Electricity Market Reform

Challenges and opportunities facing market participants

June 2013
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Section 1

Overview
Section 1 – Overview

PwC has global experience in EMR strategy

We have experience in:

<table>
<thead>
<tr>
<th>Restructuring</th>
<th>Regulation</th>
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<tbody>
<tr>
<td>Retail Competition</td>
<td>IPPs</td>
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<tr>
<td>Interconnectors</td>
<td>Nuclear</td>
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<tr>
<td>Unbundling</td>
<td>Trading</td>
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<td>Market Power</td>
<td>Systems</td>
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Section 1 – Overview

Our worldwide energy and utilities network has five centres of excellence

<table>
<thead>
<tr>
<th>UK</th>
<th>US</th>
<th>Germany</th>
<th>Norway</th>
<th>Australia</th>
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<tbody>
<tr>
<td>Steve Jennings</td>
<td>David Etheridge</td>
<td>Norbert Schwieters</td>
<td>Staale Johansen</td>
<td>Michael Happell</td>
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<tr>
<td>Head of UK Utilities</td>
<td>Head of US Utilities</td>
<td>Global Utilities Leader</td>
<td>Head of Norwegian Utilities</td>
<td>Head of Australian Utilities</td>
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UK Energy and Utility Team

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<tr>
<td>Antony Cook</td>
<td>Karen Dawson</td>
<td>Ronan O’Regan</td>
<td>Akira Kashima</td>
<td>Yoichi Hazama</td>
</tr>
<tr>
<td>Asset Management</td>
<td>Restructuring and Deals</td>
<td>Trading and Financing</td>
<td>Head of Japan Consulting</td>
<td>Head of Japan Utilities</td>
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Japan

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<tr>
<td>Koichi Noguchi</td>
<td>Michihiko Irinoda</td>
</tr>
<tr>
<td>Strategy</td>
<td>Operation and Technology</td>
</tr>
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Section 2

Japan faces electricity market challenges
Japan will undertake a four step process to electricity reform to address energy security and competition

1. Nation-wide transmission operation

2. Active generation competition

3. Unbundle the transmission / distribution sector

4. Full retail competition

Vertically integrated big 10 Power Company

Wholesale Electricity Utility
Independent Power Produced (IPP)

Power Produced and Supplier (PPS)

Open Access to T&D

Specified-scale Power Company

In-house Power Generation

Regulated customer (household, etc.)

Customer in the liberalized sectors (factories, office buildings, etc.)
As part of the market reform, there are a series of choices for industry participants

There are five key issues to address:

1. Electricity trading arrangements
2. Coordination of transmission expansion
3. Implementation considerations
4. Evolution of regulation and competition
5. Meeting the carbon challenge

Challenges and opportunities will vary according to market participants’ roles and the phase of regulatory change they are focussed on.
**Shape of the Future**

Nationwide Transmission Organization (NTO) will be established around 2015. Regional TSO still remains under NTO around 2018 – 2020 in the current plan.

<table>
<thead>
<tr>
<th>Current Status</th>
<th>Around 2015</th>
<th>Around 2018 – 2020</th>
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<tbody>
<tr>
<td><strong>West 60Hz</strong></td>
<td>G G G G G</td>
<td>G G G G G G G G G G</td>
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<tr>
<td><strong>East 50Hz</strong></td>
<td>T T T T T T T T T</td>
<td>T T T T T T T T T T</td>
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- 9 vertically integrated EPCs
- Establishing of National Transmission Organization
- Unbundling of Transmission and Distribution from these vertically integrated EPCs

[Diagram showing transmission organization changes from 2015 to 2020]
Section 2 – Japan faces electricity market challenges

**Likely path of change**

**Bills**

2013

1. Establishment of the Nationwide Transmission Organization
   2. Action programs for 2nd and 3rd reforms etc.

2014

- Full liberalization

2015

- Legal unbundling of T/D sector

**Reforms**

Apr. 2, 2013

1. Formulation of a wide-area supply and demand plan
2. Wide-area management of supply and demand and system (to be started as soon as the system will have been made ready)
3. Supply and demand adjustment at the time of emergency and when supply-demand is tight etc.

**First Stage**

At around 2015

- Establishment of the Nationwide Transmission Organization

**Second Stage**

At around 2016

- Full liberalization (entry)

**Third Stage**

At around 2018 through 2020

- Legal unbundling of T/D sector

- Reforms

- Legal unbundling of T/D sector

<table>
<thead>
<tr>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
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<tbody>
<tr>
<td>1. Establishment of the Nationwide Transmission Organization</td>
<td>Full liberalization</td>
<td>Legal unbundling of T/D sector</td>
</tr>
<tr>
<td>2. Action programs for 2nd and 3rd reforms etc.</td>
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<td></td>
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</tbody>
</table>

- Housesholds and other small-scale users can freely pick electric power company or rates setting of their choice
- Formulate systems necessary for user protection (ultimate guarantee service, universal service, etc.)
- Realization of competitive market environment

- Period of transitional arrangement for rate schedule

**Cabinet Decision on the Policy on Electricity system reform**

- Establishment of the Nationwide Transmission Organization
- Action programs for 2nd and 3rd reforms etc.
- Full liberalization (entry)
- Abolition of tariff regulation
Unbundling may result in structural changes

Section 2 – Japan faces electricity market challenges

As Is

1st Stage: NTO

EPC +
Nationwide TSO

2nd Stage:
Unbundling and new entrants

Regulated only player

Competitive only player

Full value chain

3rd Stage: Network separation

Suppliers

Full value chain

Legal separation

EPC

Generator

Network

Generator

Network

Generator

Network

Generator

Network

Transmission

Distribution

PwC
Section 2.1

Trading arrangements
Section 2.1—Trading arrangements

Trading arrangements evolution

- Vertical Integration
- Single Buyer
- Pool
- Bilateral
Section 2.1 — Trading arrangements

Participants face a variety of challenges as the market liberalises

Vertical Integration
- What is the right structure for the industry?
- How should the market be regulated?
- How to implement organisational change?

Single Buyer
- How to attract and retain customers?
- What new systems and procedures are required?
- How to enter the market?
- What should be the trading strategy & organisational setup?

Pool
- How to improve operational performance?
- What new products and services can be offered?
- How to improve contracting strategy?
- Should investment be made in different parts of the value chain?

Bilateral
- What changes are required to improve strategic position?
- What is the impact of LNG on fuel strategy?
- How to improve risk management?
- Are strategic investors required?

Unbundling is a complex process but all value chain activities must be retained
All interfaces must be defined;
Opportunities to enhance competitive positions require a clear strategy
Section 2.1—Trading arrangements

**Vertical integration (current EPCs)**

As the value chain moves from a vertically integrated one towards an unbundled model, there are two important considerations:

1. No activities are lost in the transformation
2. Ensure that all commercial, contractual and technical interfaces are fully defined with clear accountability
Section 2.1 — Trading arrangements

**Single buyer**

A single buyer model is suitable for small systems. It can be successful where there are concerns about market dominance.

**What countries have this?**

- Northern Ireland Electricity (as privatised)
- Thailand (and other SE Asian countries)
- Oman (and other Middle East countries)
Section 2.1 – Trading arrangements

**Pool**

A pool agreement provides established terms and conditions for pool members in order to retain the principle of merit order dispatch and balance electrical load over a larger system with multiple competing participants.

**What countries have this?**

- Ireland
- Argentina
- Spain
- Singapore (but regulated)

Diagram:
- Producers
- Suppliers
- Exchange or Pool
- Spot Price
- Flow of electricity
- Contract
Bilateral contracts

Bilateral Contracts & Imbalance Markets

Bilateral contracts are generally simpler than a pool agreement. The buyer and seller negotiate a set of master terms and conditions that form their basis of trade. Electricity trading can then begin on contracts of any length. Complexity is left to the imbalance market.

What countries have this?

- Australia
- USA
- GB (new)
# Case studies from Great Britain, Nord Pool and Germany give directional indications for Japan

## Case studies from Great Britain, Nord Pool and Germany give directional indications for Japan

<table>
<thead>
<tr>
<th>Great Britain</th>
<th>Germany</th>
<th>Nordpool</th>
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<tbody>
<tr>
<td>Wholesale market description</td>
<td>In Germany, large wholesale volumes are traded off the exchange through over the counter contracts, but spot trading is increasing on the EEX exchange.</td>
<td>A high share of physical trading on the exchange (Nord Pool), drives wholesale accessibility attractiveness. Nord Pool Spot is owned by the Nordic TSOs and Baltic TSOs.</td>
</tr>
</tbody>
</table>

### Diagram

**Producer**

- **N2EX / APX Endex**
- **Bilateral Contracts**
- **Supplier**
- **Flow of electricity Contract**

**OTC Contracts**

- **Exchange**
- **Spot prices**
- **Supplier**
- **Flow of electricity Contract**

### Facts

- **350TWh/year physical trades**
- **~5 TWh/year day ahead, ~14TWh spot/prompt (APX Endex 2012)**
- **Physical trades ~100TWh/year**
- **~930TWh derivatives trades, ~350TWh spot on EEX 2012**
- **Nord Pool Spot’s market share of total consumption was 74% in 2010 or 300 TWh (day ahead & intra-day trading)**
Section 2.1 — Trading arrangements

The frequency split across the Japanese grid may make the transition to a wholesale market challenging.

As the market is restructured, there are a number of challenges going forward, including:

1. The optimisation of resource use;
2. Managing the transition from EPC to a wholesale market; and
3. The implications of levelling wholesale prices.
Cross regional transmission is also limited in Japan, creating interconnection challenges

Frequency in West: **60Hz**

* DC – direct current, FC – frequency conversion
Section 2.2

Coordination of transmission expansion
Ownership and/or control changes may occur as a result of the national TSO

Section 2.2 – Coordination of transmission expansion
Ownership and/or control changes may occur as a result of the national TSO

Strategies required for:
- System modelling
- Capital investment/reinforcement/extension
- Financing commercial arrangements
- Third Party Access
- Implementation (system build for infrastructure extension)
- Charging mechanisms
Section 2.3

Implementation considerations
Current EPC operational model

Single set of systems:

• Finance
• HR
• Procurement
• Management information
• Metering
Establishing strategies, operation models and IT systems

Competitive internal systems:
- Finance
- HR
- Procurement
- Management information

Regulated internal systems:
- Finance
- HR
- Procurement
- Management information

Trading
Market
Settlement system
Customer billing and management systems
Meter registration systems
**Future: maximising competitive advantage through breadth and depth of value chain opportunities**

- **Depth of value chain**
  - Fuel company acquisitions
  - New generation investment
  - Network company M&A
  - Supplier M&A

- **Breadth of value chain**
  - Fuel transportation (e.g. shipping or pipelines)
  - Generation M&A
  - Retail services

*Traditional region + cross-regional*
New entrant competitive strategy case study: Centrica

How they started: key acquisitions
- Acquired gas assets
- 14m gas customers as monopoly provider of gas

Features of their strategy
- PPAs
- Trading system
- Fuel contracts
- Marketing

Where they are now
- 10.5m customers
- 50% dual fuel
- 50% take at least 1 service product

Competition

Section 2.3 – Implementation considerations
Section 2.3 – Implementation considerations

**Nuclear generator case study: British Energy**

- **1999:** Purchased retail supply business - sold in same year
- **2000:** Bought 2GW coal-fired generation £314/kW (market peak)
- **2002:** Reduced availability, increased back-end fuel costs Coal now £163/kW
- **2004:** Government rescue £3bn
- **2005:** New Electricity Trading Arrangements: prices fall
- **2008:** EDF pays £12.5bn for British Energy
- **2009:** Centrica purchases rights to 20% of nuclear output
- **2010:** Coal plant returned to bondholders
- **2012:** EDF achieves significant increase in plant availability
Section 2.4

Evolution of regulation and competition
### Illustrative steps in regulation and licensing

#### Potential liberalisation timeline

<table>
<thead>
<tr>
<th>Generator</th>
<th>Transmissio</th>
<th>Distribution</th>
<th>Supplier</th>
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<tbody>
<tr>
<td><strong>Mandatory CfDs</strong></td>
<td><strong>RPI - X</strong></td>
<td><strong>RPI - X</strong></td>
<td><strong>Licence criteria</strong></td>
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<tr>
<td><strong>Cost reflective bids</strong></td>
<td><strong>Benchmarks and comparisons</strong></td>
<td><strong>Efficiency frontiers</strong></td>
<td><strong>Consumer Standards</strong></td>
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<tr>
<td><strong>none</strong></td>
<td><strong>Efficiency frontiers</strong></td>
<td><strong>Efficiency frontiers</strong></td>
<td><strong>Tariffs</strong></td>
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<td><strong>Carbon taxes</strong></td>
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</table>
### In Great Britain, retail supply the competitive market is the furthest evolved

#### 1994 — Pre-liberalisation

<table>
<thead>
<tr>
<th>No. of players</th>
<th>Participant actions</th>
<th>Domestic Customer impact</th>
<th>I&amp;C customer impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 regional suppliers</td>
<td>Dash for customers</td>
<td>Segmented pricing</td>
<td>Segmented pricing</td>
</tr>
<tr>
<td>30 suppliers</td>
<td>Fixed Tariffs</td>
<td>Cost Certainty</td>
<td>Cost Certainty</td>
</tr>
</tbody>
</table>

#### Late 1990s — Market expansion

- Suppliers hedge energy requirements
- Working capital concerns

#### Early 2000s onwards — Market contraction

- Market consolidation
- Focus on high value customer
- Big 6 ~10 small suppliers
- 98% 2%

- Customers are price and value sensitive
- Customers are price sensitive
The building blocks for a successful customer strategy will include short, medium and long term goals.

### Customer Value
Understanding of the current drivers of value:
- Brand
- Churn
- Loyalty
- Tariff flexibility
- Competitors
- Customer segmentation

### Market Influences
Size and scale of:
- Company
- Competitors
- Market

Market features:
- Green energy
- Smart Meters
- Energy efficiency measures
- Regulation

Identification of customer value and opportunities

Definition of long term opportunities and risk

Short, medium and long term commercial strategy
Trading is a key issue as energy procurement costs are high and are a driver of participant failure

Electricity cost breakdown, January 2013

Impact on suppliers

- Energy procurement costs represent a significant proportion of total costs (often around 50%) for any energy supply
- Energy price volatility can be disruptive if not effectively hedged
Section 2.5

Meeting the carbon challenge
The energy market won’t deliver. The financial market is also unlikely to deliver, making financing support required (through subsidy or tax).

Policy interventions such as Great Britain’s EMR aim to solve this issue through:
Section 3

Risks and opportunities of liberalisation
Section 3 — Risks and opportunities of liberalisation

**Liberalisation: the process**

1. **Data gathering for all periods to be presented**
   - Financial statements
   - Asset details

2. **Assess allocation process**
   - Analyse income and costs including extent of existing overhead cost allocation
   - Analyse existing asset allocation, fixed asset register, liaise with technical advisors as appropriate
   - Allocate head count to separate businesses
   - Analyse shared costs and determine basis of allocation
   - Analyse central costs that may need to be carved-in, as applicable

3. **Apply allocation to income statement, balance sheet and cash flow items**
   - Facilitate the carve-out / separation
   - Apply allocations to relevant assets, liabilities, revenues and expenses
   - Separate items in accounting records
   - Prepare standalone historical track records
During each phase, liberalisation brings risks and opportunities for EPCs

[1st Stage] At around 2015
- Establishment of the Nationwide Transmission Organization

[2nd Stage] At around 2016
- TSO & Distributors
  - Outage & invest. timing
  - Third party access
  - Management of constraints
  - System security
- Market operator
  - Timely and accurate information
  - Reliable systems and communications

[3rd Stage] At around 2018 through 2020
- Full liberalization (entry)
- Generators
  - Market share
  - Price exposure
  - Force majeure
  - Fuel supply
  - Outage & invest. timing
- Suppliers
  - Market share
  - Price exposure
  - Force majeure
  - Good payment record
  - Stable customer base

- Legal unbundling of T/D sector
- TSO & Distributors
  - Outage & invest. timing
  - Third party access
  - Management of constraints
  - System security
During each phase, liberalisation brings risks and opportunities for network companies

Section 3 – Risks and opportunities of liberalisation

**Cabinet Decision on the Policy on Electricity system reform**

- **TSO & Distributors**
  - Establishment of the Nationwide Transmission Organization
  - Outage & invest. timing
  - Third party access
  - Management of constraints
  - System security

- **Market operator**
  - Timely and accurate information
  - Reliable systems and communications

- **Generators**
  - Full liberalization (entry)
  - Market share
  - Price exposure
  - Force majeure
  - Fuel supply
  - Outage & invest. timing

- **Legal unbundling of T/D sector**
  - Outage & invest. timing
  - Third party access
  - Management of constraints
  - System security

**TSO & Distributors**

- **1stagelabel** At around 2015
- **2stagelabel** At around 2016
- **3stagelabel** At around 2018 through 2020
In Phase 2, liberalisation brings risks and opportunities for gas companies and new entrants

Section 3 – Risks and opportunities of liberalisation

- Full liberalization (entry)
  - Market share
  - Price exposure
  - Force majeure
  - Fuel supply
  - Outage & invest. timing
- Generators
- Suppliers
  - Market share
  - Price exposure
  - Force majeure
- New IPPs and suppliers
  - Commercial contracts
  - Shareholder return
  - Financially strong counterparties

Establishment of the Nationwide Transmission Organization

Cabinet Decision on the Policy on Electricity system reform

【1st Stage】
At around 2015

【2nd Stage】
At around 2016

【3rd Stage】
At around 2018 through 2020

Legal unbundling of T/D sector

Section 3 – Risks and opportunities of liberalisation
There will be new structures for key parts of your business as a result of liberalisation

Businesses need a clear understanding of the impact of strategic and operational decisions

1. Develop short, medium and long term strategies for each of the following:
   a) Ownership strategy
      • New forms of contracts
      • Understanding of counterparties
      • Different criteria for investment decisions
   b) Commercial strategy
      • New and updated commercial, trading operational and regulatory systems
   c) Business process strategy
      • Improved management reporting
      • New operational procedures
      • New training requirements
      • Corporate integrity
   d) IT and systems strategy

2. Integrated implementation and planning to achieve the strategies
Appendices

1. Additional case studies UK and Nordpool
2. Selected experience
3. CVs
1. Additional case studies UK and Nordpool
UK electricity market reforms in the 1990s encompassed three different wholesale market models: one for each England and Wales; Northern Ireland; Scotland

**Starting position**

- Inefficient and technologically conservative – Big coal
- Regular arguments
- Wanted own IPP Generation
- 12 area boards

G = Generation, D = Distribution, T = Transmission, S = Supply

Appendices — 1. Additional case studies UK and Nordpool
Case study comparisons – England and Wales (2 of 7)

1. The starting point post reform encourages competition between new entrants, Independent Power Producers and 2nd Tier Suppliers, but it was not stable.

2. Volatile pool price encouraged vertical integration.

3. Regulator responded with NETA in 2001. There was a big reduction in wholesale price. Then, more consolidation.
Case study comparisons – England and Wales (3 of 7)

Key outcomes: The Government constraint of limited tariff shocks

Relevant for both Margaret Thatcher and Cecil Parkinson in their Conservative Government

New pool prices couldn’t support NBV of ex CEGB generation. Old coal and nuclear technology inherited by NP and PG

Write down of generation assets to MEAV (asset value) in reference to new entrant Combined Cycle Gas Turbine (+/-)

Key outcomes: Steps down in franchise

- Worry about Pool/wholesale price volatility meant CfDs could be written S to G for volumes which matched Retail franchise volumes in S
- Mapping steps down in franchise to steps down in bilateral contracts (to Generation and to fuel suppliers through the value chain)
- Smoothing the transition from price controls to competition in retail supply

£/MWh

MW Contracted

1985 1990 1995


Appendices – 1. Additional case studies UK and Nordpool
Case study comparisons – England and Wales (4 of 7)

Key outcomes: Lots of new “architecture” to let market work

4. New System Codes and licensing arrangements to:
   • Allow Third Party Access under non discriminatory terms
   • Grid codes and new System Operator arrangements

Key outcomes: Almost immediate new entry of Independent Power Producers using new (relatively cheap) gas-fired Combined Cycle Gas Turbine

• 1991 – Roosecote/Lakeland Power, Enron TPL
• Rush for Gas as capacity got cheap to build and operate
• Competition for despatch meant pressure on prices and on incumbents to manipulate Pool prices to manage their wholesale market participation to avoid wholesale market price collapse and maintain prices at levels to pressure asset values

Appendices – 1. Additional case studies UK and Nordpool
Appendices — 1. Additional case studies UK and Nordpool

**Case study comparisons – England and Wales (5 of 7)**

1999 – Generator ‘good market behaviour’ licence – later rejected by CC

2000 – Wholesale market abuse generator guidelines

2008 – Ofgem duties include sustainability and un-necessary burdens, and in 2009 another for security of supply

2001 – NETA introduced

1996 – British Energy privatised

2012-2014 - EMR

UK power price and commodity prices 2006-2012

- Power (APX)
- Gas (ICE)
The market can be divided into new entrants, IPPs and 2nd Tier Suppliers.

Case study comparisons – England and Wales (6 of 7)

2013

- Only 2 of Consolidated Big 6 still part of VI Supply businesses
- All of the Big 6 are now vertically integrated upstream and downstream, offer dual fuel (electricity and gas) and compete nationally

G = Generation, D = Distribution, T = Transmission, S = Supply

New entrants

Independent Power Producers

2nd Tier Suppliers

The market can be divided into new entrants, IPPs and 2nd Tier Suppliers
Case study comparisons – England and Wales (7 of 7)

- More of a trading ‘mind set’; balancing physical and contract/trading hedges
- Procurement of wholesale energy at minimised cost
- Customer-centricity to keep customers
The Nord Pool is the world’s first international power market. It combines several countries with different generation mixes, and consequently challenges:

- Norway
- Denmark
- Sweden
- Finland

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>Norwegian power market deregulated</td>
</tr>
<tr>
<td>1993</td>
<td>Nord Pool established by Norwegian TSO as ‘Statnett Marked’</td>
</tr>
<tr>
<td>1998</td>
<td>Finland joins Nordic pool</td>
</tr>
<tr>
<td>2000</td>
<td>Denmark joins</td>
</tr>
<tr>
<td>2002</td>
<td>Nord Pool Spot established as a separate company for short-term power trading</td>
</tr>
<tr>
<td>2006</td>
<td>Nord Pool Spot opens bidding area in Estonia</td>
</tr>
</tbody>
</table>

**Fuel mix**
- Fossil Fuel
- Hydro
- Wind
- Nuclear
- Other

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Appendices — 1. Additional case studies UK and Nordpool
Individual, national TSOs still hold responsibility for security of supply in each country.

Financial markets operate in each country to ensure flow of money between suppliers and generators.

However, electricity can transfer between countries through the Pool. This is facilitated by the additional regional financial market, and Elspot to handle the physical trades.
One of the key intentions of Nord Pool was to ensure stable prices across the region despite a heavy reliance in certain areas (for example Norway and parts of Sweden) on hydro. In principle, the pooled market should allow imbalances due to intermittency of generation to be settled without a spike in prices.

• However, in late 2002 and early 2003 there was a dramatic spike in electricity prices due to inadequate power produced from hydro.

• This was because of unusual weather in which low rainfall reduced the output of hydro generators and low temperatures increased the demand for electricity; consequently the overall electricity supply reduced, demand increased and prices went up.
Different capacity mechanism approaches are available to support security of supply (1 of 2)

- **Strategic Reserve**: An independent agent, usually the network operator, contracts or tenders with peaking units for reserve capacity.

- **Capacity Payment**: Fixed or variable payment awarded to all or part of the capacity declared/actually available by generators. Can also be made available to large consumers for demand reduction.

- **Capacity Obligations**: Each supplier has an obligation to meet the anticipated loads of its customers, exceeded by an agreed margin.

- **Capacity Auction**: The system operator uses an auction several years before delivery is required to secure projected peak load demand economically.

- **Reliability Auction**: Auctioning of forward capacity options (CfDs); the exercise of the options entitles the owner to the difference between energy spot and strike prices.
Different capacity mechanism approaches are available to support security of supply (2 of 2)

Price based capacity mechanism

Capacity Payment

Spain, Ireland

Volume based capacity mechanism

Targeted mechanisms

Strategic reserve

Nordpool countries

GB

Market wide mechanisms

Centralised vs. Decentralised

Contracts can be awarded centrally or through bilateral arrangements

Targeted vs. Market wide

The mechanism can be applied to all generation technologies or to a sub-set

Price vs. volume

Policy markers can set the price and let the market invest, or set the volumes and invite bids from the market

Capacity Payment

GB

Capacity Obligation

New England (USA), France (proposed)

Capacity Auction

GB (EMR)

Reliability Auction

Theoretical model

Appendices — 1. Additional case studies UK and Nordpool
Very competitive feed in tariffs for wind and solar have driven CCGT operating hours (30-40% of their capacity in 2011), greatly impacting profitability.

Spain has employed a flat-rate availability payment to plant capacity available during peak periods. The regulator sets the capacity price (5,150 EUR/MW in 2012), which is multiplied by the technology specific historical availability factor.

The remuneration is only paid to current units and is intended to cover the fixed costs of remaining on standby to meet peak consumption and shortfalls in wind.

The remuneration is reduced in line with unavailable power and hours of unavailability during peak demand.

Under the New England Forward Capacity Market (FCM) retailers are obligated to ensure that there is enough capacity to meet the demand of their customers by purchasing capacity in an auction.

The capacity is purchased three years ahead of the obligation to delivery; capacity suppliers that clear in the FCM will receive the same remuneration (/MW) in the delivery year equal to the clearing price set in the auction.

 Suppliers are obligated to provide capacity for a specified period (1 year for existing capacity and up to 5 years for new capacity).

 Suppliers are responsible for purchasing a share of the region’s capacity obligation, based on their customers’ historical use.

The EMR proposes a quantity-based mechanism in which the desired capacity is determined centrally.

The energy needed to ensure security of supply will be contracted through competitive central auction run by the system operator. The auctions will be held 4-5 years ahead of delivery.

Successful bidders will enter into capacity agreements, receiving predictable revenue in the delivery period, and must deliver when required or face penalties.

The mechanism includes new and existing generators as well as demand side response.

Appendices — 1. Additional case studies UK and Nordpool
Trading in a bilateral contracts with imbalance market

Trading Arrangements
Bilateral contracts, Over The Counter (OTC) trades, Power Exchange

Balancing Arrangements
Balancing mechanism run by System Operator
Settlement of cash flows

Hedge physical position to lock in revenues
Fully hedged position
Refine position
Manage physical position
Bids and offers from generators & large consumers

100%

Time
2 - 3 Year
1 Year
1 Month
Day Ahead
Real Time

Appendices — 1. Additional case studies UK and Nordpool
Example of a European EPC structure

- Market
- Generation business
  - Fuel business (eg gas, coal)
- Dispatch
- Trading Division
- Transmission management
- T & D business (own)
- Retail business
- T&D business (others)
- Client liaison

Appendices – 1. Additional case studies UK and Nordpool
2. Selected experience
Public Power Corporation, Greece: Wholesale market opening design

Description
The European Commission issued a decision in August 2009 against Greece, declaring that PPC had privileged access to lignite, thus enabling it to maintain or reinforce its dominant position in the wholesale power market. In the wake of the sovereign debt crisis that affected Greece in 2010 it became important for Greece to address the concerns of the EC in order to maintain access to required funding. Infringement actions were likely to be taken against Greece if it were not to act. PPC appointed PwC UK and PwC Greece to develop its strategy in responding to the EC's decision, while optimising value retention/creation for PPC. PPC asked us to mobilise a highly experienced team in order to assist in the identification and evaluation of alternative options, to consider lessons of experience and local/regional circumstances, that served both PPC's strategic objectives and competitiveness of the energy market, and to provide support during the discussions with key stakeholders.

Relevant experience
We reviewed the operation of the Greek mandatory pool system along with its legal, technical and commercial dimensions and in combination with an analysis of the current objectives of the EU/IMF/ECB Memorandum of Understanding (MoU) with the Greek Government, we liaised with the EC to agree upon a set of 'equivalent remedies' that would speed up wholesale market opening. The remedies were such that third parties would have access to 40% of PPC's lignite-fired generation capacity, through a set of structural and transitory long term products.

We drafted term sheets for the proposed product set. In refining the products proposed as alternative remedies, we worked closely with PPC senior management and the Board, as well as the Greek Energy Minister. We also conducted a market sounding exercise, during which a large number of industry stakeholders (including the economic regulator) and potential counterparties were met, to test the appropriateness of the proposed solution and the appetite for the proposed products.
### Kosovo lignite power technical advisory project, Central Europe: Changes to market structure

**Description**

Between 2007 and 2010, PwC UK led the financial advisory work on the Kosovo Lignite Power Technical Assistance Project supported by its technical mining and power station engineers. We advised on the changes to the market structure required to facilitate a transaction for a new mine and power plant. We considered alternative transaction structures based on the inclusion of different generation assets and undertook market sounding to assess the appetite of bidders. The financial turmoil of 2009 led to the withdrawal of shortlisted bidders and we advised the Government on a relaunch of the transaction. We developed a range of transaction options for the Government to consider and undertook a marketing exercise to find new bidders. We organised a bidders’ conference, developed EOI material and selection criteria and ran a short-listing tender. We worked with the Government, donor agencies and legal advisors to develop an RFP and associated contract package and liaised with bidders over risk allocation and Government shareholdings. We co-ordinated with the regulator on changes required to the regulatory regime to permit long term PPAs and derogations required from competition directives. The transaction was halted by the Govt in late 2010.

**Relevant experience**

The initial stage of the work involved the identification of changes needed to the structure of the mining and power sectors to facilitate the transaction; consideration of commercial, regulatory, technical, environmental and social policy issues, working with legal and environmental advisors to determine legal and regulatory changes that would be required; developing potential transaction structures for consideration by the steering committee and determining possible bidding parameters that would allow Kosovo to extract value from the transaction. Later stages involved assessing the financial impact on the company, other participants in the sector and consumers of alternative structural packages.

The project required regular liaison with the Ministry of Energy and Mining, the Finance Ministry, the Environment Ministry, the energy and mining regulators, the mining and power sector companies and other advisors in the sector, as well as negotiation with shortlisted bidders on contracting terms.
### Nalcor Energy, Canada: Feasibility and finance ability assessment of new generation and transmission

**Description**
PwC UK and PwC Canada are lead financial advisor to the Newfoundland utility Nalcor Energy and have worked with the client to develop the feasibility and finance ability of the Lower Churchill hydro project and associated transmission since 2007. The project has now reached front end engineering stage, with final investment decision and financing anticipated during 2013.

**Relevant experience**
We have advised the company across a range of commercial, financial and regulatory workstreams. These included developing a financial model of the generation and transmission components of the project that allowed consideration of alternative financing structures, tariff proposals, contracted offtake and technical solutions. We advised on contracting strategy and risk allocation under long-term PPAs including alternative pricing mechanisms, the development of trading skills for non-contracted output, corporate restructuring to ringfence the existing regulated business from the new project and to put in place appropriate service level agreements between the different parts of the company. We advised on the relative strengths and weaknesses of alternative financing options and the potential for bringing in third party equity investors. We developed a programme for taking the project to market to raise debts, the development of the data room and the gaining of provincial governmental approval. We supported the company on developing a package to present to rating agencies to get a view on the rating that would be applied to the project prior to seeking financing.

### Bord Gáis Energy, Ireland: Establishing an independent transmission operator

**Description**
In order to comply with the EU Third Directive, Bord Gáis Energy (‘BGE’) is in the process of establishing an ITO as a separate wholly owned subsidiary of BGE that will incorporate the business, assets and staff of its transmission networks. PwC Ireland and PwC UK were asked between 2011 – 2012 to provide valuation, structuring and transaction advice regarding the separation of the transmission network business as a viable business.

**Relevant experience**
Our analysis enabled BGE to assess appropriate asset values that need to be transferred to the ITO business, including the Regulated Asset Value (RAV).

We analysed whether the proposed long term funding arrangements for the ITO are viable and could be expected to support a certain shadow rating for the ITO. This included an assessment of the appropriate capital structure of the ITO considering equity instruments, debt/equity ratio and the use of funding guarantees.

As part of our analysis we reviewed the commercial and financial agreements with the remaining part of the business for completeness and appropriateness in the light of operational requirements and commercial practicalities.
## Northern Ireland electricity: Restructuring advice

<table>
<thead>
<tr>
<th>Description</th>
<th>Over a 15 years period starting in 1989, we have advised Northern Ireland Electricity (NIE) on strategic and market restructuring issues.</th>
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</table>
| **Relevant experience** | **Initial advice – Privatisation & unbundling:**  
• NIE was the fully vertically integrated public company responsible for provision of electricity in Northern Ireland. It was due to be privatised and unbundled into operational business units – generation, transmission and distribution and supply. The unbundling was a precursor for competition in supply/retail and to enable new market entrants in generation. Our work included: Contract development for wholesale supply to the retail market (Bulk Supply Tariff), Financial modelling, Regulatory and tariff determination, Negotiating with Government on the financing structure and associated pricing in Power Purchase Agreements (PPAs) between Northern Ireland Electricity and the newly privatised generators.  
**Market restructuring – Implications of pool:**  
• Advised NIE on the strategic, commercial and operational implications of regulatory proposals to introduce wholesale trading through a pooling mechanism. Issues addressed included competition in generation and supply, provision of ancillary services, trading with externally interconnected parties, impact upon existing PPAs (including charging of a levy for stranded costs) and the role of contracts for differences within the proposed trading framework.  
**Moyle inter connector:**  
• We advised on the privatisation of the Moyle inter connector and supported the project management. We advised on the implementation of trading system and the associated settlement.  
**Strategy for system operator disposal:**  
• We advised on the strategy in relation to the disposal of its system operator subsidiary including valuation, commercial agreements required post disposal and approach to negotiation with the regulator on the extent to which the fair market value should exceed the regulatory value. |
**Palestine electricity authority: Development of an IPP**

**Description**
Between 2009 – 2010 PwC UK, PwC Austria and PwC Palestine provided a joint team to advise the Palestine Electricity Authority on the requirements for the selection of a developer to develop a gas-fired IPP. We worked with technical and legal specialists.

**Relevant experience**
The range of issues to be addressed covered legal, technical, commercial and financial concerns. We first reviewed the plans of the Authority to confirm that their requirements from the IPP were consistent with their stated strategic objectives. Based on technical engineering guidance and legal assessment, we determined the appropriate size and location of the IPP and the changes required to the regulatory and legal framework to accommodate the new plant.

We recommended payment structures to be included in the PPA to be associated with the IPP and identified topics to be negotiated with the preferred supplier, and if appropriate with any international financing institution that might provide finance. PwC UK provided subject matter expertise and QA roles, with detailed work being carried out by team members from Austria and Palestine.

**Slovenske Elektrarne, Slovak Republic: Privatisation advice**

**Description**
In 2001 PwC Slovakia and PwC UK were the financial advisor on the sale of a 66% stake in the Slovak state-owned generation company which had brown coal, gas, nuclear and hydro generation.

**Relevant experience**
We advised the client on structuring the sale so that a wide range of bidders would be attracted, and so that the sale could go ahead with or without the inclusion of nuclear assets.

We developed a financial model that assessed the value of the company based on our view of the future operation of the assets and developed a bid assessment model that allowed the comparison of bids which included nuclear assets and those that did not.

We ran a competitive tender process, selected shortlisted bidders and ran the due diligence phase. We supported the Government on the negotiations with the preferred bidder on the contractual terms, including the future investment that the bidder would make in the sector.

We assisted the Government on the development of changes to the electricity market to allow for the existence of a private sector investor, to put in place regulatory and legal arrangements for nuclear decommissioning and to support the restructuring of the company and the introduction of new offtake arrangements from plant that had not been included in the sale.
Hidroelectrica, Romania: Generation investment strategy

**Description**

PwC Romania and PwC UK were advisor between 2007 – 2008 to Hidroelectrica in respect of a plan to seek private sector investment into a number of hydro opportunities. Our role was to prioritise the opportunities in terms of attractiveness to investors and to advise on the method to attract investors.

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**Relevant experience**

We reviewed the role of hydro generation in the Romanian electricity sector and compared this to other Western European countries with significant levels of hydro generation. We reviewed the cost estimates provided by the company to provide a view on their potential attractiveness to investors compared to other hydro opportunities in the region.

We advised on alternative forms of investment, including concessions, strategic investments and privatisation, that could be sought and commented on their attractiveness to different types of investor. We considered alternative options for packaging assets. In particular, we considered the pros and cons of combining hydro plant on a single river into cascades so as to allow optimisation of their use once commissioned.

We highlighted changes to the legal and regulatory structure that would be required to facilitate foreign investment and identified a range of tasks that the company might wish to undertake before offering the packages to investors. We assessed the selection of projects to be offered for investment against those which the company intended to invest in itself to support our conclusions on project attractiveness.

We pulled together all strands of analysis to rank the opportunities in order of attractiveness and recommended the next steps for the company.
## EDF energy, France: Virtual generation capacity auction

<table>
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<tr>
<th>Description</th>
<th>In 2005, PwC UK were appointed to advise EDF on the design and implementation of an electricity generation capacity auction, required by the EU.</th>
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| Relevant experience | We helped EDF to develop the detailed design of the products to be sold, and to prepare the associated contracts. We developed an inter-locking contract architecture involving a Master Agreement for the overall contract terms and conditions, and then Individual Contracts for each particular product purchased.  
We advised and assisted EDF in marketing the auctions, including preparing a Preliminary Information Memorandum, a more detailed Information Memorandum, developing content for the EDF auction web site, preparing and running a bidders’ conference for the auctions, developing and overseeing the procedures for qualifying bidders (including advising EDF on issues of financial security), and providing a forum for responding to questions and comments on the auction throughout the process. We assisted EDF throughout the process in consulting with bidders and in reporting to the Trustee.  
We supported EDF in the execution of the auction, including issuing instructions to bidders, running a mock auction as training for the bidders and in running a help-desk throughout the auction. We provided advice to EDF as auctioneer, and assisted EDF in evaluating the results of the communication. We evaluated the overall outcome of the auction and made recommendations to EDF on changes to improve subsequent auctions. |
# UK electricity market reform

**Project** | **Description/Relevant experience**
--- | ---
**UK Government: CCS Financing/Project Feasibility** | From 2008 – 2009 PwC UK were engaged to advise the UK Government Department for Business, Enterprise and Regulatory Reform on the design and execution of the competition to develop the UK’s first commercial-scale demonstration of Carbon Capture and Storage (CCS) on a power plant.

**Major UK utility: Impact of FITs/CfDs** | Following the publication of the DECC EMR consultation paper, in 2012 PwC UK were requested by one of the ‘Big 6’ players to prepare a paper discussing the implications and risks of the FIT with CFD proposals for different categories of market participants, including Government and central bodies involved in administering the instruments. We addressed a range of issues including the impacts on financing, the risks borne by each party, the level of debt that could be raised and the impact on company balance sheets. We identified potential benefits and disadvantages and considered how these might vary according to whether project developers were integrated generators or IPPs and according to the detailed design of the instruments.

**Carbon capture and storage developer: Impact of FITs/CfDs** | In 2012, PwC UK was asked to provide a briefing paper for a CCS developer summarising the main features of the CfD FiT mechanism proposed under the EMR programme, taking account of the specific requirements of carbon capture and storage schemes and how these might be addressed in the CfD negotiations.
### Independent Power Producers (IPP) and related electricity market restructuring

<table>
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<tr>
<td>Exim Bank: IPP counterparty in Tunisia</td>
<td>In 1997, we advised the Japanese Exim Bank on credit worthiness issues associated with the financing of the Rades IPP in Tunisia. The proposed off-take contract was with STEG, the State Gas and Electricity Business of Tunisia, and we provided analysis to assess any potential risks which the bank may wish to take account of in its contract negotiations.</td>
</tr>
<tr>
<td>Electricity Generating Authority of Thailand (‘EGAT’): Strategy for implementation of IPP tender</td>
<td>In 2005, we worked with EGAT in Thailand to prepare draft PPAs and other commercial documents prior to the successful tender for new IPP capacity. PwC provided assistance and advice to the Electricity Generation Authority of Thailand on the creation of a new framework of rules to allow IPPs to join the system. The work included development of the Grid Code to cover the technical operation of the system, advice on bulk tariff setting and the preparation of commercial power purchase agreements and technical connection agreements.</td>
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# Advising government and regulatory authorities on electricity market restructuring

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<tr>
<td>Energy Planning and Policy Office, Thailand: Tariff Development</td>
<td>PwC advised the Energy Planning and Policy Office of the Royal Thai Government on the 2005-2009 electricity tariff study. We reviewed the Thai utilities’ investment and operating efficiency forecasts, developed a marginal cost model which quantified the cost to supply customer classes across geography, time and voltage, estimated marginal cost based tariffs and scaled marginal cost based tariffs to yield sufficient financial return for the Thai utilities, which were to be privatised at some time in the future, produced full sets of accounts for each of the component businesses of the three Thai utilities under a range of scenarios and determined the final recommended tariff set which allocated a Uniform National Tariff across customer classes throughout the country.</td>
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<tr>
<td>Saudi electricity regulator: Regulatory strategy</td>
<td>In 2006, PwC were retained to provide institutional support to the Saudi electricity regulator, SERA during the set-up phase of the Authority. This involved advising the Authority on issues of Institutional Planning and Organisation design, and identifying the role of the regulator and the skills and staffing required to carry out those roles. Our role covered a range of regulatory, budgeting and institutional structuring services including design of the transitional and longer term organizational structure for the regulator, developing job descriptions and operational procedures and assistance with recruitment of key staff.</td>
</tr>
<tr>
<td>National Electric Power Authority, Nigeria: Corporate Restructuring</td>
<td>A PwC led consortium were appointed between 2002 – 2003 by the National Council on Privatisation in Nigeria to prepare a comprehensive plan for restructuring NEPA and establish the enterprises formed from the restructuring of NEPA as limited liability companies. Our recommendations considered the appropriate industry structure for the unbundling of NEPA from the perspective of economic efficiency and financial viability in a competitive wholesale power market. The recommendations will focus on unbundling NEPA’s core functions into generation business units, transmission, system operation, supply and distribution business units; Setting up the trading arrangements for wholesale power based on one or a combination of bilateral contracts, pooling (balancing, voluntary or compulsory), and forward market trading; and which can evolve to more complex and competitive arrangements as the local institutional capacity in the wholesale market develops with experience; Determining the market settlement arrangements appropriate to the trading arrangements.</td>
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Advising utilities on corporate and electricity market restructuring

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<tr>
<td>Electricity Supply Board (ESB), Ireland: Market development strategy</td>
<td>From 1997 – 2007, PwC advised ESB, the Irish utility on market liberalisation issues over a 10 year period. We advised on the use of contracts between internal divisions of ESB, procurement of new generation through IPPs (both renewable and thermal), the setting up of a power procurement business, the operating and commercial issues to be addressed in moving to an ex-post price in a pool environment and the risks associated with regulated IPPs.</td>
</tr>
<tr>
<td>RAO UES, Russia: Review of regulatory framework</td>
<td>In 2003, we performed a global review for RAO UES (Russia) of the regulatory frameworks that were typically successful in attracting international finance in power projects. We advised RAO UES on the risks associated with implementing a competitive electricity market model for each category of participant and addressing commercial, regulatory and operational risks. We provided insights on how these risks could be mitigated and provided case studies from selected worldwide markets</td>
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## Supporting business planning to cope with financial pressures

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<tr>
<td><strong>Banking Group: Restructuring AES Drax</strong></td>
<td>Between 2002 – 2005, we acted as advisers to the agent bank managing the restructuring of AES Drax. Key workstreams included, reviewing short term cash flow forecasts, assisting the plant in formulating its trading strategy, reviewing the credit requirements associated with trading the plant’s output, reviewing the plant’s coal procurement and developing the financial model to be used as the basis for the restructuring discussions.</td>
</tr>
<tr>
<td><strong>Killingholme Power Ltd: Restructuring advice</strong></td>
<td>In 2002, we advised the management of Killingholme Power Ltd on the commercial options open to their plant, following the decision of XCEL to reduce NRG’s exposure to merchant power plant. The plant had been offered for sale but an offer acceptable to the parent company had not been received. The company was aware that it needed to restructure its finances and become independent of NRG if it were to have a future. We advised and assisted management in the development of their business case, the assessment of alternative operational structures, the implications on cashflows and debt payment capabilities and supported their discussions with the banking syndicate over the restructuring of loans.</td>
</tr>
<tr>
<td><strong>OVO Energy</strong></td>
<td>We provided financial advice on the options for OVO Energy to improve its trading position and economic value through a combination of a credit-wrap agreement with a trader and offering an opening for a new equity investor. We advised on the financial metrics required for the client to achieve its business objectives. We supported them in drafting an information memorandum to take to potential investors and traders willing to provide a wholesale trading supply to OVO’s independent retail business or to invest in the company. Our work focused on optimising OVO’s market position in a wholesale market within the constraints of regulatory and compliance requirements.</td>
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## Transaction advisory services

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<tr>
<td><strong>Electricity Regulator, Belgium: Valuation advice</strong></td>
<td>To comply with European Directives, the national Belgian vertically integrated electricity company (Electrabel) was forced to unbundle its transmission grid and sell a majority share to an independent Transmission and System Operator (TSO). As part of this project in 2001, we provided advice on approaches to asset valuation and calculation of the regulatory asset base for the Belgian transmission network. This involved valuation of the transmission grid and business and analysis of different regulatory structures on future revenues and shareholder returns.</td>
</tr>
<tr>
<td><strong>Buy side advisor to a UK utility seeking to acquire a Dutch electricity network and retail company</strong></td>
<td>In 2001, we were appointed as a financial advisor by a UK utility. Our work included the assessment of the enterprise value of the business on the basis of a sum-of parts valuation based on discounted cash flows and market multiples. We further undertook a separate assessment of the value of the customer base (retail) and the (regulated) distribution business and provided negotiation advice during the bid process.</td>
</tr>
<tr>
<td><strong>EirGrid financial interconnector advice</strong></td>
<td>We provided a risk analysis, allocation and mitigation approach to designing a good practice guide to the financing and contracting options facing EirGrid for its interconnector project. The solution needed to be agreeable to the CER and acceptable to the EU. We brought our knowledge of the two electricity markets, interconnector projects and understanding of the alternative approaches for regulating large capital infrastructure projects in a regulated market.</td>
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# Strategic business review and business development

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<tr>
<td><strong>UK supply business:</strong> Achievable business margins</td>
<td>In 2000, PwC provided advice to a UK supply business on achievable business margins: This advice involved the preparation of a detailed report considering the costs and revenues associated with the business in each of the customer segments, which was used by the client in their submission to the UK electricity regulator.</td>
</tr>
<tr>
<td><strong>Centrica: Strategic assessment of market exposure risks</strong></td>
<td>In 2001, we advised Centrica on the development of its energy policy and to identify the strategic actions it should take to reduce its risk exposure. We considered its policy centred on its contract portfolio, taking account of its gas and power supply businesses, its portfolio of fuel supply contracts across its generation plant, the options it had to provide gas to power stations or its supply business and the impact of expected changes in the two markets on its contracting alternatives. Our recommendations focused on practical means of achieving policy objectives through contracting, acquisitions and monitoring of prices.</td>
</tr>
<tr>
<td><strong>UK power generation company:</strong> Developing a new supply business</td>
<td>In 2004, we advised a UK power generation company in developing a business plan for setting up a new supply business: We advised a generator on its business plan to set up a supply business to mitigate its price exposure in the electricity wholesale market. The project involved analysis of future trading strategies and contracting options, market and competitor analysis, switching and churn rates, drafting the business plan, and building a fully integrated and flexible cash-flow and valuation model.</td>
</tr>
<tr>
<td><strong>Infrastructure Investment Fund: Morgan Stanley</strong></td>
<td>We provide a monthly review of the market performance of a small retail supplier to an infrastructure fund in connection with their energy trading arrangements. We review the supplier’s realised and forecast performance against its financial covenants, identifying any material changes and their underlying cause. We consider changes to the business model and accounts, key performance indicators and market assumptions impacting future performance. We assess the impact of operational developments within the market on the supplier.</td>
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## Organisational design, benchmarking

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<tr>
<td><strong>UK Power utility</strong></td>
<td>We assisted the CEO and 4 functional executives to redesign the central functions to align with the sale of a networks business and deal with the resultant stranded cost. We advised on design principles, structure and role options, accountability and decision rights, bringing insight from within and without the sector to challenge conventional thinking. We advised on the transformation programme, the cost and benefit analysis and the management of the delivery programme. We removed significant areas of organisational complexity and delivered simpler functional alignment between the centre and counterpart functions in the business units.</td>
</tr>
<tr>
<td><strong>National Grid</strong></td>
<td>We advised National Grid on regulatory benchmarking of electricity network companies, to compare the relative efficiency of its UK and US businesses. We assembled an extensive database of information covering costs, outputs and operating environments for a range of UK and US distribution system operators. We used regression techniques and data development analysis to assess the relative efficiency of each business. We calculated a series of efficiency factors for each business based on the lag in efficiency and the timescale within which it could be addressed. The efficiency targets were then incorporated into business unit plans.</td>
</tr>
<tr>
<td><strong>Nuclear sector company</strong></td>
<td>We advised the company on the strategy to adopt to improve its efficiency and performance to position itself as a top quartile performer in the global market. We focused on four key areas – strategic planning, financial; effectiveness, operational improvements and personnel reorganisation. We undertook an initial review and produced a blueprint which recommended changes, priorities, “quick wins” and an approach to maintaining the engagement of all staff during implementation. We developed a staged implementation plan with key milestones identified and the level of external support required at different stages of the process.</td>
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3. CVs
Steve Jennings

Steve is the leader of PwC’s UK utilities practice with over 25 years of industry experience. He has spent much of his career working with utility clients on designing and implementing strategic change programmes to respond to performance pressures or in response to market and regulatory change.

Selected experience

Steve’s experience covers advising on strategic issues, developing business scenarios, benchmarking, feasibility studies, preparation of business cases and the design of business transformation programmes. He has worked across all parts of the utility sector value chain and in both water and power.

He was involved in all phases of the deregulation of the UK electricity sector. This included:

- Working with the newly privatised electricity generators as they restructured their operations and processes (and enabling IT) to prepare for a new commercial environment;
- Advising the Regulator on an operational framework which outlined the ways of working, commercial arrangements, plans and timetable for the introduction of retail competition;
- Acting as the programme manager for all of the activities required to enable a regional electricity company prepare for retail competition. This included restructuring and separation of the business, introduction of new IT systems and the management of significant change;
- Advising a regional electricity company on their preparations for the introduction of competition into metering.

Steve has presented the lessons learnt from the experiences in the UK to utilities and regulators in the US and Europe.
Mark Hughes

Senior Economics Advisor.

Mark has over 25 years of experience providing strategic, commercial, transaction and valuation advice to the energy and utility sector worldwide. Mark leads PwC’s London-based team of specialist energy sector advisors covering the full range of economic and financial advisory capability. He is an economist by training with a BSc and MSC in Economics from LSE, London University.

The project illustrated demonstrate his international experience of advising clients on aspects of market reform along the liberalisation spectrum, taking account of specific country factors and basic economic principles underpinning liberalisation.

Selected experience

**Kosovo Ministry of Energy and Mining:** Mark led our advice to the Ministry of Energy on seeking an international investor to develop an IPP project, guiding the team and providing senior level advice to Ministers, the steering committee and international donors on the progress of the transaction.

**Nalcor Energy, Canada:** Mark was the International Project Partner on our work for Nalcor Energy, advising our Canadian colleagues on the lessons to be brought from Europe on financing, structuring and market reform. He advised the client on contract tenors and on regulatory reforms required to reduce project risk.

**PPC, Greece:** Mark was the International Project Partner and brought his experience of advising clients on restructuring to comply with regulatory directives to guide the structuring of the solutions for PPC. His knowledge and experience of generation auctions, contract structuring and determination of indifference pricing helped shape the proposals that were developed and put to the European Commission.

**The Crown Estates EMR advice:** Mark was the Project Partner on our work advising the Crown Estates on the potential structure of contracts for difference to be developed in the UK under the Electricity Market Reform structure.
Antony Cook

Antony has extensive experience in shaping and delivering business transformation, often enabled by IT, mostly within the utilities sector. Antony is a subject matter expert to utility transmission and distribution companies in field force transformation for operations and field services. He is a Partner in our UK practice and leads our UK consulting Enterprise Asset Management proposition. Antony has strong consulting skills to define problems and identify solutions with high energy and enthusiasm.

Selected experience

Programme management:
- Antony was an interim Programme Director overseeing the portfolio of Asset Management programmes ranging from preparing for the next regulatory price control review, designing and implementing decision support tools for asset prioritisation and investments and creating tools to understand the unit costs of assets
- Created and transitioned a PMO reporting to the executive committee to a client team covering nine initiatives ranging from SAP ERP and work and asset management implementation, a Lean process improvement programme in operations, management upskilling and pay/reward programmes through to preparing for property consolidation and move to a new corporate centre

Operating model transformation design authority:
- Project Director on a design authority set-up, including development of component business model for a customer services function of a major utility
- Design Authority Director on a global corporate simplification and transformation programme which covered the end to end management and operations for an oil and gas field services company

Business architecture and transformation programme definition:
- Antony supported the definition and of a global operating model for this energy distribution organisation to drive significant business benefits through cost reduction and increase process compliance. Antony’s role specifically was to help shape the operating model discussions, providing insight and challenge.
Karen Dawson

Karen is a Director in our Energy and Utilities Strategy practice who specialises in advising on restructuring and developing competitive advantage for clients in liberalised markets.

Karen has over 20 years’ experience of advising Governments, utilities, regulators and market entrants on issues associated with changing energy markets. She has advised clients in over 35 countries worldwide, providing her with insights as to the type of solutions that work (and those that do not work) in different circumstances.

Karen has a degree in Mathematics with French from Westfield College, London University, an MSc in Management Science from Imperial College, London University and a background in operational research, statistics and financial analysis.

Karen’s experience spans electricity markets with different structures and at different stages of the liberalisation journey. Examples of her work include:

**GB market:** Advised the regional electricity companies during the liberalisation of the GB market, tested settlement systems and advised on market rules. Advised on the introduction of incentive based regulation and the introduction of demand side management into pricing mechanisms. Advised on the amendment of market rules governing the introduction of full retail competition and the interaction with operational procedures and bidding and settlement systems. Advised the TSO on the practical and operational implications of the introduction of a bilateral trading market with imbalance settlement. Advised on the implications of the Electricity Market Reform proposals on various types of market participants.

Advised new entrants on market risks, contracting strategy, business plan development and identification of target companies for acquisition.

**USA:** Advised on the operational procedures to implement the settlement system for the Californian power exchange so that the principles outlined in the rules were adopted, and developed a users’ guide to support user training.

**Australia:** Advised on the costs associated with the set-up of a pool based system.

**Central Europe:** Advised the Governments, regulators and utility companies of 7 interconnected countries on the steps required to set up a regional electricity market with interconnector trading and staged development over time dependent on the readiness of stakeholders.

**Ireland:** Advised the single buyer in Ireland on the procurement of new generation and on the treatment of stranded costs when a pool trading system was implemented. Advised the TSO on the operational implications of adopting regulatory directives. Advised the incumbent utilities on the treatment of stranded costs as a competitive market was implemented. Advised the regulators on the impact of collateral and other market financial requirements on different categories of market participant.
Ronan O’Regan

Ronan has over 20 years experience in the UK and European energy markets, gained through both industry and consultancy. He worked as an Electricity Trading Manager for a utility prior to joining PwC where he led the analytics and negotiations on CfDs with a range of generators. He also drafted numerous long term commercial CfDs including those with the Medway IPP and Nuclear Electric.

At PwC he has worked on a range of financial advisory engagements for different types of generators, from the restructuring of out of the money power and fuel contracts, to the restructuring of Drax and British Energy, to the sale of numerous generation assets such as InterGen to GMR, Advanced Power to 3i and Gunfleet Sands to Marubeni.

Selected experience

Ronan also has deep expertise in the UK and European power market, leads our power and utilities strategy team. Ronan has been involved in the market for 20 years as a trading manager within a utility to working with most of the independent retail businesses since market deregulation. He has worked for numerous large corporate energy users on hedging strategy and energy risk management. Ronan has been advising clients on various aspects of the Government’s proposals for the introduction of CfDs under EMR.

Selected experience International

Ronan was the Project manager on the corporate restructuring of NEPA (Nigerian state power company) where he managed the PwC led consortium appointed by the National Council on Privatisation to prepare a comprehensive plan for restructuring NEPA and establish the enterprises formed from the restructuring of NEPA as limited liability companies.

Ronan was commercial advisor to the Royal Thai Government on retail tariff setting, where he managed the financial modelling of the Thailand power sector in our role as adviser to the Government on setting retail tariffs.
Stuart Cook

Stuart has over 23 years experience in energy and utilities. He joined PwC from Ofgem (the GB Energy Regulator) where he was a member of the Ofgem Board. Whilst with Ofgem, he led the division responsible for all aspects of network policy (transmission, distribution, electricity and gas). He oversaw the conclusion of Ofgem’s fundamental review of network regulation which resulted in the new RIIO (Revenue = Incentives + Innovation + Output) regulatory framework, and led the most recent review of transmission and gas distribution prices. More recently, Stuart was Managing Director of Ofgem’s delivery arm (Ofgem E-Serve). Ofgem E-Serve is responsible for implementing the offshore transmission regulatory regime, and for administering the government’s energy efficiency, environmental and social programmes.

Prior to joining Ofgem, Stuart worked as a consultant and advised leading international utilities clients on strategy, regulation and the delivery of organisation change.

Selected experience

Stuart has wide experience of the design of regulatory regimes and incentive frameworks. He is an expert in regulatory strategy and has extensive experience of regulatory price controls.

Working with Steve Jennings, Stuart advised on the design of the liberalised retail market in England & Wales. Stuart subsequently led the design of the liberalised electricity market in Scotland and was responsible for developing the multi-party agreement which underpinned the Scottish electricity market.

Outside Great Britain, Stuart has advised on regulation and on the introduction of retail market competition in Northern Ireland, the Republic of Ireland, Australia, Korea and North America.
Technology

Alan Dion

Alan is a highly experienced advisor on business and IT enabled transformation.

He has led development of National Grid’s pipes and wires strategy. This advice led to the merger between National Grid and Transco. Other key clients include Shell, whom he advised on its strategy for entry into the Brazilian power market. He also advised BT on the design of its target global operating model.

Selected experience

Business transformation

• Led design of new operating model for NGT’s gas distribution business. This included the development of aggressive cost reduction targets, leveraging mobile technology.
• Led design of new operating model for National Grid’s electricity business and support during implementation of subsequent cost reduction programme.
• Key role in National Grid Transco merger integration, including facilitating agreement to cost reduction targets across the business. This was the largest merger in the UK in 2002 and exceeded its announced cost reduction targets.

IT transformation

• Since November 2008, leading support to BP on the transformation of its Enterprise Systems Division, which is responsible for the development and support of SAP systems across BP. The project has included: support during the retendering of the outsource contracts for provision of SAP application and development; management of transition for SAP projects; design and management of the implementation of a new organisation structure for the operational support organisation within Enterprise Systems; and design and build of a new reporting dashboard.
• Led support to Centrica over the period 2006–7 with its mid-stream transformation programme, which was based on a wholesale system replacement. Role included: development of the programme business case and provision of management of change and programme office support to the programme.
Stephen Knight

Stephen is a retail utilities specialist in PwC’s Consulting practice. He has experience both as a consultant and as a senior manager in major corporations of developing strategy, leading complex customer service transformation programmes, driving marketing and call centre optimisation, delivering business change and outsourcing. He has worked across a number of sectors including Financial Services, Telecoms manufacturing and for the last 9 years the Utilities sector. He is a Fellow of the Institute of Direct Marketing and a member of the Energy Industries Club.

Selected experience

Customer Relationship Management & Contact Centres

• **npower Strategic Customer Segmentation Review** – Undertook an assessment of the current approach to segmentation, its usability and fitness for purpose. Identifying the needs of the different stakeholders, to develop a set of options and recommendations for the future approach to segmentation

• **Leadership Team Member for British Energy Retail** – Head of Insight, managing all elements of customer knowledge, research, satisfaction and insight. This led to the restructuring of the retail division around customer needs to maximise customer satisfaction, retention and long term value.

SAP ISU & technology

• **Redesign of npower retail business in preparation for SAP** – Led a team to develop the To-Be process landscape for the retail business, leveraging best practice both globally and across industry. This was in preparation for a £250m transformational programme underpinned by the implementation of SAP CRM & IS-U.

• Programme assurance for **npower’s Retail SAP IS-U & CRM implementation** – Since joining PwC, Stephen has continued his involvement in npower’s programme by undertaking assurance activities to identify risks, issues and mitigating activities to support the successful implementation of this large change.

Service based Retail

• **British Energy – Establish an SME supply business** – Part of a small team tasked by the board to establish a ‘green field’ supply business specifically targeting the SME market. Responsible for the market analysis, customer segmentation and development of products and propositions.

Outsourcing

• **npower** – advised on the reprocurement of domestic telesales activities, for a 3 years £17m contract. Supported the development of assessment methodologies and RFP development.

• **EDF Energy** – Led team to drive the procurement of a £40m+ outsourcing contract for transitional support services in moving from a legacy platform to a new SAP IS-U platform. This included developing and managing the vendor selection and review process, clarifying and documenting the client requirements, managing the vendors through an open and discursive RFI and ITT process and developing an innovative contractual framework to manage risk.
Thomas Romberg

Thomas leads the London based energy and infrastructure valuations group and has 15 years experience in providing sector specific valuation advice for mergers and acquisitions, financial reporting, expert opinions, corporate restructuring, and refinancing purposes.

Over the years, Thomas has provided valuation services to a range of major power generation businesses and utilities including GDF Suez, International Power, AES, Drax Power Power and EON as well as Infrastructure Funds and PE houses investing in power, utility and infrastructure businesses in the UK and internationally.

Selected experience

GDF Suez / International Power – Currently engaged to provide valuation advice to both parties in relation to the purchase price allocation (PPA) exercise required for the acquisition accounting under IFRS 3. Assets being valued include a portfolio of generation assets in the Middle East.

Actis / Globeleq – Advised Actis Capital on the fair market value of a global power plant portfolio which was being transferred from one fund to another.

Drax Power – Valuation for financial restructuring – Working on behalf of the lending banks, responsible for scoping and developing a financial restructuring model and developing financial restructuring options. Scope also included a valuation of the business.

3i / Advanced Power – Commercial due diligence and valuation advice to 3i in relation to its successful acquisition of Advanced Power, an IPP project development company operating across Europe.

Infrastructure Funds – Currently engaged as independent valuation advisor by a number of infrastructure funds including GIC, Citi Infrastructure Partners, QIC and IFM. The subject assets include UK regulated utilities, power companies, ports and airports.