Financing Nuclear Power

@ Nuclear Power Asia 2013
15-16 January 2013
Shangri-La Hotel, Kuala Lumpur

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1. Cost Components for a Nuclear Power Project - An Overview
Budget Distribution in NPP Construction

Direct cost : Indirect cost = 60 : 40
Unit : %
2. Cost Estimates of Nuclear Power Plants
The construction cost estimates for new nuclear power plants are very uncertain and have increased significantly in recent years. Companies that are planning new nuclear units are currently indicating that the total costs (including escalation and financing costs) will be in the range of $5,500/kW to $8,100/kW or between $6 billion and $9 billion for each 1,100 MW plant.

Recent nuclear construction costs estimates are summarized in the following table:

<table>
<thead>
<tr>
<th>Forecast</th>
<th>Overnight Cost ($/kW)</th>
<th>Total Plant Cost ($/kW)</th>
<th>Total Plant Cost - 2 Units (billions$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOE (2002)</td>
<td>$1,200</td>
<td></td>
<td>$2</td>
</tr>
<tr>
<td></td>
<td>$1,500</td>
<td></td>
<td>$4</td>
</tr>
<tr>
<td>MIT (2003)</td>
<td>$2,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Keystone Center (2007)</td>
<td>$2,950</td>
<td>$3,600</td>
<td>$2</td>
</tr>
<tr>
<td></td>
<td>$2,950</td>
<td>$4,000</td>
<td>$4</td>
</tr>
<tr>
<td>Moody's Investor Services (2007)</td>
<td>$4,000</td>
<td></td>
<td>$12.1</td>
</tr>
<tr>
<td></td>
<td>$6,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Florida Power &amp; Light (2007)</td>
<td>$3,108</td>
<td>$5,492</td>
<td>$17.8</td>
</tr>
<tr>
<td></td>
<td>$4,540</td>
<td>$8,081</td>
<td>$14.0</td>
</tr>
<tr>
<td>Progress Energy (2008)</td>
<td></td>
<td></td>
<td>$6.4 for 45% of 2 plants</td>
</tr>
<tr>
<td>Georgia Power (2008)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Overnight costs: the cost of a construction project if no interest was incurred during construction, as if the project was completed "overnight."
Figure III shows the overnight costs for both the completed plants and the projections for future plants. The estimates are roughly equally divided between government consultants, utilities, government entities, utilities, and Wall Street/independent analysts, plus a small number of academic institutions.

The "great bandwagon market" for nuclear reactors comprised construction delays and cost overruns, as well as regulatory changes which drove the cost of reactors up dramatically. More than half of all the orders for reactors were cancelled.

By 2008, projected costs were three to four times higher than the initial cost projections in 2001-2004.

Source: Nuclear Monitor, Economics of Nuclear Reactors- Rennaisance or Relapse August 28, 2009
3. Key Challenges for Financing Nuclear Power
High Up-front Capital Investments (~ US$ 2 billion per plant)

Long construction period (~ 4-8 years) - Construction periods for nuclear power plants in various countries have ranged from 4 to 15 years

Long Operations period required to cover up-front investment - Long term return on investment

Low marginal Energy production cost
Beyond 15-25 years of operations, after capital recovery, the project becomes very economic. License to print money

Longer plant lifetime pre-designed into project – current 60 years compared to previous 40 years

Need to collect decommissioning fund during plant operations period

Very long project costs/revenue streams (~100 years)
4. Financing Structures and Its Changing Dynamics
Dynamics of financing
Changing dynamics – Government to private sector

Ownership evolution

Government & State owned companies
- France (EDF)
- Sweden (Vattenfall)
- UK (BE)
- Russia
- China
- India

Large utilities privatised
- Often as a consequence of privatisation
- Belgium (Electrabel)
- Germany (E.ON, RWE)
- Japan (Tepco, Kansai Electric, Kyushu...)
- Spain (Endesa, Iberdrola, UF)
- US (Entergy, Exelon, FPL)

Independent developers
- Finland (TVO)
- US (NuStart, Unistar Nuclear)

Debt evolution:
- Government debt
- Equity & Corporate debt
- Hybrid debt

Will true project finance be possible? Level of Government involvement?

Pre-conditions for Financing Nuclear power
Overview of Financing Structures for NPPs

Sovereign Risk

- Sovereign Guarantee or Equivalent
- State Companies Regulated Market
- Corporate Risk Regulated Market
- Cooperative Structure
- Greenfield/Brownfield SPC's, With Strong State Support

Project Risk

- Limited Recourse
- Merchant Plant BOT PPP

Countries:
- Russia: 70'-90'
- India, China: 60' - up to now
- USA: 60'-70'
- Finland: 2003
- Canada, USA: 00'-10'

IAEA INFRASTRUCTURE TECHNICAL MTG 5-9 Nov 2007
5. Sources for Financing Nuclear Power
Financing of Nuclear Power

Local/Domestic Financing Sources
- Utilities/Owners/Investors own resources
  - EQUITY Capital (min 15%)
  - Internal Cashflow
- Debt
  - Local Commercial bank loans
  - Domestic Bonds
  - Standby Facilities for Cost increase

International Financing Sources
- International Markets
  - International Commercial bank loans
  - International Bonds (E.g. Eurobonds)
- Export Credit Agencies (ECAs)
  - Subject to OECD Consensus
  - Financing covers 85% of the cost of services & equipment (excluding IDC) from exporters' country
  - Export credits from exporting country's ECAs through supplier or buyer credit scheme
- Bilateral Financing sources
- Multilateral Development Institutions (MDIs)
  - The World Bank Group
  - Development Bank & Organizations
  - European Investment Bank (EIB)
  - Other Institutions

Source: Financing Arrangements for Nuclear Power Projects in Developing Countries, A Reference Book, IAEA, TECHNICAL REPORTS SERIES No. 353, 1993
6. Banks Financing Nuclear Power
Between 2000 – 2009, 867 transactions involving 124 commercial banks had financed nuclear power to the sum of Euro 176 billion.

<table>
<thead>
<tr>
<th>Nos</th>
<th>Type</th>
<th>Number of Transactions</th>
<th>Nuclear Value Euro Billion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Bond Issue</td>
<td>595</td>
<td>92,188</td>
</tr>
<tr>
<td>2.</td>
<td>Corporate Loans</td>
<td>134</td>
<td>66,281</td>
</tr>
<tr>
<td>3.</td>
<td>Share issue</td>
<td>45</td>
<td>6,763</td>
</tr>
<tr>
<td>4.</td>
<td>Shareholder</td>
<td>29</td>
<td>435,000</td>
</tr>
<tr>
<td>5.</td>
<td>Project Loan</td>
<td>15</td>
<td>2,189</td>
</tr>
<tr>
<td>6.</td>
<td>Revolving Credit</td>
<td>6</td>
<td>1,276</td>
</tr>
<tr>
<td>7.</td>
<td>Bond holder</td>
<td>16</td>
<td>401,000</td>
</tr>
<tr>
<td>8.</td>
<td>Others</td>
<td>27</td>
<td>3,044</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>867</td>
<td>176,492</td>
</tr>
</tbody>
</table>

Bulk of nuclear financing takes place in the form of bond issues (595 transactions) and corporate loans (134 transaction) between 2000-2009.

Source: Nuclear Banks, No Thanks – A Study by Profundo, an independent consultancy firm based in Netherlands commissioned by Greenpeace/Banktrack.
### Top 10 Banks Financing Nuclear Power from 2000-2009

<table>
<thead>
<tr>
<th>Rank</th>
<th>Bank</th>
<th>Country</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>PNB Paribas</td>
<td>France</td>
<td>Euro 13,502 million</td>
</tr>
<tr>
<td>2.</td>
<td>Barclays</td>
<td>United Kingdom</td>
<td>Euro 11,463 million</td>
</tr>
<tr>
<td>3.</td>
<td>Citi</td>
<td>United States</td>
<td>Euro 11,413 million</td>
</tr>
<tr>
<td>4.</td>
<td>Societe Generale</td>
<td>France</td>
<td>Euro 9,750 million</td>
</tr>
<tr>
<td>5.</td>
<td>Credit Agricole</td>
<td>France</td>
<td>Euro 9,179 million</td>
</tr>
<tr>
<td>6.</td>
<td>Royal Bank of Scotland (RBOS)</td>
<td>United Kingdom</td>
<td>Euro 8,576 million</td>
</tr>
<tr>
<td>7.</td>
<td>Deutsche Bank</td>
<td>Germany</td>
<td>Euro 7,842 million</td>
</tr>
<tr>
<td>8.</td>
<td>HSBC</td>
<td>UK / Hong Kong</td>
<td>Euro 7,578 million</td>
</tr>
<tr>
<td>9.</td>
<td>JP Morgan Chase</td>
<td>United States</td>
<td>Euro 6,721 million</td>
</tr>
<tr>
<td>10.</td>
<td>Bank of China</td>
<td>China</td>
<td>Euro 6,011 million</td>
</tr>
</tbody>
</table>

Top 10 Nuclear Banks had offered Euro 92 billion to the nuclear industry between 2000 – 2009

Source: Nuclear Banks, No Thanks – A Study by Profundo, an independent consultancy firm based in Netherlands commissioned by Greenpeace
### Subsequent Top 10 (11-20) Banks Financing Nuclear Power from 2000-2009

<table>
<thead>
<tr>
<th>Rank</th>
<th>Bank</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.</td>
<td>Mitsubishi UFJ</td>
<td>Euro 5,389 million</td>
</tr>
<tr>
<td>12.</td>
<td>Mizuho</td>
<td>Euro 4,799 million</td>
</tr>
<tr>
<td>13.</td>
<td>Morgan Stanley</td>
<td>Euro 4,327 million</td>
</tr>
<tr>
<td>14.</td>
<td>Merrill Lynch</td>
<td>Euro 4,082 million</td>
</tr>
<tr>
<td>15.</td>
<td>UBS</td>
<td>Euro 3,990 million</td>
</tr>
<tr>
<td>16.</td>
<td>UBN Amro</td>
<td>Euro 3,979 million</td>
</tr>
<tr>
<td>17.</td>
<td>Commerz bank</td>
<td>Euro 3,926 million</td>
</tr>
<tr>
<td>18.</td>
<td>Goldman Sachs</td>
<td>Euro 3,731 million</td>
</tr>
<tr>
<td>19.</td>
<td>Sumitomo Mitsui</td>
<td>Euro 3,238 million</td>
</tr>
<tr>
<td>20.</td>
<td>Natixis</td>
<td>Euro 3,145 million</td>
</tr>
</tbody>
</table>

source: Nuclear Banks, No Thanks – A Study by Profundo, an independent consultancy firm based in Netherlands commissioned by Greenpeace
## 21-44 th Banks Financing Nuclear Power from 2000-2009

<table>
<thead>
<tr>
<th>Rank</th>
<th>Bank</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.</td>
<td>Credit Suisse</td>
<td>Euro 2,924 million</td>
</tr>
<tr>
<td>32.</td>
<td>Nordea</td>
<td>Euro 2,686 million</td>
</tr>
<tr>
<td>33.</td>
<td>Bank of America</td>
<td>Euro 2,361 million</td>
</tr>
<tr>
<td>34.</td>
<td>UniCredit/HVB</td>
<td>Euro 2,310 million</td>
</tr>
<tr>
<td>35.</td>
<td>Nomura</td>
<td>Euro 2,172 million</td>
</tr>
<tr>
<td>36.</td>
<td>Bayerische Landesbank (BLB)</td>
<td>Euro 1,755 million</td>
</tr>
<tr>
<td>37.</td>
<td>BBVA</td>
<td>Euro 1,658 million</td>
</tr>
<tr>
<td>38.</td>
<td>ING</td>
<td>Euro 1,563 million</td>
</tr>
<tr>
<td>39.</td>
<td>Royal Bank of Canada</td>
<td>Euro 1,538 million</td>
</tr>
<tr>
<td>40.</td>
<td>Lehman Brothers (now bankrupt)</td>
<td>Euro 1,428 million</td>
</tr>
<tr>
<td>41.</td>
<td>SEB Bank</td>
<td>Euro 1,287 million</td>
</tr>
<tr>
<td>42.</td>
<td>Gazprombank</td>
<td>Euro 1,236 million</td>
</tr>
<tr>
<td>43.</td>
<td>Intesa San Paolo</td>
<td>Euro 1,071 million</td>
</tr>
<tr>
<td>44.</td>
<td>China Construction Bank</td>
<td>Euro 1,027 million</td>
</tr>
</tbody>
</table>

Source: Nuclear Banks, No Thanks – A Study by Profundo, an independent consultancy firm based in Netherlands commissioned by Greenpeace
7. Export Credit Agencies (ECAs) Financing Nuclear Power
Export financing schemes

In general, two types of lending programs are available from ECAs to finance electric power projects in developing countries.

The first is a supplier's credit, which has been widely used to encourage export of energy production plants and other heavy machinery and equipment. This scheme is a form of indirect financing as shown in Fig. 4.1.

In other words, instead of making direct provisions to overseas power utilities, ECAs extend credits to their countries' exporters. From the viewpoint of the ECA, the supplier's credit is a relatively easy method and covers a range of items, from turbines or insulators to a complete turnkey project.
The other scheme is a buyer's credit, in which an ECA directly funds overseas buyers or overseas financial institutions as shown in Fig. 2.

The terms and conditions of the above types of export financing are bound by the OECD Consensus on export credit. For example, the maximum repayment period and the lowest interest rate are fixed by its rules.

The OECD Consensus has to be strictly observed by ECAs. Export loans can be supplemented by commercial loans for those parts not covered by credit insurance, e.g., 15% of down payments or local costs.

Fig. 2 Buyer credit scheme
Export-Import Bank of the United States (Ex-Im Bank) has authorized a $2 billion direct loan to the Barakah One Company of the United Arab Emirates (U.A.E.) to underwrite the export of American equipment and service-expertise for the construction of a nuclear power plant in the Emirate of Abu Dhabi, U.A.E.
8. Financing of Nuclear Power Plants by Government
Traditionally and in a large number of countries presently, Government has a significant interest and stake in the energy sector primarily due to the concern for security of energy supply.

Consequently Government took an active role in financing and managing the energy sector entities.

In many countries including the BRICs (Brazil, Russia, India and China), the traditional method of financing energy projects, in particular for nuclear energy involves nuclear power plants (NPPs) being financed and owned by government and state-owned enterprises.
Government Financing

Traditional Methods of Financing

Government Budget

Official Borrowing

Public Utility

Nuclear Power Project

IAEA
9. Financing of Nuclear Power Plants by Cooperatives

Hybrid Financing
9. Financing of Nuclear Power Plants by Cooperatives
Hybrid Financing
9. Financing of Nuclear Power Plants by Cooperatives
Hybrid Financing
Finland has several industries related to paper and metal production that are highly dependent on the availability of low cost energy.

At the same time EU targets oblige Finland to reduce greenhouse gas emissions from burning fossil fuels and to produce enough renewable energy to cover 38% of all energy consumption by 2020.

The new climate and energy strategy, developed in response to this EU directive, aimed to make Finland self-sufficient in electricity production, and to reduce greenhouse gas emissions. It included nuclear power as a future option.
In December 2003, TVO concluded an agreement with a consortium comprising Areva and Siemens for the plant’s construction.

The global amount of the turnkey project was estimated at €3 billion. In order to finance this project, TVO raised fresh equity capital from its shareholders and concluded loans.

One of the loans, for €570 million, is guaranteed by Coface, the company that manages export-credit insurance on behalf of the French government. For this guarantee, TVO pays a fee to the French government called the “guarantee premium”
The Olkiluoto 3 (OL3) project is the first Generation III+ reactor to be constructed in the world.

TVO is the developer, owner and operator of the Olkiluoto nuclear power plant.

Teollisuuden Voima Oyj (TVO) Company is a Finnish power company jointly owned by 16 Finnish industrial companies and power utilities established in 1969, to produce electricity for its shareholders at cost price.

TVO makes no profit as a company and the shares do not give right to dividends.

According to its articles of association, TVO shareholders pay fixed costs in relation to their shares of the stock, and receive corresponding right to the produced electricity.

• This is called “Mankala principle”, the name refers to a Supreme Administrative Court decision made in 1963 in a case where Oy Mankala Ab (hydropower company) was charged on paying hidden dividends to its shareholders.
Financing of Nuclear Power Plant- Okiouluoto, Finland

The Olkiluoto 3 project is the first Generation III+ reactor to be constructed in the world.

**Customer:** Teollisuuden Voima Oyj (TVO) a private power company

**Supplier:** Consortium formed by AREVA NP and Siemens AG (73%/27%), led by AREVA NP

- Areva is supplying the nuclear island & coordinating the overall project
- Siemens PG built the turbine island and will supply the turbine generator set.

**Supply scope:** 1 EPR™ unit in turnkey construction

The turnkey contract between TVO and AREVA was signed at the end of 2003.

**Net electric output:** 1,600 MWe

The construction license was granted and construction started in 2005.
TVO’s Ownership Structure

TVO's underlying shareholders are a mix of:
- industrial companies (including power companies), which account for about two-thirds of the shares 44% industry + 26 % Fortum = 70 %,
- and municipalities= 30 %, which account for about one-third.

Its shareholders receive a proportion of the electric power produced at cost according to their share

TVO’s largest shareholders with a combined ownership of over 80% are energy companies Fortum Power and Heat, and Pohjolan Voima, the latter in turn is owned mostly by pulp and paper companies UPM-Kymmene (43%) and Stora Enso (15%)

The A series shares entitle the shareholders to the electricity generated by the current plant units, the B series shares to the electricity by the new plant unit OL3, and the C series shares to the electricity generated by the Meri-Pori coal-fired power plant.

RECENT DEVELOPMENTS OF NUCLEAR POWER IN FINLAND: OLkiluoto 3, AND MORE… Jarmo Vehmas, University of Turku and Finland Futures Research centre 15th REFORM Group meeting Schloss Leopoldskron, Salzburg, 10.9.2010
Shareholders have committed to contributing 25% of total investment costs in the form of equity and subordinated shareholder loans.

Each TVO shareholder contributes a proportion of the costs of building and operating the plant, in return for electricity supplies (principally for their own use, with any surplus being sold in the Nordic electricity market).

There are long term off take contracts in place (~15 years) from a wide group of high/intensive energy users.

Shareholders Are at-Cost Electricity Off-Takers

TVO’s six shareholders — five utilities (some municipally owned) and Kemira, a chemicals company, with large electricity needs — are the off-takers of the electricity generated in its plants. The two largest are PVO (57.9% stake), itself a not-for-profit generator owned by a consortium of Finnish industrials (mainly in pulp and paper) and municipally owned utilities, and Fortum Power and Heat (26.1% stake), a wholly owned subsidiary of Fortum Corporation.
About sixty companies from Helsinki to Rovaniemi have invested in the OL3 unit. These companies will either use the electricity themselves or sell it on the free market.

Sellers of Electricity involved in OL3

TVO generate electricity for its shareholders, who use it themselves or resell it to their clients. The nuclear power produced is used across Finland through municipalities and industrial companies owning TVO.

Industrial sector
- Kemira Oyj
- Kemira GrowHow Oyj
- Kumera Oy
- Oy Metsä-Botnia Ab
- M-Real Oyj
- Myllykoski Oyj
- Outokumpu Oyj
- Rautaruukki Oyj
- Stora Enso Oyj
- UPM-Kymmene Oyj
Finland case study – Olkiluoto 3

Financing structure development

18 December 2003

30 September 2006

Long-term expectation

Pre-conditions for Financing Nuclear power

Source: Case Study: Financing the Olkiluoto 3 project, Lauri Flexkar, TVO, Euromoney Conference

ING
New Long Term Financing Commitments for OL3 Project

Observation:

I) From 2003 - 2008

1) Shareholders equity at 20 % and loan at 5 % - remains throughout
2) Revolving Credit Facility is reduced from 57 % to 44 %
3) Bilateral Loans is reduced from 18 % to 14 %
4) Buy’s credit introduced - is at 17 %

II) Under TVO’s Long term Plan

1) Shareholders equity at 20 % and loan at 5 % - remains throughout
2) Revolving Credit Facility is reduced
3) Bilateral Loans is reduced from 14% to 10 %
4) Buy’s credit is reduced from 17 % to 10 %
5) Introduction of new financing schemes – i) Private Placements at 15 % and ii) Bonds at 30 %
New Long Term Financing Commitments for OL3 Project

As of 18 December 2003

TVO has also signed a number of bilateral loans with other financial institutions that will approximately cover 15–30% of the total project costs. One of these loans was granted by AB Svensk Exportkredit (SEK) - a 100% owned Swedish State Export Credit insurer for 110m Swedish crowns (€100m). = 4%

As of 31 December 2008

Original Credit facility (syndicated credit) agreed in December 2003 Euro 1.95 billion = 58% Offered by 5 banks lead by BLB

Adjustments were made in 2004

- The Credit facility is Reduced to Euro 1.35 billion = 42% due to another credit Euro 570 million granted by nearly same syndicated bank and guaranteed by COFACE (This loan is directly insured by COFACE acting as the insurer for export credits on behalf of the French government.

- £570 million, the guaranteed loan was equivalent to nearly 30 per cent of the total £1.9 billion loan,

IN 2005
TVO signed a new Credit facility of Euro 1.6 billion and will pay a lower interest rate than that of credit facility obtained in 2003 and cancelled the original credit facility of 2003

Long-term plan

Shareholders have committed to contributing 25% of total investment costs in the form of equity and subordinated shareholder loans.

Two export credit institutions are also involved:
1) France's Coface, with a €610m export credit guarantee covering Areva supplies, and
2) the Swedish Export Agency SEK for €110m.

In March 2004, a EUR587m facility guaranteed by French export credit agency Coface was arranged, replacing part of the original revolving credit facility, while in June 2005, the rest of the original revolving credit facility and some bilateral loan commitments were refinanced.

All other four banks in the consortium are private banks, being responsible for the biggest part of the facility and therefore their banking conditions given to TVO are the guideline for market economic behaviour of a private investor.
In October 2006, the European Commission opened its investigation on the basis of two complaints, a formal investigation procedure to verify whether the guarantee had been granted on market terms and did not include state aid elements.

The European Commission (EC) has closed its investigation under state aid rules and found the French government guarantee from COFACE insuring a loan to TVO does not constitute state aid.
10. New Financing Models
- Loan Guarantees (USA)
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A nuclear project will normally be led by a large utility, often one experienced in the field of nuclear operations, possibly joined by other partners.

These may include other utilities which will also own rights to sell a proportion of the electricity produced, non utility investors whose only role is to provide finance, and even large electricity consumers who take a proportion of the plant’s output for their own use. In any event, there will be other parties to the project, including at least the nuclear industry companies contracted to actually build the plant. These other parties will be expected to share some of the risks of the project, even if they do not directly provide financing.

IDEAL FINANCING MODEL
The lead utility (and its partners, if any) can raise financing for the project from its own resources, i.e. from a mixture of cash in hand, current revenues, and loans taken against existing assets. The availability and cost of such financing depends on the strength of the balance sheet(s) of the project participant(s). The utility (and any partners) will directly own the NPP as an asset, and will also operate the plant and earn revenues from its output.

Insofar as financing is provided by banks and other financial institutions, these loans are secured against all the assets of the utility and any other partners, not against the nuclear project itself.

Lenders will be willing to provide loans if the collateral is considered sufficient.

The drawback of such financial arrangement is that it places the assets of the utility and any partners directly at risk if there should be problems with the project. With the investment in an NPP amounting to several billion US dollars, unless the utility is a very substantial company such an investment would:
1) in itself have a negative effect on the company’s credit rating,
2) increasing its cost of capital across the board.
3) Clearly, the failure of the project could put the company in danger of bankruptcy.

### Table 3. Approximate market capitalisation of leading US utility companies

<table>
<thead>
<tr>
<th>Utility</th>
<th>Market capitalisation (USD billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exelon Corporation</td>
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<tr>
<td>FPL Group</td>
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<td>Southern Company</td>
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<td>Dominion Resources</td>
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<td>Duke Energy Corporation</td>
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<td>Public Service Enterprise Group</td>
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<td>Entergy Corporation</td>
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<td>PG&amp;E Corporation</td>
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<td>American Electric Power</td>
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<td>PPL Corporation</td>
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<td>Firstenergy Corporation</td>
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*Source: Yahoo Finance.*  
*As of May 2009.*

### Table 4. Approximate market capitalisation of selected European utility companies

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<thead>
<tr>
<th>Utility</th>
<th>Market capitalisation (USD billion)</th>
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<tr>
<td>Électricité de France</td>
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<td>GDF-Suez (France)</td>
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<td>E.ON (Germany)</td>
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<tr>
<td>RWE (Germany)</td>
<td>42</td>
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<tr>
<td>ENEL (Italy)</td>
<td>35</td>
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</table>

*Source: individual company websites.*  
*As of May 2009.*  
*Exchange rate: EUR 1 = USD 1.37.*
The U.S. Energy Policy Act of 2005 (EPACT) authorized the DOE to provide government loan guarantees for advanced nuclear reactors or other emission-free technologies up to 80 percent of the project cost - loan guarantees allow the purchasers of reactors to obtain the lowest possible interest rates.

Congress had authorized up to $18.5 billion for new nuclear power plants.

On Feb. 16, 2010 President Obama announced the award of $8.3 billion in federal loan guarantees to build two additional reactors at the Vogtle nuclear plant in Georgia.

This award marks the first loan guarantee for a nuclear plant under the provisions of the Energy Policy Act of 2005. The loan guarantee is conditional until the Vogtle project receives a combined construction and operating license from the NRC, expected in late 2011.

EPACT also allows for up to $2 billion to compensate companies building the first six nuclear power reactors for regulatory delays in the startup process.

Extension for 20 years of the Price Anderson Act for nuclear liability protection.
11. New Financing Models
– Foreign equity Participation – Taishan (CGNPC & EDF)
Chinese Vice Premier Li Keqiang (R) meets with French Prime Minister Francois Fillon in Beijing, capital of China, Dec. 21, 2009. (Xinhua/Huang Jingwen)

China and France on 20 December 2009 launched a long-awaited nuclear power plant joint venture, located in Taishan southern China's Guangdong province,

In August 2008, EDF and CGNPC signed the final agreements for the creation of Taishan Nuclear Power Joint Venture Company Limited (TNPC), 70 percent owned by China Guangdong Nuclear Power Corp and 30 percent by EDF. TNPC responsible for financing, building and operating the first phase of the Taishan Nuclear Power Plant.

The joint venture was formally kicked off during a visit to Beijing by French Prime Minister Francois Fillon.
The Taishan nuclear power plant will be the People’s Republic of China’s first Gen III (third-generation) nuclear power plant and is located in Taishan, Guangdong Province.

French export credits for the project are reported as €1.7 billion ($2.4 billion), covering purchase of equipment such as pressure vessel and steam generators for unit 1 from French suppliers.

Bank of China and Societe Generale signed a comprehensive cooperation agreement on export credit of the Taishan nuclear power station.

China Development Bank and Bank of China serve as co-borrowers relating to the €1.75 billion (approximately US$2.53 billion) financing to purchase equipment and technology from Areva and Alstom for the nuclear power plant to be built by Taishan Nuclear Power Company Limited.

The Guangdong Development Commission quotes the total investment in both units as CNY 49.85 billion ($7.3 billion). [50.2 billion yuan (7.35 billion U.S. dollars).]

The joint venture partners will put up CNY 16.45 billion (33% of project cost) and the balance will be borrowed with guarantee from the Central Bank of France.

EDF has 30% equity € = 2.4 billion. Over 4 years it will pay €600-800 million each year.
12. Recommendations
THANK YOU

sheriffahnai@hotmail.com
## Major Financial risks: Credit Risk

<table>
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<th>Fitch</th>
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<th>Moody's</th>
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**Source:** Nadira