



Preparing for a Game Change

22nd NREL Industry Growth Forum

Alan Mawdsley
November 4, 2009



Bechtel - Four Generations of Leadership



Uninterrupted Family Leadership Provides Stability, Continuity





A skilled and diverse workforce

- 44,000 employees from 117 nations
- Nearly one in six have at least 20 years of service with the company
- Some 12 percent have advanced academic degrees

A vibrant company working worldwide

- 2008 workoff of \$31.4 Bn
- Active on more than 300 projects in 44 countries
- More than 100 “major projects”



A full range of services

- Project development and financing
- Engineering, procurement, construction, and construction management
- Project and program management
- Startup, operation, and maintenance

Safety – The Top Priority



Our philosophy: zero accidents

- More than 50 projects achieved at least 1 million safe work hours in 2008
- Most projects completed the year without a lost-time accident
- A safety record far better than the average for U.S. industry



Major projects
in Europe, the
Middle East,
and the U.S.

- West Coast Route Modernization in UK
- Extending Metrorail to Dulles Airport
- Building highways in Romania and Albania
- Constructing major new airport in Qatar
- Starting Crossrail project through London

Metrorail Extension

Washington, D.C.





End-to-end services for advanced networks

- Managing upgrade of AT&T Mobility network
- Working with Cox Communications on wireless deployment
- Helping Arqiva switch from analog to digital TV broadcasting in the UK



Expanding production capacity around the globe

- Expanding Los Pelambres and Los Bronces copper mines in Chilean Andes
- Expanding alumina refineries in Queensland and Western Australia
- In 2008 completed construction of Sohar aluminum smelter in Oman



Meeting
global
demand for
energy

- Helping build pipeline to carry oil from Canada to U.S. refineries
- Working on offshore-onshore gas pipeline in India's Bay of Bengal
- Recently completed first phase of LNG receiving terminal in Louisiana

Jamnagar Refinery

Jamnagar, India



Sabine Pass LNG Terminal

Cameron, LA





A leader in fossil and nuclear power plants

- New “cleaner coal” plant being built in Indiana in alliance with GE Energy
- Completing Unit 2 of Watts Bar Nuclear plant
- Targeting opportunities in alternative energy, including wind and solar



A leading provider to
Defense and Energy
departments

- Teaming to operate Los Alamos and Lawrence Livermore national labs
- Building a huge facility in Washington State to treat radioactive waste
- Eliminating chemical weapons at defense sites in Colorado and Kentucky



Helping create new projects

- Helping customers develop power and civil projects
- Working with customers to finance mega projects
- Investing equity in projects, such as the BrightSource - Ivanpah Project

- Will the changes be **evolutionary or revolutionary**?
- What is the **magnitude of the need**?
- What are the expected **demands on resources**?
- How are we **changing to meet the future**?

Yesterday



Kerman PV



Solar Two



SEMASS Resource Recovery



AeroEnergia Wind



Indiantown Cogeneration Station



Polk IGCC Power Station



BrightSource



Watts Bar Unit 2 Nuclear



Duke Edwardsport IGCC



Various Photovoltaic & Wind

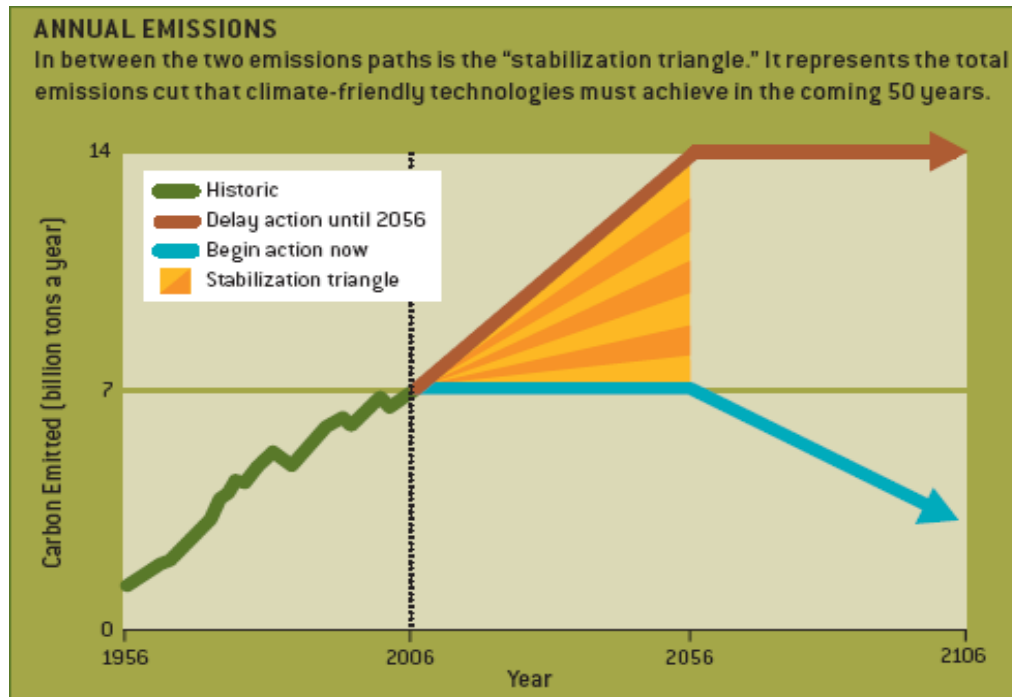


Combined Cycle Power Projects

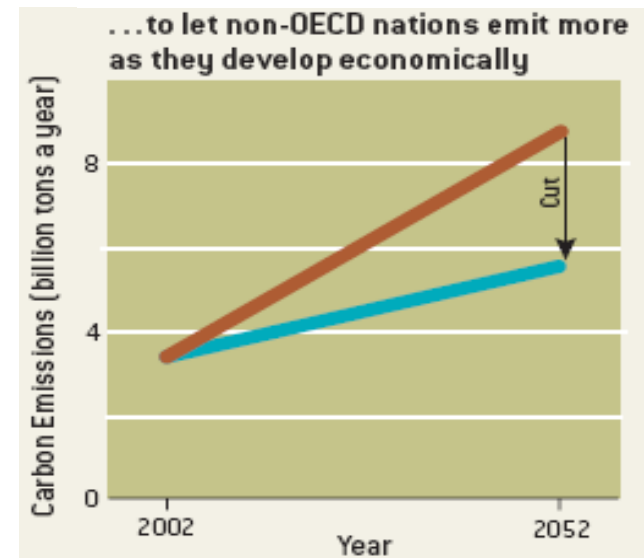
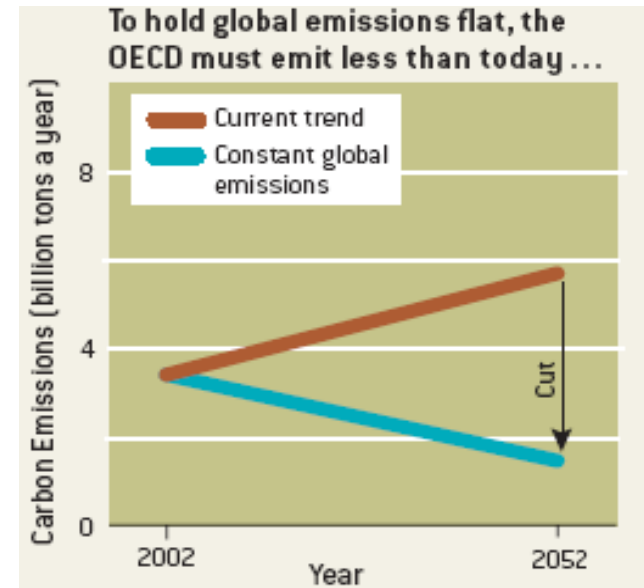
Stabilization Triangle



- Pacala & Socolow, Princeton University
- Stabilize greenhouse gas emissions over next 50 years
- Provide worldwide reduction of 7 giga ton of carbon from "business-as-usual" trajectory
- Eliminating 7 giga tons of carbon = 25 giga ton of CO₂



Source: Scientific American



Stabilization Triangle Requirements

- Eliminate 25 giga ton CO₂/year from BAU by 2054
- On average, each year must reduce rate by ~0.5 giga ton/year

Business as Usual – coal-fired power as the comparator

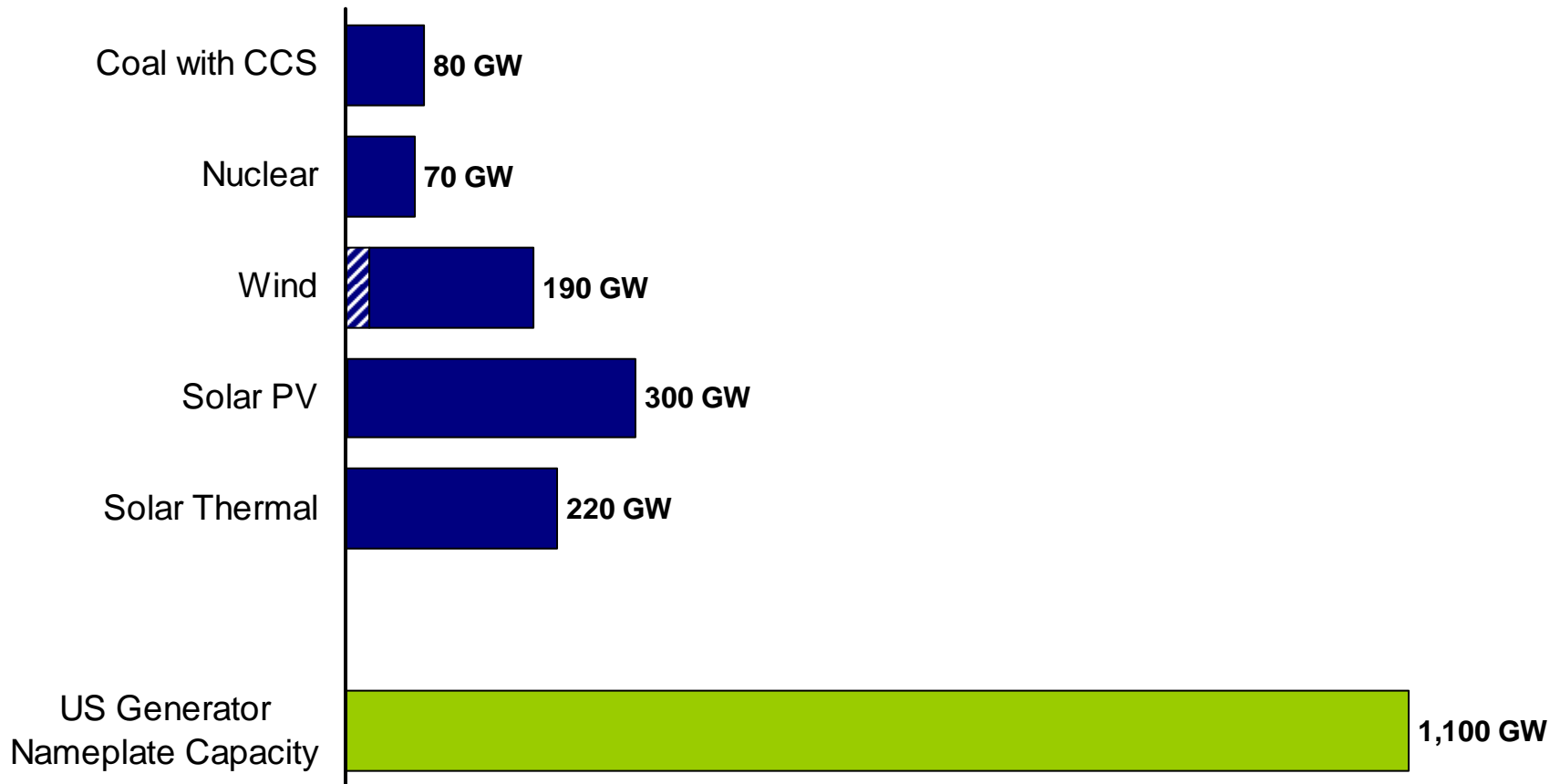
- Coal plant CO₂ emissions rate ~ 0.88 ton/MWh
- One 500MW coal plant emits ~ 3.6 million ton of CO₂/year
- 140 coal plants (500MW) emit ~ 0.5 giga ton of CO₂/year

Equivalent to 70 GW coal-fired power
(each year!)

Resource Requirements - Capacity



Some Options to Eliminate 0.5 giga ton of CO₂/year:



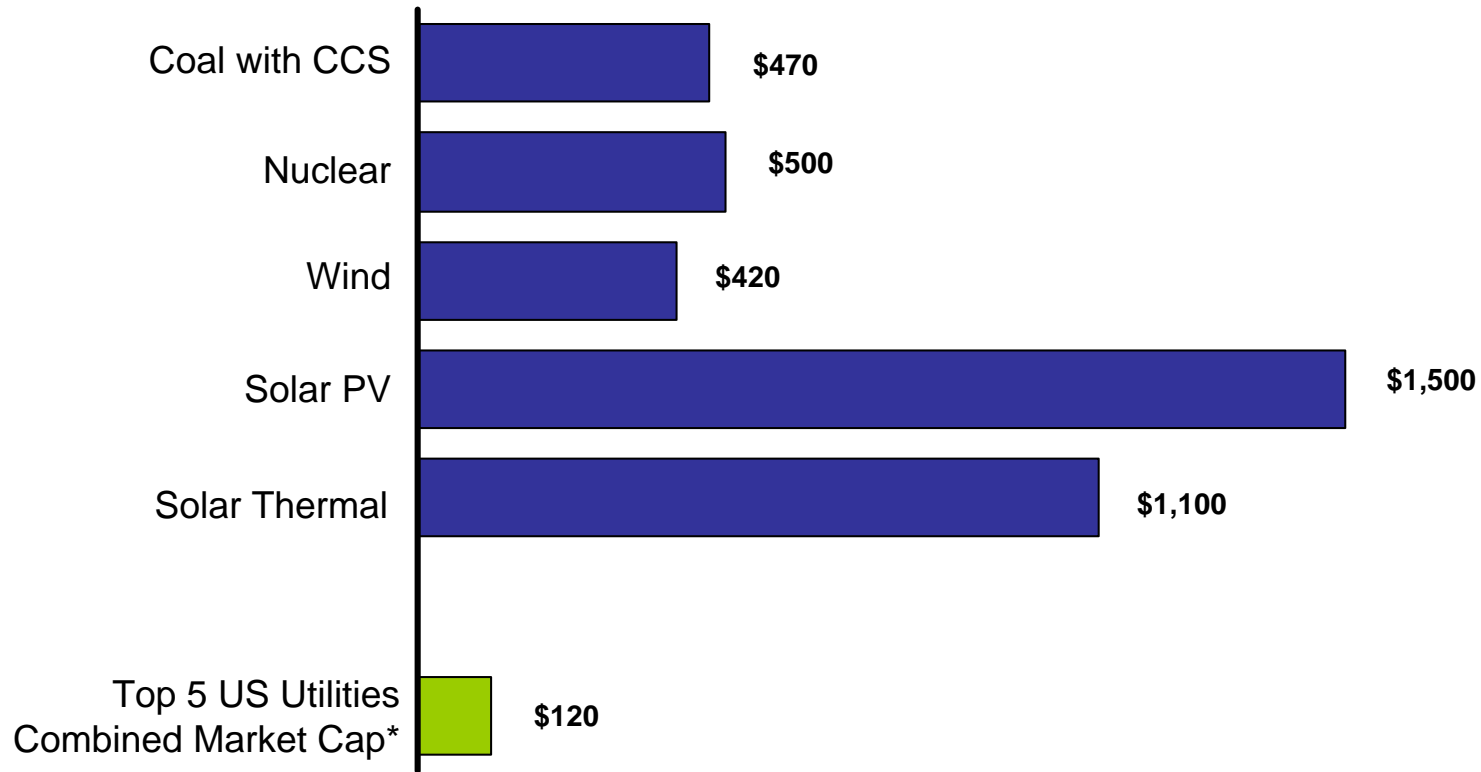
Actual capacity additions in 2008 are overlaid with hatch lines

*DOE EIA Data Released: January 21, 2009
Source: Bechtel Internal Research

Resource Requirements - Capital Cost



Some Options to Eliminate 0.5 giga ton of CO₂/year:



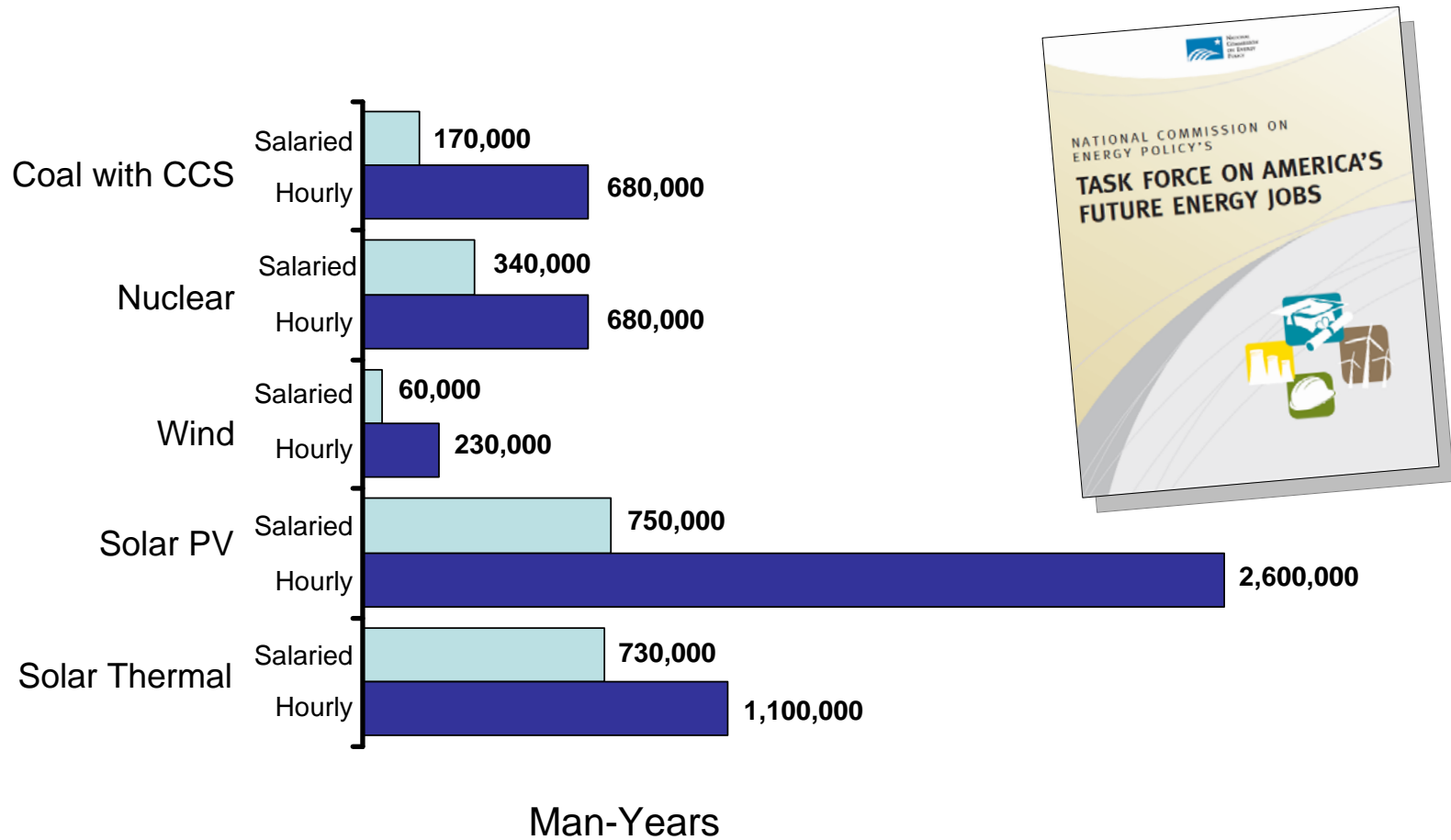
Billions of Dollars

* Oct 2009: Exelon, Southern Company, FPL, Dominion, and Duke Energy
Source: Bechtel Internal Research

Resource Requirements - People



Some Options to Eliminate 0.5 giga ton of CO₂/year:



Source: National Commission on Energy Policy
Bechtel Internal Research

Bechtel Gets Organized for Game Change



Change for the future

- Require business units to address climate change driven opportunities
- Assign *Bechtel Enterprises* responsibility to stay abreast of technology advances
- Establish *New Technologies* business unit in Bechtel Power
- Invest in projects we build

Feel the Heat!



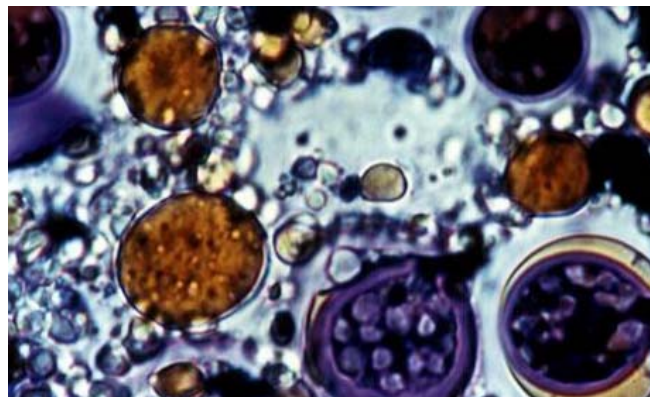
Get close to
the action

- Gain a detailed understanding of emerging and competing technologies
- Track changes in product economics
- Prepare business plans to grow
- Identify compatible partners
- Target projects where our unique skills make a difference to customer's success



©2009 Babcock & Wilcox
Used by Permission

Small Modular Reactor



Biofuels



Thin-film Photovoltaic



CO₂ Capture & Sequestration



Advanced Thermal Storage

Take-away Thoughts



- We need all solutions – let's not plan on finding the *silver bullet*
- The organizational challenges are ever present
- Implementation may impact scarce resources