World Nuclear Association Annual Symposium
4-6 September 2002 - London

Public or Private Ownership?

Derek May

Introduction

Much of the world's commercial nuclear industry remains in government ownership. The general trend in the past decade has been to move nuclear generation and fuel cycle companies from government ownership to investor ownership – privatisation in other words. Significant companies that have made that transition include: USEC, British Energy, Endesa and AEAT. This movement of ownership has not been all one way. The Westinghouse and ABB nuclear businesses have been sold by investor-owned companies to the government-owned BNFL, and Siemens' nuclear business is now majority-owned by the French government. In addition, difficulty and controversy seem to surround several recent privatisation prospects:

- The privatisation of CEZ has been deferred after two abortive attempts.
- BNFL's potential privatisation now depends on a lengthy restructuring of the company and the creation of a 'new BNFL', stripped of most of the current nuclear liabilities.
- A start to the partial privatisation of EdF was delayed until after the French presidential and legislative elections and is now facing the delicate challenge of reaching an understanding with the EdF trades unions.

This paper:

- summarises the public/private ownership split of the world's nuclear industry (generation, fuel cycle and services);
- analyses the public/private ownership split by sector and looks at whether ownership differences account for any differences in performance;
- discusses whether there are any 'natural barriers' to the introduction of private ownership into any parts of the world commercial nuclear industry;
- highlights some national differences in approach to the ownership of nuclear companies; and
- speculates about how the mix of public/private nuclear industry ownership might evolve in the future.

Privatisation

This paper takes as its working definition of the term privatisation as being:

'the transfer to private entities of a significant proportion of the company's equity and/or shareholder voting rights'.

In some countries the word privatisation has become politically incorrect. 'Public–Private Partnership' is a term used now in the UK by the Labour government. This term was devised principally to distance the Labour government from the privatisations of the previous Conservative government. The name may be different, but the result is the same.

Rather than use euphemisms, and at the risk of offending the politically sensitive, the term privatisation (defined as above) will be used throughout this paper.

Typically, governments privatise assets or companies because they wish to achieve one or more of the following aims:

- to relieve themselves of financing requirements or raise money for expenditure in other areas;
- to step back from interfering (or being suspecting of interfering) in the operation of (newly) liberalised markets;
- to distance themselves from potentially difficult decisions;
- to enable a better separation of management from regulation;
- to enable greater efficiency of operation and business development to be undertaken by more commercially motivated (and international) management;
- to transfer risk to the private sector where it can be better managed.

Clearly, as far as the nuclear industry is concerned, governments will continue to have a major part to play in its future regardless of who owns it. Governments will exert strong influences on the industry through many explicit and implicit means. National and regional energy policies will determine the framework within which nuclear generation competes. Environmental regulation will set some of the most important boundary conditions for the industry.

Public/private ownership

Generation

Figure 1 shows how the total amount of nuclear electricity generated in the world is split between utilities ultimately owned by governments on the one hand, and utilities owned by private investors on the other hand [1]. Over the period 1990 to 2001, the split of nuclear electricity generated between private and publicly-owned utilities has remained roughly constant at around 55% to 45%. Over this period, the total amount of nuclear electricity generated has increased by over 25%. Increases in private sector generation through:

- significant improvements in US plant performance;
- new reactors coming into operation in Japan; and
- nuclear utility privatisations in the UK and Spain

have been balanced by increases in nuclear generation from government-owned companies, principally through:

- new reactors coming into operation in France;
- new reactors coming into operation in South Korea; and
- improved reactor performance in a number of government-owned companies including the Russian nuclear generating company, Rosenergoatom, and TVA, the US utility owned by the federal government.

Fuel cycle

Figures 2, 3, 4, 5 & 6 present snapshots of the split between private and public ownership of the output of the various parts of the fuel cycle [2]. The period covered is 1990 to 2001. The following observations can be made from examining these figures:

- in most segments of the fuel cycle there is long-standing competition between publicly- and privately-owned companies;
- the enrichment segment features one company, Urenco, with hybrid ownership – the company being a joint venture between two governments and two privately-owned nuclear utilities: for the purposes of this paper, Urenco is regarded as being a private sector company;
- the overall picture is one of increased public ownership of the output from the various parts of the fuel cycle over the past 10 years;
- public ownership of output in the uranium industry has increased mainly as a result of the increased sales by the FSU states and by AREVA not being quite balanced by increased sales by Cameco;
- despite USEC's privatisation and the increased market share won by Urenco, government-owned output predominated in the enrichment sector: this is due to Minatom virtually doubling its share of the market over the period;
- the acquisition of the privately-owned nuclear businesses of Westinghouse and ABB by BNFL and the acquisition of control of Siemens' nuclear business by AREVA have increased markedly the proportion of publicly-owned fuel fabrication output over the period;
- all reprocessing output was publicly owned over the period under consideration.

Performance differences

Generation output

Figure 7 analyses the performance of the world's PWRs in 2001 [1]. The figure presents a 2 x 2 matrix splitting the PWRs on two dimensions: private or public ownership and load factor for 2001 above or below the average (81%) for the world's PWRs. From the figure it can be seen that the publicly-owned PWRs performed significantly worse (as measured by load factors) than the privately-owned PWRs.

Figure 8 presents the same analysis, this time excluding the French PWRs. This exclusion could be justified on the grounds that there is a large nuclear over-capacity in France, so load factors would be expected to be low. Making this adjustment does not, however, change the conclusion: privately-owned PWRs appear to perform significantly better (as measured by load factors) on average than publicly-owned plants. In saying this, it must, of course, be acknowledged that the PWRs operated by the government-owned Korean Electric Power Company achieve among the highest load factors of any reactors in the world.

Figure 9 introduces another variable, that of whether the reactor is operating within a competitive electricity market or whether the market is still heavily regulated. This figure shows:

- only a relatively small number of PWRs achieving lower than world average load factors are operating in liberalised electricity markets;
- conversely, a relatively large number of under-performing PWRs operate in regulated electricity markets.

Finally in this analysis of PWR load factors, *Figures 10 & 11* look at the star performers – defined as those plants achieving a load factor of over 90% in 2001 – and the laggards – defined as those plants achieving a load factor of less than 75%. Each of these categories of reactors is presented in a 2 x 2 matrix. One axis is ownership, the other is the nature of the electricity market as in Figure 9. These two figures show, not surprisingly,:

- the overwhelming majority of star performers measured by load factor in 2001 are privately owned, and operating in competitive electricity markets;
- the overwhelming majority of laggards are publicly owned and operating in regulated electricity markets;
- there is a significant number of privately-owned reactors operating in competitive markets that exhibited laggard performance on the basis of load factor in 2001 (14 reactors on this analysis);
- there is a significant number of private and publicly-owned reactors operating in regulated markets – particularly in South Korea and Japan – that achieved star performance measured by load factor in 2001.

Generation costs

Insufficient public information is available to analyse generation cost in the same way that load factors were looked at above. However, an interesting piece of analysis is to look at the production cost of the publicly-owned US nuclear utility, TVA, and compare it with the costs of the US nuclear stations as a whole.

Figure 12 shows that TVA's production cost has been consistently below the average of the US nuclear fleet over the past 10 years [3]. Over this period the average production cost of the US fleet has fallen by some 35%; TVA's average production cost has fallen by almost 25% over the same period.

Safety

Figure 13 shows how the industrial safety record of the world's reactors has improved over the past 10 years [4]. This overall improvement has in part been driven by the huge amount of transfer of best practice and general benchmarking that has gone on within the industry. Organisations such as WANO have been in the vanguard of efforts to transfer best practice across country boundaries. Against this background it is not surprising that no evidence can be found to suggest that the safety record of privately-owned reactors is significantly different from that of publicly-owned reactors.

Natural barriers to private ownership

Generation

The following observations can be made:

- nuclear operations can and are successfully undertaken by privately-owned companies and by government-owned companies;
- for understandable reasons, liberalised electricity markets tend to be populated by privately-owned companies, including nuclear companies. There are some examples – the UK and Scandinavia – of government-owned nuclear companies competing in liberalised markets;
- new nuclear reactor construction has not yet been funded privately in a liberalised electricity market: the planned 5th station in Finland will set a precedent in this respect;
- public ownership combined with private operation – as with Bruce Power – could be a business model of relevance to other parts of the world.

Fuel cycle

The following points can be made:

- a mixture of ownership types is found in most segments of the fuel cycle;
- the recent enrichment trade case which examined whether Urenco and Cogema received state aid in competing with USEC in the US market did find limited evidence that the French government in particular was assisting Cogema in a way that a private owner would not;
- the biggest two players (three, if the Russians are regarded as one company) are government owned – BNFL and AREVA;
- BNFL is slated to move into the private sector in the next few years;
- there is no current private involvement in reprocessing operations, but:
    - private Japanese plant is under construction; and
    - under the UK government's plans to restructure BNFL, a privately-owned 'New BNFL' may eventually operate Sellafield.

Waste management and disposal

Although mainly part of the fuel cycle, there are some particular ownership issues here worth noting:

- experience of managing the US government's nuclear clean-up programme has demonstrated that private operation of most, if not all, activities is acceptable and can be successfully carried out: where ownership-type risks have been transferred to the private sector, or attempted to be so, problems have emerged;
- private operation of waste disposal sites is common;
- public ownership of sites for spent fuel/long-lived reprocessing waste disposal is the norm.

National differences

Currently, four main clusters can be identified that segment the ownership of nuclear activities around the world:

1st Cluster: Mainly Privately Owned, Operating in a Competitive Market

- USA
- Germany
- Spain

2nd Cluster: Mainly Privately Owned, Regulated Markets

- Japan
- Switzerland

3rd Cluster: Mixed Ownership, Competitive Markets

- UK
- Scandinavia
- Holland
- Belgium

4th Cluster: Public Ownership, Regulated Markets

- France
- South Korea
- Russia
- Eastern Europe
- China
- Taiwan
- India.

Naturally, none of these clusters is a perfect fit for the complex circumstances of the individual utilities. However, they are a useful characterisation, particularly when considering likely future changes to ownership.

Future developments

The following developments are considered likely.

- There will be a continuing trend to private ownership and/or investment in nuclear activities. This will be driven more by governments wishing to move things in this direction rather than by the private sector itself initiating nuclear investments. This private sector involvement will be despite equity returns on nuclear companies under-performing more general stockmarket returns over the past few years. The *1 Nuclear Place* nuclear indices [5] shown in *Figure 14* indicate that nuclear equity investments on average have under-performed the Dow Jones by 25 to 35% over the past 4 years.
- Within the fuel cycle, the trend over the past 10 years has generally been to increase the proportion of output controlled by government-owned companies. This trend will only reverse if BNFL's (and/or AREVA's) commercial activities are privatised.
- The private sector nuclear contracting industry will continue to operate large parts of the nuclear industry.
- Electricity market liberalisation will continue in parallel with this nuclear ownership trend.
- Continuing friction can be expected to arise where government-owned companies are competing in a liberalised market with privately-owned companies (e.g. EdF's expansion into liberalised European electricity markets).
- The eventual development of sites for spent fuel disposal and reprocessing waste disposal is likely to see public ownership and private operation.

REFERENCES

1. Nuclear Engineering International.
2. NAC estimates.
3. Nucleonics Week.
4. WANO 2001 Performance Indicators.
5. The *1 Nuclear Place* website at http://www.1nuclearplace.com contains indices that plot the stockmarket prices of a basket of nuclear utilities worldwide, and separately, of a broader basket of companies worldwide with significant nuclear activities.

Figure 1. Worldwide nuclear generation

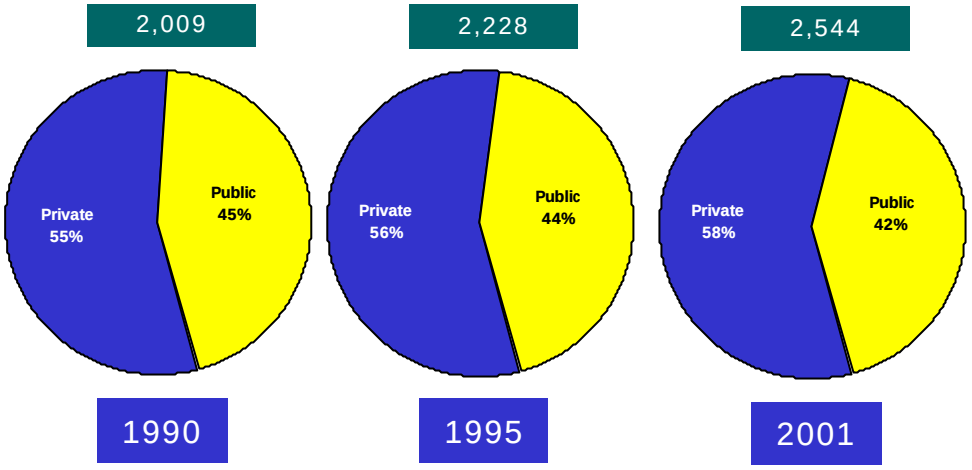


Figure 2. Uranium mining

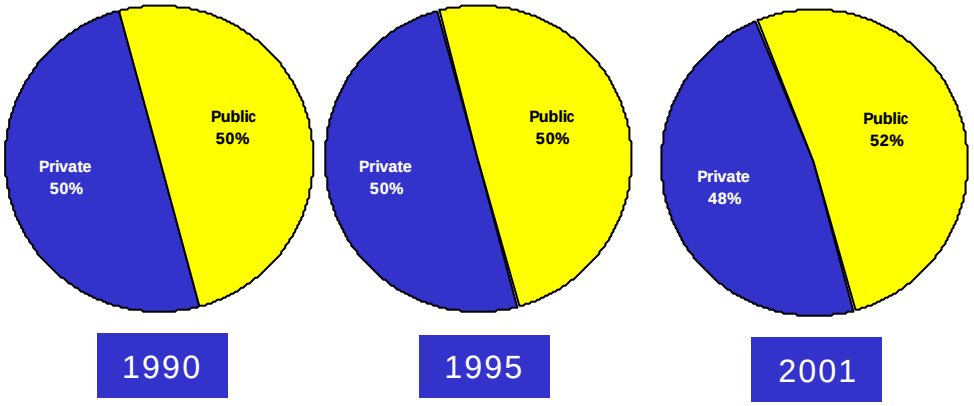


Figure 3. Hex conversion

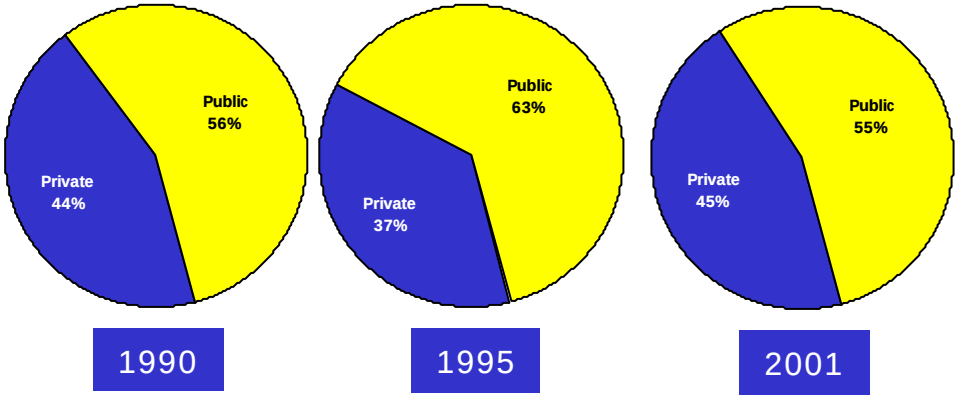


Figure 4. Enrichment

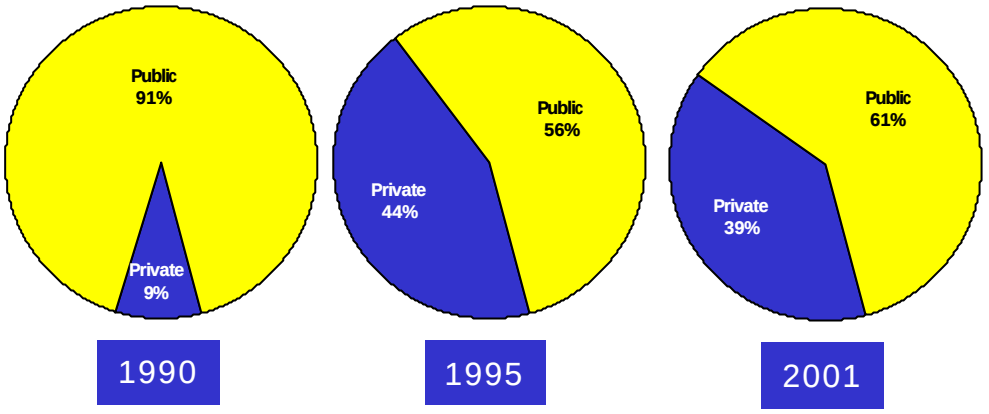


Figure 5. Fuel fabrication

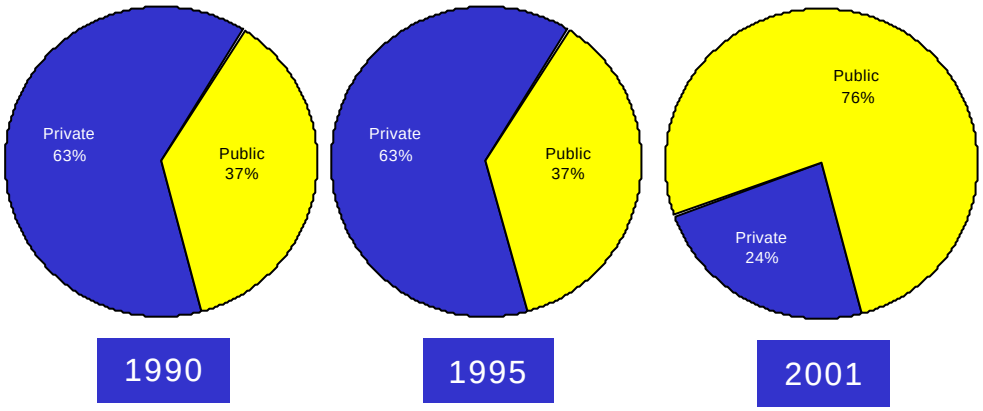


Figure 6. Reprocessing

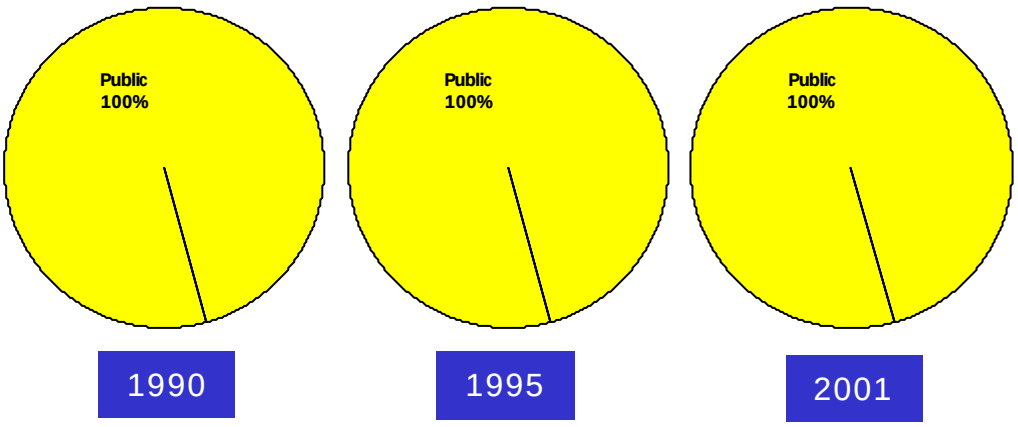


Figure 7. PWR load factors in 2001 (1) [1]

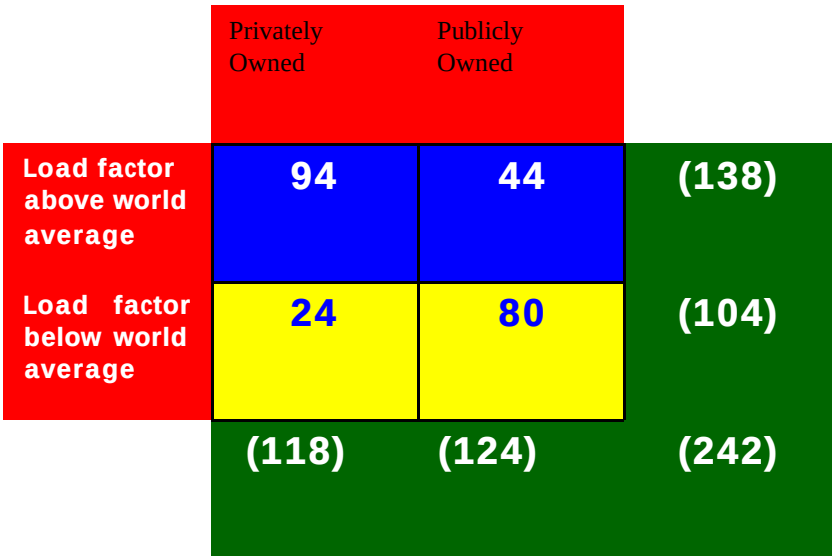


Figure 8. PWR load factors in 2001 (2) excluding France [1]

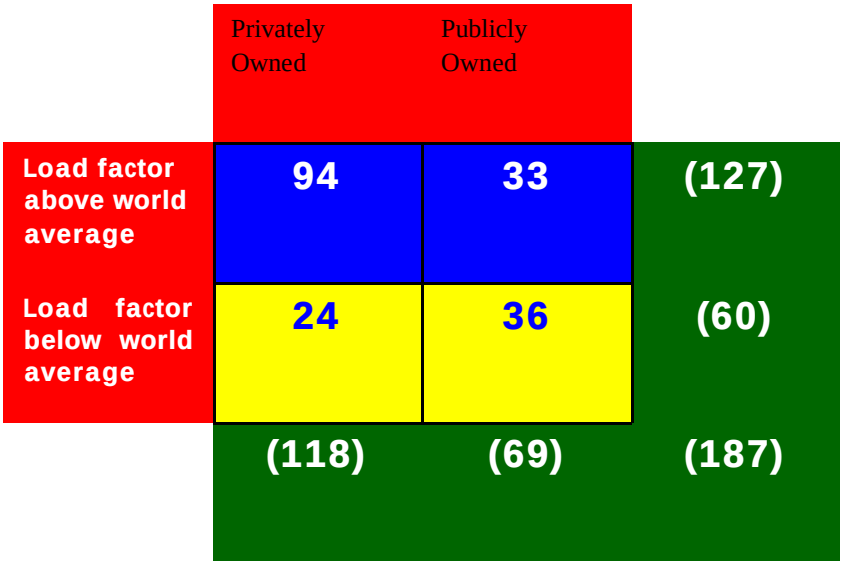
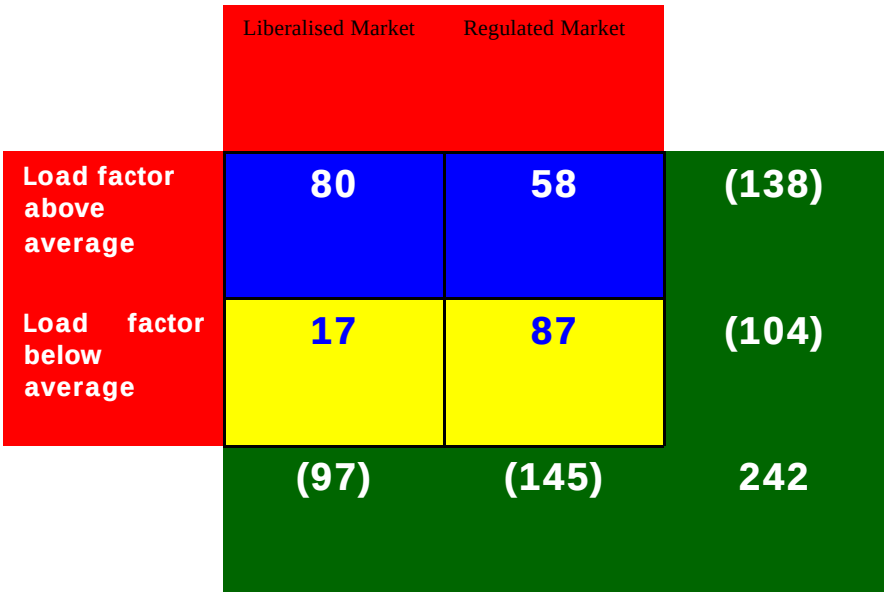
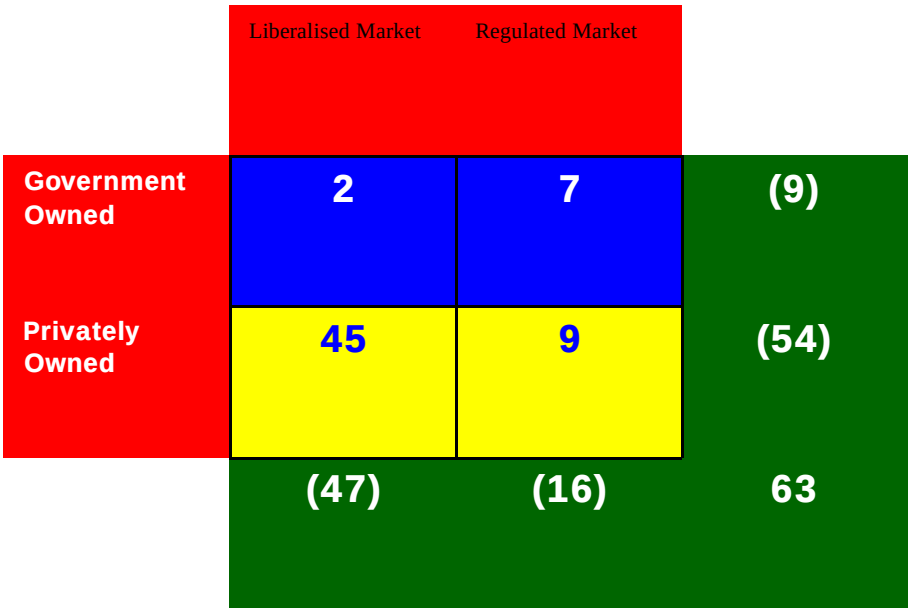


Figure 9. PWR load factors in 2001 (3)



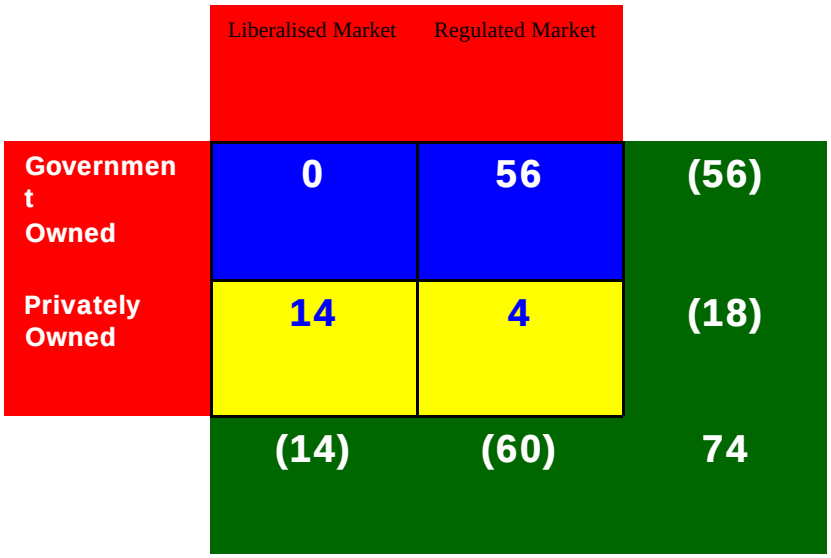
For the purpose of this analysis, liberalised markets are allowed to be present in the United States, United Kingdom, Sweden, Finland, Spain, Germany, Belgium and Holland.

Figure 10. PWR load factors in 2001 (4) load factors above 90%



For the purpose of this analysis, liberalised markets are allowed to be present in the United States, United Kingdom, Sweden, Finland, Spain, Germany, Belgium and Holland.

Figure 11. PWR load factors in 2001 (5) load factors below 75%



For the purpose of this analysis, liberalised markets are allowed to be present in the United States, United Kingdom, Sweden, Finland, Spain, Germany, Belgium and Holland.

Figure 12. Reactor operation costs. Average US reactor production costs versus average nuclear production costs for TVA

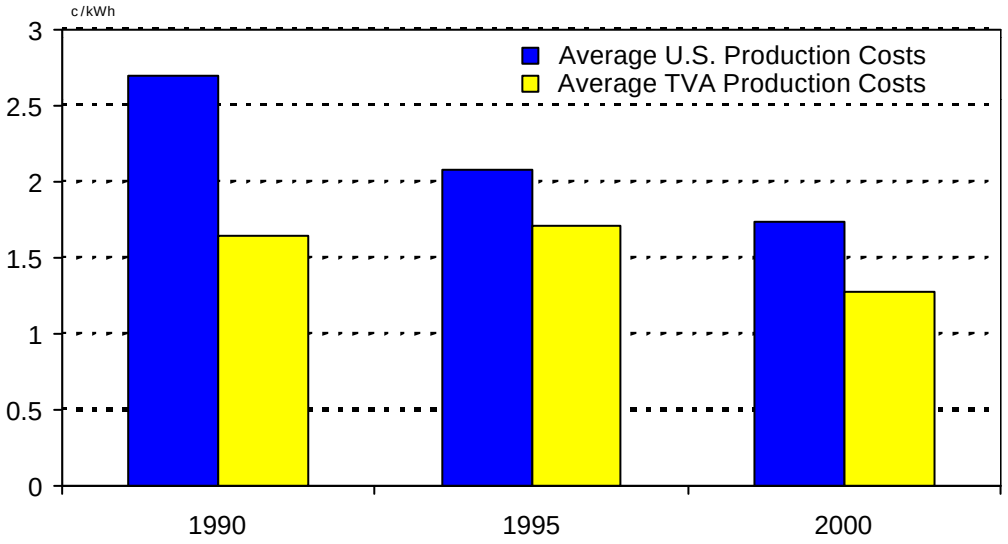


Figure 13. Industrial safety accident rate [4]

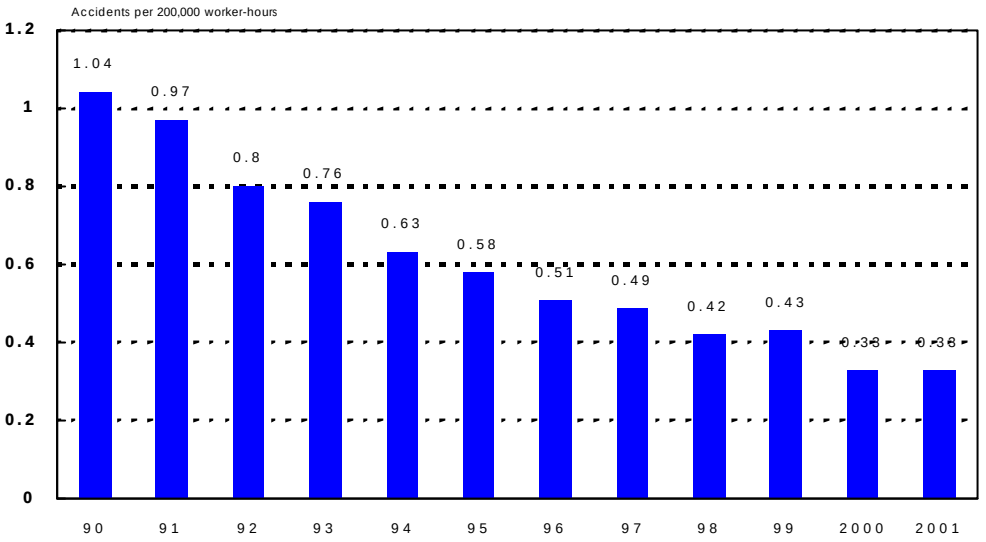


Figure 14. Relative performance of nuclear equity investments