These strengths allow US-based firms to win prime contracts in international markets, against countries such as France and Russia. The Americans' systematic, coordinated approach when working with foreign firms and governments is proving to be a successful formula for partnerships, with an acceptable level of risk exposure.

When competing for new nuclear business in some international markets, US-based EPC firms can face several distinct disadvantages. Unlike many competitors, US firms are not state-run and so are not financially backed by the government to the same extent as in other countries.

US-based firms cannot secure assurances to mitigate the excessive financial risk exposure in countries such as India, where there is an 80-year post-project-completion accident liability requirement. A certain level of red tape, has also slowed several commercial projects. Also, while the American domestic market is undergoing resurgence, the long gap between the construction of US power plants may have damaged its credibility as a vendor country.

Advantages

- Unmatched nuclear experience
- Efficiency and expertise in consulting and engineering
- Flexibility to meet client demands with a business-oriented approach, and a high emphasis on localization
- A unique network of US embassies strongly involved in promotion all over the world
- Widely recognized safety authority

Weaknesses

- Considerable red tape
- Lack of government backing in some international markets
- Lack of financing options
- Slower return to marketplace
- Fragmented industry, which sometimes lacks organization

8 NUCLEAR DECOMISSIONING SUMMARY

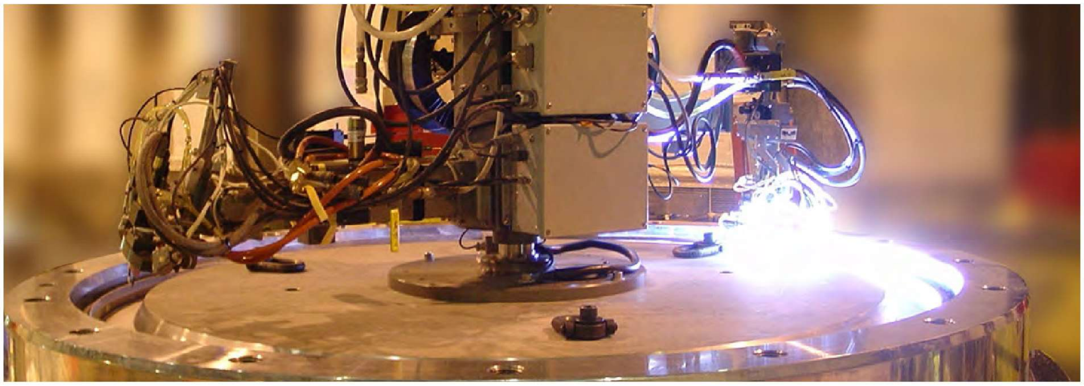

Figure 9 - Sealing of spent nuclear fuel ©Westinghouse

- To date, about 110 commercial power reactors, 46 experimental or prototype reactors, over 250 research reactors and a number of fuel cycle facilities have been retired from operation. Some of these have been fully dismantled.
- Most parts of a nuclear power plant do not become radioactive, or are contaminated at only very low levels. Most of the metal can be recycled.
- Proven techniques and equipment are available to dismantle nuclear facilities safely and these have now been well demonstrated in several parts of the world.
- Decommissioning costs for nuclear power plants, including disposal of associated wastes, are reducing and contribute only a small fraction of the total cost of electricity generation.

All power plants, coal, gas and nuclear, have a finite life beyond which it is not economically feasible to operate them. Generally speaking, early nuclear plants were designed for a life of about 30 years, though some have proved capable of continuing well beyond this. Newer plants are designed for a 40 to 60 year operating life. At the end of the life of any power plant, it needs to be decommissioned, cleaned up and demolished so that the site is made available for other uses. For nuclear plants, the term decommissioning includes all clean-up of radioactivity and progressive dismantling of the plant. This may start with the owner's decision to write it off or declare that it is permanently removed from operation. For practical purposes it includes defueling and removal of coolant, though NRC at least defines it as strictly beginning only after fuel and coolant are removed. It concludes with licence termination after decontamination is verified and wastes removed.

8.1 DECOMMISSIONING OPTIONS

The International Atomic Energy Agency (IAEA) has defined three options for decommissioning, the definitions of which have been internationally adopted:

- Immediate Dismantling (or Early Site Release/'Decon' in the US): This option allows for the facility to be removed from regulatory control relatively soon after shutdown or termination of regulated activities. Final dismantling or decontamination activities can begin within a few months or years, depending on the facility. Following removal from regulatory control, the site is then available for re-use.

- Safe Enclosure ('Safstor') or deferred dismantling: This option postpones the final removal of controls for a longer period, usually in the order of 40 to 60 years. The facility is placed into a safe storage configuration until the eventual dismantling and decontamination activities occur after residual radioactivity has decayed. There is a risk in this case of regulatory change which could increase costs unpredictably.
- Entombment (or 'Entomb'): This option entails placing the facility into a condition that will allow the remaining on-site radioactive material to remain on-site without ever removing it totally. This option usually involves reducing the size of the area where the radioactive material is located and then encasing the facility in a long-lived structure such as concrete, that will last for a period of time to ensure the remaining radioactivity is no longer of concern.

Each approach has its benefits and disadvantages. National policy determines which approach or combination of approaches is adopted or allowed. In the case of immediate dismantling (or early site release), responsibility for completion of decommissioning is not transferred to future generations. The experience and skills of operating staff can also be utilised during the decommissioning program. Alternatively, Safe Enclosure (or Safstor) allows significant reduction in residual radioactivity, thus reducing radiation hazard during the eventual dismantling. The expected improvements in mechanical techniques should also lead to a reduction in the hazard and also costs.

In the case of nuclear reactors, about 99% of the radioactivity is associated with the fuel which is removed following permanent shutdown. Apart from some surface contamination of plant, the remaining radioactivity comes from "activation products" in steel which has long been exposed to neutron irradiation, notably the reactor pressure vessel. Stable atoms are changed into different isotopes such as iron-55, iron-59 and zinc-65. Several are highly radioactive, emitting gamma rays. However, their half-life is such (2.7 years, 45 days, 5.3 years, 245 days respectively) after 50 years from closedown their radioactivity is much diminished and the occupational risk to workers largely gone.

8.2 COST AND FINANCE

In most countries the operator or owner is responsible for the decommissioning costs.

The total cost of decommissioning is dependent on the sequence and timing of the various stages of the program. Deferment of a stage tends to reduce its cost, due to decreasing radioactivity, but this may be offset by increased storage and surveillance costs. Even allowing for uncertainties in cost estimates and applicable discount rates, decommissioning contributes a small fraction of total electricity generation costs. In USA many utilities have revised their cost projections downwards in the light of experience. Financing methods vary from country to country. Among the most common are:

- Prepayment, where money is deposited in a separate account to cover decommissioning costs even before the plant begins operation. This may be done in a number of ways but the funds cannot be withdrawn other than for decommissioning purposes.
- External sinking fund (Nuclear Power Levy): This is built up over the years from a percentage of the electricity rates charged to consumers. Proceeds are placed in a trust fund outside the utility's control. This is the main US system, where sufficient funds are set aside during the reactor's operating lifetime to cover the cost of decommissioning.
- Surety fund, letter of credit, or insurance purchased by the utility to guarantee that decommissioning costs will be covered even if the utility defaults.

In the USA, for example, utilities are collecting 0.1 to 0.2 cents/kWh to fund decommissioning. They must then report regularly to the NRC on the status of their decommissioning funds. About two thirds of the total estimated cost of decommissioning all US nuclear power reactors has already been collected, leaving a liability of about $9 billion to be covered over the remaining operating lives of 100 reactors (on basis of average $320 million per unit).

An OECD survey published in 2003 reported US dollar (2001) costs by reactor type. For western PWRs, most were $200-500/kWe, for VVERs costs were around $330/kWe, for BWRs $300-550/kWe, for CANDU $270-430/kWe. For gas-cooled reactors the costs were much higher due to the greater amount of radioactive materials involved, reaching $2600/kWe for some UK Magnox reactors. This last figure remains to be tested in experience.

8.3 REASONS FOR SHUTDOWN

Most decommissioned reactors were shut down because there was no longer any economic justification for running them. Practically all are relatively early-model designs, and about 45 are experimental or prototype power reactors. Three categories are listed here:

- Experimental, early commercial types and commercial unit whose continued operation was no longer justified, usually for economic reasons. Most of these started up before 1980 and their short life is not surprising for the first couple of decades of a major new technology. At least 41 of these 101 ran relatively full-term, for a design life of 25-35 years or so (design lives today are 40-60 years). Total 104.
- Units which closed following an accident or serious incident (not necessarily to the reactor itself) which meant that repair was not economically justified. Total 11.
- Units which were closed prematurely by political decision or due to regulatory impediment without clear or significant economic or technical justification. Total 25, 17 of these being early Soviet designs.

In fact, the distinctions are not always clear, e.g. Chernobyl 2 was closed in 1991 after a turbine fire when it would have been politically impossible to repair and restart it. Rheinsberg was closed in 1990 though it was nearly at the end of its design life – both these are in the 'political decision' category.

8.4 DECONTAMINATION & DECOMMISSIONING (D&D)

Westinghouse has extensive experience in decommissioning pressurized water reactors (PWRs), boiling water reactors (BWRs), gas-cooled reactors (GCRs), sodium-cooled reactors, research reactors and fuel fabrication plants. Westinghouse provides comprehensive, integrated services and state-of-the-art solutions for spent fuel and the treatment and handling of radioactive waste, and offers proven solutions for the interim storage and final disposal of all levels of waste.

Capabilities include:

- D&D project planning
- Post-operation support
- Spent fuel services
- Decommissioning studies
- Waste treatment systems
- Site and waste characterization plans
- Nuclear component segmentation
- Waste optimization studies
- Waste packaging
- Decontamination for decommissioning
- Final site surveys and monitoring
- Waste storage and disposal facilities design
- Regulatory issues management

Westinghouse is a full-scope supplier that delivers on its promise of working with and supporting customers during all project phases. Westinghouse provides its customers both expertise and experience based on our integral approach, and they support all the phases of a project, from concept and licensing to implementation and work supervision.

All Westinghouse technologies and systems are designed to meet International Atomic Energy Agency regulations and guidelines, as well as specific legal or environmental requirements of our customer's respective countries.

9 RISK MANAGEMENT ANALYSIS

The liberalisation of electricity markets has presented certain risks associated within the power production market. These are summarised in the following table.

Main risk factors for investors in power generation			
Plant Risk	**Market Risk**	**Regulatory Risk**	**Policy Risk**
Construction costs	Fuel cost	Market design	Environmental standards
Lead time	Demand	Regulation of competition	CO_2 constraints
Operational cost	Competition	Regulation of transmission	Support for specific technologies (renewables, nuclear, CCS)
Availability/performance	Electricity price	Licensing and approval	Energy efficiency

Figure 10 - Main risk factors for investors in power generation

The OECD summarises the risks involve with each technology very succinctly in the following paragraph. We have quoted it in full.

> Although some risks are common to all technologies (e.g. demand and policy uncertainties) the nature and degree of risks differ significantly from project to project and from technology to technology. For example, the regulatory risk may be the most important risk facing nuclear and coal power plant projects, due to social and local acceptance issues as well as complexity and uncertainty of siting and permitting. Furthermore, nuclear projects face high risks of cost overruns due to the limited recent construction experience (which may diminish over time), while coal- fired power projects face the risks of stringent environmental regulation and climate polices. The regulatory risk of investments in gas- fired generation may be low, but investors in this technology in countries heavily dependent on gas imports face the relatively high risks associated with gas supply and price increases which can potentially affect significantly gas- fired generation costs. Nuclear, on the other hand, benefits from stable costs once operating, and a much more secure fuel supply. Renewable projects, perhaps generally less subject to environmental scrutiny, face nevertheless the risks associated with transmission, including access, interconnection, and integration – all of which do have an impact on costs, although again, like nuclear, benefit from low and stable operating costs.[7]

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[7] International Energy Agency, Nuclear Energy Agency, and the OECD. Projected Costs of Generating Electricity: 2010 Edition. International Energy Agency. Paris, France: 2010.

The associated risks for the above are discussed in the following paragraphs and how they are mitigated. The information will show that Westinghouse generally takes a relatively conservative view of risk, which is the major factor in a new NPP.

9.1 PLANT RISK

9.1.1 CONSTRUCTION COSTS

Based on the information from the IAE and NEA in Figure 11, China has proven that is able to drop construction costs significantly compared to other nuclear competitors. The reported overnight costs of **$2,302/kWe** is one of the lower reported figures in the table, based on a 2010 analysis.

Country	Nuclear	USD/kWe	Coal	USD/kWe	Gas	USD/kWe	Onshore wind	USD/kWe
Belgium	EPR-1600	5 383	Bk SC	2 539	Single Shaft CCGT	1 249	3x2MWe	2 615
			Bk SC	2 534	CCGT	1 099	1x2MWe	2 461
					CCGT	1 069		
					CCGT	1 245		
Canada							33x3MWe	2 745
Czech Republic	PWR	5 858	Br PCC	3 485	CCGT	1 573	5x3MWe	3 280
			Br FBC	3 485	CCGT w/CC(S)	2 611		
			Br IGCC	4 671				
			Br FBC w/ BioM	3 690				
			Br PCC w/CC(S)	5 812				
			Br FBC w/CC(S)	6 076				
			Br IGCC w/CC(S)	6 268				
			Br FBC w/BioM and CC(S)	6 076				
France***	EPR	3 860					15x3MWe	1 912
Germany	PWR	4 102	Bk PCC	1 904	CCGT	1 025	1x3MWe	1 934
			Bk PCC w/CC(S)	3 223	Gas Turbine	520		
			Br PCC	2 197				
			Br PCC w/CC(S)	3 516				
Hungary	PWR	5 198						
Italy					CCGT	769	25x2MWe	2 637
Japan	ABWR	3 009	Bk	2 719	CCGT	1 549		
Korea	OPR-1000	1 876	Bk PCC	895	LNG CCGT	643		
	APR-1400	1 556	Bk PCC	807	LNG CCGT	635		
Mexico			Bk PCC	1 961	CCGT	982		
Netherlands	PWR	5 105	Bk USC PCC	2 171	CCGT	1 025	3MWe	2 076
Slovak Republic	VVER	4 261	Br SC FBC	2 762				
Switzerland	PWR	5 863			CCGT	1 622	3x2MWe	3 716
	PWR	4 043						
United States	Adv GenIII+	3 382	Bk PCC	2 108	CCGT	969	100x1.5MWe	1 973
			Bk IGCC	2 433	AGT	649		
			Bk IGCC w/CC(S)	3 569	CCGT w/CC(S)	1 928		
NON-OECD MEMBERS								
Brazil	PWR Siemens/Areva	3 798	Br SUBC PCC	1 300	CCGT	1 419		
China	CPR-1000	1 763	Bk USC PCC	656	CCGT	538	200MWe (Park)	1 223
	CPR-1000	1 748	Bk SC	602	CCGT	583	33x1.5MWe	1 541
	AP-1000	2 302	Bk SC	672			41x0.85MWe	1 627
							30MWe (Park)	1 583
Russia	VVER-1150	2 933	Bk USC PCC	2 362	CCGT	1 237	100x1MWe	1 901
			Bk USC PCC w/CC(S)	4 864				
			Bk SC PCC	2 198				
South Africa			Bk SC PCC	2 104				

Figure 11 - Overnight costs of electricity generating technologies (USD/kWe) - mainstream technologies

One reason for this is that Westinghouse owns the components supply and therefore can take a better view of price and own capabilities; a benefit most other companies cannot do. It is essential that every effort be made by all parties involved to reduce the uncertainties and risks associated with the specific characteristics of nuclear power projects. To this end, it is necessary to improve the overall climate for financing such projects.

There are five essential elements to mitigating these risks:

1. **Commitment of government** – The commitment of the government to a nuclear power program, together with strong policy support is needed to reduce the uncertainties and associated risks and improve the overall climate for financing.
2. **Investment climates –** Given the complexities of financing a nuclear power project, it is of critical importance that, in addition to ensuring that all is done to maintain the schedule and keep within budget constraints, the climate surrounding such a project should be favourable. The investment climate can be enhanced if the government and the owner organization of the host country maintain consistent and fair dealing with lenders and investors, and if they develop an electricity tariff structure adequate for the financial strength of the utility.
3. **Financing plan -** The utility and government together should prepare a financing plan to finance the project cost from the initial stage to develop nuclear power program. A financing plan must be designed to accommodate the special characteristics of nuclear power projects such as long construction times, large capital requirements and the likelihood of cost overruns and delays. The financing plan should be made to achieve the following objectives:
    a. securing sufficient financing resources to complete the project;
    b. securing the necessary funds at the lowest practicable cost;
    c. optimizing the financing mix among not only internal financing such as utilizing retained earnings and capital surplus, but also external financing which comprises direct financing such as stock or bond issuance and borrowing from commercial banks or other financial institutions;
    d. maximizing the value of the tax benefits of ownership.
4. **Export credits -** The present schemes of export credits and commercial financing do not adequately meet the needs of financing nuclear power projects in most developing countries in terms of the repayment periods or profiles, nor do they provide the flexibility necessary to deal with delays and cost overruns. In particular, the profile of the required repayment schedule (equal instalments of principal plus interest payments) imposes a high annual capital charge requirement, especially during the first year after starting operation. Furthermore, some of the conditions attached to the interest rates and the exclusion of aid credits tend not to favour nuclear power projects in comparison with conventional projects. Some specific steps can be taken to alleviate the problems of export credits. **In particular, opportunities for multi-vendor projects should be investigated and, where appropriate, it must be promoted as a means of overcoming limitations on export guarantees and distributing the financial risk**.
5. **Creditworthiness -** Doubts regarding the creditworthiness of the host country can preclude the financing of a nuclear power project. Only countries with acceptable credit ratings can qualify for bank loans and other credits for financing such a project. The development of sound economic policies, good debt management, and project risk sharing contribute to this end.

9.1.2 LEAD TIME

Risk due to delayed construction lead times can severely affect projects. At the time of printing a Bloomberg article in 2010, Areva had already booked €2.6 billion of provisions for the EPR it's developing in Finland, initially estimated to cost €3 billion.[8]

9.1.3 OPERATIONAL COST

Nuclear power plants require many of the same supplies as any other business in addition to a few unique items. Nuclear power plants must maintain higher standards of operational excellence due to the scrutiny placed on the industry and the potential safety hazards of equipment in poor condition. High repair and maintenance expenses are a result of these standards, yet it can be argued that the increased cost is offset by the enhanced performance of the nuclear power plant.[9]

9.2 MARKET RISK

9.2.1 FUEL COST

It is a fact that the total fuel costs of a nuclear power plant in the OECD are typically about a third of those for a coal-fired plant and between a quarter and a fifth of those for a gas combined-cycle plant.[10]

Morgan (Figure 12) suggests that 80% of the cost of a coal-fired plant is the fuel; for a gas-fired plant the figure is 93%; and for nuclear the uranium is about 26%.[11]

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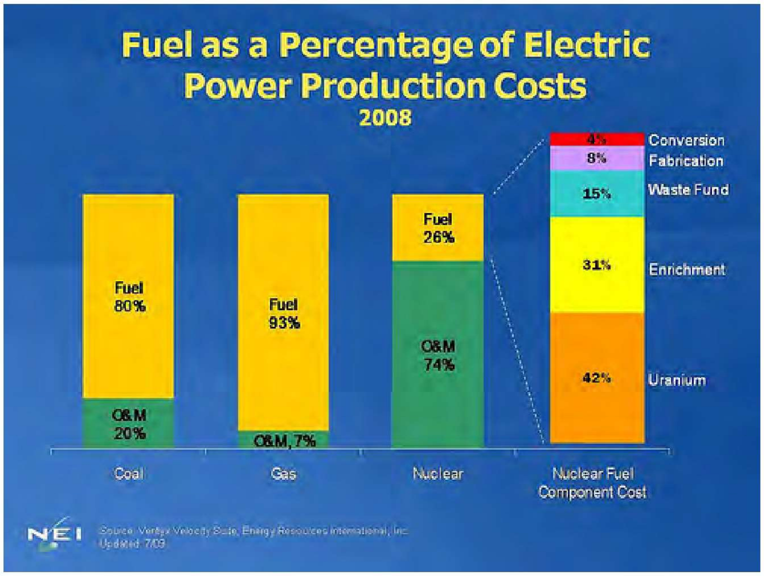
[8] Beaupuy, Francois de and Tara Patel. "China Builds Nuclear Reactor for 40% Less Than Cost in France, Areva Says." Bloomberg. 24 November 2012. 6 February 2012 <http://www.bloomberg.com/news/2010-11-24/china-builds-french-designed-nuclear-reactor-for-40-less-areva-ceo-says.html>

[9] Morgan, Jason. "Operating Costs of a Nuclear Power Plant." Nuclear Fissionary. 15 March 2010. 7 February 2012 <http://nuclearfissionary.com/2010/03/15/operating-costs-of-a-nuclear-power-plant/>

[10] World Nuclear Association. "The Economics of Nuclear Power." World Nuclear Association. December 2011. 6 February 2012 <http://www.world-nuclear.org/info/default.aspx?id=410&terms=financing>

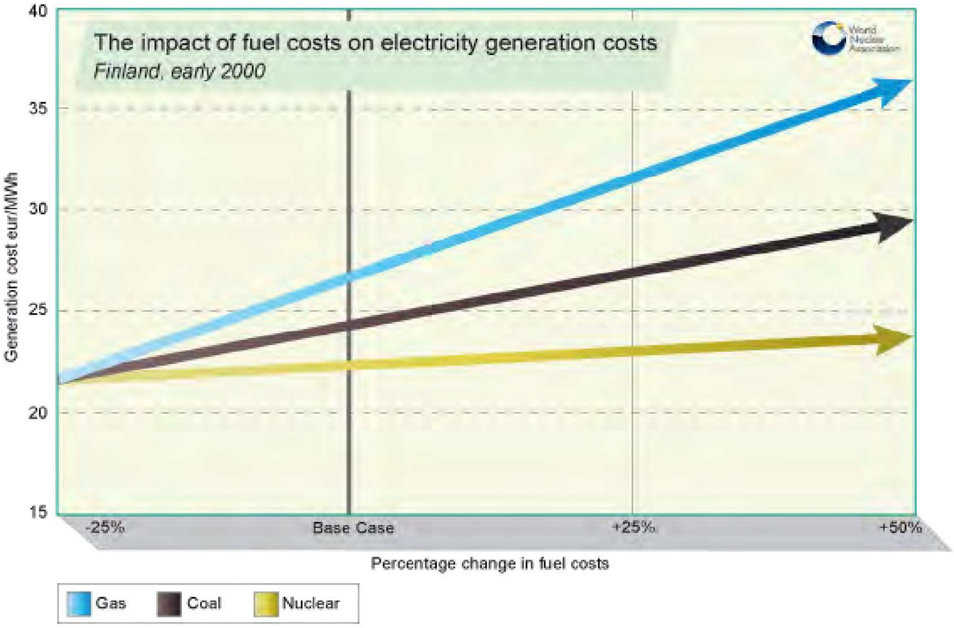
[11] Morgan, Jason. "Operating Costs of a Nuclear Power Plant." Nuclear Fissionary. 15 March 2010. 7 February 2012 <http://nuclearfissionary.com/2010/03/15/operating-costs-of-a-nuclear-power-plant/>


Fuel as a Percentage of Electric Power Production Costs
2008

Source: Ventyx Velocity Suite, Energy Resources International, Inc.
Updated: 7/09

Figure 12 - Fuel as a percentage of electric power production costs

Furthermore, O&M at a NPP is not as significantly affected by a rise in uranium prices as compared to a rise in the price of LNG or coal. Figure 15 shows that a doubling of fuel prices would result in the electricity cost for nuclear rising about 9%, for coal rising 31% and for gas 66%. Gas prices have since 2000 risen significantly.



Source: World Nuclear Association

Figure 13 - The impact of fuel costs on electricity generation costs

9.2.2 DEMAND

According to the International Energy Agency's Annual World Energy Outlook 2010, the financial crisis of 2008-2009 put the world's energy markets in turmoil. The agency's outlook states that,

> It will be governments, and how they respond to the twin challenges of climate change and energy security, that will shape the future of energy in the longer term… The past year has also seen notable steps forward in policy making, with the negotiation of important international agreements on climate change and on the reform of *inefficient fossil-fuel subsidies*. And the development and deployment of *low-carbon technologies received a significant boost* from stepped-up funding and incentives that governments around the world introduced as part of their fiscal stimulus package… But doubts remain about the implementation of recent policy commitments. Even if they are acted upon, *much more needs to be done* to ensure that this transformation happens quickly enough. ***The policy commitments and plans that governments have recently announced would, if implemented, have a real impact on energy demand and related CO_2 emissions*** (emphasis added).[12]

The report continues that world primary energy demand increases by **36%** between 2008 and 2035, from approximately 12,300 million tonnes of oil equivalent (Mtoe) to over 16,700 Mtoe (a 1.2% yearly increase on average). Brussels estimates that EU-27 demand for electricity will increase by 35% by 2030, based on 2007 forecasts.[13]

9.2.3 COMPETITION

One of the most high-profile successful nuclear bids in recent years has been that of Korea's KEPCO bid in the United Arab Emirates. The $40 billion contract that KEPCO won in the UAE has caused concern among the six big firms that have dominated the industry for decades: GE and Westinghouse of America, Areva of France, and Toshiba, Hitachi and Mitsubishi Heavy Industries of Japan. The competition is confronted by emerging-market "national champions" like KEPCO with the full backing of their governments—an invaluable asset in a high-liability business like nuclear power.

The Japanese and American nuclear firms, for their part, say **they cannot compete with state-backed bids**. Big American utilities have little interest in teaming up with nuclear vendors to mount joint bids abroad. Japanese firms have a distressing record of falsified inspection reports and frequent outages.[14] Despite their joint venture, Hitachi and GE are pushing two competing reactors. Areva and

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[12] International Energy Agency. World Energy Outlook 2010 Executive Summary. International Energy Agency. Paris, France: 2010.

[13] Capros, P, et al. European Energy and Transport Trends to 2030 — Update 2007. European Commission Directorate-General for Energy and Transport. Brussels, Belgium: 2008.

[14] The Economist. "Unexpected Reaction: The handful of firms that build nuclear reactors face new competition." The Economist. 4 February 2010. 5 February 2012 <http://www.economist.com/node/15457220>

Mitsubishi Heavy have rival designs of their own, but have also set up a joint venture to promote yet another type of reactor. An analyst in Japan was quoted as saying, "it's chaos at the vendor level."[15]

American and Japanese nuclear firms' chances of maintaining an edge may depend on how far their governments are willing to push nuclear power at home.

Currently, the global industry is closely watching developments at Braka to see if KEPCO's published economics and timeframes of the project can be met. If they are unable to meet them, this will be potentially very damaging to the Korean nuclear industry.

This leads to the other question of how KEPCO intends to deal with the fraudulent certificates scandal. It is well known in the media that Korea Hydro and Nuclear Power (KHNP), which owns and operates all 23 of Korea's nuclear power reactors, had allegedly been supplied with falsely-certified parts for at least five of them, with up to 60 quality control certificates covering 7682 components delivered between 2003 and 2012.[16] Over 100 people have been indicted in Seoul, which is causing huge concern in Abu Dhabi and tarnishing Korea's reputation. KEPCO must form a public relations strategy in order to address all these concerns in potential markets, or face being overlooked when bidding on new projects.

9.2.4 ELECTRICITY PRICE

Electricity price is possibly one of the most critical factors affecting risk. The underlying fact is that if the utility cannot recover the cost of building the NPP through appropriately priced tariffs, it does not make sense to build one.

KAERI points out, "electricity tariffs are of special importance in arranging for and repaying loans for nuclear power projects… it is usually thought to be crucial that the overall electricity tariff structure reflects the full electricity generation and distribution costs, which for nuclear power plants include funds for disposal of spent fuel, radwaste and decommissioning… Tariffs vary between countries, but should reflect costs which are essential for the economic strength and internal financing capabilities of the utility."[17]

According to Morgan, the optimum financing for new nuclear construction is by pre-charging ratepayers a small per kWh fee and by using cash on hand a utility company can drastically reduce the size of the loan(s) required to fund the project, without creating public backlash.[18]

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[15] The Economist. "Unexpected Reaction: The handful of firms that build nuclear reactors face new competition." The Economist. 4 February 2010. 5 February 2012 <http://www.economist.com/node/15457220>

[16] World Nuclear News. Korea probes forged quality certificates. 7 November 2012. <http://www.world-nuclear-news.org/RS-Korea_probes_forged_quality_certificates-0711124.html

[17] KAERI. Financing of Nuclear Power Projects. KAERI. 7 February 2012 <http://www.kntc.re.kr/openlec/policy/part1/part1_contents.htm>

[18] Morgan, Jason. "Operating Costs of a Nuclear Power Plant." Nuclear Fissionary. 15 March 2010. 7 February 2012 <http://nuclearfissionary.com/2010/03/15/operating-costs-of-a-nuclear-power-plant/>

9.3 REGULATORY RISK

9.3.1 MARKET DESIGN

The deregulation of the electricity market and the tightening of regulations have brought upon energy producers challenges that they never had to manage. Larsen and Bunn summarise these newfound challenges below.

	Industry Changes	
Attribute	Monopolistic market	Competitive market
Business environment	Stable with only gradual adjustment, technically driven changes. Uncertainties in demands on costs.	Unstable, volatile prices, new stakeholders, with diverse objectives. Market, corporate and regulatory uncertainties.
Information	Open and public domain information. Planned future.	Information becomes secret. Future signals misleading.
Market power	Not an issue as there as there was a regulated monopoly.	Now crucial for regulators and companies.
Conservation and environment	Easily incorporated into energy policy.	Adds one more layer to regulatory risk.
Public R&D	Public R&D was seen as an important part of long-term obligation.	Companies cannot justify public domain R&D.

Figure 14 - Changes taking place at industry level when an industry is restructured

When deregulation has been associated with a novel market structure, which is almost always the case in the utility sector, there has been neither an evolutionary history of such a system from which to learn, nor reasonable analogies elsewhere. In other words, these are new markets with no history to learn from, and there is no way of using the past to understand the present and predict the future. This market 'inexperience' is common to all companies, the regulator and the political framework in which everybody operates. The challenge for the company is therefore to understand how the system works and the nature of its weakness, thereby to develop strategies either for competitive exploitation or for political lobbying to influence future change.[19]

9.3.2 REGULATION OF COMPETITION

Besides requiring capital in the form of public acceptance of NPPs, a system of government support must exist for them to exist. As mentioned above, the commitment of the government to a nuclear power program, together with strong policy support is needed to reduce the uncertainties and associated risks and improve the overall climate for financing. Therefore, governments that wish to see a nuclear contribution to energy supply need to take a number of steps to enable and facilitate the necessary investment. Key actions to be considered by governments that wish to see such investment include:

1. Provide **clear and sustained policy support for the development of nuclear power**, by setting out the case for a nuclear component in energy supply as part of a long-term national energy strategy. Winning public acceptance of a role for nuclear power in meeting environmental goals while providing secure and affordable energy supplies must be accomplished at the political level.
2. Work with electricity utilities, financial companies and other potential investors, and the nuclear industry, from an early stage to **address concerns that may prevent nuclear investment** and to avoid mistakes in establishing the parameters for new NPPs. The government will need to take an active role in facilitating nuclear projects, even where investment is to be made by commercial entities.
3. Establish an **efficient and effective regulatory system** which provides adequate opportunities for public involvement in the decision making process, while also providing potential investors with the certainty they require to plan such a major investment. **A one-step licensing process** with pre-approval of standardised designs offers clear benefits in this regard.
4. Put in place **arrangements for the management of radioactive waste** and spent fuel, with progress towards a solution for final disposal of waste. For investors in NPPs, the financial

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[19] Larsen, E.R. and D.W. Bunn. Deregulation in Electricity: Understanding Strategic and Regulatory Risk. "The Journal of the Operational Research Society." 50.4: 337-344. April 1999.

arrangements for paying their fair share of the costs must be clearly defined. An effective framework for nuclear insurance and liabilities must also be in effect.

5. Ensure that **electricity market regulation does not disadvantage NPPs**. Long-term arrangements may be necessary to provide certainty for investors in NPPs, reflecting the long-term nature of nuclear power projects. Where reducing CO2 emissions is to act as an incentive for nuclear investments, the government may need to provide some guarantees that policy measures will keep carbon prices at sufficiently high levels. Allowing nuclear projects to generate carbon credits could also provide incentive, provided the policy was sufficiently long-term.

9.3.3 REGULATION OF TRANSMISSION

Nuclear generating stations have historically been susceptible to transmission system voltage excursions. When nuclear generating stations trip because of voltage excursions, the resulting loss in real and reactive power support can exacerbate transmission events. New standards are being developed which should help improve nuclear plant and transmission system reliability.[20]

Two specific issues that need to be addressed are project authorisation and financing. Permitting and cross-border cooperation must become more efficient and transparent to increase public acceptance and speed up delivery. Financial solutions must be found to meet investment needs– estimated at about one trillion euros for the coming decade of which half will be needed for energy networks alone. Regulated tariffs and congestion charges will have to pay the bulk of these grid investments. However, under the current regulatory framework, all necessary investments will not take place or not as quickly as needed, notably due to the non-commercial positive externalities or the regional or European value-added of some projects, whose direct benefits at national or local level is limited. The slowdown in investment in infrastructure has been further compounded by the recession.[21]

9.3.4 LICENSING AND APPROVAL

This is very much related to the market design in that the complexity of the licensing and approval of NPPs is directly related to how willing a government is to build NPP projects. It is important to have a predictable licensing process that can avoid unexpected costs and facilitate getting the new plant up to safety and design requirements at an early date to start electricity – and revenue – generation.

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[20] Kirby, Brendan et al. "Nuclear Generating Stations and Transmission Grid Reliability." 8 February 2012. <http://info.ornl.gov/sites/publications/files/Pub6895.pdf>

[21] European Commission Directorate General for Energy. Energy Infrastructure: priorities for 2020 and beyond – A Blueprint for an integrated European energy network. European Union. Brussels, Belgium: 2011.

9.4 POLICY RISK

9.4.1 ENVIRONMENTAL STANDARDS

The Fukushima Daiichi nuclear disaster reignited great concern throughout the world about the safety of nuclear power. This terrible event also caused the European to revaluate its nuclear safety, which is of primary concern. Public acceptance of NPP is important to the process. Without, governments will find it difficult to convince their constituents that nuclear is the best option for power.

By making sure that NPPs abide by safety and environmental rules throughout the lifecycle of a plant, it can mitigate concerns associated with the environment.

As of 2011, nuclear safety considerations occur in a limited number of situations, including:

- Nuclear fission power used in nuclear power stations, and nuclear submarines and ships
- Nuclear weapons
- Fissionable fuels such as uranium and plutonium and their extraction, storage and use
- Radioactive materials used for medical, diagnostic, batteries for some space projects, and research purposes
- Nuclear waste, the radioactive waste residue of nuclear materials
- Nuclear fusion power, a technology under long-term development
- Unplanned entry of nuclear materials into the biosphere and food chain (living plants, animals and humans) if breathed or ingested.

With the exception of thermonuclear weapons and experimental fusion research, all safety issues specific to nuclear power stems from two issues:

1. the toxicity and radioactivity of heavy fissionable materials, waste by-products, and other radioactive materials; and
2. the risks of unplanned or uncontrolled nuclear fission events.

Nuclear safety therefore covers at minimum:

- Extraction, transportation, storage, processing, and disposal of fissionable materials
- Safety of nuclear power generators
- Control and safe management of nuclear weapons, nuclear material capable of use as a weapon, and other radioactive materials
- Safe handling, accountability and use in industrial, medical and research contexts
- Disposal of nuclear waste
- Limitations on exposure to radiation

The International Atomic Energy Agency (IAEA) works with Member States to promote safe and secure technologies. Great improvements have been made to the design of nuclear power reactors to increase their safety and downtime; however thorough research and planning must be carried out to prevent accidents from occurring. As one director of a U.S. research laboratory put it, "fabrication, construction, operation, and maintenance of new reactors will face a steep learning curve: advanced technologies will have a heightened risk of accidents and mistakes. The technology may be proven, but people are not."[22]

9.4.2 CO₂ CONSTRAINTS

This does not apply to NPP directly. However, when comparing the cost of different generating technologies, it is important to note that the cost of carbon offsets is calculated on average at $30/tonne. Figure 21 compares the typical amounts of waste that is generated by different generating technologies. These figures make it easy to draw conclusions about CO_2 emissions, especially in regard to environmental impact.

Type of Plant	Amt of Electricity Produced (MWh)	Nuclear Used Fuel (tonnes)	Coal Ash (tonnes)	Nitrogen Oxide (tonnes)	Carbon Dioxide (tonnes)	Carbon Monoxide (tonnes)	Total Annual Waste (tonnes)	Waste per kWh (lbs)
Nuclear	7,971,600	27	0	0	0	0	27	0
Coal	6,683,880	0	400,000	20,400	7,400,000	1,440	7,841,940	2,347
Natural Gas	998,640	0	0	157	199,472	68	199,711	400
Oil	1,173,840	0	0	898	328,655	66	332,036	566

Source: Nuclear Science and Technology

Figure 15 - Annual waste produced by 1,000 MW plant

This table shows the amount of each type of waste produced by the four energy sources being compared based on the amount of energy produced by a 1,000 MW plant in one year. Understanding that not all power plants are 1,000 MW, nor are the various types of plants necessarily similar in size or duration of operation, these factors were built in to ensure an apples-to-apples comparison.

The raw data for the coal waste was based on an annual operation of a 500 MW coal plant, so this analysis simply multiplied those waste figures by two. Natural gas and oil plants' waste data was based on 1 billion BTU. This is equivalent to 292.875 MWh. The average output of a 1,000 MW rated

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[22] Sovacool, Benjamin K. "A Critical Evaluation of Nuclear Power and Renewable Electricity in Asia." Journal of Contemporary Asia, Vol. 40, No. 3, August 2010, p. 381.

natural gas and oil plant, with capacity factors of 11.4% and 13.4% respectively, was calculated to come up with the number of MWhs produced by each theoretical plant in one year (NG = 998,640, Oil = 1,173,840). These results were divided by 292.875 and then multiplied by the waste figures in the data. This calculation converts the raw data from the 1 billion BTU base to waste information for a 1,000 MW rated plant. Taking this further, the waste amounts to pounds per kWh were broken down to give a true, levelised waste figure for each energy generation source using the same per unit base.

9.4.3 SUPPORT FOR SPECIFIC TECHNOLOGIES

It goes without saying that in order for a technology to be used in a specific country, that country must support its use. The physical risk lies with a particular country's power grid to be able to support the technology. As noted above, the European Union is making effort to mitigate the risk associated with grids not being to cope with certain technical irregularities that cause failures and outages.

9.4.4 ENERGY EFFICIENCY

A particular technology's energy efficiency is an important factor in deciding which generation technology to choose. The following data compares different fuel types and their respective energy densities.

Fuel Type	Energy Density (kWh/kg)	Number of Times Denser than Coal
Nuclear Fission (100% U-235)	24,513,889	2,715,385
Natural Uranium (99.3% U-238, 0.7% U-235) in a fast breeder reactor	6,666,667	738,462
Enriched Uranium (3.5% U-235) in a light water reactor	960,000	106,338
Natural Uranium (99.3% U-238, 0.7% U-235) in a light water reactor	123,056	13,631
LPG propane	13.8	1.5
LPG butane	13.6	1.5
Gasoline	13.0	1.4
Diesel fuel/Residential heating oil	12.7	1.4
Biodiesel oil	11.7	1.3
Anthracite Coal	9.0	1.0
Water at 100 m dam height	0.0003	N/A

Source: Nuclear Science and Technology

Figure 16 - Energy densities of nuclear, coal, natural gas, and oil

The results show that 1 kg of 3.5% enriched uranium produces approximately 100,000 times more energy than 1 kg of anthracite coal.

10 THE OWNER'S ENGINEER ROLE IN REDUCING RISK

The role of the owner's engineer in power projects can be summed up in the following list. The primary role of the owner's engineer is to provide:

- Extensive expertise with professional project support and management.
- Risk minimization of budget overruns, environmental issues, procedural claims, quality issues and non-deliveries.
- Assurance that technical and contractual requirements are met.
- Comprehensive consulting services in all project phases.
- Overall project cost control / control on investment.
- Less risks for claims and contractual penalties.

Although there is no way to remove all risks from a project, an owner's engineer can simultaneously enhance opportunities, reduce overall risk, and ensure a deliverable that is closer to the owner's expectations.

Though it may not seem intuitive, hiring an owner's engineer can actually reduce a project's overall capital and operation and maintenance costs. The expense of the owner's engineer is often easily counterbalanced by cost savings obtained through tight control of the schedule, scope management, change orders, and overall project controls. The owner's engineer can also identify design options that reduce the owner's lifecycle costs. Even the tendency of an EPC contractor to raise costs in response to ill-defined scope or increased risk can be better controlled when an owner's engineer is working on behalf of the project owner to develop a tighter scope.

Developing a detailed project scope definition at the outset can keep a project on track, just as failure to properly develop one can lower a project's odds of successful completion. Some project owners choose to perform their own initial conceptual design, cost estimating, and scheduling. Before hiring an owner's engineer, they may even bring on an EPC contractor to serve as a technical reviewer of project progress. Limiting the owner's engineer role in that way can lead to less-than-optimal results, caused, perhaps, by a lack of clear scope definition that can lead to project costs climbing above budget. An owner's engineer who is involved from the outset can help develop a project execution plan and contracting strategy, and the owner benefits from having a partner who is intimately familiar with all aspects of the project as the work progresses. Laying the groundwork with the aid of an owner's engineer can help the owner identify opportunities that may otherwise be overlooked while avoiding or minimizing risks.

Beyond boosting documentation and rationale to result in the best possible financing deal for a project, having an owner's engineer involved at the earliest stage of a project can help an owner select the most qualified EPC contractor. Potential EPC contractors want to know many of the same things that financial backers need to know as they make a decision about whether to bid on a project. Just putting an EPC contract together for a large project is time-consuming and can cost several million dollars, but devoting attention to the details and minutia of all contract documents can pay big dividends in avoided change orders and delays as a project progresses.

From the outset of a project, an owner's engineer should be able to provide these deliverables:

- Defining and/or reviewing the project scope.
- Assessing and evaluating the budget and identifying financing sources.
- Conducting feasibility and site selection studies and alternatives analysis.
- Analysing available technologies and their suitability to a project.
- Preparing early project schedules and design criteria.
- Preparing technical specifications for owner-furnished equipment.
- Preparing EPC contract documents, including RFP (request for proposal) issuance and response analysis.
- Providing permitting assistance and addressing related environmental concerns.

As a project moves along, the owner's engineer is a critical link in keeping the work on schedule and on budget, tracking progress, and taking note of any emerging trends. When issues arise, as they nearly always do on large and complex projects, the owner's engineer can be an effective middle man to check original contract documents and review events to avoid unnecessary and unproductive finger-pointing. Depending on the type of contract, the owner's engineer may provide detailed design, overall project management, contract administration, and construction oversight.

An owner's engineer can be extremely helpful to an owner who wants to purchase equipment by writing technical specifications and assisting in the purchase of owner-furnished equipment and making sure that equipment suppliers are in compliance with all contract requirements. The owner's engineer can solicit and evaluate bids, negotiate contracts, and work with the owner's outside counsel to develop contracts.

Change management, implementation of earned value, project cost reporting and trending, and overall project controls are other areas in which an owner's engineer can help as a project progresses.

11 THE DEAL

We propose that Westinghouse Electric Company be acquired by CEFC China, with the support and assistance of Bernhard Capital Partners / EEIG. CEFC China has huge appetite to continue to expand its portfolio in the energy market, in China and abroad. Westinghouse is the logical partner to meet this end. If Westinghouse is positioned as the owner's engineer for China's domestic and international programs, with oversight over the major EPC contractor in China – China Nuclear Engineering and Construction Corporation (CNECC) – it would be a tremendously effective consortium for delivering new NPP on-time and on-budget.

11.1 REASONS FOR PROPOSAL

We base our proposal on the following reasons:

1. Now is an opportune time to capitalise on Toshiba's serious financial troubles. In 2015 concerns were expressed that the value of assets and goodwill in Westinghouse were overstated. Following an accounting scandal in which profits were overstated at Toshiba, leading to the CEO resigning, although Toshiba stated that the Westinghouse nuclear business was more profitable than at acquisition in 2006. As reported in The Register in February 2016,

> Life isn't getting any easier for Toshiba: the accountancy-scandal-hit Japanese conglomerate has forecasted a wider net loss of ¥710bn ($6bn) for its fiscal year, which ends in March. The worst set of losses in the company's history – it was founded in 1875 – are being blamed on restructuring costs, and amortisation of the energy and infrastructure unit. Net sales for the full financial year are expected to come in at ¥6.2tr ($53.1bn), versus ¥6.65tr ($56.9bn) a year earlier; operating income estimates were reduced to ¥340bn ($2.9bn) from ¥430bn ($3.6bn). The net loss previously forecasted was ¥550bn ($4.7bn). In April last year, it emerged that Tosh had inflated profits by $1.2bn since the start of the financial crisis, largely due to overly ambitious top line targets and a corporate culture that dissuaded staff from calling out execs on their crappy decisions… For the three months to the end of December 2015, total sales fell six per cent on the year-ago quarter to ¥4.42tr ($37.9bn) and Tosh made an operating loss of ¥295bn ($2.5bn), some ¥431.3bn ($3.7bn) worse than the previous year's period.[23]

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[23] Kunert, Paul. "Sorry, Toshiba, speak up … What was that? A $6bn loss amid an accounting scandal?" The Register. 4 February 2016. < http://www.theregister.co.uk/2016/02/04/toshiba_record_losses/>

2. Westinghouse retains all the intellectual property (IP) rights and licenses for the AP1000 and CAP1000. It is the world leader in nuclear new build and retains a sizeable U.S. based workforce.
3. The design and/or licensing of the AP1000 is the most widely used in the world. Nearly all Asian designs borrow from Westinghouse IP & licensing. **China has officially adopted the AP1000 as a standard for inland nuclear projects.**
4. China will own the intellectual property rights for CAP1400 (possibly followed by a 1700 MW design). **Exporting the new larger units may be possible with Westinghouse's cooperation**.
5. Furthermore, because the AP1000 is a U.S. design, Westinghouse has significant lobbying power in Congress. U.S. support is a must-have for any nuclear new build. This gives assurance and insurance to the nuclear new build owners, especially if they are a considered a new entrant to the nuclear power market, as China certainly is considered.
6. Because other nations that are bidding on similar nuclear new build use Westinghouse licensing, they can potentially have regulatory issues when trying to export their technology.
7. This structure could potentially give China monopoly advantage (with the exception of Russia).

11.2 KEY FACTORS

1. Nuclear new build heavily indebts the delivery country, which makes it an excellent area to spend China's currency reserves.
2. Nuclear new build creates thousands of jobs per construction site.
3. This deal would give China the opportunity to globalise their high-tech industries in IT and civil infrastructure.
4. Learning programmes will be key in educating the highest level workforce in international business programme.
5. It will make CEFC China the primary driver in the Chinese business sector.
6. CB&I (formerly The Shaw Group – where Mr. Bernhard was CEO) is currently providing nuclear support on 2 of 3 nuclear reactor new builds utilizing the AP1000.
7. Japan may not look positively upon a Chinese acquisition of its nuclear power sector, even though it makes complete economic sense, post-Fukushima, to sell it off the business. Therefore, the deal should maybe be structured so that it does not outwardly appear as such. This is where Bernhard Capital Partners can play a significant role, by acting as the conduit for the sale.

11.3 PROJECTED COST OF ACQUISITION

Approximately USD 5 billion

12 APPENDIX A - COUNTRY-BY-COUNTRY DATA ON ELECTRICITY GENERATING COSTS FOR MAINSTREAM TECHNOLOGIES

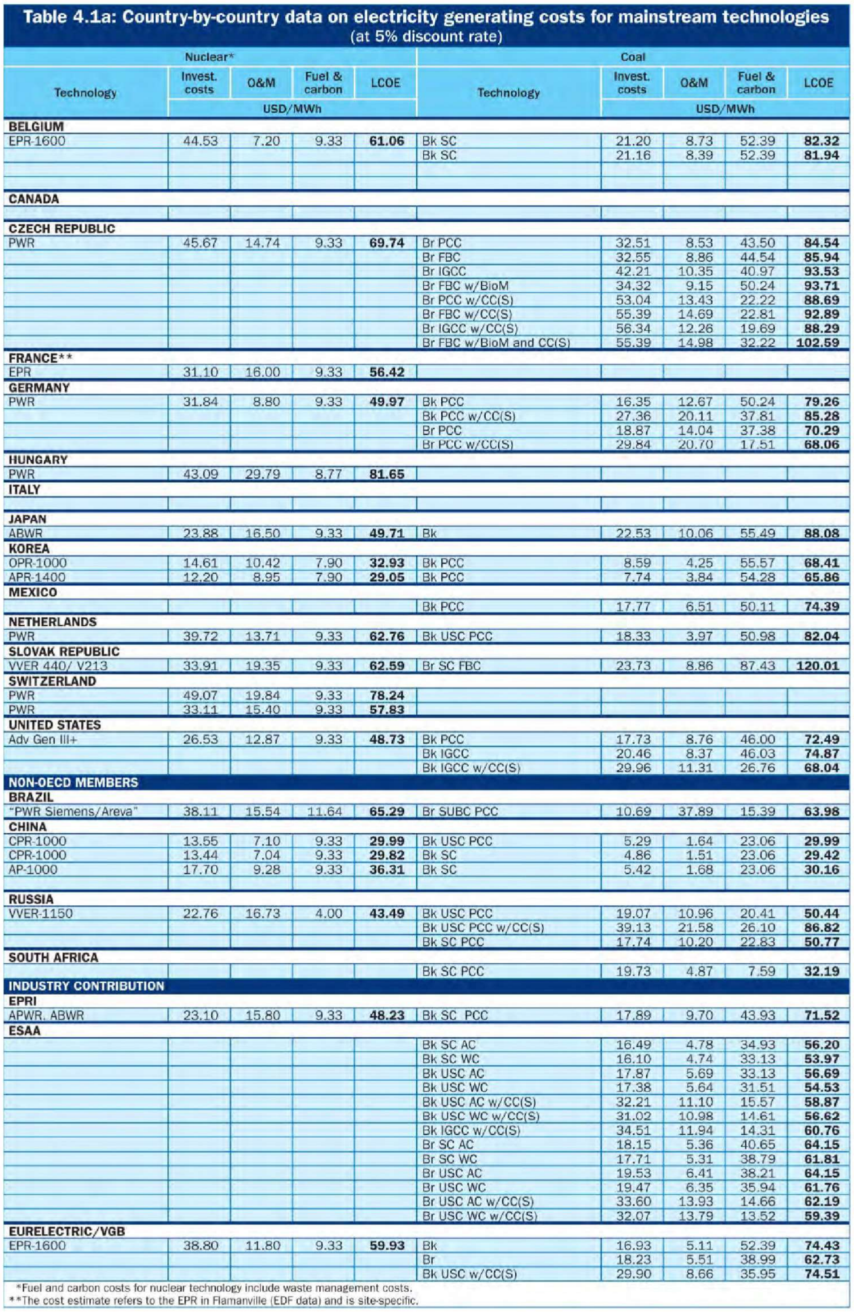

Table 4.1a: Country-by-country data on electricity generating costs for mainstream technologies
(at 5% discount rate)

	Nuclear*				Coal				
Technology	Invest. costs	O&M	Fuel & carbon	LCOE	Technology	Invest. costs	O&M	Fuel & carbon	LCOE
	USD/MWh					USD/MWh			
BELGIUM									
EPR-1600	44.53	7.20	9.33	**61.06**	Bk SC	21.20	8.73	52.39	**82.32**
					Bk SC	21.16	8.39	52.39	**81.94**
CANADA									
CZECH REPUBLIC									
PWR	45.67	14.74	9.33	**69.74**	Br PCC	32.51	8.53	43.50	**84.54**
					Br FBC	32.55	8.86	44.54	**85.94**
					Br IGCC	42.21	10.35	40.97	**93.53**
					Br FBC w/BioM	34.32	9.15	50.24	**93.71**
					Br PCC w/CC(S)	53.04	13.43	22.22	**88.69**
					Br FBC w/CC(S)	55.39	14.69	22.81	**92.89**
					Br IGCC w/CC(S)	56.34	12.26	19.69	**88.29**
					Br FBC w/BioM and CC(S)	55.39	14.98	32.22	**102.59**
FRANCE**									
EPR	31.10	16.00	9.33	**56.42**					
GERMANY									
PWR	31.84	8.80	9.33	**49.97**	Bk PCC	16.35	12.67	50.24	**79.26**
					Bk PCC w/CC(S)	27.36	20.11	37.81	**85.28**
					Br PCC	18.87	14.04	37.38	**70.29**
					Br PCC w/CC(S)	29.84	20.70	17.51	**68.06**
HUNGARY									
PWR	43.09	29.79	8.77	**81.65**					
ITALY									
JAPAN									
ABWR	23.88	16.50	9.33	**49.71**	Bk	22.53	10.06	55.49	**88.08**
KOREA									
OPR-1000	14.61	10.42	7.90	**32.93**	Bk PCC	8.59	4.25	55.57	**68.41**
APR-1400	12.20	8.95	7.90	**29.05**	Bk PCC	7.74	3.84	54.28	**65.86**
MEXICO									
					Bk PCC	17.77	6.51	50.11	**74.39**
NETHERLANDS									
PWR	39.72	13.71	9.33	**62.76**	Bk USC PCC	18.33	3.97	50.98	**82.04**
SLOVAK REPUBLIC									
VVER 440/ V213	33.91	19.35	9.33	**62.59**	Br SC FBC	23.73	8.86	87.43	**120.01**
SWITZERLAND									
PWR	49.07	19.84	9.33	**78.24**					
PWR	33.11	15.40	9.33	**57.83**					
UNITED STATES									
Adv Gen III+	26.53	12.87	9.33	**48.73**	Bk PCC	17.73	8.76	46.00	**72.49**
					Bk IGCC	20.46	8.37	46.03	**74.87**
					Bk IGCC w/CC(S)	29.96	11.31	26.76	**68.04**
NON-OECD MEMBERS									
BRAZIL									
"PWR Siemens/Areva"	38.11	15.54	11.64	**65.29**	Br SUBC PCC	10.69	37.89	15.39	**63.98**
CHINA									
CPR-1000	13.55	7.10	9.33	**29.99**	Bk USC PCC	5.29	1.64	23.06	**29.99**
CPR-1000	13.44	7.04	9.33	**29.82**	Bk SC	4.86	1.51	23.06	**29.42**
AP-1000	17.70	9.28	9.33	**36.31**	Bk SC	5.42	1.68	23.06	**30.16**
RUSSIA									
VVER-1150	22.76	16.73	4.00	**43.49**	Bk USC PCC	19.07	10.96	20.41	**50.44**
					Bk USC PCC w/CC(S)	39.13	21.58	26.10	**86.82**
					Bk SC PCC	17.74	10.20	22.83	**50.77**
SOUTH AFRICA									
					Bk SC PCC	19.73	4.87	7.59	**32.19**
INDUSTRY CONTRIBUTION									
EPRI									
APWR, ABWR	23.10	15.80	9.33	**48.23**	Bk SC PCC	17.89	9.70	43.93	**71.52**
ESAA									
					Bk SC AC	16.49	4.78	34.93	**56.20**
					Bk SC WC	16.10	4.74	33.13	**53.97**
					Bk USC AC	17.87	5.69	33.13	**56.69**
					Bk USC WC	17.38	5.64	31.51	**54.53**
					Bk USC AC w/CC(S)	32.21	11.10	15.57	**58.87**
					Bk USC WC w/CC(S)	31.02	10.98	14.61	**56.62**
					Bk IGCC w/CC(S)	34.51	11.94	14.31	**60.76**
					Br SC AC	18.15	5.36	40.65	**64.15**
					Br SC WC	17.71	5.31	38.79	**61.81**
					Br USC AC	19.53	6.41	38.21	**64.15**
					Br USC WC	19.47	6.35	35.94	**61.76**
					Br USC AC w/CC(S)	33.60	13.93	14.66	**62.19**
					Br USC WC w/CC(S)	32.07	13.79	13.52	**59.39**
EURELECTRIC/VGB									
EPR-1600	38.80	11.80	9.33	**59.93**	Bk	16.93	5.11	52.39	**74.43**
					Br	18.23	5.51	38.99	**62.73**
					Bk USC w/CC(S)	29.90	8.66	35.95	**74.51**

*Fuel and carbon costs for nuclear technology include waste management costs.

**The cost estimate refers to the EPR in Flamanville (EDF data) and is site-specific.

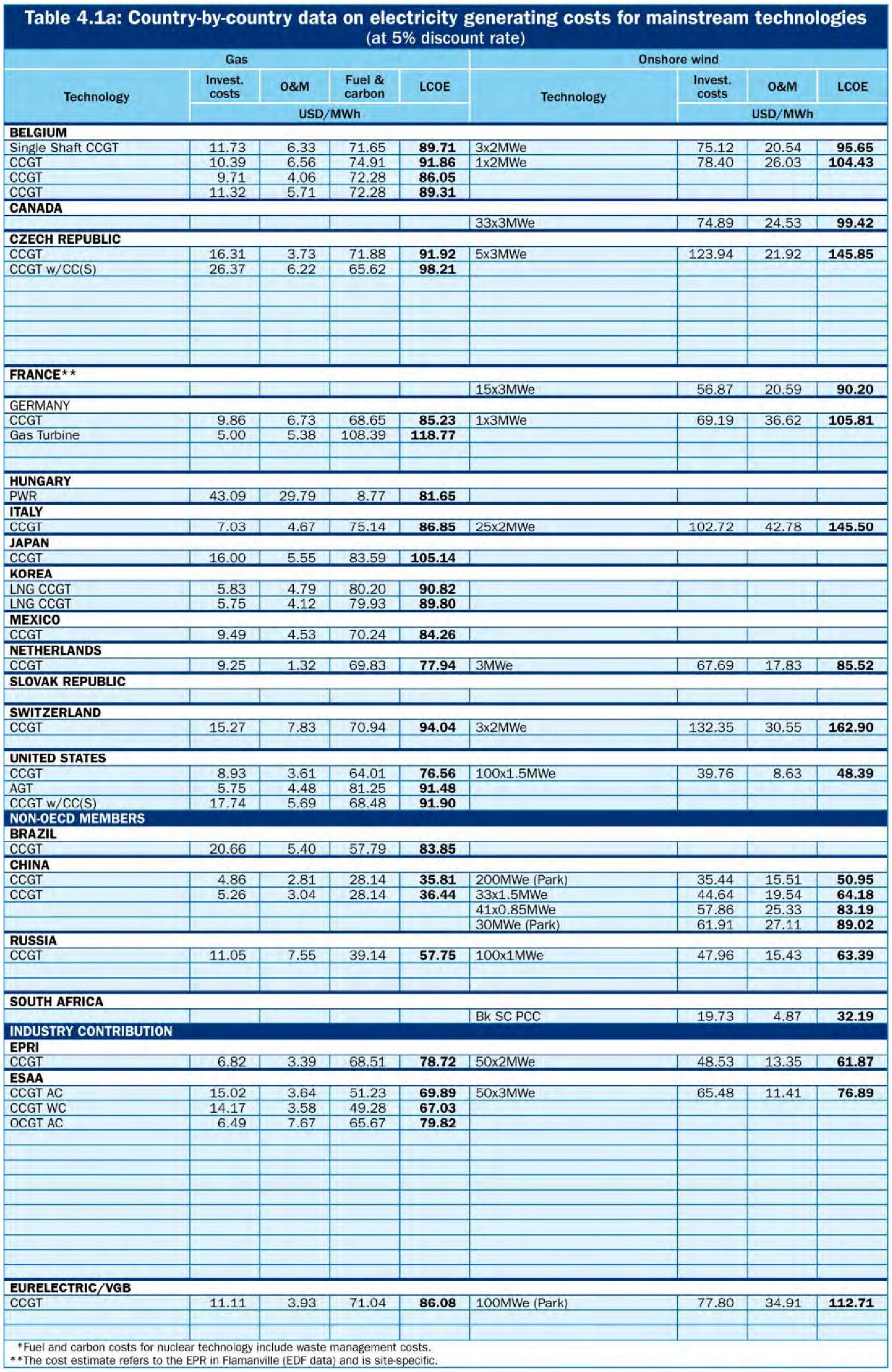

Table 4.1a: Country-by-country data on electricity generating costs for mainstream technologies
(at 5% discount rate)

Gas					Onshore wind			
Technology	Invest. costs	O&M	Fuel & carbon	LCOE	Technology	Invest. costs	O&M	LCOE
	USD/MWh					USD/MWh		
BELGIUM								
Single Shaft CCGT	11.73	6.33	71.65	**89.71**	3x2MWe	75.12	20.54	**95.65**
CCGT	10.39	6.56	74.91	**91.86**	1x2MWe	78.40	26.03	**104.43**
CCGT	9.71	4.06	72.28	**86.05**				
CCGT	11.32	5.71	72.28	**89.31**				
CANADA								
					33x3MWe	74.89	24.53	**99.42**
CZECH REPUBLIC								
CCGT	16.31	3.73	71.88	**91.92**	5x3MWe	123.94	21.92	**145.85**
CCGT w/CC(S)	26.37	6.22	65.62	**98.21**				
FRANCE**								
					15x3MWe	56.87	20.59	**90.20**
GERMANY								
CCGT	9.86	6.73	68.65	**85.23**	1x3MWe	69.19	36.62	**105.81**
Gas Turbine	5.00	5.38	108.39	**118.77**				
HUNGARY								
PWR	43.09	29.79	8.77	**81.65**				
ITALY								
CCGT	7.03	4.67	75.14	**86.85**	25x2MWe	102.72	42.78	**145.50**
JAPAN								
CCGT	16.00	5.55	83.59	**105.14**				
KOREA								
LNG CCGT	5.83	4.79	80.20	**90.82**				
LNG CCGT	5.75	4.12	79.93	**89.80**				
MEXICO								
CCGT	9.49	4.53	70.24	**84.26**				
NETHERLANDS								
CCGT	9.25	1.32	69.83	**77.94**	3MWe	67.69	17.83	**85.52**
SLOVAK REPUBLIC								
SWITZERLAND								
CCGT	15.27	7.83	70.94	**94.04**	3x2MWe	132.35	30.55	**162.90**
UNITED STATES								
CCGT	8.93	3.61	64.01	**76.56**	100x1.5MWe	39.76	8.63	**48.39**
AGT	5.75	4.48	81.25	**91.48**				
CCGT w/CC(S)	17.74	5.69	68.48	**91.90**				
NON-OECD MEMBERS								
BRAZIL								
CCGT	20.66	5.40	57.79	**83.85**				
CHINA								
CCGT	4.86	2.81	28.14	**35.81**	200MWe (Park)	35.44	15.51	**50.95**
CCGT	5.26	3.04	28.14	**36.44**	33x1.5MWe	44.64	19.54	**64.18**
					41x0.85MWe	57.86	25.33	**83.19**
					30MWe (Park)	61.91	27.11	**89.02**
RUSSIA								
CCGT	11.05	7.55	39.14	**57.75**	100x1MWe	47.96	15.43	**63.39**
SOUTH AFRICA								
					Bk SC PCC	19.73	4.87	**32.19**
INDUSTRY CONTRIBUTION								
EPRI								
CCGT	6.82	3.39	68.51	**78.72**	50x2MWe	48.53	13.35	**61.87**
ESAA								
CCGT AC	15.02	3.64	51.23	**69.89**	50x3MWe	65.48	11.41	**76.89**
CCGT WC	14.17	3.58	49.28	**67.03**				
OCGT AC	6.49	7.67	65.67	**79.82**				
EURELECTRIC/VGB								
CCGT	11.11	3.93	71.04	**86.08**	100MWe (Park)	77.80	34.91	**112.71**

*Fuel and carbon costs for nuclear technology include waste management costs.
**The cost estimate refers to the EPR in Flamanville (EDF data) and is site-specific.

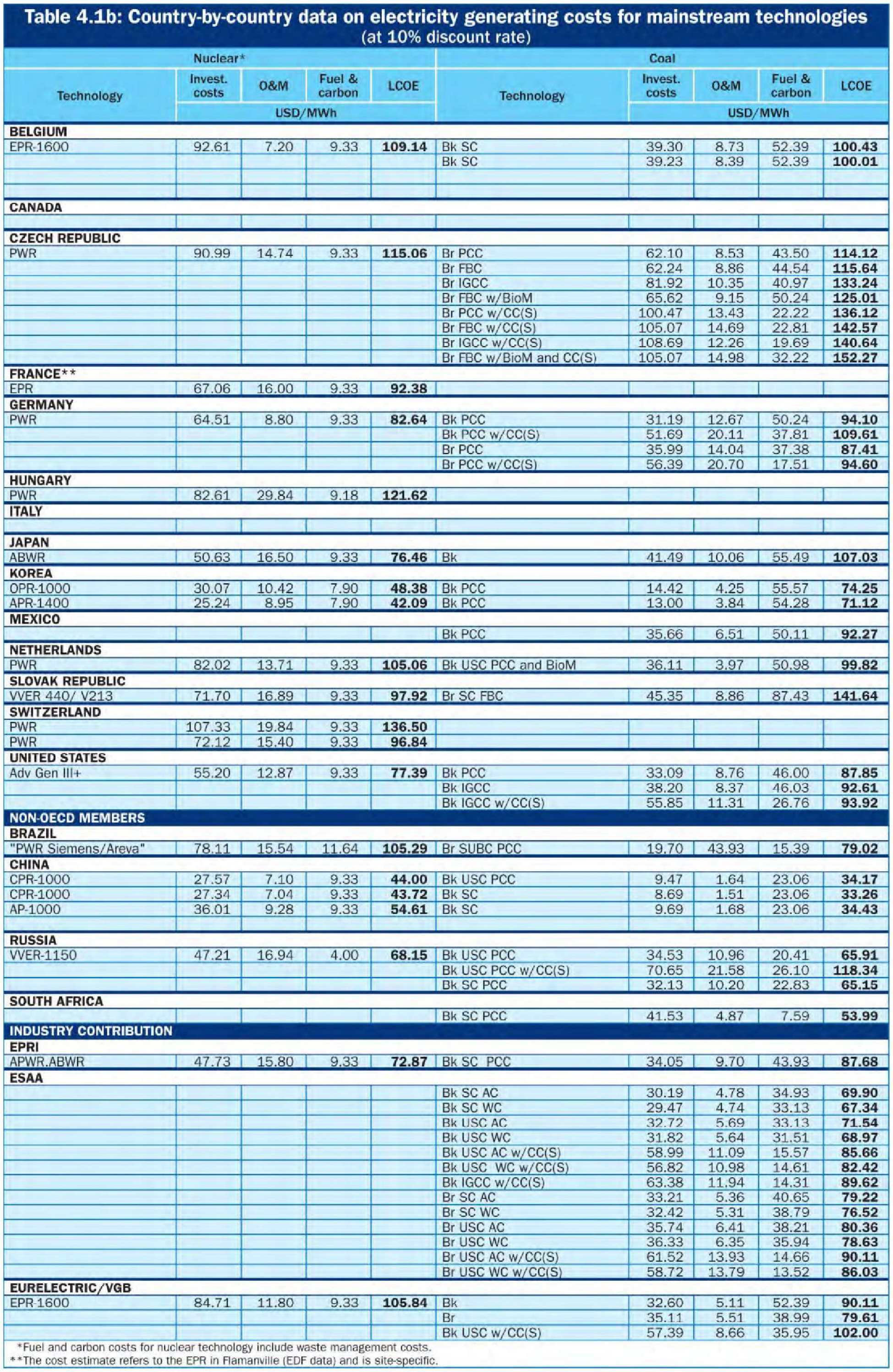

Table 4.1b: Country-by-country data on electricity generating costs for mainstream technologies
(at 10% discount rate)

Nuclear*					Coal				
Technology	Invest. costs	O&M	Fuel & carbon	LCOE	Technology	Invest. costs	O&M	Fuel & carbon	LCOE
	USD/MWh					USD/MWh			
BELGIUM									
EPR-1600	92.61	7.20	9.33	**109.14**	Bk SC	39.30	8.73	52.39	**100.43**
					Bk SC	39.23	8.39	52.39	**100.01**
CANADA									
CZECH REPUBLIC									
PWR	90.99	14.74	9.33	**115.06**	Br PCC	62.10	8.53	43.50	**114.12**
					Br FBC	62.24	8.86	44.54	**115.64**
					Br IGCC	81.92	10.35	40.97	**133.24**
					Br FBC w/BioM	65.62	9.15	50.24	**125.01**
					Br PCC w/CC(S)	100.47	13.43	22.22	**136.12**
					Br FBC w/CC(S)	105.07	14.69	22.81	**142.57**
					Br IGCC w/CC(S)	108.69	12.26	19.69	**140.64**
					Br FBC w/BioM and CC(S)	105.07	14.98	32.22	**152.27**
FRANCE**									
EPR	67.06	16.00	9.33	**92.38**					
GERMANY									
PWR	64.51	8.80	9.33	**82.64**	Bk PCC	31.19	12.67	50.24	**94.10**
					Bk PCC w/CC(S)	51.69	20.11	37.81	**109.61**
					Br PCC	35.99	14.04	37.38	**87.41**
					Br PCC w/CC(S)	56.39	20.70	17.51	**94.60**
HUNGARY									
PWR	82.61	29.84	9.18	**121.62**					
ITALY									
JAPAN									
ABWR	50.63	16.50	9.33	**76.46**	Bk	41.49	10.06	55.49	**107.03**
KOREA									
OPR-1000	30.07	10.42	7.90	**48.38**	Bk PCC	14.42	4.25	55.57	**74.25**
APR-1400	25.24	8.95	7.90	**42.09**	Bk PCC	13.00	3.84	54.28	**71.12**
MEXICO									
					Bk PCC	35.66	6.51	50.11	**92.27**
NETHERLANDS									
PWR	82.02	13.71	9.33	**105.06**	Bk USC PCC and BioM	36.11	3.97	50.98	**99.82**
SLOVAK REPUBLIC									
VVER 440/ V213	71.70	16.89	9.33	**97.92**	Br SC FBC	45.35	8.86	87.43	**141.64**
SWITZERLAND									
PWR	107.33	19.84	9.33	**136.50**					
PWR	72.12	15.40	9.33	**96.84**					
UNITED STATES									
Adv Gen III+	55.20	12.87	9.33	**77.39**	Bk PCC	33.09	8.76	46.00	**87.85**
					Bk IGCC	38.20	8.37	46.03	**92.61**
					Bk IGCC w/CC(S)	55.85	11.31	26.76	**93.92**
NON-OECD MEMBERS									
BRAZIL									
"PWR Siemens/Areva"	78.11	15.54	11.64	**105.29**	Br SUBC PCC	19.70	43.93	15.39	**79.02**
CHINA									
CPR-1000	27.57	7.10	9.33	**44.00**	Bk USC PCC	9.47	1.64	23.06	**34.17**
CPR-1000	27.34	7.04	9.33	**43.72**	Bk SC	8.69	1.51	23.06	**33.26**
AP-1000	36.01	9.28	9.33	**54.61**	Bk SC	9.69	1.68	23.06	**34.43**
RUSSIA									
VVER-1150	47.21	16.94	4.00	**68.15**	Bk USC PCC	34.53	10.96	20.41	**65.91**
					Bk USC PCC w/CC(S)	70.65	21.58	26.10	**118.34**
					Bk SC PCC	32.13	10.20	22.83	**65.15**
SOUTH AFRICA									
					Bk SC PCC	41.53	4.87	7.59	**53.99**
INDUSTRY CONTRIBUTION									
EPRI									
APWR.ABWR	47.73	15.80	9.33	**72.87**	Bk SC PCC	34.05	9.70	43.93	**87.68**
ESAA									
					Bk SC AC	30.19	4.78	34.93	**69.90**
					Bk SC WC	29.47	4.74	33.13	**67.34**
					Bk USC AC	32.72	5.69	33.13	**71.54**
					Bk USC WC	31.82	5.64	31.51	**68.97**
					Bk USC AC w/CC(S)	58.99	11.09	15.57	**85.66**
					Bk USC WC w/CC(S)	56.82	10.98	14.61	**82.42**
					Bk IGCC w/CC(S)	63.38	11.94	14.31	**89.62**
					Br SC AC	33.21	5.36	40.65	**79.22**
					Br SC WC	32.42	5.31	38.79	**76.52**
					Br USC AC	35.74	6.41	38.21	**80.36**
					Br USC WC	36.33	6.35	35.94	**78.63**
					Br USC AC w/CC(S)	61.52	13.93	14.66	**90.11**
					Br USC WC w/CC(S)	58.72	13.79	13.52	**86.03**
EURELECTRIC/VGB									
EPR-1600	84.71	11.80	9.33	**105.84**	Bk	32.60	5.11	52.39	**90.11**
					Br	35.11	5.51	38.99	**79.61**
					Bk USC w/CC(S)	57.39	8.66	35.95	**102.00**

*Fuel and carbon costs for nuclear technology include waste management costs.
**The cost estimate refers to the EPR in Flamanville (EDF data) and is site-specific.

Table 4.1b: Country-by-country data on electricity generating costs for mainstream technologies (at 10% discount rate)

Gas					Onshore wind			
Technology	Invest. costs	O&M	Fuel & carbon	LCOE	Technology	Invest. costs	O&M	LCOE
	USD/MWh					USD/MWh		
BELGIUM								
Single Shaft CCGT	20.31	6.33	71.65	**98.29**	3x2MWe	115.69	20.54	**136.23**
CCGT	18.07	6.56	74.91	**99.54**	1x2MWe	120.75	26.03	**146.78**
CCGT	16.23	4.06	72.28	**92.57**				
CCGT	18.91	5.71	72.28	**96.90**				
CANADA								
					33x3MWe	115.38	23.85	**139.23**
CZECH REPUBLIC								
CCGT	28.87	3.73	71.88	**104.48**	5x3MWe	197.27	21.92	**219.18**
CCGT w/CC(S)	46.06	6.22	65.62	**117.90**				
FRANCE**								
					15x3MWe	88.84	20.59	**121.57**
GERMANY								
CCGT	17.44	6.73	68.65	**92.81**	1x3MWe	106.34	36.62	**142.96**
Gas Turbine	8.84	5.38	108.39	**122.61**				
HUNGARY								
ITALY								
CCGT	11.86	4.67	74.91	**91.44**	25x2MWe	187.20	42.78	**229.97**
JAPAN								
CCGT	30.39	5.55	83.59	**119.53**				
KOREA								
LNG CCGT	9.70	4.79	80.20	**94.70**				
LNG CCGT	9.57	4.12	79.93	**93.63**				
MEXICO								
CCGT	16.87	4.74	70.24	**91.85**				
NETHERLANDS								
CCGT	15.33	1.32	69.83	**82.40**	3MWe	104.26	17.78	**122.04**
SLOVAK REPUBLIC								
SWITZERLAND								
CCGT	26.42	7.83	70.94	**105.19**	3x2MWe	203.77	30.55	**234.32**
UNITED STATES								
CCGT	15.14	3.61	64.01	**82.76**	100x1.5MWe	61.84	8.63	**70.47**
AGT	9.35	4.48	81.25	**95.08**				
CCGT w/CC(S)	30.02	5.69	68.48	**104.19**				
NON-OECD MEMBERS								
BRAZIL								
CCGT	31.66	5.40	57.79	**94.84**				
CHINA								
CCGT	8.07	2.81	28.14	**39.01**	200MWe (Park)	56.49	15.51	**72.01**
CCGT	8.73	3.04	28.14	**39.91**	33x1.5MWe	71.16	19.54	**90.70**
					41x0.85MWe	92.22	25.33	**117.55**
					30MWe (Park)	98.69	27.11	**125.80**
RUSSIA								
CCGT	18.44	7.55	39.14	**65.13**	100x1MWe	74.17	15.43	**89.60**
SOUTH AFRICA								
					Bk SC PCC	19.73	4.87	**32.19**
INDUSTRY CONTRIBUTION								
EPRI								
CCGT	11.35	3.39	68.51	**83.25**	50x2MWe	77.96	13.35	**91.31**
ESAA								
CCGT AC	24.77	3.64	51.23	**79.64**	50x3MWe	102.54	11.41	**113.95**
CCGT WC	23.49	3.58	49.28	**76.36**				
OCGT AC	10.58	7.67	65.67	**83.91**				
EURELECTRIC/VGB								
CCGT	18.87	3.93	71.04	**93.84**	100MWe (Park)	119.79	34.91	**154.71**

*Fuel and carbon costs for nuclear technology include waste management costs.

**The cost estimate refers to the EPR in Flamanville (EDF data) and is site-specific.

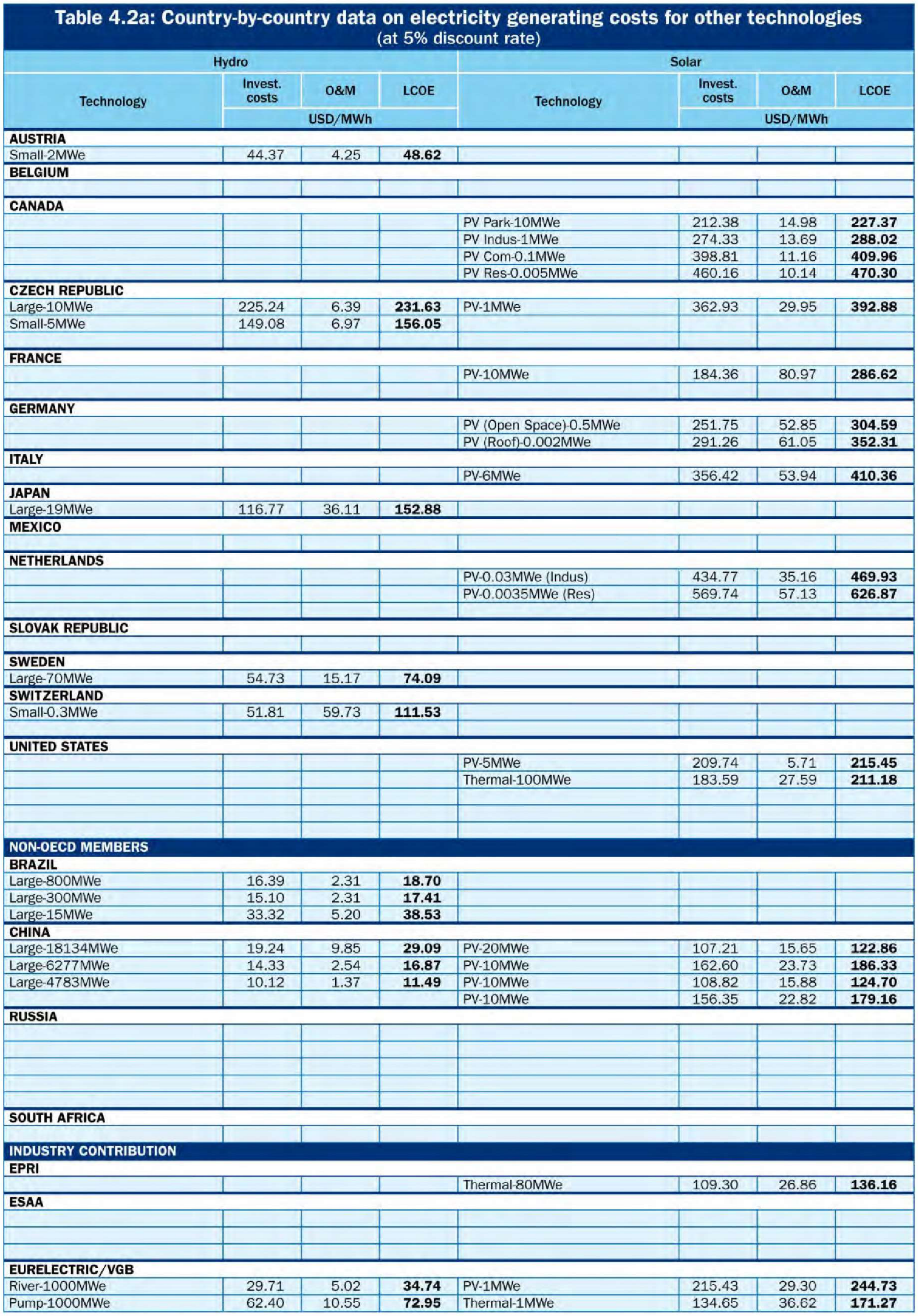

Table 4.2a: Country-by-country data on electricity generating costs for other technologies
(at 5% discount rate)

Hydro				Solar			
Technology	Invest. costs	O&M	LCOE	Technology	Invest. costs	O&M	LCOE
	USD/MWh				USD/MWh		
AUSTRIA							
Small-2MWe	44.37	4.25	**48.62**				
BELGIUM							
CANADA							
				PV Park-10MWe	212.38	14.98	**227.37**
				PV Indus-1MWe	274.33	13.69	**288.02**
				PV Com-0.1MWe	398.81	11.16	**409.96**
				PV Res-0.005MWe	460.16	10.14	**470.30**
CZECH REPUBLIC							
Large-10MWe	225.24	6.39	**231.63**	PV-1MWe	362.93	29.95	**392.88**
Small-5MWe	149.08	6.97	**156.05**				
FRANCE							
				PV-10MWe	184.36	80.97	**286.62**
GERMANY							
				PV (Open Space)-0.5MWe	251.75	52.85	**304.59**
				PV (Roof)-0.002MWe	291.26	61.05	**352.31**
ITALY							
				PV-6MWe	356.42	53.94	**410.36**
JAPAN							
Large-19MWe	116.77	36.11	**152.88**				
MEXICO							
NETHERLANDS							
				PV-0.03MWe (Indus)	434.77	35.16	**469.93**
				PV-0.0035MWe (Res)	569.74	57.13	**626.87**
SLOVAK REPUBLIC							
SWEDEN							
Large-70MWe	54.73	15.17	**74.09**				
SWITZERLAND							
Small-0.3MWe	51.81	59.73	**111.53**				
UNITED STATES							
				PV-5MWe	209.74	5.71	**215.45**
				Thermal-100MWe	183.59	27.59	**211.18**
NON-OECD MEMBERS							
BRAZIL							
Large-800MWe	16.39	2.31	**18.70**				
Large-300MWe	15.10	2.31	**17.41**				
Large-15MWe	33.32	5.20	**38.53**				
CHINA							
Large-18134MWe	19.24	9.85	**29.09**	PV-20MWe	107.21	15.65	**122.86**
Large-6277MWe	14.33	2.54	**16.87**	PV-10MWe	162.60	23.73	**186.33**
Large-4783MWe	10.12	1.37	**11.49**	PV-10MWe	108.82	15.88	**124.70**
				PV-10MWe	156.35	22.82	**179.16**
RUSSIA							
SOUTH AFRICA							
INDUSTRY CONTRIBUTION							
EPRI							
				Thermal-80MWe	109.30	26.86	**136.16**
ESAA							
EURELECTRIC/VGB							
River-1000MWe	29.71	5.02	**34.74**	PV-1MWe	215.43	29.30	**244.73**
Pump-1000MWe	62.40	10.55	**72.95**	Thermal-1MWe	134.65	36.62	**171.27**

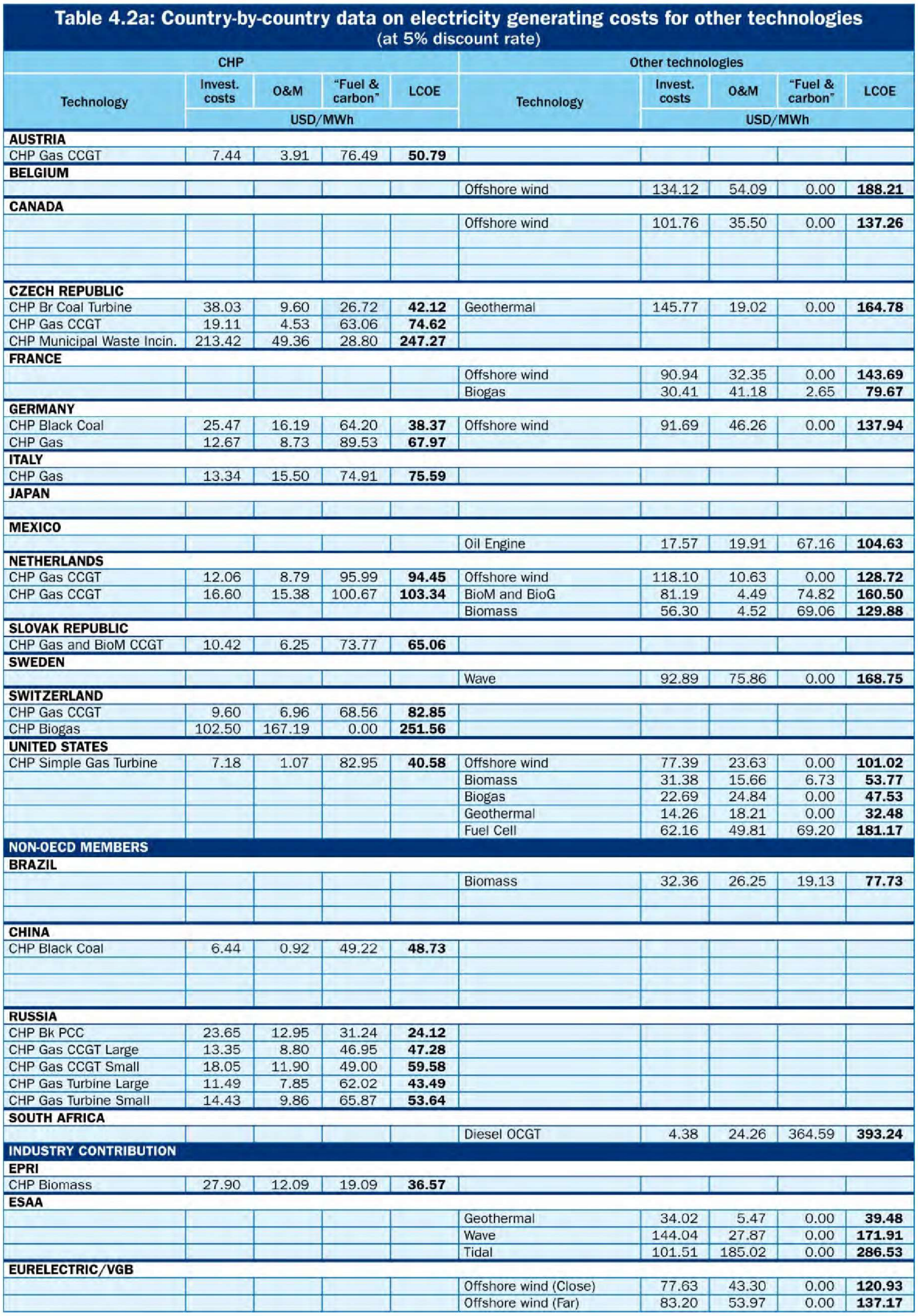

Table 4.2a: Country-by-country data on electricity generating costs for other technologies
(at 5% discount rate)

CHP					Other technologies				
Technology	Invest. costs	O&M	"Fuel & carbon"	LCOE	Technology	Invest. costs	O&M	"Fuel & carbon"	LCOE
	USD/MWh					USD/MWh			
AUSTRIA									
CHP Gas CCGT	7.44	3.91	76.49	**50.79**					
BELGIUM									
					Offshore wind	134.12	54.09	0.00	**188.21**
CANADA									
					Offshore wind	101.76	35.50	0.00	**137.26**
CZECH REPUBLIC									
CHP Br Coal Turbine	38.03	9.60	26.72	**42.12**	Geothermal	145.77	19.02	0.00	**164.78**
CHP Gas CCGT	19.11	4.53	63.06	**74.62**					
CHP Municipal Waste Incin.	213.42	49.36	28.80	**247.27**					
FRANCE									
					Offshore wind	90.94	32.35	0.00	**143.69**
					Biogas	30.41	41.18	2.65	**79.67**
GERMANY									
CHP Black Coal	25.47	16.19	64.20	**38.37**	Offshore wind	91.69	46.26	0.00	**137.94**
CHP Gas	12.67	8.73	89.53	**67.97**					
ITALY									
CHP Gas	13.34	15.50	74.91	**75.59**					
JAPAN									
MEXICO									
					Oil Engine	17.57	19.91	67.16	**104.63**
NETHERLANDS									
CHP Gas CCGT	12.06	8.79	95.99	**94.45**	Offshore wind	118.10	10.63	0.00	**128.72**
CHP Gas CCGT	16.60	15.38	100.67	**103.34**	BioM and BioG	81.19	4.49	74.82	**160.50**
					Biomass	56.30	4.52	69.06	**129.88**
SLOVAK REPUBLIC									
CHP Gas and BioM CCGT	10.42	6.25	73.77	**65.06**					
SWEDEN									
					Wave	92.89	75.86	0.00	**168.75**
SWITZERLAND									
CHP Gas CCGT	9.60	6.96	68.56	**82.85**					
CHP Biogas	102.50	167.19	0.00	**251.56**					
UNITED STATES									
CHP Simple Gas Turbine	7.18	1.07	82.95	**40.58**	Offshore wind	77.39	23.63	0.00	**101.02**
					Biomass	31.38	15.66	6.73	**53.77**
					Biogas	22.69	24.84	0.00	**47.53**
					Geothermal	14.26	18.21	0.00	**32.48**
					Fuel Cell	62.16	49.81	69.20	**181.17**
NON-OECD MEMBERS									
BRAZIL									
					Biomass	32.36	26.25	19.13	**77.73**
CHINA									
CHP Black Coal	6.44	0.92	49.22	**48.73**					
RUSSIA									
CHP Bk PCC	23.65	12.95	31.24	**24.12**					
CHP Gas CCGT Large	13.35	8.80	46.95	**47.28**					
CHP Gas CCGT Small	18.05	11.90	49.00	**59.58**					
CHP Gas Turbine Large	11.49	7.85	62.02	**43.49**					
CHP Gas Turbine Small	14.43	9.86	65.87	**53.64**					
SOUTH AFRICA									
					Diesel OCGT	4.38	24.26	364.59	**393.24**
INDUSTRY CONTRIBUTION									
EPRI									
CHP Biomass	27.90	12.09	19.09	**36.57**					
ESAA									
					Geothermal	34.02	5.47	0.00	**39.48**
					Wave	144.04	27.87	0.00	**171.91**
					Tidal	101.51	185.02	0.00	**286.53**
EURELECTRIC/VGB									
					Offshore wind (Close)	77.63	43.30	0.00	**120.93**
					Offshore wind (Far)	83.20	53.97	0.00	**137.17**

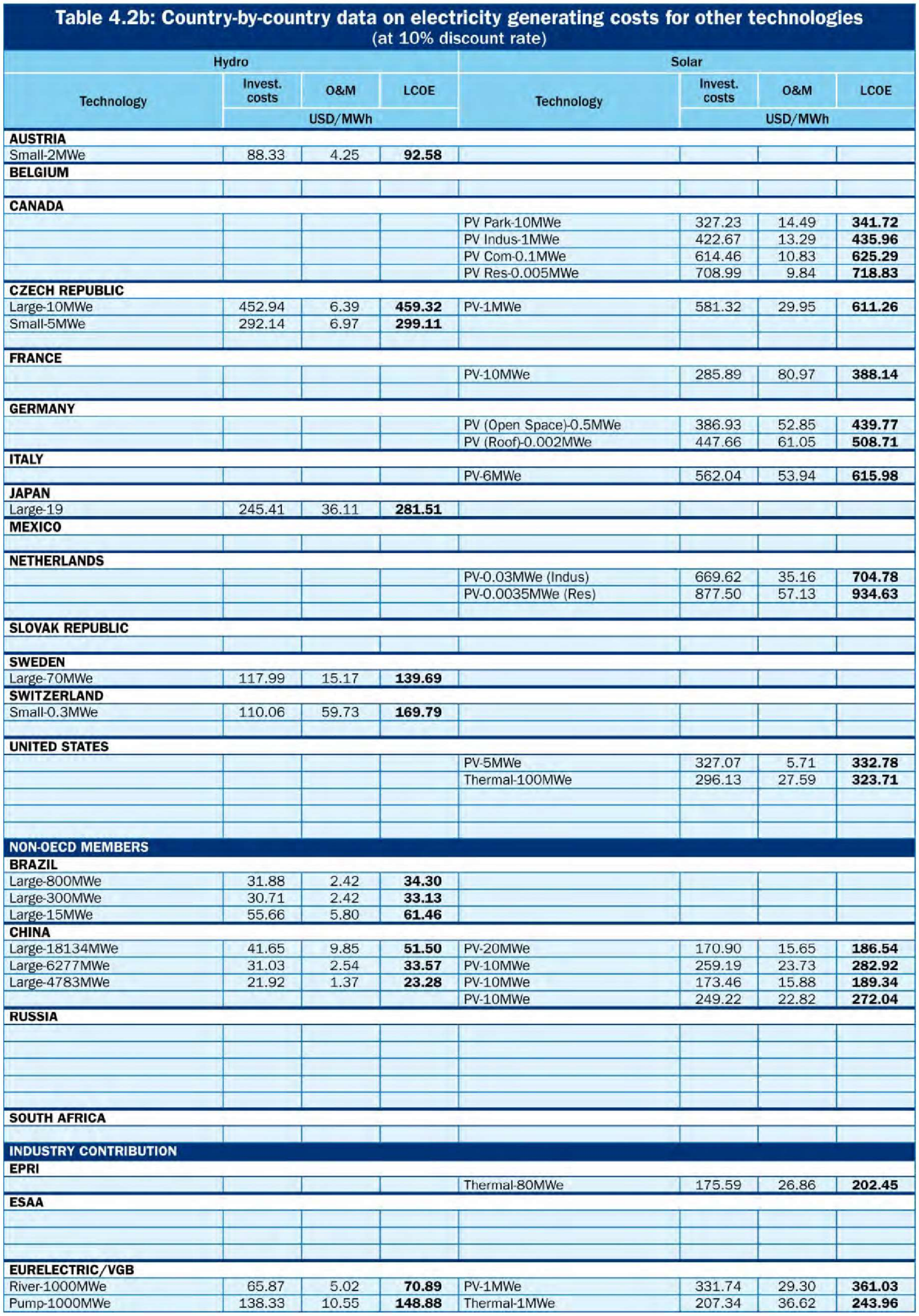

Table 4.2b: Country-by-country data on electricity generating costs for other technologies
(at 10% discount rate)

Hydro				Solar			
Technology	Invest. costs	O&M	LCOE	Technology	Invest. costs	O&M	LCOE
	USD/MWh				USD/MWh		
AUSTRIA							
Small-2MWe	88.33	4.25	**92.58**				
BELGIUM							
CANADA							
				PV Park-10MWe	327.23	14.49	**341.72**
				PV Indus-1MWe	422.67	13.29	**435.96**
				PV Com-0.1MWe	614.46	10.83	**625.29**
				PV Res-0.005MWe	708.99	9.84	**718.83**
CZECH REPUBLIC							
Large-10MWe	452.94	6.39	**459.32**	PV-1MWe	581.32	29.95	**611.26**
Small-5MWe	292.14	6.97	**299.11**				
FRANCE							
				PV-10MWe	285.89	80.97	**388.14**
GERMANY							
				PV (Open Space)-0.5MWe	386.93	52.85	**439.77**
				PV (Roof)-0.002MWe	447.66	61.05	**508.71**
ITALY							
				PV-6MWe	562.04	53.94	**615.98**
JAPAN							
Large-19	245.41	36.11	**281.51**				
MEXICO							
NETHERLANDS							
				PV-0.03MWe (Indus)	669.62	35.16	**704.78**
				PV-0.0035MWe (Res)	877.50	57.13	**934.63**
SLOVAK REPUBLIC							
SWEDEN							
Large-70MWe	117.99	15.17	**139.69**				
SWITZERLAND							
Small-0.3MWe	110.06	59.73	**169.79**				
UNITED STATES							
				PV-5MWe	327.07	5.71	**332.78**
				Thermal-100MWe	296.13	27.59	**323.71**
NON-OECD MEMBERS							
BRAZIL							
Large-800MWe	31.88	2.42	**34.30**				
Large-300MWe	30.71	2.42	**33.13**				
Large-15MWe	55.66	5.80	**61.46**				
CHINA							
Large-18134MWe	41.65	9.85	**51.50**	PV-20MWe	170.90	15.65	**186.54**
Large-6277MWe	31.03	2.54	**33.57**	PV-10MWe	259.19	23.73	**282.92**
Large-4783MWe	21.92	1.37	**23.28**	PV-10MWe	173.46	15.88	**189.34**
				PV-10MWe	249.22	22.82	**272.04**
RUSSIA							
SOUTH AFRICA							
INDUSTRY CONTRIBUTION							
EPRI							
				Thermal-80MWe	175.59	26.86	**202.45**
ESAA							
EURELECTRIC/VGB							
River-1000MWe	65.87	5.02	**70.89**	PV-1MWe	331.74	29.30	**361.03**
Pump-1000MWe	138.33	10.55	**148.88**	Thermal-1MWe	207.34	36.62	**243.96**

Table 4.2b: Country-by-country data on electricity generating costs for other technologies
(at 10% discount rate)

CHP					Other technologies				
Technology	Invest. costs	O&M	"Fuel & carbon"	LCOE	Technology	Invest. costs	O&M	"Fuel & carbon"	LCOE
	USD/MWh					USD/MWh			
AUSTRIA									
CHP CCGT	12.72	3.91	76.49	**56.07**					
BELGIUM									
					Offshore wind	206.71	54.09	0.00	**260.80**
CANADA									
					Offshore wind	160.38	34.55	0.00	**194.93**
CZECH REPUBLIC									
CHP Br Coal Turbine	65.76	9.60	65.62	**108.75**	Geothermal	248.44	21.49	0.00	**269.93**
CHP Gas CCGT	33.44	4.53	63.06	**88.95**					
CHP Municipal Waste Incin.	366.09	49.36	28.80	**399.94**					
FRANCE									
					Offshore wind	142.00	32.35	0.00	**194.74**
					Biogas	46.21	41.18	2.65	**95.47**
GERMANY									
CHP Black Coal	48.59	16.19	64.20	**61.48**	Offshore wind	140.51	46.26	0.00	**186.76**
CHP Gas	22.42	8.73	89.53	**77.81**					
ITALY									
CHP Gas	23.27	15.08	74.91	**85.11**					
JAPAN									
MEXICO									
					Oil Engine	31.22	20.66	67.16	**119.03**
NETHERLANDS									
CHP Gas CCGT	23.54	8.79	95.99	**105.94**	Offshore wind	185.91	10.63	0.00	**196.53**
CHP Gas CCGT	32.42	15.38	100.67	**119.16**	BioM and BioG	117.73	4.49	74.82	**197.04**
					Biomass	81.63	4.52	69.06	**155.21**
SLOVAK REPUBLIC									
CHP Gas and BioM CCGT	17.95	6.25	73.77	**72.26**					
SWEDEN									
					Wave	148.29	75.86	0.00	**224.15**
SWITZERLAND									
CHP Gas CCGT	16.87	6.96	68.56	**90.12**					
CHP Biogas	177.62	167.19	0.00	**326.68**					
UNITED STATES									
CHP Simple Gas Turbine	11.66	1.07	82.95	**45.07**	Offshore wind	122.81	23.63	0.00	**146.44**
					Biomass	58.43	15.66	6.73	**80.82**
					Biogas	38.48	24.84	0.00	**63.32**
					Geothermal	26.17	20.58	0.00	**46.76**
					Fuel Cell	94.13	49.81	69.20	**213.14**
NON-OECD MEMBERS									
BRAZIL									
					Biomass	51.98	31.49	19.13	**102.60**
CHINA									
CHP Black Coal	10.41	0.92	49.22	**52.70**					
RUSSIA									
CHP Bk PCC	44.94	12.95	31.24	**45.40**					
CHP Gas CCGT Large	23.08	8.80	46.95	**57.00**					
CHP Gas CCGT Small	31.20	11.90	49.00	**72.73**					
CHP Gas Turbine Large	19.16	7.85	62.02	**51.16**					
CHP Gas Turbine Small	24.07	9.86	65.87	**63.28**					
SOUTH AFRICA									
					Diesel OCGT	7.76	24.26	364.59	**396.62**
INDUSTRY CONTRIBUTION									
EPRI									
CHP Biomass	46.96	12.09	19.09	**55.64**					
ESAA									
					Geothermal	63.13	5.47	0.00	**68.60**
					Wave	214.00	27.87	0.00	**241.87**
					Tidal	160.40	187.50	0.00	**347.90**
EURELECTRIC/VGB									
					Offshore wind (Close)	119.58	43.30	0.00	**162.89**
					Offshore wind (Far)	128.16	53.97	0.00	**182.13**

SIGNATURE PAGE

James A. Gilliar Digitally signed by James A. Gilliar
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Approved by: ______________________________

James A. Gilliar
President and Managing Partner of EEIG