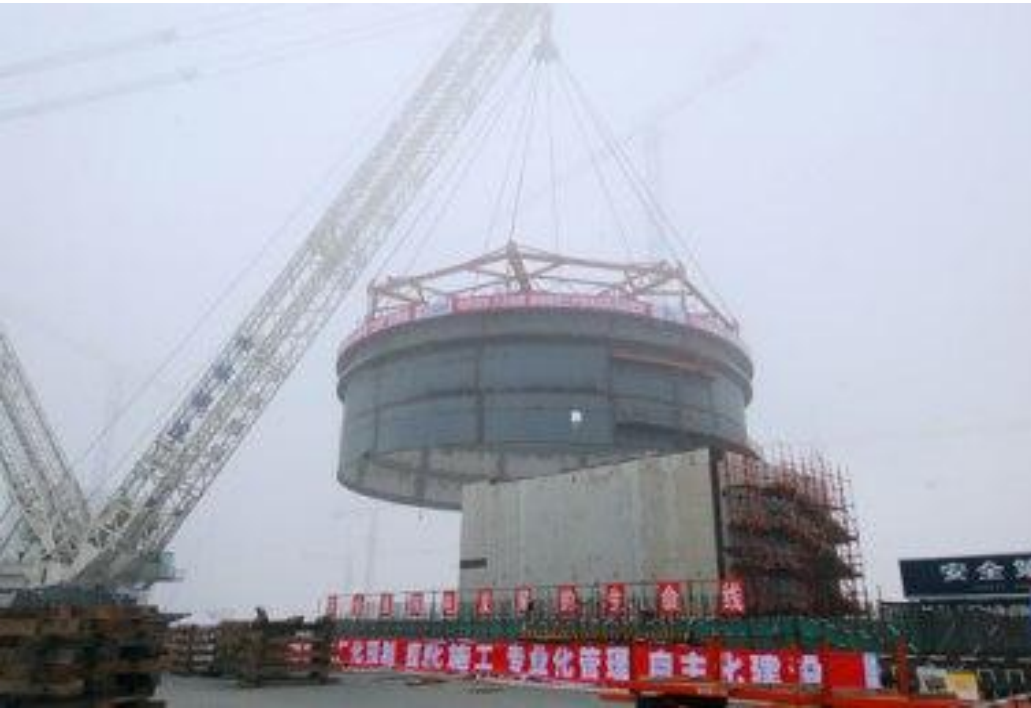


# Scenarios for Nuclear Power

--Post Fukushima



## Roundtable / Dinner



*Nuclear Energy Insider  
Maintenance & Modernization  
Conference*

--May 25, 2011

**Linton Consulting**

# Scenarios for Nuclear Power

--Post Fukushima



**ALSTOM**



**ap**

**serco**

**ABB**



**CEZ GROUP**

**B&W**

babcock & wilcox canada ltd.

**TRACTEBEL Engineering**  
*GDF SUEZ*

**Electrabel**  
*GDF SUEZ*



**Rolls-Royce**

 **Eskom**

**JACOBS**

 **Fortum**

 **eye for energy**

  
**energis**  
HIGH VOLTAGE RESOURCES, INC.®

*Linton Consulting*

# Why Are We Here?



- ◆ Knowledge exchange
  - Status of nuclear revival
  - Discuss challenges
- ◆ Share insights / perspectives
  - Utilities (demand side)
  - Vendors & suppliers (supply side)
  - Advisors, associations & advocacy groups
- ◆ Timely issues with a lot of associated questions
  - Fukushima
  - Financing issues

# Situation Analysis



- ◆ “Nuclear renaissance” in the news for 5-7 years
  - Growing L.T. demand for baseload, low carbon electricity
  - Growing public support for nuclear
  - Maturing reactor technologies
  - Active construction in Japan, China, Korea, India, U.S.
- ◆ Policy / Regulatory trends more favorable
- ◆ Globalization and change in Energy
  - Shifting global growth & demand: Asia
  - Energy dynamics & competition: oil, gas, coal, nuclear
- ◆ Nuclear already facing several challenges
  - **Then Fukushima...!**

# Situation Analysis – Post Fukushima



- ◆ Reactions to Fukushima Event:
  - Germany: Exit nuclear, close 7 units; Italy?
  - Slower development : Italy, UK,...
  - Pause in Nuclear development : Malaysia, Thailand, ...
  - Continue forward with additional safety controls: U.S., China, France, India, Russia, ...
  - Continue plans: Vietnam, Turkey, Indonesia, ...
- ◆ Energy demand growth worldwide continues

# Key Questions



- ◆ What will be the impact of Fukushima on the nuclear revival?
- ◆ Which countries will decide to phase out of nuclear?
- ◆ Which new entrants will stop plans for nuclear?
- ◆ Will we see a trend to replace older plants with new technologies?
- ◆ What will be the new regulatory – imposed design requirements?
- ◆ What retrofits will be needed for improved safety margins?
- ◆ How will these changes impact major nuclear suppliers: vendors, EPCs, component manufacturers?
- ◆ Others (list)



# Key Areas of Impact



- ◆ Japan and worldwide
  - Electricity shortages
  - Decommissioning and clean up expense (Japan)
  - TEPCO financial crisis
  - Investment in gas generation, short term
- ◆ Regulators, peer review groups
  - Japanese regulator, US-NRC, European Commission and local regulators will study and update regulations
  - IAEA, WANO, will grow stronger
  - Expect increased harmonization and stronger oversight

# Key Areas of Impact



## ◆ Operating Reactors

- Assessments, stress tests, safety and back up system evaluations
- Possible shutdown of coastal reactors?
  - Build seawall or decommission?
  - Some temporarily shut down (Chubu Electric - Hamaoka)
- Possible shutdown of reactors in seismically active areas?
- Investment in additional to assure back up power, emergency cooling water and fire protection systems

## ◆ New Reactors

- More stringent designs?
- Certification delays?
- Construction delays of 1-2 years likely in some regions



# Key Areas of Impact



- ◆ Regions for potential development delays
  - Asia / Japan
  - Europe
  - U.S.?
- ◆ Fuel Cycle – Backend
  - Review of spent fuel pools; possible reconfigurations
  - Faster transition to dry cast storage and increased demand
  - Push for recycling, long term waste repositories

# Scenarios



## Country examples for each:

1. Exit nuclear, build gas, alternatives
2. Maintain, but no new build; pause or stop development
3. Slower development
4. Continue with additional safety controls
5. No change – continue pace of development

# Scenarios – Changing Demand



- ◆ Increasing demand, interest
  - Consulting, evaluations, assessments, stress tests
  - Peer reviews, monitoring
  - Rulemaking, harmonization/standardization, legal
  - Safety retrofits (& associated EPC); backup power systems, fuel storage ponds, flood control/seawalls, etc.
  - Uprates
  - Dry cask storage systems
  - Small reactors?
- ◆ Slowing/reduced or postponed demand
  - New Build - Engineering & Construction (globally and selected countries)

# Linton Consulting Insights for Industry and Government



# Who is Linton Consulting?



- ◆ Independent practice providing strategic development and market development services in Energy and Manufacturing
  - Over 30 years experience with large engineering and construction firms: CH2M HILL, Lockwood Greene, Fluor
  - Over a decade of consulting experience
  - Extensive industry contacts & ongoing interviews

## Strategic View Industry Studies

- 2010 Energy Challenges/ Energy Parks
- 2008 Nuclear Renaissance
- 2007 Oil, Gas, Chemicals
- 2006 Energy
- 2005 Mfg./Industrial
- 2004 Food & Beverage
- 2003 Pharmaceutical
- 2002 Power
- 2001 Infrastructure Life Cycle, Others

## Past *Linton* Industry Studies

- Oil & Gas
- Electric Power
- Engineering and Construction
- Water/Wastewater
- Environmental
- Asia/Pacific
- *Market Reports* - Series



# 2010 Research Conducted – For SRNS



## 115 Interviews, Discussions, and Meetings\*

|  |                                   |                         |                                    |
|--|-----------------------------------|-------------------------|------------------------------------|
| Ameresco                                     | Dow Chemical                      | Marathon                | Shaw Group                         |
| American Nuclear Society                     | Eastman Chemical                  | Marston Consulting      | Siemens-America                    |
| Arizona Clean Fuels                          | Economic Development Partnership  | MIT                     | Southern Company                   |
| B&W  | EIA                               | NEI                     | SRNL                               |
| BetterPlace                                  | EPRI                              | New Carolina            | SRNS                               |
| BP   | Exelon Corporation                | NNSA                    | SRNS- Honeywell                    |
| Building Construction Trades Dept. (AFL-CIO) | Fluor                             | NRC                     | SRNS- Northrup Grumman             |
| Canup & Associates                           | Gasification Technologies Council | Peabody Coal            | SRS-CRO                            |
| Carolinas' Nuclear Cluster                   | General Atomics                   | PJM Interconnection     | TerraPower                         |
| CH2M Hill                                    | General Electric                  | Progress Energy         | Technology Ventures                |
| ConocoPhillips                               | GE- Hitachi                       | Rentech                 | Three Rivers Solid Waste Authority |
| CSIS   | George Mason University           | S-4 Energy Solutions    | University of South Carolina       |
| Duke Energy                                  | Honeywell                         | SCANA                   | UOP - Honeywell                    |
| DOE  | Hyperion Power                    | SC Regional Development | USEA                               |
| DOE- EM                                      |                                   | Senator Graham's Office | Westinghouse                       |
|  |                                   | Senator DeMint's Office |                                    |

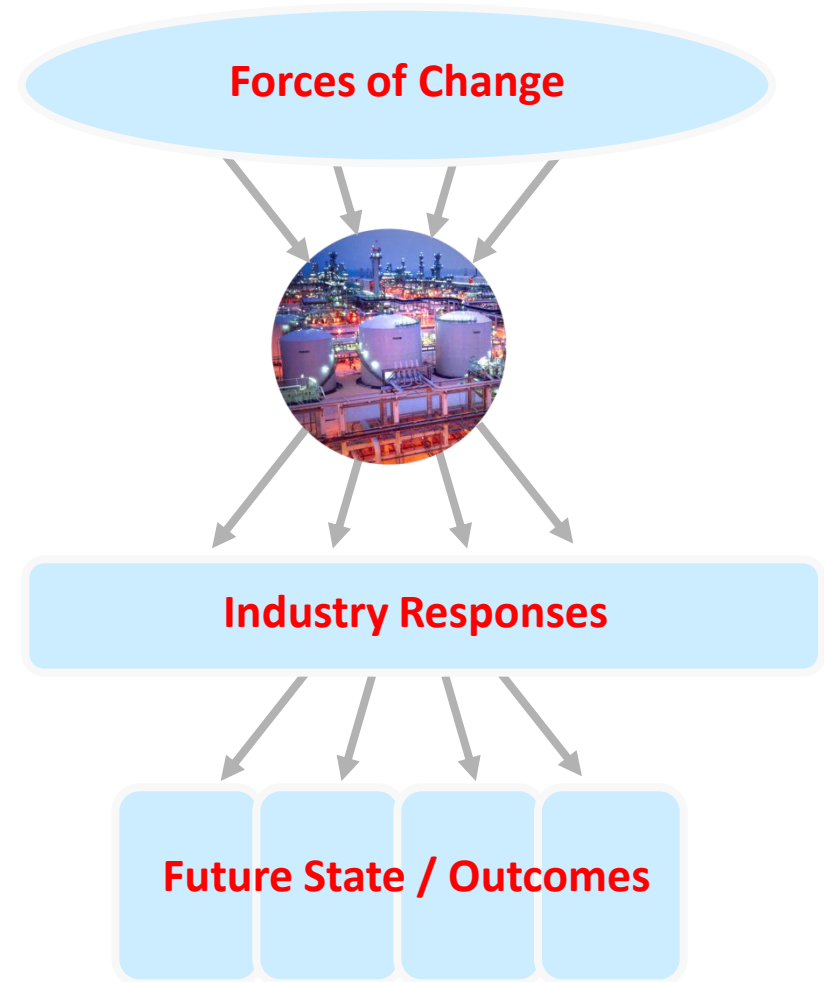
\*Some organizations had multiple interviews



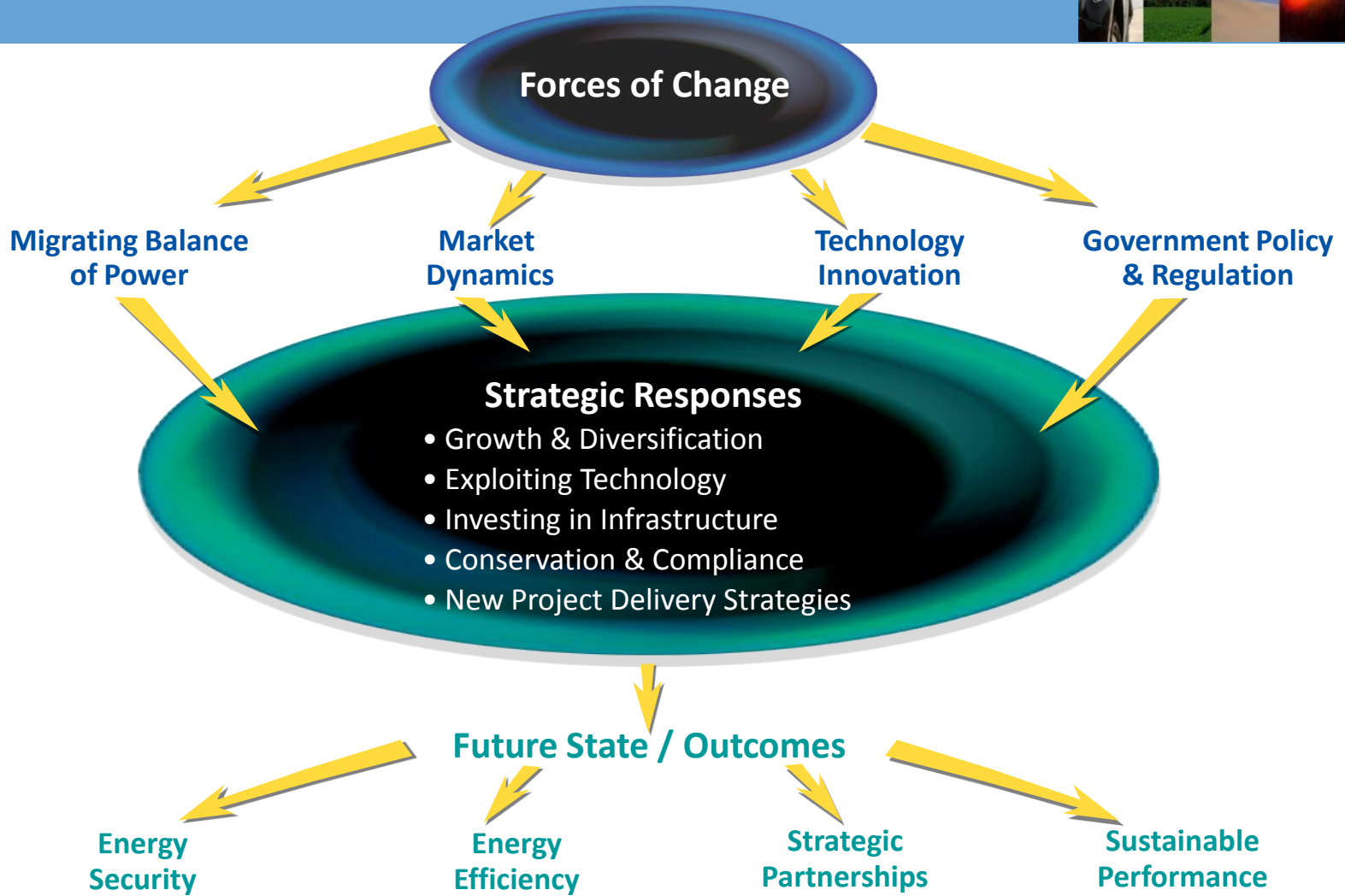
# What is *Strategic View*?



- ◆ Research model
  - Used 14 years; 5 in energy
  - Forces affecting the future of the energy industry
  - Industry responses
  - Where it is leading – the future state/outcomes
- ◆ Process
  - Interviews with executives and thought leaders
  - Research & analysis
  - Executive Roundtable
  - Follow up & plan integration



# Strategic View – Energy (Example)



# Executive Roundtables



## ◆ Common purpose

- Convene executives and thought leaders for knowledge exchange
- Expand understanding
- Share perspectives
- Confirm/challenge paradigms
- Advise leadership
- Uncover ideas and opportunities for your organization
- Explore Future – trends and challenges
- Establish practical, realistic path forward