



International Atomic Energy Agency: Milestones for Nuclear Power Infrastructure Development

Opening Remarks - Finance



PAUL M. MURPHY

Senior Counsel
Bechtel Power Corporation

Vienna, Austria
November 8, 2007



- **Welcome**

The Journey: 19 Milestones

- National Position
 - Management
 - Legislative Framework
 - Regulatory Framework
 - Stakeholder Involvement
 - Site & Supporting Facilities
 - Environmental Protection
 - Nuclear Fuel Cycle
 - Industrial Involvement
 - Procurement
 - Funding & Financing
 - Nuclear Safety
 - Safeguards
 - Radiation Protection
 - Electrical Grid
 - Human Resources Development
 - Emergency Planning
 - Security & Physical Protection
 - Radioactive Waste
 - Role of Government
 - Leadership / Commitment
 - Legal Framework & Rule of Law
 - Institution Building
-
- ```
graph TD; A[Industrial Involvement] --> D[Role of Government]; B[Funding & Financing] --> D; D --> E[Leadership / Commitment]; D --> F[Legal Framework & Rule of Law]; D --> G[Institution Building];
```

2



- **Categories of milestones**
- **(1) Common to all (even fuel)**
- **(2) More specific to nuclear (even grid)**
- **(3) All impact financing, which is our focus now (as opposed to funding)**
- **(4) Govt role is pervasive throughout all the milestones, but there is a unique impact on financing**

## Key Motivations

- Overall Growth in Demand for Energy
  - Linkage between energy and development
- Energy Security / Self-Reliance
- Energy Diversity

3

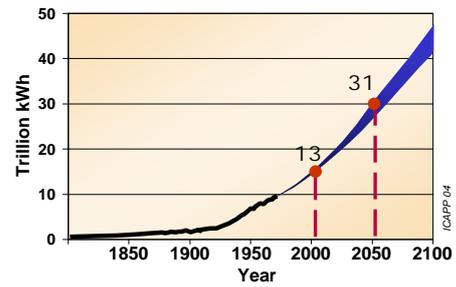
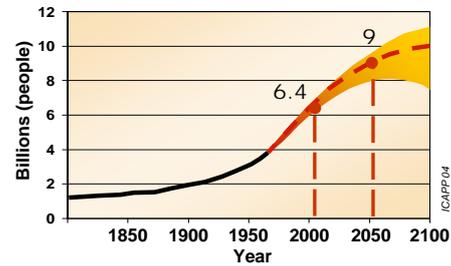


- **Key Motivations help frame the discussion; provide context for the debate**

## World Overview

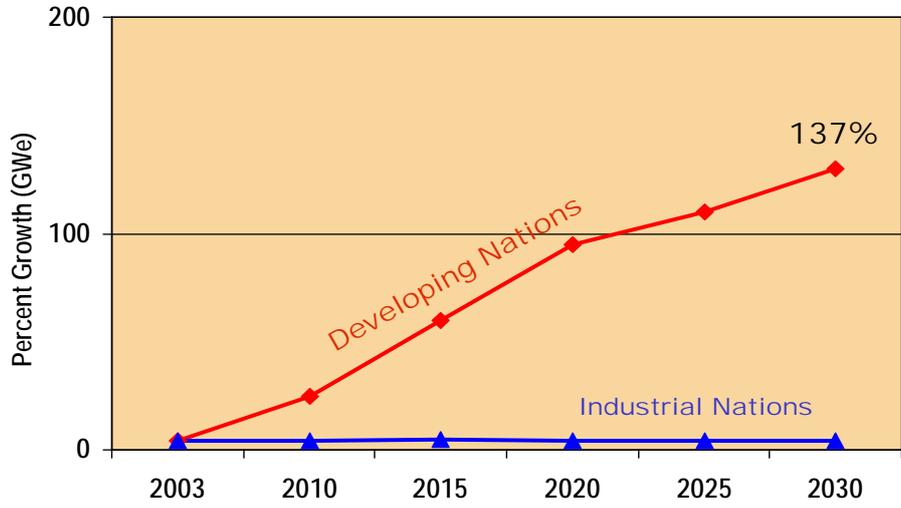
- Global electricity demand to increase 50% by 2025

- ▶ 1.6%/yr for industrial world
- ▶ 3.6%/yr for developing world



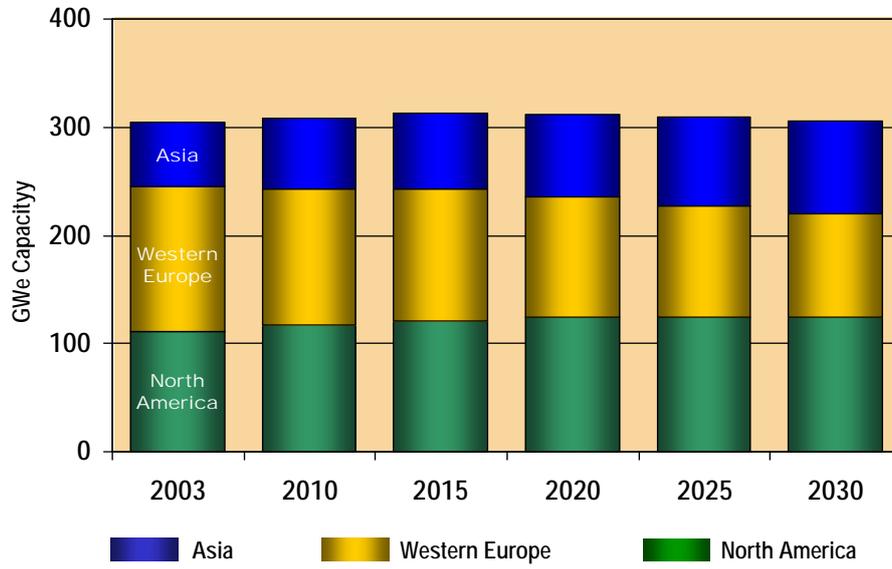
- Servicing the demand for power is what this is all about

# Percent Growth in Nuclear Capacity



# Forecasted Nuclear Capacity

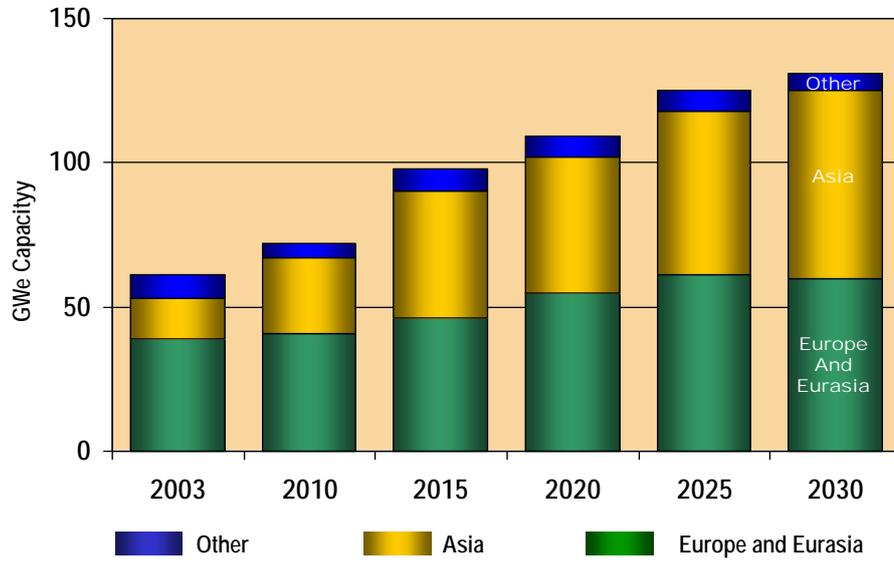
Mature Market Economies (industrial nations)



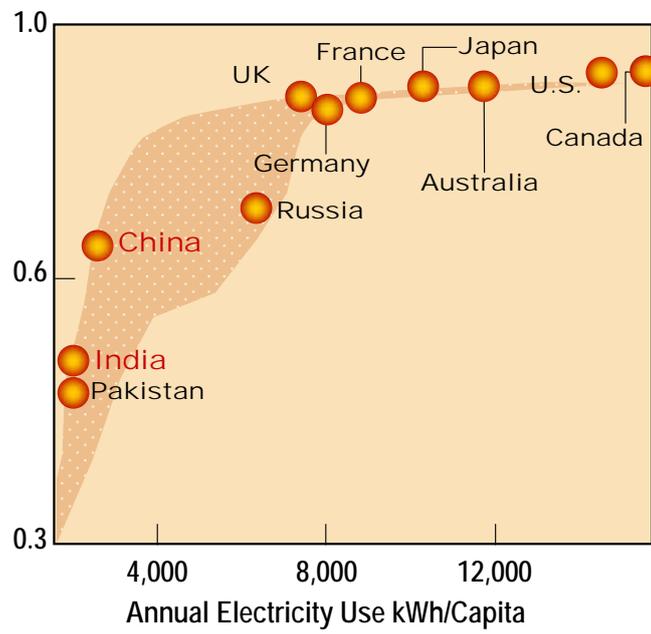
6

# Forecasted Nuclear Capacity

## Emerging Economies (developing nations)



# U.N. Human Development Index



- What is the dividend?

# Key Motivations

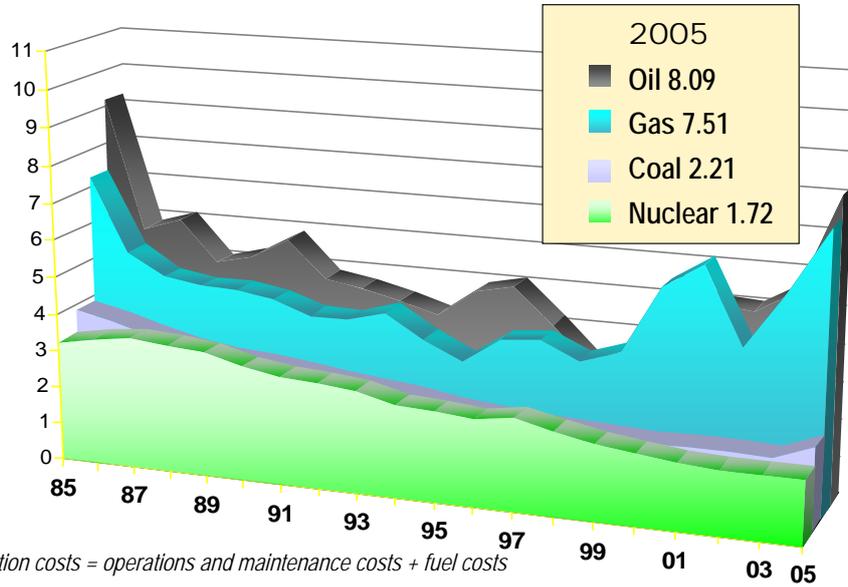
- Overall Growth in Demand for Energy
  - Linkage between energy and development
- Energy Security / Self-Reliance
- Energy Diversity
- Economics
  - Low operational costs relative to other forms of power



9

# United States Perspective Electricity Production Costs

1995–2005 (averages in 2005 cents per kWhr)



*Production costs = operations and maintenance costs + fuel costs*

*Source: Global Energy Decisions*

10



## Key Motivations

- **Overall Growth in Demand for Energy**
  - Linkage between energy and development
- **Energy Security / Self-Reliance**
- **Energy Diversity**
- **Economics**
  - Low operational costs relative to other forms of power
- **Emissions / Global Warming**



*World Overview*  
**Quick Facts—Nuclear**

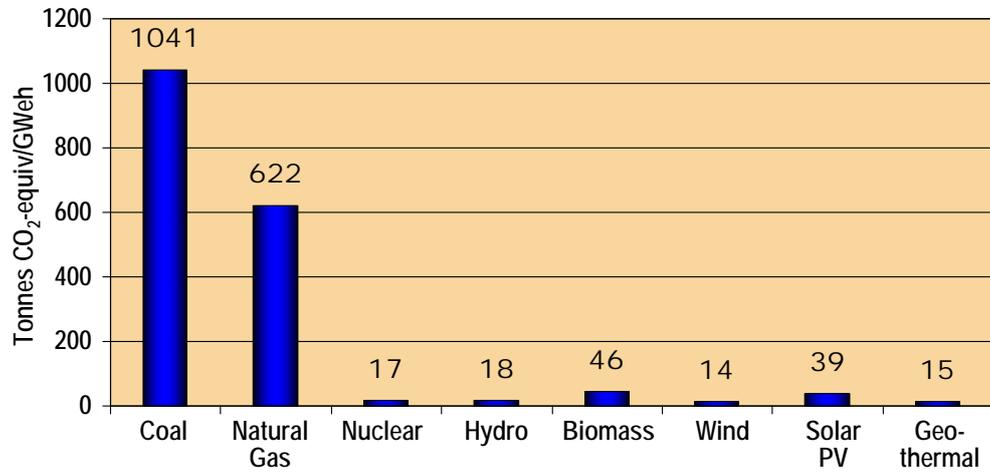
- 16% of world's electricity
- Displaces 2.5 billion metric tons of CO<sub>2</sub>/year
- 38 GW brought on line or under construction since 2000



12



# Life Cycle CO<sub>2</sub> Emissions Analyses



13



- **Moreover, when carbon costs are internalized, nuclear becomes economically more competitive, relative to coal and natural gas (REGARDLESS OF COST PER KWH, FOR WHICH PROJECTIONS ARE ALL OVER THE PLACE)**

# Key Motivations

- **Overall Growth in Demand for Energy**
  - Linkage between energy and development
  
- **Energy Security / Self-Reliance**
  
- **Energy Diversity**
  
- **Economics**
  - Low operational costs relative to other forms of power
  
- **Emissions / Global Warming**
  
- ❖ **Note: Drivers are different, depending on national situation**

14



## Financing Issues

- High Capital Costs
- Long Construction Periods
  - ▶ Return on Investment is an Issue
- First-of-a-Kind Risk
- Sustainability of Government Commitment
- Regulatory Uncertainty
- Commitment to International Regimes
  
- Supply Chain
- Fuel Cycle
- Operational Success & Safety Culture
- Human Resources



15



- **Nuclear is not the only type of “big capital project” out there**
  
- **Government involvement is a key**
  - ▶ 100 year effort
  - ▶ Prior failures
  - ▶ Only type of international power

## What makes nuclear power unique?

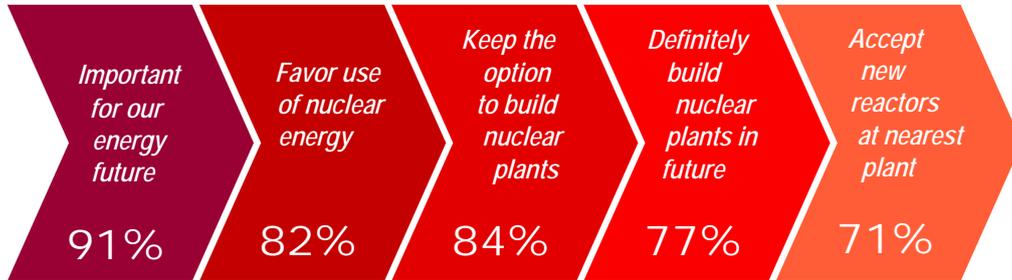
- Scale
  - Cost
  - Development / Construction Period
- Safety
- Public Perception / Public Relations

16



- **First is common to all big projects**
- **Safety (corporate bias) is essential in everything we do**
- **Public perception / public relations is becoming very relevant in coal**

*United States Perspective*  
**Increasing Public Support**



Summer 2007 survey of residents living near Nuclear power plants.

*Source: Bisconti Research Inc.*



17

## What makes nuclear power unique?

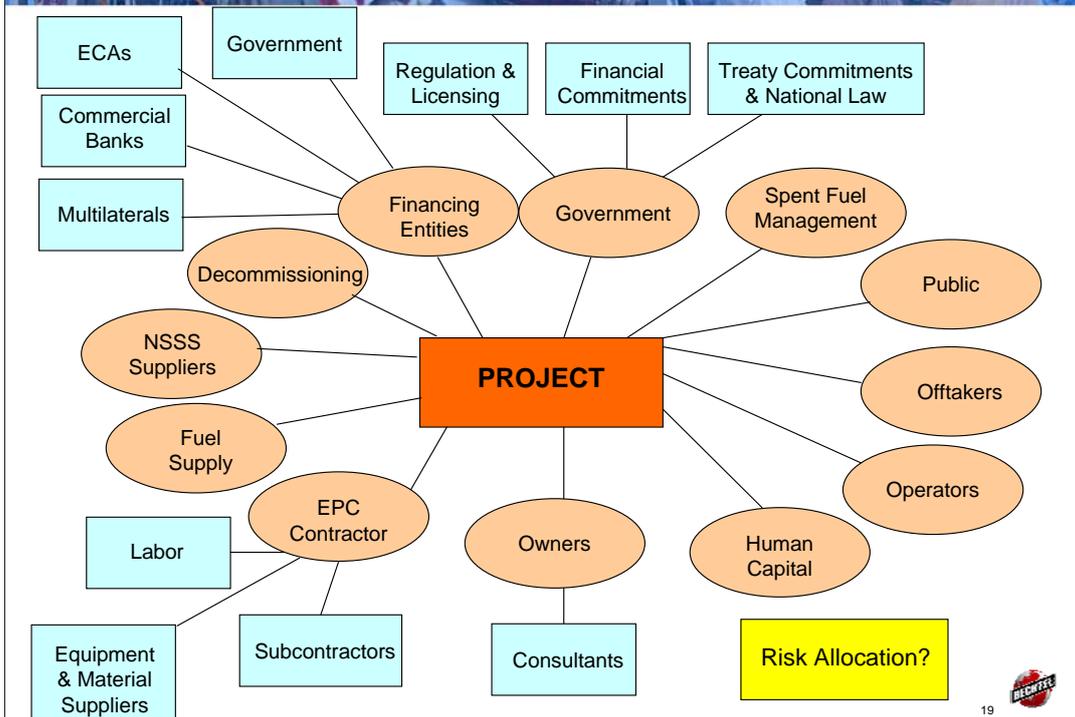
- Scale
  - Cost
  - Development / Construction Period
- Safety
- Public Perception / Public Relations
- Regulatory Environment
- Fuel Cycle
- Site Security
- International Features
  - Treaty Regimes / Legal Framework
  - Cross-Border
  - Non-Proliferation
- ✓ Interdependence of the Nuclear Industry
  - ✓ Impact of Success/Failure
  - ✓ Being Part of the “Nuclear Club”
    - ❖ Commitment to Excellence

18



- **Nuclear-specific issues**
- **International Nature**
  
- **A unique industry**
- **An unusual industry**
- **Importance of doing it the right way**
- **In this industry, it is not OK to be a C student.**
- **In this industry, you have to get it right the first time and get it right every time**
- **Membership has its privileges; membership has its responsibilities**

## Parties Involved In a Nuclear Power Project



- **Many players**
- **Putting together a good project is key**
  - ▶ Market capacity will hinder development
  - ▶ How can my project be favored over the next project?
  - ▶ Will the project work on its economics? IS IT VIABLE ?!?!
- **Proper risk allocation is key**
  - ▶ A nuclear deal is not a coal or gas deal; it must be thought of differently
  - ▶ A first unit country might have to take on risk that an experienced country does not (and even that isn't true in the US right now)

## Concluding Thoughts

- There is no one, right way to achieve success
- However, there are certain fundamental principles that will enhance the chances of success



20

- **What is today about?**
  - ▶ Not 1.5 days of hard core financing
  - ▶ You don't need an MBA to sit here today
  - ▶ It is about issue spotting
  - ▶ It is about thinking about risk allocation and risk management
  - ▶ It is about understanding how certain decisions might affect financing
  - ▶ With some of examples of:
    - What has been done
    - What is being done presently
    - What might be done
  - ▶ Goal: understanding the marketplace; framing the milestone planning within the marketplace, so that you complete Phase 2 and can actually get a project financed and supported
  - ▶ Differences from the first three days: One theme from different perspectives. More interactive. Need your active participation.
  - ▶ Schedule adjustments.