

## “글로벌 원전 개발과 금융의 현황: 한국의 위상과 과제”

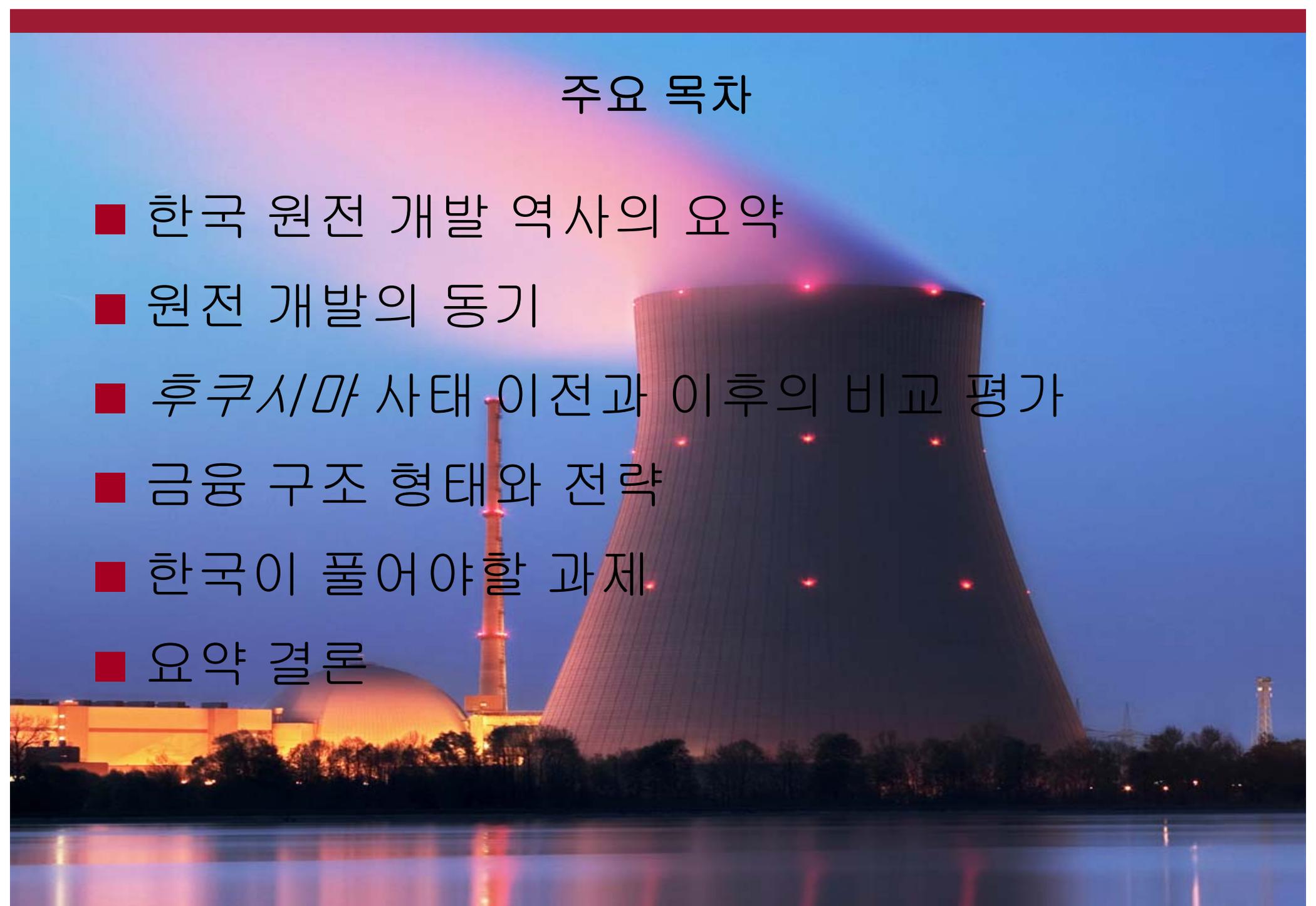
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## 주요 목차

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- 한국이 풀어야 할 과제
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# 한국 원전 개발 역사의 요약

- 여러 번의 뜻하지 않은 전화위복의 연속
  - 소규모 핵연구와 핵무기 비밀개발 추구
  - 5공 정부의 정당성 필요와 장기적 “한국형” 평화적 원전개발의 본격적 추구
  - Three Mile Islands 과 Chernobyl 사태가 한국 원전발전에 우연히 획기적인 기여
  - 세계가 모르는 동안에 꾸준한 기술 개발과 안전 운영 경험 축적
  - 일본과 프랑스의 2파전에 “끼어들어” 판을 뒤집은 UAE Abu Dhabi 원전 수주
  - 앞으로의 전망

## 원전 추구의 주요 동기

- 에너지 수요증가
- 에너지와 국가 안보, 에너지 자급률 개선
- 에너지 다변화
- 지구 온난화 / 이산화탄소 방출 축소
- 기본 에너지 대체
- 경제성
- 담수시설 관련
- 국가발전, 경쟁력 강화와 위상 증대

# Key Motivations for Nuclear Power

- Overall Growth in Demand for Energy
  - Linkage between energy and development
- Energy Security / Self-Reliance
  - Many nations lack fossil fuel reserves to support power generation
  - Many nations with fossil fuel reserves project that such reserves will be exhausted over the course of the 21<sup>st</sup> century
- Energy Diversity
  - Desire to diversify among forms of power generation to limit reliance and market influence of any one form of power generation
- Emissions / Global Warming
  - Nuclear has a significant advantage relative to other forms of baseload generation (coal and natural gas)
- Energy Substitution
  - Use nuclear energy as baseload generation to free up current sources of baseload generation (oil and natural gas for more lucrative applications)

# Key Motivations for Nuclear Power (cont.)

## ■ Economics

- Low operational costs relative to other forms of power

## ■ Desalination

- Potable water is in short supply in many parts of the world, with one fifth of the world's population lacking access to safe drinking water (with such proportion expected to grow, given projected population growth relative to available water resources)
- Half of all desalination is located in the Middle East
- Desalination is an energy-intensive process

## ■ National Development & Government Leadership

- National pride, human resources development (university-level jobs), local content / growth of local industry
- Note major government incentive programs present in countries with long nuclear histories (e.g., the Energy Policy Act of 2005 in the United States, the United Kingdom's EMR)

Notes: Drivers are different, depending on national situation.

## 후쿠시마 사태 이후의 평가

- 기본 동기는 불변
- 변화된 환경 여건 과 여론
  - 안전성에 대한 관심도 강화
  - 반핵 여론 재부상
- 금융에의 영향

# Post-Fukushima Assessment

## ■ *The aforementioned “Key Motivations” have not changed !*

- Note, too, that Fukushima has not really affected nuclear power plant development in the USA. Other factors (shale gas, lower demand, lack of a federal carbon policy) had already stalled the “nuclear renaissance” prior to Fukushima

## ■ But what do we see following Fukushima?

- Heightened scrutiny on safety, with heavy emphasis on design basis and the impact of external events on a nuclear power plant
  - Remember: Three Mile Island and Chernobyl were caused by internal problems, whereas the Fukushima incident was initiated by external events
  - Example: EU “stress tests”
  - New safety standards have the potential to drive nuclear power plant costs even higher
- Renewed anti-nuclear sentiment
  - Some countries are turning away from nuclear power (Germany, Italy, Switzerland)
  - Others are delaying their decisions (Thailand)
  - But, many are still going forward (China, India, Russia, UAE, United Kingdom, Czech Republic, Saudi Arabia, Vietnam, Finland, Turkey, Hungary)
  - Conclusion: Managing the public will be even more critical

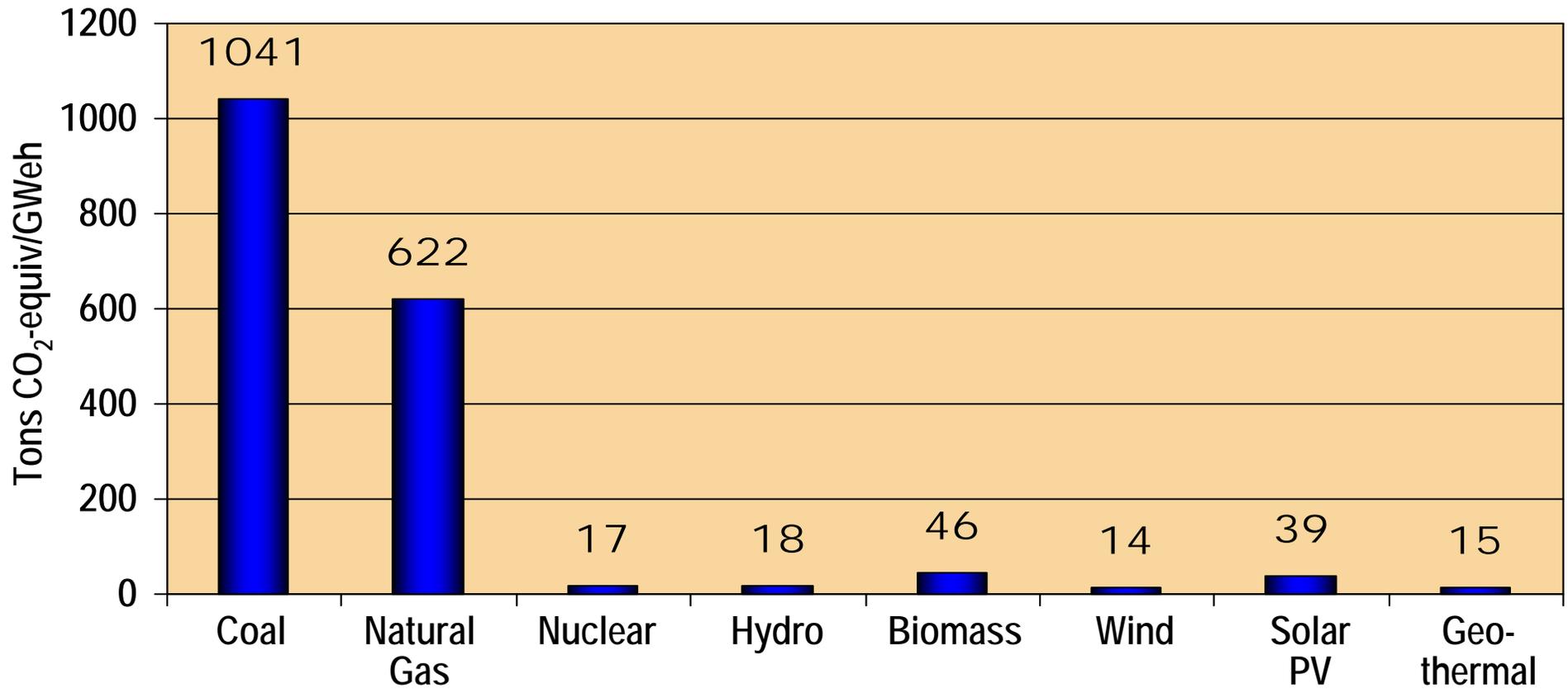
# Post-Fukushima Assessment (cont.)

- Are banks more “nervous” about financing nuclear power?
  - Perhaps, commercial banks are keeping a low profile right now
  - Renewed focus on project risks:
    - Total loss of multiple generation assets
    - Premature decommissioning, with higher costs
    - Premature shutdown of operating assets (Germany)
      - ✓ ... and without any discussion of compensation for loss of operating life
    - Extended shutdown of assets to address safety and government / public concerns, despite regulatory compliance (e.g., Chubu Electric’s Hamaoka plant)
    - “All bets are off” regarding nuclear liability structures
      - ✓ Japanese Government does not recognize “grave natural disaster” exception under the nuclear liability law
      - ✓ Retroactive assessment on Japanese nuclear utilities
      - ✓ Question about the adequacy of current limits of liability under international nuclear liability regimes
      - ❖ Conclusion: Need for entity structuring to reduce corporate exposure

# Financing – Current Market Conditions

- We are in a period of financial conservatism:
  - Continuing effects of the Global Financial Crisis of 2008
  - Eurozone troubles
    - Query: Have views on sovereign guarantees changed?
  - Basel III requirements
  - Fukushima places renewed focus on project risk
  
- Result: Money is tight
  - Combined with traditional challenges for the financing of nuclear power plants, there are limited options
    - Export Credit Agencies
    - Russian approach (Vietnam, Turkey, Bangladesh, Belarus, etc.)
    - China for China (and maybe beyond? ... UK, South Africa)
    - Oil Economies (UAE, Saudi Arabia)

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



# MIT “Update on the Cost of Nuclear Power”, May 2009

Note that gas prices have fallen dramatically since this study was done.

Technology	Nuclear A (with risk premium)*	Nuclear B (with no risk premium)**	Coal	Gas
Capital Cost (\$2007/kW)	4,000	4,000	2,300	850
Fuel (\$2007/mmBtu)	0.67	0.67	2.60	[7.00]
Weighted average cost of capital (WAAC)	10%*	7.8%**	7.8%	7.8%
Levelized Cost (¢/kWe)	8.4*	6.6**	6.2	6.5
Levelized Cost (¢/kWe) with \$25/tCO <sub>2</sub>			8.3	7.5

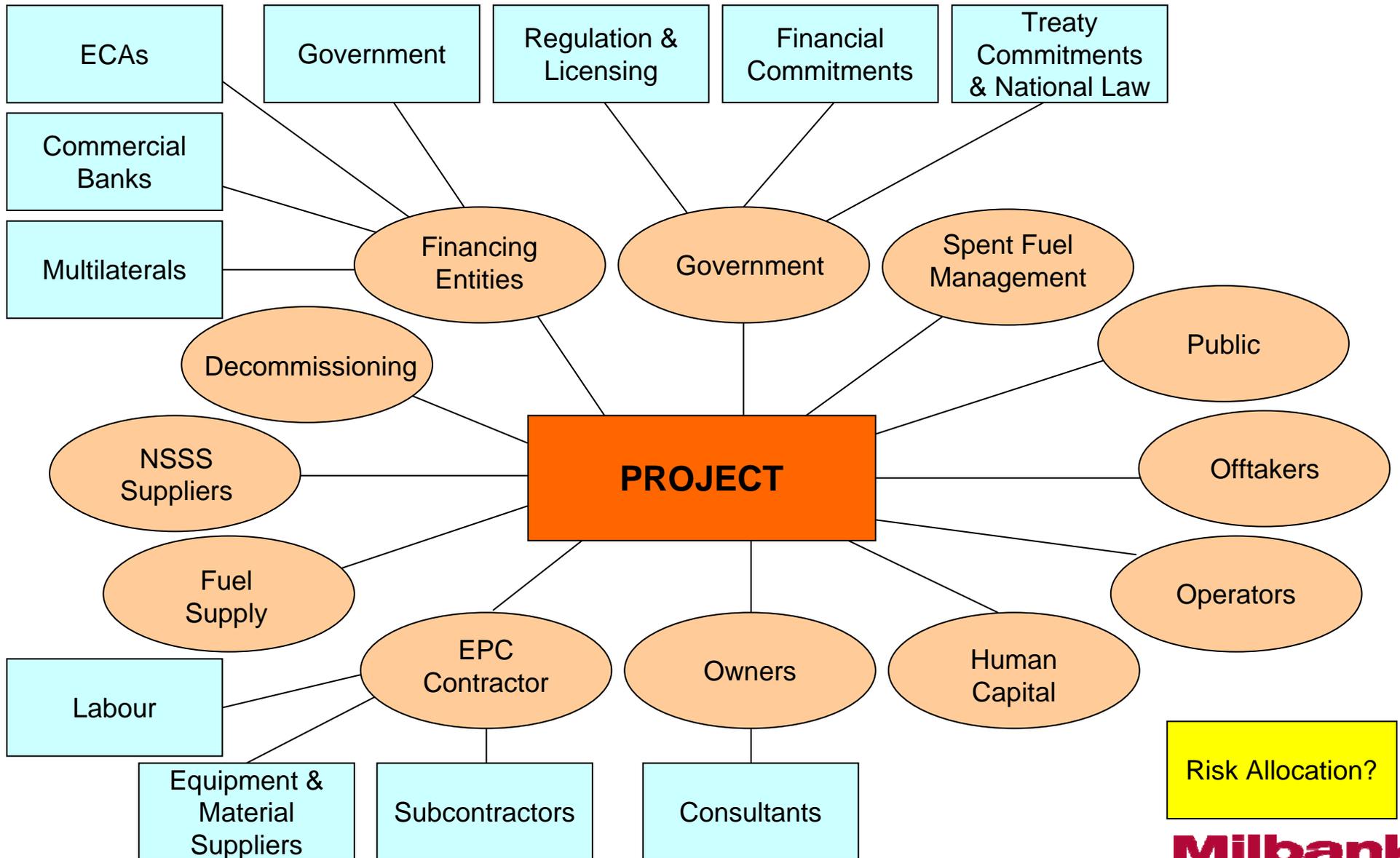
# Nuclear Financing Concerns

- Primary Concerns for Financiers
  - **Long development / construction periods**
  - **High capital costs**
  - **Regulatory uncertainty**
  - **Reputational Risk**
  - First-of-a-kind risk
  - Safety culture
  - Operational Success
  - Human Resources and Supply Chain
  - Sustainability of government commitment
  - Fuel cycle concerns
  - Environmental responsibility
  - Commitment to International Regimes and Standards

# Are nuclear power projects “different”?

- Nuclear vs. Other Major Infrastructure Projects
  - Nuclear projects share many similar risks with other large infrastructure projects (high cost, long construction period, etc.)
    - *BUT*: How such risks are “scored” might be very different
- Note: The biggest challenge for nuclear power projects is financing such projects
- Financing risk is all about project risk

# 원전 프로젝트 관련 이해 당사자들



# Types of Risk

- Political
- Country
- Regulatory / Licensing
- Technology
- **Completion**
- Labor & Materials
- Electricity Market
- Operational
- Environmental
- Nuclear Incident
- Reputational

## Speaking of Risk ... (cont.)

- One of the principles of Project Finance is ...

*The risk should be borne by the party in the best position to manage the risk.*

**Consider: Is this statement fully applicable to a nuclear power project?**

- But in a financing / project development context, important to consider incremental costs to the project:

**What is the “risk premium” associated with the assumption of risk by supplier, contractor, or offtaker?**

**Who bears the risk if the key project participants got it wrong?**

**For lenders, the key question is: Have all the risks been addressed and allocated among the key project participants?**

# Risk Allocation: The Players

## ■ Risk Allocation can be sorted among

- Developer / Owner
  - Operator
  - Government
  - NSSS supplier
  - Other major equipment suppliers (*i.e.*, turbine supplier)
  - Major contractor(s)
  - Insurance providers
  - Offtaker
  - Financing entities
- **Lenders are probably the least likely entity for risk allocation purposes**

## ■ Government support is critical to the development and financing of a nuclear power plant

- ❖ Government as a potential option for risk transfer
- ❖ Government has the ability to take the “long view” (e.g., France’s decision in the 1970s)
- ❖ Government as guarantor

# Possible Ownership/Financing Structures



## 소유/금융 구조 유형

- 주권 정부 주도형 모델
- 유틸리티 주도형 모델
- 연계 투자자 모델
- 대형 전력 소비 산업 주축 모델
- 다수 유틸리티 연합 모델
- 프로젝트 파이낸스 모델

# Financing a Nuclear Power Project

- Conclusion: Need for creative and tailored remedies to support financing structures
  - Even though it might not be a “project financed” transaction, reputational concerns will necessitate a robust reporting and covenant package, applying project finance discipline to the project review process
    - Environmental considerations
      - ❖ Equator Principles
      - ❖ IFC Environmental Guidelines
      - ❖ OECD Environmental Guidelines
    - International Nuclear Obligations
      - ❖ Nuclear Liability
      - ❖ The 3Ss of Safety / Security / Safeguards
      - ❖ Bilateral agreements
    - Confidence in the host country regulator
    - Importance of technical due diligence on the project
      - ❖ Getting paid back is only half of the equation

# Traditional Models / Sovereign: Increasing / Reducing Country Risk

- Areas of Concern
  - Choice of law
  - Choice of forum (dispute resolution)
  - Exchange rate
  - Currency controls
  - Local content
  - Technology transfer
  - International regimes
    - Nuclear liability
    - Non-proliferation & safeguards
    - Environmental issues
    - International codes and standards
  - Tax policy
  - Import restrictions
  - Anti-corruption / ethical behavior
  - Licensing restrictions
  - Ownership restrictions

# Government-to-Government Model

- The nuclear procurement is done at a government-to-government level
- Financing can be through an intergovernmental loan
- Currently being used by Russia in a number of locations (India, Vietnam, Bangladesh, Belarus, Nigeria, etc.)
- Pros: Makes financing easier
- Cons: Limits technology choice
- Key Consideration: Strength of bilateral relationship
- Realization: Government is a key factor in a nuclear development program

# Traditional Models / Utility Balance Sheet

## ■ Utility Balance Sheet Model

- National (or regional) utility is the developer / owner / operator
- Financing is obtained based on the strength of the utility's balance sheet
  - Regulated power market
  - Ability to pass along development costs to the rate base (during construction and operation)
  - Possible need for a sovereign guarantee
    - Function of utility's size
    - Function of nuclear liability regime
  - ECA financing and commercial financing are both possible
- But note market capitalization limitations

# United States Utilities – Market Values of Companies

<i>Utility</i>	<i>Market Capitalization (Billions)</i>
Duke Energy*	\$47.4
Southern	\$41.8
Exelon	\$33.2
Dominion	\$30.9
NextEra	\$29.5
Entergy	\$12.7
SCANA	\$6.3
NRG	\$4.5

- Utilities are small compared to the multi-billion dollar NPP investment
- Building a single new nuclear plant is a “bet the company” proposition
- Publicly traded companies, judged on quarterly and annual results, struggle (because of long NPP development periods and costs) to justify the benefit of an asset that generates revenue for 60 – 80 years
- Whereas corporate entities might not be able to take the “long view”, governments can

■ Source: Bloomberg.com (as of July 26, 2012)

\* Just completed merger with Progress Energy

## European Utilities – Market Values of Companies (Cont'd)

<i>Representative European Utilities</i>	<i>Billions (Apr 2012)</i>	<i>Billions (Oct 2009)</i>
GDF Suez	\$48.5	\$65.8
E.ON	\$42.1	\$74.6
EDF	\$35.6	\$71.0
ENEL	\$24.5	\$39.8
RWE	\$23.7	\$48.3
Iberdrola	\$20.6	\$48.9

- Utilities abroad are larger compared to the multi-billion plant investment
- Building a single nuclear plant might not be a “bet the company” proposition, but capacity constraints still remain
- Note the decline, even since 2009
- Source: Bloomberg.com  
(as of July 26, 2012)

# “Tied Equity Investor” Model

- TEI involves an equity investment by the technology provider, with possible additional support from “country of origin” utilities
- Examples include:
  - South Texas Units 3&4 – Toshiba invested and TEPCO intended to invest in the project
  - Comanche Peak Units 3&4 – MHI has invested in the project
  - UAE Units 1-4 – KEPCO has invested in the project
  - UAE Units 1-4 – Total and GDF Suez intended to invest in the project
  - Turkey / Akkuyu Units 1-4 – Rosatom / Atomstroyexport will invest in the project
  - Lithuania – Hitachi’s equity investment as a precursor to the NSSS selection
- Rationale:
  - Provides foreign source of equity
  - Reduces burden on host owner
  - Facilitates export of technology; it is not a traditional “equity play”
  - Provides further human resources development of “country of origin” utilities (as well as source of expertise in cases like the UAE and Turkey)
  - Creates an alignment of interests (?)

# Equity Considerations – Multi-utility Model

## ■ Structure:

- Multiple utilities hold an ownership interest in the asset
- Rationales:
  - Share project risk
  - Minimize impact to balance sheet
  - Achieve economies of scale by developing a larger project
  - Share a desirable site
  - Combine competences
- Tenant in Common / Undivided Interest
  - Share all project costs to develop the project
  - Share all operations & maintenance costs after commercial operation commences
  - Protection against bankruptcy of another participant
  - Special approval rights over “major decisions”

# Export Credit Agencies – The OECD Rules

- Governed by the “OECD Arrangement on Officially Supported Export Credits”
  - Designed to create a level playing field, so that competition is based on the underlying goods and services, not the terms and conditions of the financing
  - For financing nuclear power plants, the key tools for project-level financing include:
    - Direct Loans
    - Guarantees of Commercial Bank Loans
    - Investment Insurance

# Points to Ponder



## 요약 결론

### ■ 주요 주제:

- 어느 나라, 어느 기업이건 초 대형 사업
- 지정학적으로 높은 가시성
- 시간과 재정상 초 대규모 장기투자 추진 필요
- 정부 지원 필수적
- 국가간 “National Champion” 지원 경쟁
- 초기에서부터 지속적인 투자가 장기적인 성공의 절대 필요 조건
  - 한국 성공의 주 요인

# Key Question: What are your policy goals?

## IF:

- one believes that nuclear power should be part of the national energy portfolio (and a strategic export from the exporting country's viewpoint) ...
- commercial banks are not willing to take “uncovered” nuclear project risk and financial markets are constrained ...
- nuclear power projects are not “winning” short term propositions from corporations whose results are driven by quarterly and annual statements ...
- the “market” is not driving the desired result ...
- host governments, in many cases, lack adequate resources to develop nuclear programs and nuclear projects ...
- financing packages are becoming key elements, if not differentiators, in bid submissions ...

## THEN:

- Government can step in to shape the result to achieve the “greater good”
- Governments can take the long term view

## THEREFORE:

- Government needs to employ a number of tools to achieve that goal
- Financial tools address the greatest challenge to nuclear power plant development
- Recognize, too, that, **globally**, NPP development is **government-driven** in today's market

# Concluding Thoughts

- Conclusion - Ultimately, it has to be a viable project
  - Economics must work
  - Participants need to be dependable
  - There is no silver bullet here.
    - Innovation will be in how risk is perceived, allocated, and mitigated. “Innovation” will come from risk allocation, not new structures
    - Conditions will change over time
  - For further thought: Do small modular reactors (SMRs) provide an alternative approach to nuclear power plant development and the challenges associated with financing nuclear power plants?

감사합니다!

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Young Joon (“YJ”) Kim, a partner of the international law firm of Milbank, Tweed, Hadley & McCloy LLP, is currently based in its Hong Kong office, having previously served in the firm’s offices both in New York and Tokyo, and focuses on international project development and finance, particularly in the areas of energy, natural resources, petrochemical, technology, telecommunications and transportation.

In the nuclear power sector, he started his involvement early in his career in the 1980s while advising international lenders in the US Ex-Im Bank-backed financing of nuclear power plants (NPPs) in Korea. He is currently advising the proposed lenders, including Korea Eximbank, in the largest cross-border financing for a major new-build NPPs project being constructed by KEPCO in Abu Dhabi.

In other sectors and regions, Mr. Kim has worked on power projects in China, Indonesia and the Middle East, petrochemical projects in Singapore and the Middle East, telecom projects in Thailand and the Philippines, steel mill projects in India and Brazil, and power and mining projects in Latin America.

Mr. Kim has spoken at conferences organized by 한국플랜트산업협회, 해외건설협회, 한국에너지경제연구소, 한국증권법학회, 대한변호사협회, 한국산업은행, 서울대학교 로스쿨, 성균관대학교 로스쿨, 이화여자대학교 국제대학원, 한국금융연수원, 한국수출입은행, 한국경영학회, Asian Corporate Governance Association, Asia Law Journal, Asia Business Forum, Asia Venture Forum, Asia-Pacific Satellite and Communications Conference, In-House Congress, and others, on topics including project finance, energy, telecommunications, international banking, private equity, M&A, and corporate governance.

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