

Global experience with electricity liberalisation

by

David Hall, Professor Stephen Thomas, Violeta Corral

d.j.hall@gre.ac.uk

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1. INTRODUCTION AND SUMMARY.....	3
2. HIGH INCOME COUNTRIES.....	3
2.1. OVERVIEW OF OECD COUNTRIES.....	3
Table 1. Common problems in liberalised electricity systems in OECD countries.....	3
2.2. U.K.....	4
2.3. EU.....	4
2.4. USA.....	5
Chart A. USA: states accepting, rejecting and reversing retail competition.....	6
2.5. JAPAN.....	6
2.6. HISTORICAL COMPARISONS.....	6
Table 2. Comparisons with USA and EU in 1930s.....	7
Table 3. Public and private electricity company prices, USA, 1942.....	7
3. DEVELOPING COUNTRIES.....	7
3.1. LARGE DEVELOPING ECONOMIES.....	7
Table 4. Electricity systems in large developing countries.....	8
3.1.1. <i>China</i>	8
Chart B. East China experimental wholesale power market.....	8
3.1.2. <i>Brazil</i>	9
3.1.3. <i>India</i>	9
3.1.4. <i>Mexico</i>	10
3.1.5. <i>South Korea</i>	10
3.1.6. <i>Iran</i>	10
3.1.7. <i>Argentina</i>	10
3.1.8. <i>Venezuela</i>	10
3.1.9. <i>South Africa</i>	10
3.1.10. <i>Thailand</i>	11
3.2. IPPS.....	11
3.3. OTHER DEVELOPING COUNTRIES.....	11
4. GENERAL.....	11
4.1. EXTENSIONS.....	11
4.2. INVESTMENT, VERTICAL INTEGRATION AND PUBLIC FINANCE.....	12
Table 5. Cost of debt finance to IPPs compared with PLN, March 2009.....	12

PSIRU, Business School, University of Greenwich, Park Row, London SE10 9LS, U.K.

Website: www.psiru.org Email: psiru@psiru.org Tel: +44-(0)208-331-9933 Fax: +44 (0)208-331-8665

Researchers: Prof. Stephen Thomas, David Hall (Director), Jane Lethbridge, Emanuele Lobina, Vladimir Popov, Violeta Corral

4.3.	CLIMATE CHANGE, RENEWABLES AND GEOTHERMAL ENERGY	12
Table 6.	Barriers to Geothermal Development in Indonesia	13
4.3.1.	<i>Chile: problems with liberalisation and investment in generating capacity</i>	13
4.4.	EFFICIENCY	13
ANNEXE: STATE AS KEY SOURCE OF FINANCE FOR RENEWABLES		14
Chart C.	Generation mix in low-carbon electricity systems	14
BIBLIOGRAPHY		15
NOTES		19

1. Introduction and summary

This paper examines global experiences with electricity liberalisation relevant to the new legislation on electricity passed by the Indonesian parliament in September 2009. Article 2 of that law states that the principle objectives of the electricity system include improving the welfare and prosperity of citizens; efficiency; a reasonable price; sufficient capacity; and sustainability. The general effect of the law is to liberalise the Indonesian electricity system and enable the private sector and market operations play a much greater role.

The following sections present empirical evidence of experience with liberalisation and privatisation in the electricity sector in other countries, focussing in particular on the objectives stated in the new law and whether the new structure will generate the investment needed to meet rapidly growing demand.

The first section reviews the experience in high income countries – the UK, EU, USA and other OECD countries. This evidence suggests that liberalisation would not assist in achieving the objects stated in the new Indonesian law, but would have the opposite effect – higher prices, lower or unchanged efficiency, less use of renewable energy, inadequate investment in generating capacity, and a worse experience for consumers.

The second section examines what has happened in other developing economies, especially those of a similar size to Indonesia. These countries' main privatisation experience is with IPPs, which have often proved corrupt, expensive, and dominated by gas turbines. The experiments with unbundling and liberalisation have generally not led to real competition, and in recent years most such countries have halted or reversed proposals for unbundling.

The final section comments on a number of the issues emerging from this survey, in particular the reliance on public finance for extensions to electricity networks, the advantages of public finance for cheaper capital and for developing renewables, and the comparative evidence on efficiency.

2. High income countries

2.1. Overview of OECD countries

Most high income countries now have 10-20 years of experience with privatisation and liberalisation of electricity systems. A recent global review of liberalisation and deregulation in the USA, EU and other OECD countries, published in the *Electricity Journal* in 2009, identified a number of common features in this experience. It found a consistent pattern of problems, including consumer opposition, lack of competition, higher prices, 'gaming', oligopoly, lack of investment or innovation.¹ The report was written by the director of the Electricity Consumers Resource Council (ELCON), which represents industrial consumers of electricity in the USA, who were expected to benefit from deregulation. ELCON now believes that "the structure of today's "organized markets" is neither competitive nor sustainable". The problems identified in the report are summarised in the table below, together with a further conclusion from an official UK climate change committee, that liberalisation is incompatible with developing renewable energy resources.²

This overview suggests that liberalisation in OECD countries has not helped achieve the objects stated in the new Indonesian law, but has rather had the opposite effect – higher prices, lower or unchanged efficiency, less use of renewable energy, inadequate investment in generating capacity and network infrastructure, and a worse experience for consumers – including industrial consumers

Table 1. Common problems in liberalised electricity systems in OECD countries

1	Consumers – both large and small – strongly oppose restructuring.
2	Restructuring has not resulted in "real" or "true" competition.
3	Restructuring has brought higher electricity prices.
4	Technological innovation has not been realized.

5	High concentration of generation ownership, and joint ownership of generation and transmission, throughout the restructured world.
6	Single-price, bid-based auctions are easy to game and difficult to police.
7	It is very difficult to negotiate reasonable long-term contracts.
8	A disincentive to invest ... failure to build necessary infrastructure leads to concerns over reliability
9	Inadequate transparency and cooperation
10	Regulators have not protected consumers from the problems of restructuring.
11	Developing renewable energy resources requires a move away from liberalised markets.

Source: 1-10 Andersen 2009³; 11 UK Climate Change Committee Report⁴

The following sections examine in more detail the specific experiences in the UK; the European Union (EU) as a whole; and the USA.

2.2. U.K.

The UK unbundled generation, transmission, distribution and retail, privatised the companies, and, later, created markets for wholesale electricity and for retail sales.

Following privatisation, electricity prices in the UK performed no better than in other countries, such as France, which did not privatise. The only significant price benefits were for the largest industrial consumers. Although there was a reduction in costs after privatisation (about 5%) this was more than offset by the increase in profits. The distribution of benefits has been unequal, with shareholders gaining most: companies have been able to make excessive returns, despite regulation (de Oliveira and Tolmasquin 2004, Buckland and Fraser 2002). Studies estimating what would have happened without privatisation concluded that electricity prices in the UK are between 10% and 20% higher than they would have been without privatisation (Branston 2000; Newbery and Pollitt 1997).

Concentration and vertical integration have been the key strategies for the private companies. The vertical unbundling has been reversed by private companies, with generators and distributors merging to provide long-term security for both sides. At the same time there has been horizontal concentration through mergers, to increase market power. (Ghobadian and Viney 2002, Woo et al 2003, Thomas 2004).

The wholesale markets have had little impact because the great majority of electricity is traded through long-term contracts between generators and distributors, or within vertically integrated companies. The retail markets failed to work for many years because domestic consumers did not switch, or failed to identify the cheapest option if they did switch.

In 2002 the owners of about 1/3 of the generating capacity of the UK were effectively bankrupt, including British Energy, the nuclear power company, which collapsed in 2002 and was rescued at huge cost to UK taxpayers (ca. US\$20bn). As part of the deal, the British government took a 65 per cent stake in the rescued company. It subsequently sold 25 per cent of the shares in May 2007⁵. The company was taken over in January 2009 by Electricite de France (EdF) which remains 85% owned by the French state.

2.3. EU

In the EU, all countries have been required to unbundled and liberalise wholesale and retail markets since 1998. But this has not had the expected impact on prices or competition.

The overall effects have been to increase prices and decrease consumer satisfaction. An EU-wide analysis of found that both privatisation and unbundling had a damaging effect: "public ownership tends to decrease prices [and] vertical disintegration tends to increase prices"⁶. A London Economics study on wholesale electricity markets in the EU in 2007 concluded that prices "are significantly higher than would be expected on perfectly competitive markets". Retail markets also fail to operate according to expectations. In most countries, only a very small percentage of domestic consumers switch. In the UK, a higher percentage now switch, but this does not produce overall benefit: study of about 400 consumers who switched supplier found that 42 per cent of those switching ended up paying more, 14 per cent were paying the same, while only 44 per cent actually made savings.⁷

Concentration of ownership has been a striking feature across Europe as a whole ever since liberalisation. There are now three dominant companies, E.ON, EDF and RWE, which have maintained or strengthened their positions in 2009 - EDF through its acquisition of British Energy, E.ON through the assets it bought from ENEL and Endesa, and RWE through its acquisition of the Dutch utility Essent. These three companies have been joined by two companies, ENEL and GDF Suez, who through a take-over and a merger, respectively, are now of comparable size. The European Union's policy to force EDF, E.ON and RWE to sell their transmission networks may, far from increasing competition as it was designed to do, reduce it further. The proceeds from selling these networks will be used to buy up more assets in Europe in the competitive activities in energy making already limited markets even more concentrated.⁸

Concentration also exists in the form of vertical integration by private companies owning both generators and retail suppliers. Despite unbundling the old public sector utilities, the private sector has recreated vertical integration. A competition report noted: "Vertical integration of generation, supply and network activities has remained a dominant feature in many electricity markets. Vertical integration of generation and retail reduces the incentives to trade on wholesale markets. Low levels of liquidity are an entry barrier because it means there is no reliable market for new entrants to sell power to or buy power from. The strong links between supply and network companies reduces the economic incentives for the network operators to grant access to third parties."⁹

Investments by private companies in new generation have not led to diversity, but the opposite. In Britain since the market was liberalised in 1990, all major power stations chosen by private companies without subsidy or cost guarantees have been gas-fired combined cycle gas turbines. Experience in other EU countries is similar.

The major blackouts experienced in Italy and elsewhere in 2003 were attributable to large amounts of commercial trading of electricity over transmission lines: an official response to the Italian blackout stated that: "The underlying causes of the incident that occurred on 28 September 2003 are the unresolved conflict between the trading interests of the involved countries and operators and the technical and legal requirements for safe and reliable operation of the networks." A similar diagnosis has been made of the USA blackouts (UCTE 2003, Rigby 2003, Thomas and Hall 2003).

2.4. USA

From the late 1930s, the USA electricity system was based on strong regulation of a mixture of private and public sector vertically integrated companies. During the 1990s, new legislation encouraged 'de-regulation', unbundling, and the creation of wholesale and retail markets. At the end of the 1990s, many states began to create wholesale electricity markets and to introduce retail competition. In 2000, blackouts and huge price rises occurred in California, causing widespread economic damage. This followed the introduction of a wholesale electricity market, and resulted from "suppliers exercising market power."¹⁰ The only part of California which escaped the crisis was the city of Los Angeles, which had refused to join the new market system and continued to operate its electricity supply through a vertically integrated, municipally owned monopoly.

The California crisis halted the trend to deregulation in the USA. The trend was then reversed as experience showed that deregulation had led to higher, not lower, prices. The New York Times reported in 2007: "More than a decade after the drive began to convert electricity from a regulated industry into a competitive one, many states are rolling back their initiatives. The main reason behind the effort to return to a more regulated market is price. Recent Energy Department data shows that the cost of power in states that embraced competition has risen faster than in states that had retained traditional rate regulation. Big industrial and commercial customers, the very forces that agitated for competition originally, are leading the return to traditional regulation. Then, and now, these big customers say they are being charged too much."¹¹ The pressures continue in 2009. The state of Maryland, where electricity bills have doubled in little more than a year, is considering returning to a regulated system¹². In Texas, where electricity prices have increased faster in areas of the state where competition has been introduced, than in places which are still served by public utilities and co-ops,¹³ the councils of over 100 cities have complained that 10 years of markets have led to "spiralling electricity prices, abuses in the wholesale power market and reduced profits for businesses".¹⁴

ownership, asserting that water power “should belong to all the people”, made it illegal for private companies to operate across state boundaries, and encouraged public ownership of electricity systems as an alternative to ‘extortionate’ private electricity companies.²¹ The evidence supported this shift towards the public sector: in 1942, the prices charged by publicly owned companies in the USA were more than 20% lower than the prices of private companies, for all types of consumer.²²

Table 2. Comparisons with USA and EU in 1930s

	year	GDP per capita *	Population
Indonesia	2006	4029	221.7
USA	1933	4777	126.2
W. Europe	1933	4022	239.7

*Constant 1990 International Geary-Khamis dollars)

Source: Maddison A. 2009²³

Table 3. Public and private electricity company prices, USA, 1942

	Consumption level (KWH per month)	Publicly owned price (cents per kwh)	Privately owned price (cents per kwh)	% difference
Domestic	25	4.06	5.40	-24.8
	500	1.61	2.07	-22.2
Industrial	15,000	1.47	2.13	-31.0
	200,000	0.91	1.18	-22.9
Overall				-23.4

Source: Emmons (1997)²⁴

3. Developing countries

The ‘model’ of privatisation and liberalisation has been spread in developing countries principally through the IMF and the World Bank including these policies as conditions for loans.

In economic crises, such as in Argentina in 2001, such contracts become socially unsustainable, but the companies continued to insist on the sanctity of the contract. The government of Argentina has refused to honour either the contracts or arbitration rulings in favour of the companies, because they would be unreasonably burdensome on a country whose citizens suffered great economic losses as a result of the crisis, and the companies should expect to share that risk as they had tried to profit from the good times.²⁵

The regulation of company behaviour is even harder in developing countries than it is in high income countries: “Developing regulatory capacity in the South with a mechanistic view of institutional and procedural replication is fraught with difficulties. Regulatory weaknesses, whether structural or transitory, have distributional consequences.”²⁶ Even in countries such as Chile, where the regulators are regarded as competent, an energy crisis in 2001 highlighted: “the inadequacies of the regulatory and institutional framework, the relative weakness of public bodies in dealing with short-term profit-oriented private firms, and the lack of a long-term energy strategy.”²⁷

Already in 2003 the World Bank and others acknowledged that privatisation had become deeply unpopular. There was a decreasing faith in markets as providing solutions to infrastructure problems, and few politicians now supported privatisation, which was seen as benefiting elite and corrupt interests at home and abroad, and as “fundamentally unfair, both in conception and execution.” (Nellis, 2003; Birdsall and Nellis 2002; Buresch 2003; Hall 1999). By then, private sector interest in energy infrastructure had declined, and many multinational companies had withdrawn, due to losses and uncertainty. (Saghir 2003, World Bank 2003, Buresch 2003, Buresch 2004, Gabriele 2004).

3.1. Large developing economies

Indonesia is one of the largest developing economies in the world. Other large developing countries have rejected, suspended or reversed plans for liberalisation and privatisation. The table covers the 10 largest developing economies – 5 larger than Indonesia, 5 smaller. None of these have introduced competitive retail

markets for domestic consumers, and only one for business consumers. Only three have attempted systematic unbundling and liberalisation, and two of these – Brazil and India – have only done so partially. Six countries have considered and rejected, or reversed, liberalisation and unbundling, notably Brazil, Mexico, South Korea, Venezuela, South Africa and Thailand. The introduction of a liberalised system would thus be out of line with the norm for comparable countries, and contrary to the recent trend, which is clearly to freeze, or reverse, such restructuring.

Table 4. Electricity systems in large developing countries

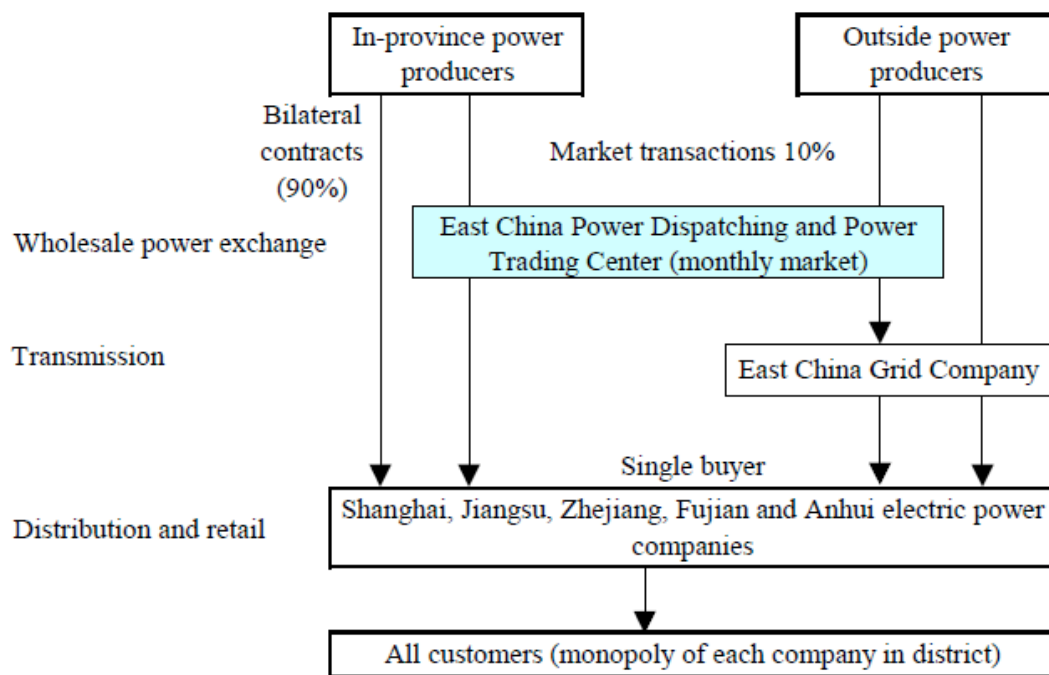
2008	GDP (USD \$bn.)	Pop. (m.)	Unbundled and liberalised?	Retail competition %	
China	3,860	1,326	Partial	0	State owns transmission, distribution, most generation
Brazil	1,613	192	Partial, halted	0	Unbundling frozen in 2002.
India	1,217	1,140	Partial	0	States resist unbundling.
Mexico	1,086	106	No	0	Single integrated state company.
Korea, South	929	49	No	0	Integrated state company.
Indonesia	514	228	No	0	Integrated state company
Iran	385	72	No	0	Single integrated state company Tavanir. ²⁸
Argentina	328	40	Yes	Business	Unbundled under IMF conditionalities in 1990s.
Venezuela	314	28	No (reversed)	0	Renationalised private distributor
South Africa	277	49	No	0	Integrated state company, municipal utilities
Thailand	261	67	No	0	Integrated state company

Source: Dagdeviren 2010 and other

3.1.1. China

China introduced IPPs in the 1990s, and restructured its power sector in 2002 to separate generation, transmission and distribution. In 2006 6.2% of generating capacity was controlled by private and foreign owners, the rest was owned by state or municipalities. ²⁹ All transmission and distribution is owned by the state or municipalities, there is no retail competition, and distributors are ‘single buyers’ and monopoly suppliers. Trials of simulated wholesale markets have been conducted in two regions. 10% of electricity was traded through the trial market in Eastern region, with 90% purchased under long-term contracts. Both regions experienced problems with excessive concentration of ownership. ³⁰

Chart B. East China experimental wholesale power market



3.1.2. Brazil

Historically, the Brazilian electricity system has been dominated by a company, Eletrobras, controlled by the federal state. It owned and operated the transmission system and a large majority of the country's generating capacity. Distribution is carried out through 50 regional distribution companies. In the 1990s the country followed the advice of the World Bank, privatised some distribution companies, and set up a regulator to help introduce liberalised markets. In 2001 there was a crisis due to a shortage of generating capacity resulting from the failure of the new market to stimulate investment in new generation. This was followed by the withdrawal of most multinational companies, and the election as President of the Workers' Party candidate, Luiz Inacio Lula da Silva, who suspended the privatisation and liberalisation programme. Some of the distribution companies were effectively brought back into public sector under Eletrobras.

The role of the state has been increased, firstly by the creation in 2004 of a new Energy Planning Company (EPE, Empresa de Pesquisa Energética) under the Ministry of Mines and Energy, which now employs about 250 people. It forecasts demand 20 years ahead, plans required infrastructure and generation, and commissions specified projects. The free market in generation has been replaced by what is, in effect, a Single Buyer system to supply the majority of consumers. A parallel market for large industrial users, who can choose their electricity supplier, exists.

(For further detail on the Brazilian system, see 'Energy Planning in Brazil' by Stephen Thomas at <http://www.psiru.org/reports/2009-11-E-Brazilplanning.doc>)

3.1.3. India

The story of privatisation and unbundling in India is slow and painful. Many attempts to set up IPPs have ended in failures, including the cancellation of the Cogentrix project in Karnataka (on environmental grounds), the collapse of a proposed Suez-Tractebel IPP (the company withdrew) and the expensive, corrupt case of the Dabhol IPP set up by Enron, which was the subject of an Amnesty investigation for human rights abuse. The first unbundling of an integrated state electricity board (SEB) was in Orissa, with partial privatisation of generation and distribution, which resulted in unaffordable prices for consumers, and the sudden exit, without notice, of the multinational company involved (AES). Despite the passing of the Electricity Act in 2003, requiring unbundling of state electricity boards, only 7 out of 29 states have done so by the end of 2009.³¹ A 2007 review of the various privatisation and liberalisation processes in India and other south Asian countries was damning:

“The lack of visible, instant, positive benefits of reform has resulted in poor overall acceptance of the reform process and contributed to its slow progress. The reform has so far failed to create a strong beneficiary base through improved performance, better service and cost reductions. The reformed utilities are hardly creditworthy... Technical performance did not improve as expected. India, Bangladesh and Sri Lanka are facing regular power shortages. Investment has suffered in the sector due to shrinking state funding and poor private investment mobilisation. ... In India, the Plan outlay for the power sector shrank to 13–14% in recent years compared to around 20% between 1960 and 1980s.... The IPP experience has left a negative impact on the public due to high cost of IPP plants, corruption charges against many of them and controversies surrounding them. Consumers on the other hand have faced repeated price hikes since reforms started.”³²

It concludes that there are greater problems with the attempted reforms, and that public interest would be better served by abandoning the policies of privatisation and liberalisation, and instead work on the improvement of public systems:

“as the reform was thrust from outside, its acceptability appears to be low....the focus should now shift to performance improvement—irrespective of reform or not. Lack of progress of reform and cases of abandonment suggest that the state utilities would remain in place in the foreseeable future. It may be better to accept the reality and start focusing on their performance improvement.”³³

3.1.4. Mexico

A vertically integrated state company, Comision Federal de Electricidad (CFE), controls all transmission and distribution (with minor exceptions), and generates 2/3 of all power. Proposals to unbundle and liberalise the system were rejected as unconstitutional by the Supreme Court in 2002, ruling that it contravened the requirement for state ownership of the system in the constitutional articles 27 and 28. The only private companies are IPPs, although the Supreme Court suggested that these too might contravene article 27: and every IPP project in Mexico has explicit government guarantees.³⁴ Mexico actually increased the integration of the electricity system under a single state-owned utility in 2009 when it transferred responsibility for electricity distribution within Mexico City to CFE.

3.1.5. South Korea

In Korea, the government, after powerful opposition to privatisation by Korean unions, commissioned the Korean Tripartite Commission to carry out a detailed investigation of the results of re-organisations elsewhere in the world. On the basis of its investigations, the Commission recommended that privatisation be abandoned, a recommendation accepted by the Korean president in 2005.³⁵

3.1.6. Iran

The electricity system of Iran is entirely state-owned. There are separate generating and regional distribution companies, all of which belong to the state electricity holding company Tavanir. There is provision for private power stations, but only 2% of electricity is generated privately.³⁶

3.1.7. Argentina

Argentina unbundled and privatised its electrical system in the 1990s, as part of a restructuring programme agreed with the IMF and World Bank. Most generating companies, and most distribution companies, were privatised, and a wholesale power market was introduced. Retail competition was introduced for industry, but not for households. The country then experienced a major economic crisis in 2001, including a massive devaluation, in which the government froze power prices to protect households, leading to disputes with the companies over the impact on profits. There has been no further privatisation or liberalisation since the crisis. Argentina now needs investment in new generating capacity, especially in renewables, and expects that most of this will come from public finance. It also uses public finance for subsidies to poor consumers, for extension of the system - especially rural electrification, investment in transmission, and renewables.³⁷

3.1.8. Venezuela

Venezuela started privatisation of its electricity sector in the 1990s, but in the mid-2000s it began reversing the process. Both distribution and generating companies have been renationalised.³⁸

3.1.9. South Africa

In 2004 South Africa abandoned its earlier plans for the unbundling and privatisation of the electricity industry, and retained Eskom as an integrated state-owned electricity company. The government also decided

against introducing private companies into electricity generation, so Eskom remains responsible for virtually all generation.³⁹ The only privatised power station, Kelvin, was abandoned twice by multinational owners – first AES, then Globeleq.⁴⁰ South Africa has massively increased the number of households connected to its electricity system, financed first by cross-subsidies and then from tax revenues. The percentage of the population with access to electricity rose from 40 percent in 1994 to 66 percent in 2002: 79 percent of the population in urban areas and 46 percent in rural areas had access to electricity.⁴¹ By the end of 2006 over 3.3 million households had been connected, and the continuing programme is financed from a national government fund.⁴² One effect of rural electrification was a significant increase in employment of women in rural areas.⁴³ South Africa also provides subsidies to enable poor households to receive 50 KWh per month free, with reduced tariffs after that point. By the end of 2006, 1 million households were benefiting from this.⁴⁴ This contrasts with the rest of Africa, where “the emphasis on profitability appears to have relegated expanded electrification of the poor to the bottom of the priority list”, and neither private sector participation nor regulation has made any significant contribution to the extension of access to network services.⁴⁵

3.1.10. Thailand

In Thailand, in March 2006, the Supreme Administrative Court declared that the privatisation process started by then prime minister, Thaksin, was illegal on a variety of grounds. It ruled that: ‘The government has abused its power in privatizing the state enterprise’. Thailand retains an integrated state-owned utility, EGAT, with a monopoly on transmission and distribution and supply. It owns about 50% of the country’s generating capacity, and acts as single buyer for the output of the other private power stations.⁴⁶

3.2. IPPs

Most developing countries have allowed the creation of some private generators, so-called independent power producers (IPPs). This has not created competitive markets, because the IPPs depend on long-term power purchase agreements (PPAs) guaranteed by governments. In many cases, PPAs have included ‘dollarisation’ clauses (guaranteeing payments in dollars, to protect companies against currency fluctuations) and ‘take or pay’ provisions, under which payments have to be made regardless of whether the output of the plant is needed or not. IPPs are now being introduced through competitive bidding in some countries, for example in Brazil, to provide at least some degree of competitive force at the start, but the PPAs which are then attached to them are still at odds with competitive wholesale markets: where markets exist, as in the EU, PPAs have been ruled as illegal state aid.⁴⁷ The potential profits from such contracts create incentive for corruption, and there have been attempts to prosecute companies over IPPs in many countries, including Pakistan, Indonesia, and Kenya, though with little success.⁴⁸

The reliance on IPPs has meant that new generating capacity has overwhelmingly consisted of combined cycle gas turbines, a technology more suited to short-term profit from relatively small-scale investment: “cheaper and cleaner generation with hydro plants, for example, is unattractive for private investors because recovering investment costs takes much longer and financing investments is more difficult.... This is why in countries like Ghana tariffs increased steeply after the introduction of thermal generation with IPPs.” (Dagdeviren 2010)⁴⁹

3.3. Other developing countries

In the other countries and smaller developing economies there is a similar picture of introducing IPPs, then discussion of reforms, some unbundling started, then frozen, so that state utilities remain in place. Egypt, for example, introduced IPPs in the mid-1990s, and split the state company into 7 regional companies which were then unbundled. But there were no further IPPs, the regional companies were never privatised, and the state is now leading a large programme of investment in generating capacity, which is expected to be cheaper than IPPs because it relies on public finance.⁵⁰

4. General

4.1. Extensions

The electricity systems of nearly all high income countries in the north were developed through the public sector, using municipal or state-owned vertically integrated systems, with subsidies used to finance expansion of the system to all households. Experience in developing countries is similar. A report by the

World Bank's Energy Sector Management Assistance Programme (ESMAP) in 2005 on electrification in a sample of African countries found that extensions of electricity were not due to privatisation, but the major factor was active intervention by government based on equality-led policies, through public investment and subsidy: whereas full cost recovery resulting from privatisation can make electricity less affordable for the poor.⁵¹ Even countries which have introduced extension liberalisation, such as Argentina, rely on state funds to finance extensions of the system.

4.2. Investment, vertical integration and public finance

Vertical integration in the electricity industry persists because it makes economic sense to unite generation and supply, whether in the public or private sector. Without this, there is the permanent risk of instability in private competitive power supply systems.⁵² This level of risk is a deterrent to investment, which is overcome by integration:

“As stand-alone businesses, both generation and retail supply are highly risky businesses. Investment in new power plant will be seen as highly risky if the plant owner has to sell the output into a competitive market in which the prices and volumes sold will not be predictable from one day to the next. ...The evidence from California and Brazil, where integration was not allowed and investment in new generation collapsed after liberalisation, is not encouraging. However, if the market is dominated by a handful of integrated companies, the risk to security of supply may be minimised. Integrated companies will tend to ensure they have enough capacity to supply their own consumers reliably. So supply security may be improved by integration, but the price will be much reduced competition.”⁵³

But the public sector always has the advantage of being able to raise capital more cheaply than the private sector. Governments and state-owned enterprises such as PLN have always been able to raise capital at lower interest rates than private companies. The crisis has widened the gap, because of reluctance to lend to the private sector, so that IPPs must pay 3% interest more than PLN. PLN is also better placed to raise longer-term international finance.⁵⁴

Table 5. Cost of debt finance to IPPs compared with PLN, March 2009

Note: JIBOR = 11% as of Dec. 2008

	Before crisis		March 2009	
	IPPs:	PLN:	IPPs	PLN
IDR (local currency) 7-10 yrs	JIBOR* + 100-200 bps	JIBOR + 100 bps	JIBOR + 400-500 bps	JIBOR + 150 bps
US\$ Interest rate, 12 years	-	LIBOR + 70-80 bps	-	LIBOR + 150 bps

Source: East Asia Energy Sector Assessment: Quick Assessment of the Impact of the Credit Crisis on Power Sector Investments EAP-EASTE March 2009⁵⁵

4.3. Climate change, renewables and geothermal energy

Indonesia has shortages of generating capacity; has too little non-carbon generation; has large underexploited opportunities for hydro-electric and geothermal power; and needs investment in existing and new transmission and distribution.

The development of renewable energy sources for electricity generation is now a major policy objective for all countries, but liberalised markets are now seen as an obstacle to this objective. In October 2009 the UK government's official climate change committee advised that developing renewable energy resources requires a move away from liberalised markets. The committee pointed out that countries with a high proportion of non-carbon generation have built their capacity through large-scale government investment, not through markets, and concludes that: “we should not accept the significant risks and costs associated with the current market arrangements... changes to the current arrangements are both required and inevitable.”⁵⁶ Chile has also found that its liberalised market cannot deliver investment in renewable energy, and has to recreate a stronger role for the state.⁵⁷ Annex 1 includes an extract from that report.

These considerations are relevant for geothermal energy, a renewable source which is of great potential in Indonesia, but requires large up-front investments. The ministry has recognized that, in a market system, it can only try and entice private investors through guarantees of high prices and weak regulation, yet it has little experience with competitive tendering procedures, and no significant technical capacity within the country - neither in the public sector nor the Indonesian private sector.⁵⁸ PT Geo Dipa Energy is now a state owned company, expected to lead this development.

Table 6. Barriers to Geothermal Development in Indonesia

Policy & Regulatory	Need for more attractive incentive framework to make the cost of developing geothermal competitive (pricing & incentives)
Institutional	Limited experience with institutional processes & procedures for competitive tendering, especially at sub-national level
Technology/Capacity	Limited availability of public information regarding geological & feasibility information Limited domestic capacity/participation in geothermal development which lead to higher costs
Investment Risk	High up-front cost of developing geothermal and uncertainty in upstream field exploration leads to higher risks

Source: Harsoprayitno 2009⁵⁹

4.3.1. Chile: problems with liberalisation and investment in generating capacity

In 1982 the military dictatorship in Chile introduced unbundling, privatisation and liberalisation of the country's electricity system, which had been run by an integrated public sector utility. Chile was the first country in the world to do this. The new regulatory system effectively "encouraged power firms to postpone or avoid altogether the installation of additional generation capacity".⁶⁰ This led to a serious energy crisis in 1998-99, initially triggered by a drought, whose effects were compounded by technical failures, delays and problems with the coordination and transparency of the private generating companies. The crisis highlighted "the relative weakness of public bodies in dealing with short-term profit-oriented private firms, and the lack of a long-term energy strategy."⁶¹ The investment problem continued: from 2000 onwards there was very little investment in new capacity, and another energy crisis arose in 2007-09 when the impact of a drought and gas shortages was worsened by the unavailability of three key power plants, leading to a 1000% (ten-times) increase in prices. The government had to spend over \$1 billion dollars to subsidise fuel and electricity prices, and make heavy use of expensive diesel generators. Private investment has increased, but only in oil and coal generation, and Chile has been unable to develop any significant proportion of generation based on renewable, such as geothermal. To deal with these problems, Chile is now planning to recreate a strong, central government agency with technical and research capacity.⁶² The International Energy Agency's 2009 report on Chile also concludes that the experience of 2007/08 showed that Chile still has real problems with security of supply, and that "the government needs to take a more proactive position with regard to monitoring energy developments and systematic risk assessment" and to develop state planning capacity.⁶³

4.4. Efficiency

There is a widespread belief that the private sector is always more efficient than the public sector, in electricity as in other sectors. This belief is not supported by empirical evidence. The evidence includes a global study in 1995 by Pollitt, which compared dozens of public and private electricity operators all over the world, and found no significant systematic difference between public and private in terms of efficiency.⁶⁴

A global review of this evidence in 2005 by the World Bank concluded: "For utilities, it seems that in general ownership often does not matter as much as sometimes argued. Most cross-country papers on utilities find no statistically significant difference in efficiency scores between public and private providers. As for the country specific papers, some do find differences in performance over time but these differences tend to matter much less than a number of other variables."⁶⁵

Studies of the UK privatisations in general have concluded that there is "little evidence that privatisation has caused a significant improvement in performance. Generally the great expectations for privatisation evident in ministerial speeches have not been borne out"⁶⁶, and were "unable to find .. evidence that output, labour, capital and TFP productivity in the UK increased substantially as a consequence of ownership change at privatisation compared to the long-term trend."⁶⁷ Even in telecoms, a sector where the private sector is assumed to be performing better than the public sector could, a global study comparing private and public

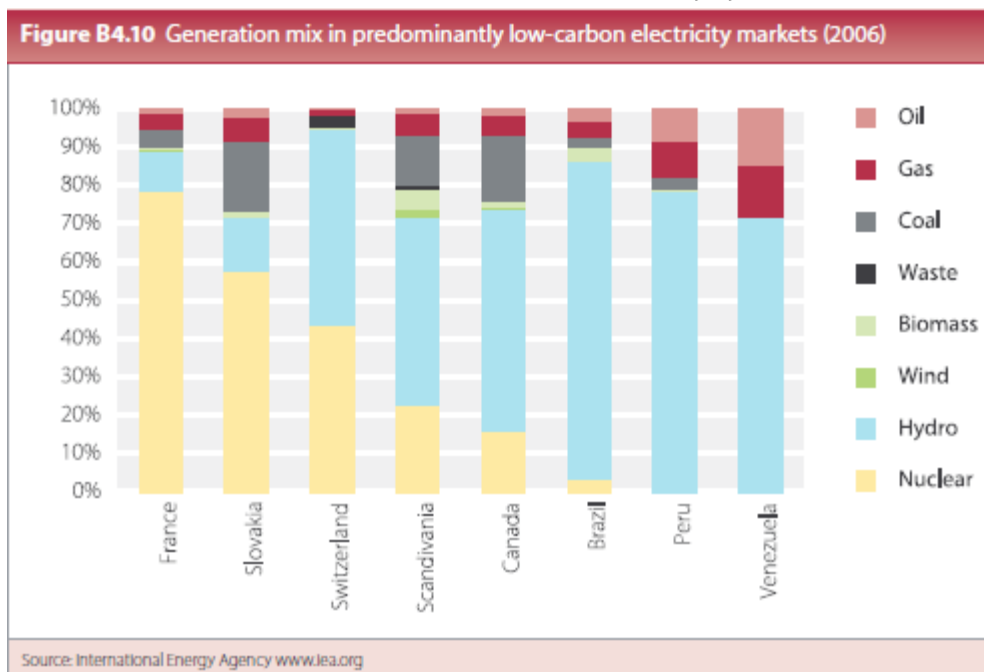
companies found that there was indeed “efficiency growth following privatizations” - but “it is significantly smaller than growth in public sectors.” (Knyazeva, Knyazeva and Stiglitz 2006). An author discussing the success of the South African policy noted that the reform process itself can damage efficiency by damaging staff morale: “radical restructuring is one of the least successful ways of remedying performance and is “characterised by uncertainty during its planning, fear of displacement and loss of security and morale ... and loss of efficiency and effectiveness”⁶⁸

Annexe: State as key source of finance for renewables

Extract from UK Committee on Climate Change, 2009. *Meeting Carbon Budgets –the need for a step change. Progress report to Parliament*. P.136-137 <http://www.theccc.org.uk/reports/progress-reports>

“Several countries already source over 70% of their power generation from low-carbon sources (Figure B4.10)⁹. For these, investment has typically only occurred with substantial government intervention, even where markets have subsequently been liberalised: • Several of these countries benefit from a large hydro resource. Hydro has very different technical and economic characteristics to wind and nuclear, and is more comparable to thermal plant: though it has low marginal costs, it has a high opportunity cost, is flexible and can be run at peak times. However, even where the main source of electricity is hydro, investment has relied on government intervention – markets in Canada and Venezuela are still dominated by state-owned firms, whilst most major hydro plants in Brazil and Peru were built prior to market reforms. • In France, Slovakia and Switzerland over 80% of generation is provided by state-owned companies, with government having directed investment to reach high levels of nuclear capacity. France has the highest level of non-hydro low-carbon generation, with 78% of generation from nuclear, which has been adapted to load follow (i.e. is more flexible than current UK capacity) and benefits from good interconnection with the rest of Europe, allowing it to export electricity at times of low domestic demand. • The integrated Scandinavian electricity market (Nordpool) has been liberalised and has a high level of low-carbon generation. However, most of the investment in low-carbon, capital intensive plant happened before liberalisation and was driven by state-owned utilities. Investment in renewables has continued since liberalisation, incentivised by a range of interventions to the market including taxes and tax rebates, investment support schemes, feed-in tariffs and obligations.”

Chart C. Generation mix in low-carbon electricity systems



Source: UK Committee on Climate Change, 2009.

Bibliography

- Anderson, J.A., 2009. Electricity Restructuring: A Review of Efforts around the World and the Consumer Response. *The Electricity Journal*, 22(3), 70-86. Available at: <http://www.sciencedirect.com/science/article/B6VSS-4VY16BV-2/2/c6a2f7d764e06203a8ec658abb98b75d> [Accessed November 15, 2009].
- Bayliss K. and Hall D. (2000) Independent Power Producers: A Review of the Issues. www.psiru.org/reportsindex.asp
- Bayliss K. and Hall D. (2001). Privatisation of electricity distribution: some economic, social and political perspectives www.psiru.org/reportsindex.asp
- Bhattacharyya S. 2007 Power sector reform in South Asia: Why slow and limited so far? *Energy Policy* 35 (2007) 317–332 doi:10.1016/j.enpol.2005.11.028
- Birdsall, Nancy and Nellis, John (2002) Winners and Losers: Assessing the distributional impact of privatization. Centre for Global Development Working Paper Number 6 May 2002 <http://www.cgdev.org/Publications/?PubID=6> .
- Bodmer E., 2009. The Deregulation Penalty: Losses for Consumers and Gains for Sellers , American Public Power Association. Available at: <http://www.appanet.org/files/PDFs/BodmerUpdatedFinancialAnalysis81309.pdf> [Accessed November 15, 2009].
- Branston, J. Robert. (2000). “A Counterfactual Price Analysis of Electricity Privatisation in England and Wales”, L'institute Discussion Paper 7, Universities of Birmingham, Ferrara and Wisconsin-Milwaukee. www.linstitute.org/papers/
- Buckland R. and Fraser P. (2002) The scale and patterns of abnormal returns to equity investment in UK electricity distribution. *Global Finance Journal* 2002 Volume 13 Issue 1
- Buresch, M. (2003) The Declining Role of Foreign Private Investment, Matthew Buresch, Deloitte Emerging Markets, World Bank Energy Forum 2003. February 24, 2003. <http://www.worldbank.org/energy/week2003/Presentations/EnergyForum1/BureschWBForumpresentation.pdf>
- Buresch, M. (2004) Re-Engaging the Private Sector in Emerging Market Power. World Bank Energy Forum 2004
- Carreón-Rodríguez, V., Jiménez San Vicente, A. & Rosellón, J., 2003. The Mexican Electricity Sector: Economic, Legal and Political Issues, Stanford University Institute for International Studies. Available at: http://iis-db.stanford.edu/pubs/20311/WP5_10_May_2004.pdf [Accessed November 13, 2009].
- Chun, C., 2006. Reform in China's Electric Power Industry - A Case Study of East China's Wholesale Electric Power Market, Institute of Energy Economics, Japan. Available at: <http://eneken.ieej.or.jp/data/en/data/pdf/336.pdf> [Accessed November 15, 2009]
- Committee on Climate Change, 2009. Meeting Carbon Budgets –the need for a step change. Progress report to Parliament, Available at: <http://www.theccc.org.uk/reports/progress-reports> [Accessed November 14, 2009].
- Dagdeviren, H., 2009. Limits to Competition and Regulation in Privatized Electricity Markets. *Annals of Public and Cooperative Economics*, 80(4), 641-664. Available at: <http://dx.doi.org/10.1111/j.1467-8292.2009.00395.x> [Accessed November 10, 2009].

- De Oliveira R. and Tolmasquin M. (2004) Regulatory performance analysis case study: Britain's electricity industry. *Energy Policy* 2004 Volume 32 issue 11.
- Dinkelman T., 2008. The Effects of Rural Electrification on Employment: New Evidence from South Africa. University of Michigan Job Market Paper Available at: <http://faculty.ucr.edu/~jorgea/econ261/electricity.pdf> [Accessed November 10, 2009]
- Dubash, N. (ed.) (2002) "Power politics: Equity and environment in electricity reform" World Resources Institute August 2002. http://pdf.wri.org/powerpolitics_execsumm.pdf
- East Asia Energy Sector Assessment: Quick Assessment of the Impact of the Credit Crisis on Power Sector Investments EAP-EASTE March 2009
http://www.esmap.org/filez/news/1072009121144_ESACredit_Crisis.pdf
- Eberhard A. and Gratwick K. 2007 From state to market and back again: Egypt's Experiment with IPPs. University of Cape Town October 2007 www.gsb.uc.ac.za/mir
- Emmons, W., 1993. Franklin D. Roosevelt, Electric Utilities, and the Power of Competition. *The Journal of Economic History*, 53(4), 880-907. Available at: <http://www.jstor.org/stable/2122643> [Accessed November 13, 2009].
- Emmons, W., 1997. Implications of Ownership, Regulation, and Market Structure for Performance: Evidence from the U.S. Electric Utility Industry Before and After the New Deal. *The Review of Economics and Statistics*, 79(2), 279-289. Available at: <http://www.jstor.org/stable/2951461> [Accessed November 13, 2009].
- ESMAP Report 306/05 August 2005 Power Sector Reform in Africa: Assessing Impact on Poor People
[http://wbln0018.worldbank.org/esmap/site.nsf/files/306-05+Final_to_Printshop.pdf/\\$FILE/306-05+Final_to_Printshop.pdf#search=%22%22Power%20Sector%20Reform%20in%20Africa%22%22](http://wbln0018.worldbank.org/esmap/site.nsf/files/306-05+Final_to_Printshop.pdf/$FILE/306-05+Final_to_Printshop.pdf#search=%22%22Power%20Sector%20Reform%20in%20Africa%22%22)
- Estache A. 2006 Africa's infrastructure: challenges and opportunities
<http://www.imf.org/external/np/seminars/eng/2006/rppia/pdf/estach.pdf>
- European Commission (2006) 'Sector Inquiry under Art 17 Regulation 1/2003 on the gas and electricity markets: Preliminary Report' European Commission, Brussels.
http://ec.europa.eu/comm/competition/antitrust/others/sector_inquiries/energy/execsum.pdf
- Fiorio C. and Florio M. 2007 The Electricity Industry Reform Paradigm in the European Union: Testing the Impact on Consumers http://www.privatizationbarometer.net/upp/uppdoc/D6.2_2.pdf
- Florio M. The Great Divestiture. 2004. MiT. A paper covering some of the results is available at The Missing Shock: The Macroeconomic Impact of British Privatisation Massimo Florio and Mara Grasseni. *Nota di Lavoro* 104.2004 July 2004
http://www.feem.it/Feem/Pub/Publications/WPapers/default.htm?WP_Year=2004&WP_Campi=Author&WP_Keyword=florio&WP_Page=1&FRAMELESS=true&NRNODEGUID=%257b1A870B4D-D3E0-403E-9701-64635CE6C28C%257d
- Gabriele, A., 2004. Policy alternatives in reforming energy utilities in developing countries. *Energy Policy*, 32(11), 1319-1337. Available at: <http://www.sciencedirect.com/science/article/B6V2W-48PVDXF-1/2/1d61a59a955f07bafc6fbdceb69f1001> [Accessed November 10, 2009]
- Gaunt, C., 2008. Electricity distribution industry restructuring in South Africa: A case study. *Energy Policy*, 36(9), 3448-3459. Available at: <http://www.sciencedirect.com/science/article/B6V2W-4SWP25M-1/2/221bb17df4953f22969e738f519b7c4b> [Accessed November 10, 2009].

Ghobadian A. and Viney H. (2002) Strategic reorientation in former public utilities: the example of UK electricity. *Management Decision* 2002 Volume 40 Issue 7.

Goto, M. & Makhija, A., 2009. The impact of deregulation and corporate structure on productive efficiency: The case of the U.S. electric utility industry, 1990–2004. *Advances in Financial Economics* 2009 Volume: 13 Page: 1 - 34. Available at:

<http://www.emeraldinsight.com/Insight/viewContentItem.do?contentType=Book&contentId=1791248>

[Accessed November 15, 2009].

Hall D. 2006 Energy privatisation and reform in East Africa <http://www.psiru.org/reports/2006-11-E-Eafrica.doc>

Hall D. 2007 Electrifying Africa <http://www.psiru.org/reports/2007-01-E-Africa.doc>

Hall D. 2007 Electricity companies in Latin America 2007 <http://www.psiru.org/reports/2007-10-E-Latam.doc>

Harsoprayitno, S., 2009. Geothermal Energy in Indonesia. Available at:

http://siteresources.worldbank.org/INTENERGY/Resources/335544-1232567547944/5755469-1239633250635/Sugiharto_Harsoprayitno.pdf [Accessed November 12, 2009].

Hoecker J. 2009 Ten Electric Power Companies & Market Liberalization

http://www.fepc.or.jp/english/library/electricity_eview_japan/_icsFiles/afieldfile/2009/04/02/erj2009_4.pdf

Holland, S. & Neufeld, J., 2009. The Evolution of Government Policy and the Structure of the U.S. Electric Power Industry, University of North Carolina at Greensboro. Available at:

http://www.uncg.edu/bae/people/holland/research/Holland_Neufeld.pdf [Accessed November 13, 2009]

IEA/OECD, 2009. Chile Energy Policy Review 2009 - exec summary, Available at:

<http://www.iea.org/Textbase/npsum/chile2009SUM.pdf> [Accessed November 12, 2009].

Joskow, P. & Kahn, E., 2002. A Quantitative Analysis of Pricing Behavior in California's Wholesale Electricity Market During Summer 2000: The Final Word Available at:

<http://www.hks.harvard.edu/hepg/Papers/Joskow-Kahn%20Final%20Word%20Feb2002.pdf> Accessed November 15, 2009].

Karakezi S. and Kimani J. (2002) Status of power sector reform in Africa: impact on the poor . *Energy Policy* Volume 30 Issues 11-12 September 2002

Ma, C. & He, L., 2008. From state monopoly to renewable portfolio: Restructuring China's electric utility. *Energy Policy*, 36(5), 1697-1711. Available at: <http://www.sciencedirect.com/science/article/B6V2W-4S0HC53-1/2/0703d087c8b53638d2d7ffaad2f07b03> [Accessed November 14, 2009].

Maddison, A., *Statistics on World Population, GDP and Per Capita GDP, 1-2006 AD* . Available at:

<http://www.ggdc.net/maddison/> [Accessed November 13, 2009]

Martin S. and Parker D. in: *The Impact of Privatisation Ownership and Corporate Performance in the UK*, Routledge, London (1997).

Millward, R., 2005. *Private and public enterprise in Europe - energy, telecommunications and transport, 1830-1990*, CUP.

Nellis, J. (2003) *Effects Of Privatization On Income & Wealth Distribution* . Presentation to WB Energy week 2003. <http://www.worldbank.org/energy/week2003/Presentations/EnergyandPoverty/JohnNellis.pdf>

Newbery, D. and Pollitt, M. (1997) "The Restructuring and Privatisation of Britain's CEBG: Was it worth It?" *Journal of Industrial Economics* Volume XLV (3) September 1997 269-303

O'Mahoney M. and Vecchi M. (2001) The electricity supply industry: a study of an industry in transition. National Institute Economic Review 2001 p.177

Percebois J. and Wright P. (2001) Electricity consumers under the state and the private sector: comparing the price performance of the French and UK electricity industries 1990-2000. Utilities Policy 2001 Issue 10 No 3/4.

Pineau, P-O. (2002) Electricity sector reform in Cameroon: is privatization the solution? Energy Policy Vol 30 Issue 11-12 September 2004

Pollitt, M. (1995), Ownership and Performance in Electric Utilities: the International Evidence on Privatisation and Efficiency, Oxford University Press, Oxford

Pollitt, M.G. (1995), Ownership and Performance in Electric Utilities. (240pp), Oxford: Oxford University Press / Oxford Institute for Energy Studies.

Prayas Energy Group (2001) Lessons of the Enron Disaster: Democratization through TAPing of Governance as the Remedy http://www.prayaspuene.org/energy/24_INFRA_Rep_01.pdf

Quadrat-Ullah H. and Davidsen P. (2001) Understanding the dynamics of electricity supply, resources and pollution: Pakistan's case. Energy Vol 26 Issue 6 June 2001

Rigby P. (2003) Deregulation's dysfunctional markets strike back: the blackout of '03 intensifies political and regulatory risk for U.S. transmission. By Peter Rigby. Platts Energy Business and Technology October 2003 <http://www.platts.com/businesstech/index.shtml>

Saghir, J. (2003) World Bank Energy Week presentation on infrastructure policy <http://www.worldbank.org/energy/week2003/Presentations/EnergyForum1/jsaghir.pdf>

Sharma D, Madamba S., and Chan R. (2004) Electricity industry reforms in the Philippines Energy Policy Vol 32 Issue 13 September 2004

Thomas S. 2002 Regulation in a deregulated energy market: British experience www.psiru.org/reports/2002-09-E-Reg.doc

Thomas S. and Hall D. (2003) Blackouts: Do liberalisation and privatisation increase the risk? www.psuiru.org/reportsindex.asp

Thomas, S. (2004) The British model in Britain: failing slowly. Paper presented at International Workshop on: "Thirty Years of World Energy Policy – cum – Editorial Board Meeting of Energy Policy" Hong Kong www.psiru.org/reportsindex.asp

Thomas S. (2004) The Seven Brothers. Energy Policy 2003

Thomas S. 2007 Electricity Liberalization Experiences in the World July 2007 PSIRU <http://www.psiru.org/reports/2007-08-E-Taiwan.doc>

Thomas S. 2009 Corporate policies in the EU energy sector <http://www.psiru.org/reports/2009-08-E-corporppolicies.doc>

Tokman, M., 2009. The Energy Crisis and its Lessons (Chile). Available at: http://siteresources.worldbank.org/INTENERGY/Resources/335544-1232567547944/5755469-1239633250635/Marcelo_Tokman.pdf [Accessed November 12, 2009].

UCTE Press Release Monday 29 Sept 2003 After The Italian Nation-Wide Black-Out On 28 September 2003 <http://www.ucte.org/pdf/News/20030929-After-the-Italian-Black-out.pdf>

Waddams-Price, C (2004) 'Spoilt for Choice? The Costs and Benefits of Opening UK Residential Energy Markets'. CCR Working Paper 04-1. Also published as University of California Energy Institute Working Paper CSEM WP-123

Wagle, S. (2000) Reforms in the Indian Electricity Sector : Resisting the World Bank Model Prayas Energy Group Pune, India. http://www.prayaspuene.org/energy/20_WB_model_presentation.zip

Woo C. (2001) What went wrong in California's electricity market? Energy Policy Vol 26 Issue 8 August 2001

Woo C., Lloyd D., and Tishler A. (2003) Electricity market reform failures: UK, Norway, Alberta and California. Energy Policy Vol 31 Issue 11 September 2003

Woo C.K. and Zarnikau J. (2009) The Electricity Journal Volume 22 Issue 2 Pages 40-45
<http://www.sciencedirect.com/science/article/B6VSS-4VPKPXT-1/2/4de9c22447cd676d8171b20299630e93>
Accessed 16 November 2009

World Bank (2003) "Implementing The World Bank Group Infrastructure Action Plan" DC2003-0015 September 13, 2003 [http://siteresources.worldbank.org/DEVCOMMINT/Resources/Fall-2003/DC2003-0015\(E\)-Infrastructure.pdf](http://siteresources.worldbank.org/DEVCOMMINT/Resources/Fall-2003/DC2003-0015(E)-Infrastructure.pdf)

Zhang, X. & Parsons, J., 2008. Market Power and Electricity Market Reform in Northeast China, MIT Centre for Energy and nvironmental Policy Research. Available at:
<http://tisiphone.mit.edu/RePEc/mee/wpaper/2008-001.pdf> [Accessed November 15, 2009]

Zhou, H. et al., 2009. Study on economic withholding in electricity market of Zhejiang Province, China. Communications in Nonlinear Science and Numerical Simulation, 14(5), 2495-2501. Available at:
<http://www.sciencedirect.com/science/article/B6X3D-4TC34X6-1/2/ce46c25c82c5e35e42706991313ae3f8>
[Accessed November 15, 2009]

Notes

¹ Anderson, J.A., 2009. Electricity Restructuring: A Review of Efforts around the World and the Consumer Response. The Electricity Journal, 22(3), 70-86. Available at: <http://www.sciencedirect.com/science/article/B6VSS-4VY16BV-2/2/c6a2f7d764e06203a8ec658abb98b75d> [Accessed November 15, 2009].

² Committee on Climate Change, 2009. Meeting Carbon Budgets –the need for a step change. Progress report to Parliament, Available at: <http://www.theccc.org.uk/reports/progress-reports> [Accessed November 14, 2009].

³ Anderson, J.A., 2009. Electricity Restructuring: A Review of Efforts around the World and the Consumer Response. The Electricity Journal, 22(3), 70-86. Available at: <http://www.sciencedirect.com/science/article/B6VSS-4VY16BV-2/2/c6a2f7d764e06203a8ec658abb98b75d> [Accessed November 15, 2009].

⁴ Committee on Climate Change, 2009. Meeting Carbon Budgets –the need for a step change. Progress report to Parliament, Available at: <http://www.theccc.org.uk/reports/progress-reports> [Accessed November 14, 2009].

⁵ Thomas S. 2007 Electricity Liberalization Experiences in the World July 2007 PSIRU
<http://www.psiru.org/reports/2007-08-E-Taiwan.doc>

⁶ Carlo V. Fiorio and M. Florio 2007 The Electricity Industry Reform Paradigm in the European Union: Testing the Impact on Consumers http://www.privatizationbarometer.net/upp/uppdoc/D6.2_2.pdf

⁷ Waddams-Price, C (2004) 'Spoilt for Choice? The Costs and Benefits of Opening UK Residential Energy Markets'. CCR Working Paper 04-1. Also published as University of California Energy Institute Working Paper CSEM WP-123

⁸ Corporate policies in the EU energy sector <http://www.psiru.org/reports/2009-08-E-corpolicies.doc>

⁹ European Commission (2006) 'Sector Inquiry under Art 17 Regulation 1/2003 on the gas and electricity markets: Preliminary Report' European Commission, Brussels.
http://ec.europa.eu/comm/competition/antitrust/others/sector_inquiries/energy/execsum.pdf

¹⁰ Joskow, P. & Kahn, E., 2002. A Quantitative Analysis of Pricing Behavior in California's Wholesale Electricity Market During Summer 2000: The Final Word Paul Joskow and Edward Kahn February 4, 2002, Harvard University.

Available at: <http://www.hks.harvard.edu/hepg/Papers/Joskow-Kahn%20Final%20Word%20Feb2002.pdf> [Accessed November 15, 2009].

¹¹ New York Times September 4, 2007. More than a decade after the drive began to convert electricity from a regulated industry into a competitive one, many states are rolling back their initiatives or returning money to individuals and businesses. By David Cay Johnston

¹² Utility bills double, triple WASHINGTON TIMES March 14, 2009

¹³ Woo C.K. and Zarnikau J. 2009 The Electricity Journal Volume 22 Issue 2 Pages 40-45 Date March 2009 DOI 10.1016/j.tej.2009.01.003 ISSN 1040-6190 URL <http://www.sciencedirect.com/science/article/B6VSS-4VPKPYT-1/2/4de9c22447cd676d8171b20299630e93> Accessed 16 November 2009 00:09:27

¹⁴ Coalition blames deregulation for higher power costs in Texas Fort Worth Star-Telegram, Texas February 10, 2009

¹⁵ Holland, S. & Neufeld, J., 2009. The Evolution of Government Policy and the Structure of the U.S. Electric Power Industry, University of North Carolina at Greensboro. Available at:

http://www.uncg.edu/bae/people/holland/research/Holland_Neufeld.pdf [Accessed November 13, 2009]

¹⁶ Edward Bodmer, 2009. The Deregulation Penalty: Losses for Consumers and Gains for Sellers , American Public Power Association. Available at:

<http://www.appanet.org/files/PDFs/BodmerUpdatedFinancialAnalysis81309.pdf> [Accessed November 15, 2009].

¹⁷ Goto, M. & Makhija, A., 2009. The impact of deregulation and corporate structure on productive efficiency: The case of the U.S. electric utility industry, 1990–2004. Advances in Financial Economics 2009 Volume: 13 Page: 1 - 34.

Available at: <http://www.emeraldinsight.com/Insight/viewContentItem.do?contentType=Book&contentId=1791248> [Accessed November 15, 2009].

¹⁸ Roll Call November 9, 2009 Electric Infrastructure Needed James Hoecker

¹⁹ Ten Electric Power Companies & Market Liberalization

http://www.fepec.or.jp/english/library/electricity_eview_japan/_icsFiles/afieldfile/2009/04/02/erj2009_4.pdf

²⁰ Millward, R., 2005. Private and public enterprise in Europe - energy, telecommunications and transport, 1830-1990, CUP.

²¹ Holland, S. & Neufeld, J., 2009. The Evolution of Government Policy and the Structure of the U.S. Electric Power Industry, University of North Carolina at Greensboro. Available at:

http://www.uncg.edu/bae/people/holland/research/Holland_Neufeld.pdf [Accessed November 13, 2009]; Emmons, W., 1993. Franklin D. Roosevelt, Electric Utilities, and the Power of Competition. The Journal of Economic History, 53(4), 880-907. Available at: <http://www.jstor.org/stable/2122643> [Accessed November 13, 2009].

²² Emmons, W., 1997. Implications of Ownership, Regulation, and Market Structure for Performance: Evidence from the U.S. Electric Utility Industry Before and After the New Deal. The Review of Economics and Statistics, 79(2), 279-289. Available at: <http://www.jstor.org/stable/2951461> [Accessed November 13, 2009].

²³ Maddison, A., Statistics on World Population, GDP and Per Capita GDP, 1-2006 AD . Available at: <http://www.ggdc.net/maddison/> [Accessed November 13, 2009].

²⁴ Emmons, W., 1997. Implications of Ownership, Regulation, and Market Structure for Performance: Evidence from the U.S. Electric Utility Industry Before and After the New Deal. The Review of Economics and Statistics, 79(2), 279-289. Available at: <http://www.jstor.org/stable/2951461> [Accessed November 13, 2009].

²⁵ Electricity companies in Latin America 2007 <http://www.psiru.org/reports/2007-10-E-Latam.doc>

²⁶ Dagdeviren, H., 2009. LIMITS TO COMPETITION AND REGULATION IN PRIVATIZED ELECTRICITY MARKETS. Annals of Public and Cooperative Economics, 80(4), 641-664. Available at:

<http://dx.doi.org/10.1111/j.1467-8292.2009.00395.x> [Accessed November 10, 2009].

²⁷ Gabriele, A., 2004. Policy alternatives in reforming energy utilities in developing countries. Energy Policy, 32(11), 1319-1337. Available at: <http://www.sciencedirect.com/science/article/B6V2W-48PVDXF-1/2/1d61a59a955f07baf6c6fbdceb69f1001> [Accessed November 10, 2009].

²⁸ See

<http://www.tavanir.org.ir/latin/template.asp?url=/latin/About/About10.asp&pagename=Specialized%20Holding%20company%20of%20Tavanir%20and%20its%20subsidiary%20companies&leftmenubar=1&rt=About%20Tavanir>

²⁹ Ma, C. & He, L., 2008. From state monopoly to renewable portfolio: Restructuring China's electric utility. Energy Policy, 36(5), 1697-1711. Available at: <http://www.sciencedirect.com/science/article/B6V2W-4S0HC53-1/2/0703d087e8b53638d2d7ffaad2f07b03> [Accessed November 14, 2009].

³⁰ Zhou, H. et al., 2009. Study on economic withholding in electricity market of Zhejiang Province, China.

Communications in Nonlinear Science and Numerical Simulation, 14(5), 2495-2501. Available at:

<http://www.sciencedirect.com/science/article/B6X3D-4TC34X6-1/2/ce46c25c82c5e35e42706991313ae3f8> [Accessed November 15, 2009].; Chun, C., 2006. Reform in China's Electric Power Industry - A Case Study of East China's

Wholesale Electric Power Market, Institute of Energy Economics, Japan. Available at:

<http://enen.iecej.or.jp/data/en/data/pdf/336.pdf> [Accessed November 15, 2009]; Zhang, X. & Parsons, J., 2008.

Market Power and Electricity Market Reform in Northeast China, MIT Centre for Energy and Environmental Policy Research. Available at: <http://tisiphone.mit.edu/RePEC/mee/wpaper/2008-001.pdf> [Accessed November 15, 2009]

³¹ http://www.powermin.nic.in/acts_notification/status_reforms_in_states.htm

³² S.C. Bhattacharyya 2007 Power sector reform in South Asia: Why slow and limited so far? Energy Policy 35 (2007) 317–332 doi:10.1016/j.enpol.2005.11.028

- ³³ S.C. Bhattacharyya 2007 Power sector reform in South Asia: Why slow and limited so far? *Energy Policy* 35 (2007) 317–332 doi:10.1016/j.enpol.2005.11.028
- ³⁴ Gabriele, A., 2004. Policy alternatives in reforming energy utilities in developing countries. *Energy Policy*, 32(11), 1319-1337. Available at: <http://www.sciencedirect.com/science/article/B6V2W-48PVDXF-1/2/1d61a59a955f07bafce6fbdbceb69f1001> [Accessed November 10, 2009]; Carreón-Rodríguez, V., Jiménez San Vicente, A. & Rosellón, J., 2003. The Mexican Electricity Sector: Economic, Legal and Political Issues, Stanford University Institute for International Studies. Available at: http://iis-db.stanford.edu/pubs/20311/WP5_10_May_2004.pdf [Accessed November 13, 2009].
- ³⁵ Electricity Liberalization Experiences in the World <http://www.psiru.org/reports/2007-08-E-Taiwan.doc>
- ³⁶ Tavanir
<http://www.tavanir.org.ir/latin/template.asp?url=/latin/About/About10.asp&pagename=Specialized%20Holding%20company%20of%20Tavanir%20and%20its%20subsidiary%20companies&leftmenubar=1&rt=About%20Tavanir>
- ³⁷ Electricity Companies in Latin America <http://www.psiru.org/reports/2007-10-E-Latam.doc>
- ³⁸ Electricity Companies in Latin America <http://www.psiru.org/reports/2007-10-E-Latam.doc>
- ³⁹ Gaunt, C., 2008. Electricity distribution industry restructuring in South Africa: A case study. *Energy Policy*, 36(9), 3448-3459. Available at: <http://www.sciencedirect.com/science/article/B6V2W-4SWP25M-1/2/221bb17df4953f22969e738f519b7c4b> [Accessed November 10, 2009].
- ⁴⁰ Hall D. 2006 Energy privatisation and reform in East Africa <http://www.psiru.org/reports/2006-11-E-Eafrica.doc>
November 2006
- ⁴¹ Dubash N. (ed.) 2002. Power politics: Equity and environment in electricity reform. World Resources Institute. August 2002.. Chapter 8: South Africa http://pdf.wri.org/powerpolitics_chap8.pdf
- ⁴² Eskom Annual report 2006 . Chief executive's report. <http://www.eskom.co.za/annreport06/chieffexecutivesreport.htm>
- ⁴³ Taryn Dinkelman, 2008. The Effects of Rural Electrification on Employment: New Evidence from South Africa. University of Michigan Job Market Paper Available at: <http://faculty.ucr.edu/~jorgea/econ261/electricity.pdf> [Accessed November 10, 2009].
- ⁴⁴ Eskom Annual report 2006 . Chief executive's report. <http://www.eskom.co.za/annreport06/chieffexecutivesreport.htm>
- ⁴⁵ Jerome 2004 p. 22; Africa's infrastructure: challenges and opportunities Antonio Estache Word Bank And ECARES, Université Libre de Bruxelles <http://www.imf.org/external/np/seminars/eng/2006/rppia/pdf/estach.pdf>. P.40
- ⁴⁶ EGAT Annual Report 2008 http://pr.egat.co.th/AnnualReport/annual2008/annual08_eng/annual2008en_p10.pdf
- ⁴⁷ European Commission IP/08/850 Brussels, 4 June 2008 State aid: Commission requests Hungary to end long-term power purchase agreements and recover state aid from power generators
<http://europa.eu/rapid/pressReleasesAction.do?reference=IP/08/850&format=PDF&aged=0&language=EN&guiLanguage=en>
- ⁴⁸ Hall D. 2007 **Electrifying Africa** <http://www.psiru.org/reports/2007-01-E-Africa.doc>
- ⁴⁹ Dagdeviren, H., 2009. LIMITS TO COMPETITION AND REGULATION IN PRIVATIZED ELECTRICITY MARKETS. *Annals of Public and Cooperative Economics*, 80(4), 641-664. Available at: <http://dx.doi.org/10.1111/j.1467-8292.2009.00395.x> [Accessed November 10, 2009].
- ⁵⁰ Eberhard A. and Gratwick K. 2007 From state to market and back again: Egypt's Experiment with IPPs. University of Cape Town October 2007 www.gsb.uc.ac.za/mir
- ⁵¹ ESMAP Report 306/05 August 2005 Power Sector Reform in Africa: Assessing Impact on Poor People
[http://wbln0018.worldbank.org/esmap/site.nsf/files/306-05+Final_to_Printshop.pdf/\\$FILE/306-05+Final_to_Printshop.pdf#search=%22%22Power%20Sector%20Reform%20in%20Africa%22%22](http://wbln0018.worldbank.org/esmap/site.nsf/files/306-05+Final_to_Printshop.pdf/$FILE/306-05+Final_to_Printshop.pdf#search=%22%22Power%20Sector%20Reform%20in%20Africa%22%22)
- ⁵² Dagdeviren, H., 2009. Limits to competition and regulation in privatized electricity markets. *Annals of Public and Cooperative Economics*, 80(4), 641-664. Available at: <http://dx.doi.org/10.1111/j.1467-8292.2009.00395.x> [Accessed November 10, 2009].
- ⁵³ Thomas S. 2002 Regulation in a deregulated energy market: British experience
www.psiru.org/reports/2002-09-E-Reg.doc
- ⁵⁴ East Asia Energy Sector Assessment: Quick Assessment of the Impact of the Credit Crisis on Power Sector Investments EAP-EASTE March 2009 http://www.esmap.org/filez/news/1072009121144_ESACredit_Crisis.pdf
- ⁵⁵ East Asia Energy Sector Assessment: Quick Assessment of the Impact of the Credit Crisis on Power Sector Investments EAP-EASTE March 2009 http://www.esmap.org/filez/news/1072009121144_ESACredit_Crisis.pdf
- ⁵⁶ Committee on Climate Change, 2009. Meeting Carbon Budgets –the need for a step change. Progress report to Parliament, Available at: <http://www.theccc.org.uk/reports/progress-reports> [Accessed November 14, 2009].
- ⁵⁷ Tokman, M., 2009. The Energy Crisis and its Lessons (Chile). Available at: http://siteresources.worldbank.org/INTENERGY/Resources/335544-1232567547944/5755469-1239633250635/Marcelo_Tokman.pdf [Accessed November 12, 2009].
- ⁵⁸ Harsoprayitno, S., 2009. Geothermal Energy in Indonesia. Available at: http://siteresources.worldbank.org/INTENERGY/Resources/335544-1232567547944/5755469-1239633250635/Sugiharto_Harsoprayitno.pdf [Accessed November 12, 2009].

- ⁵⁹ Harsoprayitno, S., 2009. Geothermal Energy in Indonesia. Available at: http://siteresources.worldbank.org/INTENERGY/Resources/335544-1232567547944/5755469-1239633250635/Sugiharto_Harsoprayitno.pdf [Accessed November 12, 2009].
- ⁶⁰ Galetovic and Fischer, 2001, quoted in Gabriele 2004)
- ⁶¹ Gabriele, A., 2004. Policy alternatives in reforming energy utilities in developing countries. *Energy Policy*, 32(11), 1319-1337. Available at: <http://www.sciencedirect.com/science/article/B6V2W-48PVDXF-1/2/1d61a59a955f07bafc6fbdceb69f1001> [Accessed November 10, 2009].
- ⁶² Tokman, M., 2009. The Energy Crisis and its Lessons (Chile). Available at: http://siteresources.worldbank.org/INTENERGY/Resources/335544-1232567547944/5755469-1239633250635/Marcelo_Tokman.pdf [Accessed November 12, 2009].
- ⁶³ IEA/OECD, 2009. Chile Energy Policy Review 2009 - exec summary, Available at: <http://www.iea.org/Textbase/npsum/chile2009SUM.pdf> [Accessed November 12, 2009].
- ⁶⁴ Pollitt, M. (1995), *Ownership and Performance in Electric Utilities: the International Evidence on Privatisation and Efficiency*, Oxford University Press, Oxford
- ⁶⁵ Estache et al (2005), p.6 (see bibliography)
- ⁶⁶ S. Martin and D. Parker In: *The Impact of Privatisation Ownership and Corporate Performance in the UK*, Routledge, London (1997).
- ⁶⁷ The Great Divestiture. Massimo Florio. 2004. MiT. A paper covering some of the results is available at *The Missing Shock: The Macroeconomic Impact of British Privatisation* Massimo Florio and Mara Grasseni. *Nota di Lavoro* 104.2004 July 2004 http://www.feem.it/Feem/Pub/Publications/WPapers/default.htm?WP_Year=2004&WP_Campi=Author&WP_Keyword=florio&WP_Page=1&FRAMELESS=true&NRNODEGUID=%257b1A870B4D-D3E0-403E-9701-64635CE6C28C%257d
- ⁶⁸ Gaunt, C., 2008. Electricity distribution industry restructuring in South Africa: A case study. *Energy Policy*, 36(9), 3448-3459. Available at: <http://www.sciencedirect.com/science/article/B6V2W-4SWP25M-1/2/221bb17df4953f22969e738f519b7c4b> [Accessed November 10, 2009].