



**Electricity Deregulation:
International Experience and its
Relevance to the Icelandic Situation**

A report prepared for:
Landsvirkjun

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Chapter 1: Introduction

1. Background

In 1997 a resolution calling for the creation of a competitive electricity market in Iceland was introduced into the Althing. Although this resolution has not yet been formally adopted, Landsvirkjun has requested Resource Strategies to prepare a report describing the experience of other high income economies with reforms of this nature. The goal is to help Landsvirkjun assess the implications of foreign experience in the context of the specific conditions prevailing in Iceland. It is hoped that the report will promote a dialogue within Landsvirkjun and among its owners and other interested parties in Iceland as to the key issues involved and the practical options available to Iceland.

Resource Strategies is an international management consulting company specializing in the natural resources sector of the world economy. In particular, the company is involved in assisting electric utilities to shift from the traditional regulated business environment to the less predictable and more competitive commodity market environment. Resource Strategies is familiar with the Icelandic power generation sector, having assisted Landsvirkjun in its marketing and contracting negotiating activities with its power-intensive metals industry customers for almost 20 years.

A team from Resource Strategies visited Iceland in May 1998 to gather further information about the structure and performance of the power sector and to hold informal discussions with various power industry participants. Resource Strategies subsequently presented its analysis of the main issues involved to Landsvirkjun's Board of Directors and senior managers in July 1998. The present report is intended to summarize these activities.

2. Status of the Report

This report solely represents the analysis and opinions of Resource Strategies. It should not be construed as representing the opinions of any part of Landsvirkjun's management, its Board of Directors or its owners or other stakeholders. Resource Strategies does not take any position of advocacy either in favor of or against deregulation or other electricity market reforms in Iceland. We believe that such decisions belong in the political arena. Rather, our purpose is to identify the main practical issues that will arise if and when the Althing takes these decisions.

3. Report Contents

Following this introduction, **Chapter 2** reviews the past performance of Landsvirkjun which, in our opinion, is a relevant background against which any proposed change needs to be evaluated. Following this, **Chapter 3** of the report summarizes the deregulation experience of other countries, principally the United States, Australia and Europe. **Chapter 4** focuses on the general considerations involved in any deregulation decision and assesses the potential for theoretical benefits to be realized in practice given the specific circumstances of Iceland.

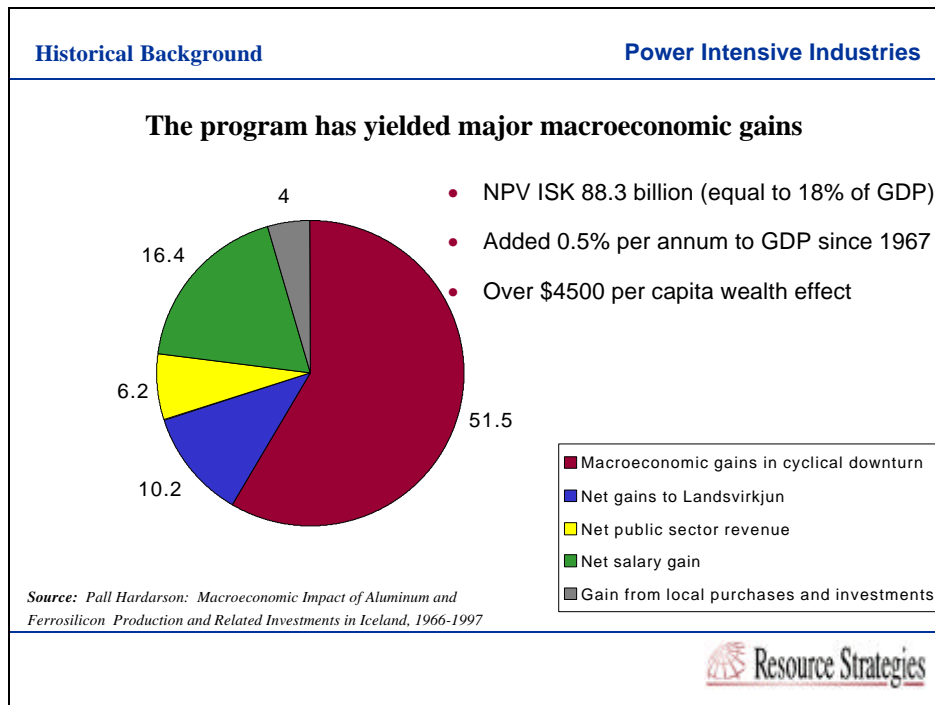
The remainder of the report moves from general principles to more particular issues. **Chapter 5** discusses the operation of the high-voltage transmission grid which, in our judgment, is a core issue at the heart of the deregulation debate. **Chapter 6** discusses the options for creating a competitive market in power generation in Iceland and **Chapter 7** discusses the regulatory and structural issues that are likely to arise.

4. Units of Measurement

All prices in this report, unless otherwise specified, refer to US \$ per megawatt-hour (MWh). Certain readers may be more familiar with the alternative nomenclature of US mills/KWh. These two concepts are identical – in other words, \$15/MWh is the same as 15 mills/KWh.

Chapter 2: Review of Landsvirkjun's Historical Performance

The major achievements of Landsvirkjun since its establishment in 1965 are well known in Iceland. The country's per capita consumption of electricity is one of the highest in the OECD, the use of fossil fuels for the purposes of power and heat has virtually been eliminated, and a relatively low-cost reliable power supply has been made available at all points throughout the country. What appears to be less well understood are the financial and macroeconomic achievements of Landsvirkjun arising from the company's successful development of the power-intensive industrial customer base. The following chart summarizes the principal findings of a recent Icelandic study on this topic.



The net present value of Landsvirkjun's direct financial gains over the period 1966 to 1997, after taking into account the cost of capital, has been ISK10.2 bn. In conventional terms, this can be considered the increase in shareholder wealth that Landsvirkjun has generated from the power-


intensive industrial program. However, the wider benefits in terms of job creation, public sector revenue and macroeconomic cyclical management are more than seven-times this amount. In particular, because Landsvirkjun has frequently built major power projects at times of cyclical downturns, and because power-intensive industries operate in a relatively stable manner, its activities have significantly cushioned Iceland against the cyclical disturbances arising from the country's exposure to the cycles inherent in the fishing industry and in the general fluctuation of the world economy. We can think of very few, if any, examples elsewhere in the world where a single industry, let alone a single company, has served to increase the underlying growth rate of GDP by 0.5% per annum over a period of 30 years which is the gain that has been attributed to Landsvirkjun.

It must also be pointed out that this study almost certainly understates the full economic benefits of the power-intensive industry program. Without this program the Icelandic power sector would have been developed in a completely different way with much smaller sized generating stations. Since there are substantial scale economies in the power industry, generation costs and, therefore, prices would almost certainly have been higher than is currently the case. This beneficial effect on the electricity supply curve has not yet been quantified, but it is likely to have been very important.

It is important to realize that these benefits have not been achieved by cross-subsidy. For many years, Landsvirkjun has followed the principle of long-run marginal costs in negotiating power contracts for new large industrial customers. Consequently, as the following chart shows, Iceland's real electricity price to the ordinary market has declined at a rate that is in the mid-range of other industrial countries.

Deregulation Experience	10-Year Trend in Electricity Prices		
	Average Annual Increase, 1986-1996		
	<u>US\$/MWh</u>	<u>Nominal LCU/MWh</u>	<u>Real LCU/MWh</u>
Korea	-1.1%	-2.0%	-7.6%
South Africa	0.4%	7.0%	-4.6%
United States	-0.7%	-0.7%	-4.2%
Taiwan	2.5%	-0.8%	-3.5%
Germany	2.9%	-0.8%	-3.3%
Iceland	1.7%	6.7%	-2.8%
UK	2.3%	1.6%	-2.8%
Sweden	3.0%	2.4%	-2.4%
France	3.5%	0.4%	-2.2%
Japan	3.1%	-1.2%	-2.0%
Netherlands	4.8%	1.0%	-0.9%
Switzerland	6.5%	2.6%	-0.2%

LCU = Local Currency Units



In reviewing this data, it is worth commenting that Landsvirkjun has managed this achievement without having the benefit of the decline in fossil fuel prices, especially coal, that has occurred over the period in question. This has been particularly helpful in countries like South Africa and the

United States. In fact, fossil fuel price declines have played a major role in all countries that have experienced faster declines in real prices than Iceland.

This contribution has also been achieved in the context of a sound, sustainable financial structure. Landsvirkjun's debt:equity ratio is comparable with the highest quality private sector utilities in North America. Although the company's debt is guaranteed by its owners (for a significant fee), the company has recently received high ratings from Standard & Poor's and Moody's indicating that it can now access international capital markets in its own right.

In summary, over the past 30 years Landsvirkjun has been instrumental in providing major developmental benefits to the Icelandic economy as a whole, as well as supplying reliable power to the general market at low and declining real prices. At the same time, it has been able to maintain a financial structure corresponding to international market expectations for Blue Chip corporations. In our opinion, it is very important that any electricity market reforms initiated in Iceland serve to enhance rather than diminish Landsvirkjun's ability to sustain this excellent track record.

Chapter 3: International Experience of Deregulation

Over the past 10 years most of the OECD countries have moved to deregulate the electricity sector and introduce competition into the market. However, despite this common policy theme, the historical experience has differed considerably in detail from country to country.

1. The United States

In the United States the regulatory responsibility for electricity is divided between the Federal and state governments. Under the interstate commerce clause of the US Constitution, the Federal government is responsible for regulating transactions that cross state lines while individual states regulate internal transactions. In the electricity and gas industries this has meant, in practice, that the Federal government regulates the transportation system (the high-voltage transmission grid) while the state government regulate the transactions between distribution companies and their customers.

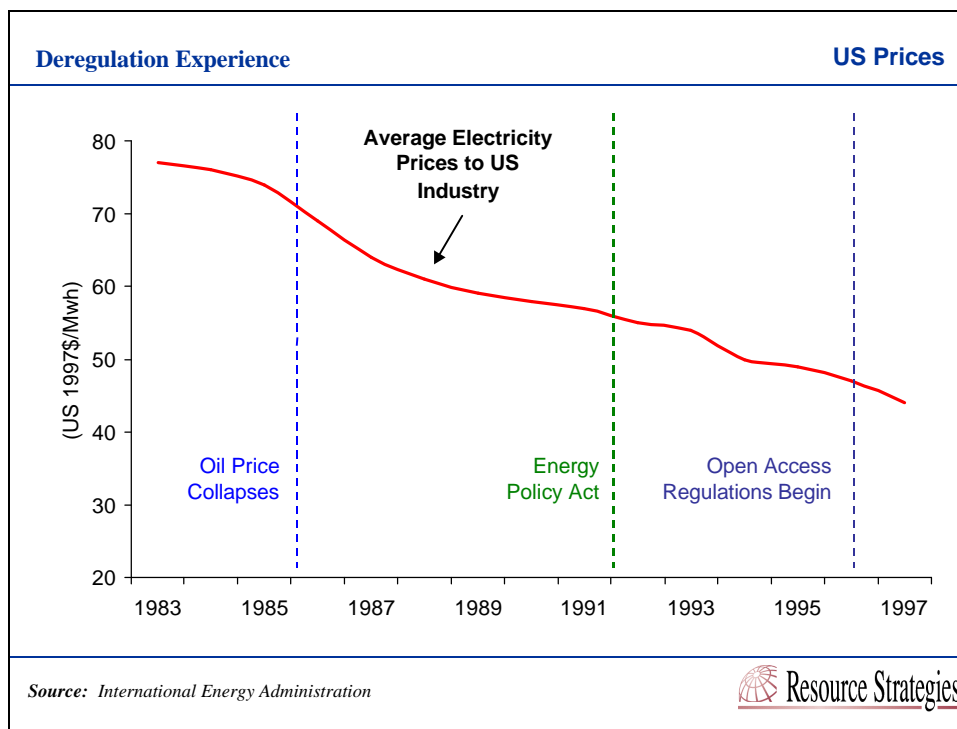
The fundamental stimulus to electricity deregulation has been the Federal government's decision to require open access to the high-voltage transmission system. Open access means that the owner of the transmission lines must make them available to any one who wishes to transport electricity on a non-discriminatory basis. Charges have to reflect costs and may not be lower for power coming from the owner's own stations or being delivered to the owner's own customers than for third party transactions. The effect of open access regulations has been to create an interstate wholesale market in electricity. Actually there are two separate physical markets: one along the West Coast stretching from California to British Columbia and the other covering the eastern half of the country from the Mississippi River to the Atlantic.

The attitude of individual states towards increased electricity competition has varied. Some, like California and Pennsylvania, are committed to radical forms of competition which allow individual households to select their generators while others effectively limit competition to industrial and commercial customers with local distribution companies purchasing for individual households on a collective basis. Approximately 20 states are in the process of deregulating their electricity markets. There are a number of federal initiatives to compel the remaining states to do the same, although it is quite likely that competitive market pressures will be more effective and quicker in achieving the same goal.

The following are the main considerations behind the wave of deregulation in the United States:

- 1.) The success of the deregulation of the natural gas and telecommunication sectors which were previously thought to be natural monopolies; gas deregulation appears to have eliminated periodic gas shortages and driven down prices; telecommunications deregulation has led to a massive improvement in service and an explosion of competitive supply options.
- 2.) A decline in confidence in a regulatory system which apparently encouraged excess capacity and a lack of cost consciousness, especially in the 1970s and early 1980s.
- 3.) The unsatisfactory technical and financial performance of the electric power generation sector; in particular, the inability of the industry to build nuclear power stations efficiently and operate them in a reliable manner has been criticized; additionally, there were a number of spectacular electric utility bankruptcies or near bankruptcies.
- 4.) A general change in the business culture of the United States, particularly after the period of the strong dollar in 1985, which emphasized the necessity for high rates of productivity growth and continuous improvement in operating performance; it became increasingly unacceptable to have the electric utility sector not participating in these tendencies.

The following chart shows how the representative prices to large industrial customers have moved in the United States. This is the category that most closely resembles wholesale markets.



The downward trend in price in the mid-1980s was associated with a major decline in fossil fuel prices. In the late 1980s and early 1990s the main factor was the decline in nominal and real interest rates. The advent of open access and the subsequent accelerated paced of deregulation is probably contributing to the most recent declines that are, if anything, intensifying.

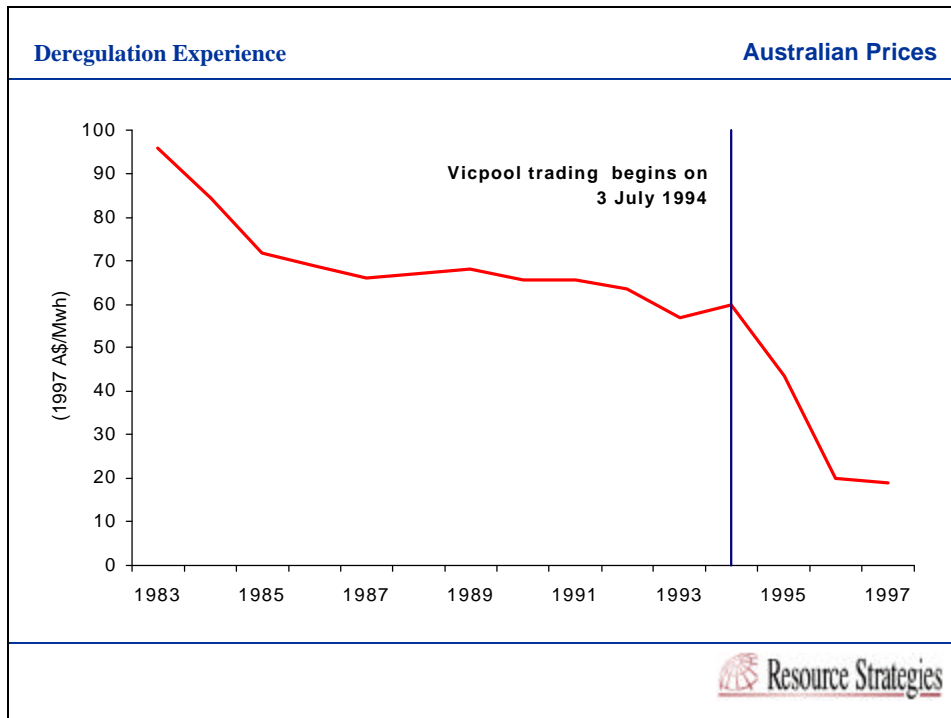
Wholesale power prices in the industrial Midwest have averaged \$23-\$24/MWh in the over-the-counter market in the last three years. This is for year round continuous power. About \$14/MWh of this reflects coal prices. If we take a typical industrial load factor of 70%, the remaining fixed cost of \$10/MWh must be increased to about \$14/MWh for a total price of \$28/MWh for such a load. Current representative costs for high voltage transmission are around \$2/MWh and for medium voltage are around \$6/MWh. Thus, the effective deregulated price for ordinary manufacturing companies will be about \$38/MWh. The implication is clear. There is every chance that the downward trend in the above chart will continue for at least the next 3-5 years as a result of deregulation.

2. Australia

In Australia the power industry has historically been a state responsibility with the exception of the Snowy Mountains hydroelectric scheme, a joint venture between New South Wales, Victoria and the Federal government. Typically, power generation, transportation and distribution services have been provided by a vertically-integrated, state-owned electricity commission.

The impetus to reform in Australia came from the state of Victoria. In the early 1980s the state decided to develop the Loy Yang brown coal resources and received commitments from two new aluminum projects led by Alcoa and a BHP-Alumax consortium, respectively, to provide a base load customer. Serious cost overruns and subsequent demands by the state to renegotiate the power contracts caused the BHP-Alumax consortium to abandon their project and Alcoa to suspend its activities. Alcoa was later induced to re-start on terms that ultimately caused major financial losses to the state.

In 1985, a conservative government took office and decided to implement a radical reform by splitting up the generation, transmission and distribution sectors, instituting market competition and selling all assets to the private sector. In these reforms, the generating industry was split into five roughly equal-sized companies and a separate grid company was formed. Although part of the motive for this change was ideological in nature, the unacceptable financial performance of the state electricity commission and, in particular, the cost overruns in the Loy Yang project and the financial embarrassment of the contract with Alcoa were major contributing factors. The following chart illustrates the dramatic effect of deregulation on wholesale prices in Victoria.



There can be very little question that this is a typical example of the benefits of moving from a regulated to a competitive environment. The following are the main factors that have allowed the power price to decline:

- 1.) Major operating cost reductions have occurred, in particular, at the brown coal mines that are owned by and integrated with a number of the large power stations.
- 2.) Significantly improved operational performance and reliability has at least temporarily created supply in excess of demand.
- 3.) An increasingly sophisticated response on the part of customers, particularly in the industrial sector, to market signals and specific actions to reduce power consumption at peak periods have translated into a much more efficient use of both generation and transmission capacity.

Although the New South Wales government was of a different political complexion, the practical experience of Victoria and the potential impact of low Victorian prices on industrial location decisions has prompted that state to follow suit by dividing its generation sector into three separate competing companies, although initially state-owned. New South Wales has thus created a power market essentially parallel to that of Victoria. The South Australian utility has also been converted to corporate status and joined into the market to create an integrated regional market in southeast Australia. In this market prices are established by a half-hourly auction and a liquid forward market operated by the Sydney Futures Exchange has developed.

In Queensland and West Australia reform has taken a different path. West Australia is a physically isolated system of relatively small absolute size (and from that perspective somewhat similar to Iceland). In that state reform has taken the following path:

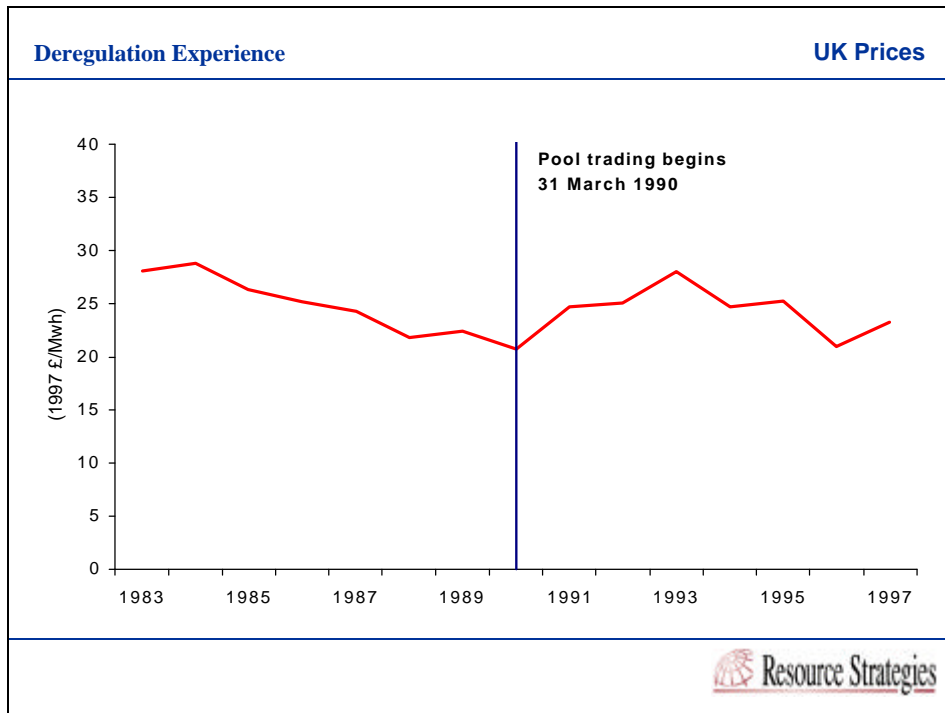
- 1.) The State Commission has been transformed into two regular corporations, one for gas and one for electricity.
- 2.) The generation, transmission and distribution activities of the state electricity company have been ring-fenced from one another and required to interact on the basis of arm's-length commercial terms.
- 3.) Competition is now permitted for new power projects and, in fact, new independent power producers have succeeded in winning competitive bids on the Northwest Shelf and in the Goldfields areas of the state.
- 4.) Large industrial customers are permitted to self-generate and/or invest in co-generation schemes; several of these are under active consideration at the present time.

The best way to describe the West Australian development is one of “incremental competition” as distinct from “radical competition” of the type instituted in Victoria. In particular, there has been no break-up of the basic power generation company in West Australia.

Queensland has followed a similar path. Initially, Queensland decided not join with New South Wales and Victoria in the national power market, but this decision is in the process of being revised in response to the construction of stronger transmission interties between the two areas. In addition, Queensland's electric company has sold one of its older stations at Gladstone to a consortium led by its principal customer, the Comalco aluminum company.

3. Europe

The United Kingdom was the leader in electricity market deregulation. Essentially this was a political decision inspired partly by the free market practices of the Thatcher government and partly by a reaction to the militancy of labor unions in the coal industry that had brought down the previous conservative government. The UK reforms broke the power generation sector up into two private companies and a state-owned company operating nuclear units (which turned out to be unsaleable). A separate grid company was formed and a system of half-hourly auctions to establish electricity prices was initiated. As the following graph shows, these changes have had virtually no effect on power prices in Britain at the wholesale level.



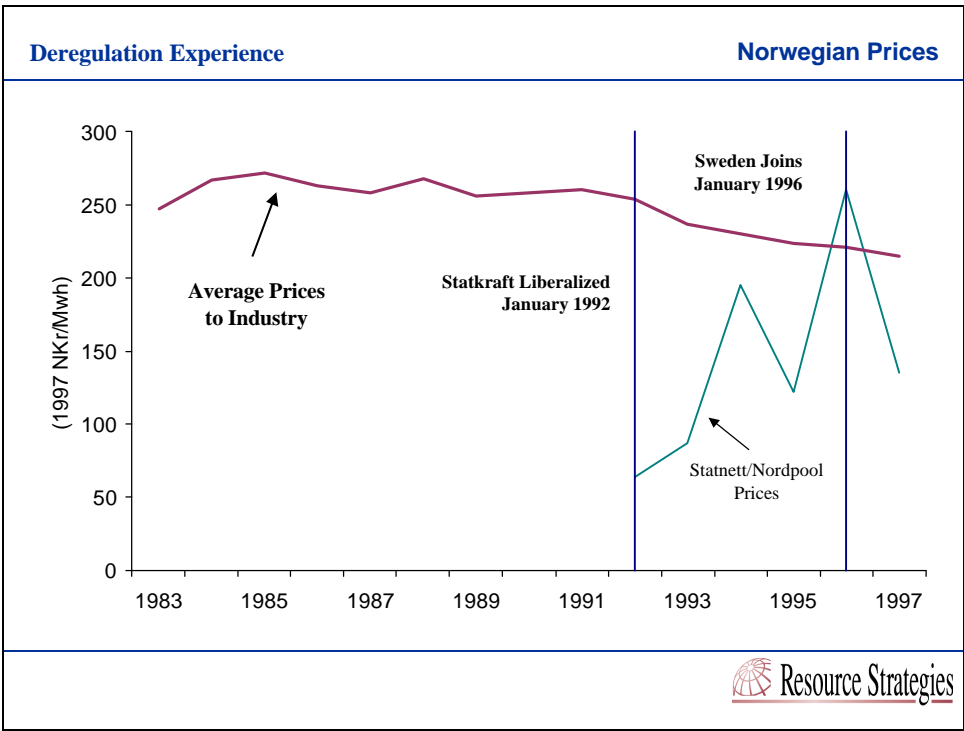
There is now increased criticism of the UK's system among power customers and further reforms are expected in the next few years. Our opinion is that there are a number of factors behind the failure of electricity market deregulation in the UK to produce a more competitive market at the generation level. These are:

- 1.) Too few players in the market; the market is dominated by two companies who have a similar asset base and cost structure, thereby creating an oligopolistic form of competition in which price decisions are driven by an appreciation of the strategic and tactical objectives of the other player rather than by marginal costs.
- 2.) The companies were privatized with long-term coal supply contracts at above market prices, limiting the scope for operating cost reduction; these contracts were necessary to allow for the subsequent privatization of the coal mining industry; as these contracts are now expiring, a more competitive market may emerge.
- 3.) The regulatory environment is too "friendly" to the generators and distributors at the expense of the customers; this was deliberate as the UK government wanted the new privatized companies to be highly profitable and therefore to create a positive climate for the privatization of other more questionable sectors of the economy such as water companies and railroads.

The other area in which electricity deregulation occurred relatively early was Scandinavia, in particular Norway. Because of the fragmented nature of the Norwegian electricity supply sector and

the weather-related uncertainties affecting both supply and demand, there had been for many years a de facto spot market among electric utilities as a means for each to balance their own demand and supply on a short-term basis. The Norwegian reforms simply built on this experience making the market more open and transparent, reducing the influence of Statkraft, the dominant supplier, and allowing power customers direct access to the market.

The most significant current development in Scandinavia involves the merging of the Norwegian and Swedish markets into a single entity which is in the process of being extended to Finland and the eastern half of Denmark. In addition, interconnections between Norway and Continental Europe are being strengthened to permit Norwegian hydro and Continental fossil fuel power to be traded more actively. The following chart shows the price experience in Norway in recent years.



It should be noted that Norwegian wholesale prices are extremely volatile, reflecting the impact of weather conditions. It is too early to determine the effect of Sweden joining the market as the recent declines in prices have certainly been influenced by the mild winter of 1997/98 and the higher level of precipitation. It should also be noted that average prices to industry remain relatively stable, reflecting long-term contracts that pre-date deregulation. Industries like aluminum and ferroalloys make only marginal use of the spot markets today, although that will probably increase considerably in the future.

In summary, the Scandinavian reforms have emphasized increased transparency and liquidity in the existing inter-utility market and have permitted customers to by-pass distribution companies, giving them direct access to the generators.

In the remainder of Europe, change is being driven by the European Union. After a lengthy and controversial debate, the European Union has adopted a directive mandating a competitive market in generation, the creation of separate regulated transmission companies (or at least financially ring-fencing the transmission function) and a phased program of access to competitive markets starting with large industrial customers early in 1999. The best way to characterize the EU process is one of incremental reform. It is clearly far too early to speculate on the practical effects of these changes.

4. Conclusions From International Experience

A review of the experience to date in North America, Australia and Europe leads us to the following conclusions about electricity market deregulation:

- 1.) Deregulation frequently leads to a decrease in the real price of electricity at the wholesale level, provided that measures are taken to impose genuinely competitive markets; it should be noted that the downward movement in wholesale prices does not necessarily translate into a downward movement in price at the household level since other factors such as distribution company costs and cross-subsidies have to be taken into account for that sector.
- 2.) The price of electricity becomes more volatile, particularly on a time-of-day basis in thermal systems and on a year-to-year basis in hydroelectric systems; when electricity is traded as a commodity, profitability depends on relative cost efficiency rather than on assets employed.
- 3.) Vertical integration is reduced; even if generation, transmission and distribution are not split into separate companies, ring-fencing exposes the real profitability of each separate element within the supply chain; inter alia, this makes cross-subsidization of one customer by another more transparent and therefore more difficult to sustain.

Chapter 4: General Considerations For Iceland

In reviewing the debate that has taken place about electricity market reform and the practical experience from specific markets, the following are the major economic efficiency arguments in favor of deregulating and creating a competitive market in electricity:

- 1.) Increased competition encourages companies to reduce operating costs as the most immediate way to increase profits at any given commodity market price level.
- 2.) Fluctuating market prices provide signals as to the nature and timing of the new generation capacity investment decisions that are required; these market signals are more likely to be economically efficient than the often politicized agenda of the regulators.
- 3.) Socio-political costs imposed on the electricity sector become more transparent and this often creates pressure for such costs to be reassumed by various levels of government.
- 4.) Prices to electricity consumers are likely to reflect the real resource costs involved, thereby encouraging an economically efficient demand response; in particular, the cost of supporting peak demand is likely to rise and the cost of purchasing energy is likely to fall as producers and consumers respond to unbundled price signals.
- 5.) Deregulation can be used as a vehicle for attracting new types of capital and broadening the financial base of the industry; this has become particularly important in an era of tight public sector budgets in many countries.

We now consider the extent to which these theoretical benefits are likely to be available in practice as a result of any Icelandic deregulation scenario.

1. Reduced Operating Costs

In our opinion the scope for reduced operating costs at the generation and transmission level in Iceland is minimal. Reductions in fuel costs have played a significant role in lowering operating costs in Australia and the United States and will almost certainly play a similar role in

European countries like Germany and Spain. However, hydroelectric operation costs are very low and, for all practical purposes, fixed. The same comment applies to transmission costs. Landsvirkjun is participating in an international benchmarking exercise to ensure that its cost structure is internationally competitive. The basic conclusion of this work is that generation costs are highly competitive. Transmission costs are less so, but this is largely a function of the low density involved in the Icelandic network. Transmission costs are likely to decline considerably in real terms provided the Icelandic system continues to expand. The main area for potential operating cost reduction in Iceland is, therefore, in the rationalization of the distribution system which is currently highly fragmented. However, this topic was beyond the scope of our study.

2. More Efficient Investment Decisions

Before making any new investments in generation and transmission capacity, Landsvirkjun goes through a rigorous and systematic planning process designed to ensure that each new project is the lowest cost incremental facility available given projected load growth. This process takes account of the impact of any one decision on all potential future decisions over a 25 to 30 year time frame.

In our review we were not able to identify any significant criticism of Landsvirkjun's investment priorities. Two investment decisions that some critics may say were politically-driven (the construction of the Krafla thermal station and the decision to build a 132 kV loop around Iceland) were, in fact, government decisions; Landsvirkjun became responsible for operating those facilities only several years after they had been built.

Landsvirkjun has been criticized for the premature construction of the Blanda hydroelectric station. However, two points need to be kept in mind. Firstly, the existence of Blanda has made possible the significant expansion of the power-intensive industries which is now occurring. Secondly, Blanda was built at a time of recession in Iceland and, as demonstrated earlier, very significant macroeconomic benefits have accrued from this policy. In any case, the financial consequences of that decision have been manageable.

While Landsvirkjun, like any business, should be accountable to its owners for its investment efficiency, it is clear that nothing has occurred in Iceland that is remotely comparable to the serious construction cost overruns that have plagued certain Australian and US utilities in the 1980s. Nor has Landsvirkjun created consistent structural excess capacity or selected inappropriate technology and scale as a result of regulatory incentives or political influence. Because we believe that Landsvirkjun's decisions have, in fact, been reasonably efficient, we are skeptical that deregulation will provide significant benefits from this perspective.

Having said this, it would be unreasonable to maintain that Landsvirkjun necessarily has a monopoly of the best technical and business concepts for the future of the Icelandic power sector in each and every case. The development of the Nesjavellir co-generation project and a similar initiative at Sudurnes appear to offer imaginative and economically efficient solutions to part of Iceland's growing power demand. Therefore, creating a business environment in which such initiatives can be tested by the market may be helpful to Iceland in its long-term challenge to keep long-run marginal costs falling in real terms.

It is important to emphasize that although potential competitors to Landsvirkjun can already propose and undertake new power projects, the current system does not insure that the economic merits of such projects are fairly tested by the market. In particular, the requirement that Landsvirkjun must sell power to distribution utilities at a single nationwide price and that it must act as a supplier of last resort imposes significant constraints on the company's commercial flexibility. Effectively, therefore, whether competing projects go ahead or not is determined by the regulatory process rather than by purely market forces.

3. Socio-Political Costs

In contrast with certain other countries, the various levels of government in Iceland do not appear to have imposed high levels of social and political costs on Landsvirkjun. However, in the case of the rule that Landsvirkjun must sell to all distribution utilities at a single nationwide price, the government is using Landsvirkjun as a vehicle for transfer payments from urban to rural areas. It should be noted, however, that this does not yield a standard price at the individual household or particularly small business level because the distribution companies themselves have different costs and some have their own generation capacity for part of their requirements.

It is possible, indeed likely, that more significant social costs are imposed at the distribution level in the system. At present these are not transparent to the household and small business customers. In particular, there is no way to ascertain whether the profits derived by distribution monopolies are reasonable in relation to assets employed, nor is there any way to determine the relative efficiency of different distribution structures. At a very minimum, the deregulation process should result in electricity bills separately identifying the costs of generation, transmission and distribution thereby promoting a more active scrutiny of efficiency at each point in the chain.

While deregulation in Iceland affords an opportunity for a constructive debate on the above matters, from the quantitative point of view these do not appear to be a very significant part of the power industry's cost structure, particularly at the generation and transmission level. Consequently, the potential for any significant downward movement in industry costs by removing the socio-political burdens is, in our judgment, quite modest in Iceland's case.

4. Consumer Pricing Issues

Unlike in a number of other jurisdictions, there is no significant cross-subsidy between the industrial sector and the general market in Iceland. Landsvirkjun's policy for many years has been to use long-run marginal costs as the basis for evaluating new long-term contracts for significant power-intensive industrial customers. This contrasts with the average cost-based procedures that, for example, have been enshrined in public utility theory in the United States. Furthermore, as an analysis of its track record shows, Landsvirkjun has more than covered its cost of capital from this program suggesting that, on balance, it has been successful in implementing these pricing policies.

Although it appears clear that large industrial customers have historically been given accurate pricing signals, this is clearly not the case for distribution companies. A major concern is that these companies have only annual contracts with Landsvirkjun. However, Landsvirkjun's system planning, its capital commitments and, most important of all, the marketing of power to new large industrial customers takes place assuming an indefinite supply obligation. In effect, Landsvirkjun is providing an open-ended call option to the distribution companies. Because of the long lead times and capital-intensive nature of hydroelectric power, the provision of such an option is extremely expensive.

It is not obvious that all of the customers of the distribution companies either need or want such an option. For example, the needs of a small industrial customer like a fish freezing plant might be contractually definable. At present, this company is forced to pay his share of the option cost resulting in a price that may be unnecessarily high. Landsvirkjun has tried innovations like discount prices for interruptible power but, in general, the current structure does not allow the fully range of options to be explored.

In general, the typical Icelandic customer is not faced with the true economic costs of using electricity in either the short-term or the long-term. Deregulation affords the opportunity to introduce a more disciplined contractual structure to the market that will ensure that distribution companies, and hopefully, their ultimate customers receive more efficient price signals.

Having said this, compared with other countries prior to deregulation, Iceland appears to suffer from relatively modest pricing distortions, so the potential for gains in efficiency due to deregulation are considered only moderate.

5. Access To New Sources of Finance

The financial condition of Landsvirkjun is broadly comparable to that of a first-class private sector utility in North America at least as regards the relationship of debt:equity in its capital structure. However, Landsvirkjun is exposed to aluminum market risk and this exposure will

increase substantially after 2003. Because the price of aluminum is quite likely to fluctuate by a factor of two on an annual average basis over the business cycle, Landsvirkjun's cash flow is less predictable than that of most other utilities. Landsvirkjun is planning to actively manage this exposure and, on this basis, has recently received a credit rating of A+ from Standard & Poor's and AA3 from Moody's.

Although Landsvirkjun borrows on its own account, its debt is underwritten by the guarantees of the owners and it is ultimately a factor in the national credit rating of Iceland. To this extent it does impose some constraints on public sector financing.

Of greater significance are the potential future capital requirements of Landsvirkjun. Depending on the rate of market growth, Landsvirkjun will probably be faced with developing the river systems of eastern Iceland at some point in the next 10 to 20 years. The initial development cost in this region will be substantial. In addition, assuming that undersea cable technology continues to advance and costs go on declining in real terms, an interconnection to the European market may also be desirable. Again, the initial capital outlay will be very large.

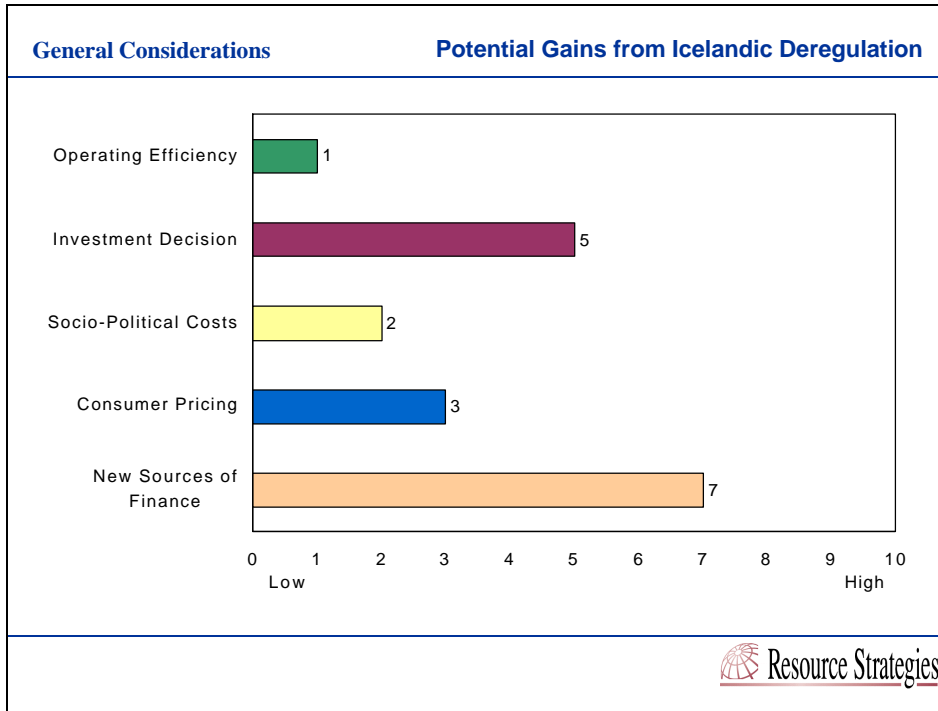
The scale of these medium and long-term capital requirements are such that any attempt to finance them out of accumulated earnings implies higher domestic electricity prices in the short-term. By the standards of most utilities, Landsvirkjun is a small company and unlikely to be in a position to undertake such a project entirely with debt. Therefore, there will be a significant call on the owners for additional capital at some future date.

This raises the fundamental question as to whether power generation is an appropriate sector for the investment of public funds and, in particular, municipal funds, especially when one considers the relatively high exposure that exists to commodity metal market risk and the fact that European electricity prices are becoming "commodified".

In our opinion, deregulation affords a clear opportunity to introduce new forms of capital into the industry, including private sector equity, thereby better preparing Landsvirkjun to finance the major projects that lie ahead, assuming that Iceland wishes to continue developing its natural resource base. In fact, we suggest that this is likely to be, by far, the most significant benefit from deregulation in Iceland's case.

6. Recommended Goals For the Deregulation Process

The following chart presents a subjective summary of the potential that, in our opinion, exists in Iceland to realize the benefits that are said to be associated with electricity market reform. The scale runs from zero (no potential benefit) to 10 (very substantial benefit).



The above assessment leads us to three criteria by which we suggest that specific deregulation proposals can be evaluated in the Icelandic case:

- 1.) The proposal should preserve, and preferably enhance, Landsvirkjun's ability to act as a driver of economic development; this in turn implies retaining a critical mass of major power projects and expertise, reducing or eliminating extraneous objectives in the area of socio-political mandates, and attracting additional sources of equity capital for future projects.
- 2.) The proposal should intensify the long-term pressure to reduce costs; it needs to be recognized that this principally means cost control on capital projects given the minor role played by operating costs in hydroelectric facilities; a competitive market for new projects may be somewhat helpful in this regard.
- 3.) The proposal should improve the economic efficiency of the ordinary power market by making the real resource cost apparent to the ultimate consumers; this may imply reform of the power distribution sector to recognize the real cost of the open-ended call option that Landsvirkjun now provides.

Chapter 5: Transmission Issues

Transmission lies at the heart of all efforts to reform electricity markets regardless of specific national circumstances. It is generally agreed that the high-voltage transmission grid is a natural monopoly and should, therefore, remain regulated and that all potential producers and consumers should have access to the grid on a non-discriminatory basis. Beyond those two general propositions, there is little consensus on specific measures that are required to achieve these goals. In this context there appear to be three key issues:

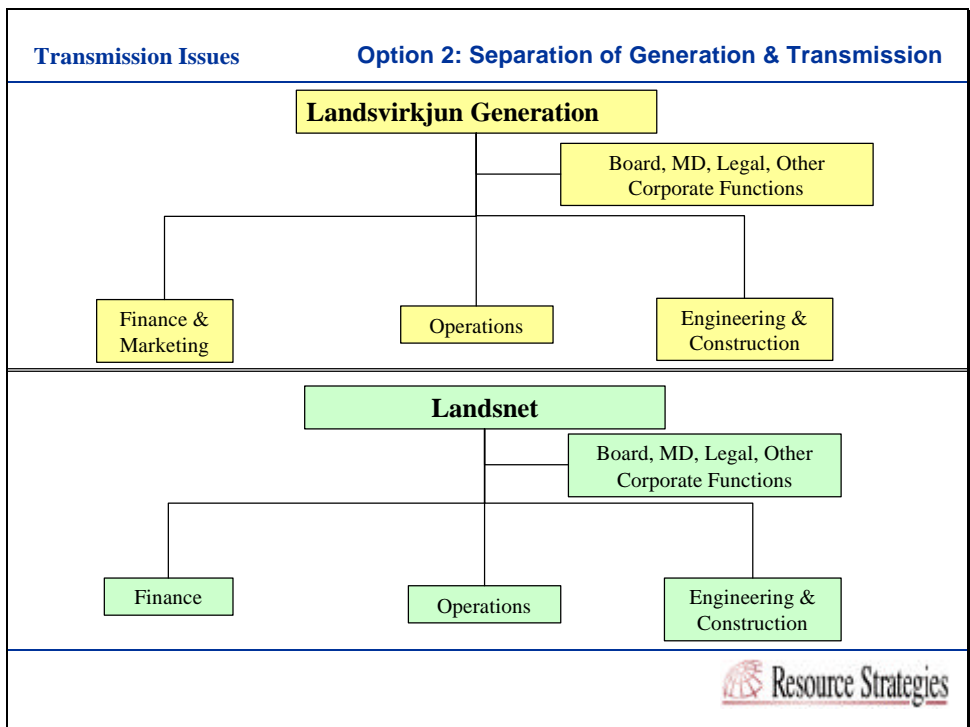
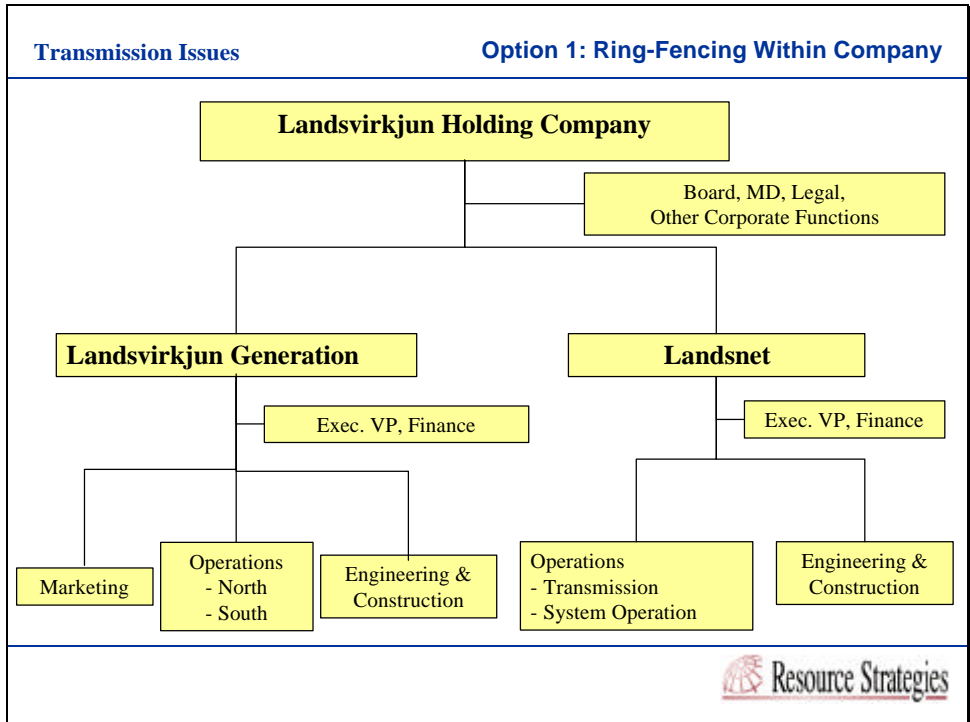
- 1.) The structure of the market;
- 2.) The role of the transmission function; and
- 3.) The way in which transmission services are priced.

We discuss each of these issues in turn.

1. Structure of the Market

The issue here is whether the transmission company should be a legally separate, stand-alone corporation or whether it can be owned by the generators or other market participants. In the latter case it is, of course, necessary for the finances of the transmission company to be ring-fenced and for regulations to be put in place to prevent the transmission company from discriminating either by price or service in favor of one or more of the owners at the expense of third parties.

In the Icelandic case the two alternatives that seem sensible are set out below. It must be noted that either structures conform to the standards now being established by the European Union.



The principal arguments in favor of complete separation are the following:

- 1.) It facilitates the development of the appropriate business culture in the new companies; the traditional public service culture is acceptable for the transmission company but the generating company needs to adopt a more competitive commodity market culture.
- 2.) The two different companies can attract different kinds of investors; the transmission company has a regulated monopoly, represents a safe income producing investment and can accept a high level of debt:equity; the generation company is a more growth oriented investment proposition and offers potentially higher rates of return but with higher risks and can, therefore, only accept lower levels of debt.
- 3.) It minimizes the regulatory burden since the institutional conflict of interest which otherwise needs to be externally monitored is removed.

The main arguments against complete separation are the following:

- 1.) It creates a duplicate corporate organization involving increased levels of administrative overhead expense.
- 2.) It may reduce the financial critical mass of Landsvirkjun and remove a stable component of Landsvirkjun's cash flow possibly causing the market to revise ratings on Landsvirkjun's debt downward and thereby triggering higher interest rates.

Before it is possible to determine what structure will be best and, in particular, to be certain that any new structure does not increase borrowing costs (the major risk), more information is required. The following is, in our opinion, the logical process.

First, Landsvirkjun needs to separate the generation and transmission functions in its own management accounts. Not only does such a change not require legislation¹, it is anyway good business practice. This task can be undertaken immediately. It goes beyond simply separating capital assets and operating expenses. It also involves splitting the tariff into two parts, which in turn means doing a revenue adequacy study for the transmission system.

Secondly, Landsvirkjun can subsequently implement Option 1 above from an organization standpoint. This will be needed anyway as a preliminary step even if Option 2 is ultimately selected. Option 2 requires the approval of Landsvirkjun's creditors as to which entity will be responsible for what old debts. In an Option 1 phase, new debts can be incurred at the operating company level paving the way for financial community acceptance.

¹ In many ordinary companies in the United States, this kind of change would probably not even require main board approval.

2. Role of the Transmission Company

The minimum role for a transmission company is simply the provision and operation of the transmission grid. Some jurisdictions even allow transmission companies to purchase or lease power lines from other owners and contract out the management function to competitive tender. A good analogy is with the highway system. The government is financially responsible for providing the highway network, but it may contract for the construction of new roads or for the maintenance of existing ones with outside parties. Under this limited role the transmission company does not buy or sell power – it simply transports it on behalf of third parties for a fee.

In any electrical distribution network there are line losses. With a minimalist approach to the transmission company, these are covered by the requirement that generators must input more than 1 kilowatt hour for each kilowatt hour sold to cover the losses involved. The transmission company may also require certain services to allow it to instantaneously balance supply and demand all the time and to deal with unforeseen emergencies or other situations. These requirements are typically secured under contract from either generators or customers. In summary, the essence of a minimalist approach is that the transmission company has no economic function in the market for power.

In a number of countries which are reforming their electricity markets, the scope of the transmission company is considerably larger. It may own its own power stations to make up losses and secure the supply of ancillary services, and under the single buyer system it may take title to all power at the generator's location and sell it at the customer's off-take point. Customers and generators still deal with one another, but the transmission company is an agent in all of these transactions. In other countries the transmission company is also being used as a vehicle for covering social costs and even for the so-called "stranded costs" of the previously regulated utilities. This is particularly the case in California. Obviously this kind of structure requires that the transmission company buys and sells power with the difference in prices allowing it recover all of the costs that have been imposed upon it.

In some cases there is also the problem of unfair competition by suppliers who try to avoid the cost of transmission by not connecting while their customers are still able to use the grid as a supplier of last resort. In most jurisdictions, therefore, there is usually a requirement that all generators must pay their fair share of any network access charge unless there is a complete physical isolation.

These considerations, in our opinion, have two implications:

- 1.)** Competition will be promoted in an environment where transport costs are as low as possible; this suggests that a minimalist version of the transmission company is to be preferred and that it should not be burdened with socio-political obligations or stranded costs.

- 2.) Competition will only be fair if measures are taken to prevent generators or customers from selectively opting out of the network costs; to this extent, Iceland will need to consider placing all lines of 66 Kv and above into the national grid.

3. The Pricing of Transmission Services

Inappropriate pricing of transmission services has, more than any other aspect of deregulation, the potential to be the source of abuse of market power and ultimately to defeat the goals of the proposed change. Unfortunately, transmission questions are frequently presented in highly complex technical forms that makes them difficult to understand, even for industry regulators, never mind business and household customers.

Basically there are two competing philosophical approaches. One proposes that all users of the transmission system should pay the same tariff regardless of the location of the supplier and the customer. This is usually called the postage stamp system. It has the advantage of being reasonably simple to calculate the correct tariff, very easy to understand and it appeals to notions of social justice and fairness.

The main objection is that the postage stamp approach does not deal effectively with congestion issues. Transactions that add to congestion in critical parts of the network do not attract a higher charge even though they impose higher costs on the network, which are ultimately paid for by all users. Of course the Post Office has to deal with congestion as well (e.g. at Christmas), but it can do so by hiring temporary workers like vacationing students and by simply taking longer to deliver the mail. The short run marginal costs of this are rather low and there are no long-run marginal costs. With a power transmission grid, however, congestion usually requires the construction of new lines, imposing very large fixed long-run costs at the margin.

This has led some jurisdictions to an alternative approach under which the price of transmission services varies according to the location of the producers and the consumers, with higher costs imposed on those located in congested areas. There are two technical difficulties with this approach. First, it is quite complex to calculate the appropriate charge for each connection point on the grid. Second, as each new generator and customer is added, the potential exists for the critical parts of the network to shift, requiring a new calculation of tariffs. Indeed, if the tariffs are providing producers and consumers with the right signals, the whole objective is to manage activity away from the critical areas.

In the case of Iceland, where the potential exists for large new industrial customers, whose load is non-marginal in relation to the existing grid (e.g. aluminium smelters), and corresponding large new generation facilities, we think it is particularly important for appropriate location signals to be given. In our opinion, this means it is probably worth dealing with the technical complexities involved in the second of these approaches.

Once the broad philosophical approach is agreed, the next question is the precise structure of the tariff. The usual approach is to divide this into two parts – a fixed charge per KW reflecting the fixed costs in the system and a variable cost per kWh reflecting the variable costs. In practice virtually all of the capital and operating costs are fixed. Unlike highways, transmission lines do not wear out with use. Moreover, the whole point of the network is that it should be available to transport power. The cost of guaranteeing this availability does not change with actual use. The main variable component is the transmission loss. This can be a significant factor in a fossil fuel-based system but will be near zero in Iceland's case.

In a few cases (for example as proposed in Germany), transmission charges are based on the distance between a producer and a consumer. Such a structure, however, does not correspond with technical or economic reality. If a producer in Portugal agreed to sell power to a consumer in Northern Germany displacing that customer's German supplier, there is no physical way in which the electrons in question would ever be delivered. Instead the Portuguese supplier would actually serve a Spanish customer, the former Spanish supplier of that customer would supply a French customer and so on. Thus, although a Portuguese station would increase production and a German station would reduce production, the actual power would come from another German station. Moreover, there would not necessarily be any noticeable change in the overall system loss. Even if there was, it would have no relationship to the distance between the Portuguese power station and the German customer. The reality is that distance-based transmission charges are economically illogical. Worse, because they reduce the number of potential suppliers that can compete for a customer's business, they have an anti-competitive effect. We doubt that they will be sustainable in the long-term and, clearly, they have no place in a country like Iceland where isolated communities would be greatly and unnecessarily disadvantaged.

It has been a basic principle of power pricing in Iceland that the wholesale price should be the same nationwide. This principle will be difficult to maintain under deregulation because not every community will have the same skill or luck in negotiating with suppliers (market expertise). However, if the transmission system is a statutory monopoly, it is quite straight-forward to maintain the concept of equity within an economically rational pricing structure for the transmission component of the tariff. This could be done simply by an equalization tax on the access charges of distribution utilities. Those with below average charges would pay the tax and the proceeds would be distributed to those with above average charges. In this way accurate location signals would be sent to the generators and to the larger industrial customers, but not to the agricultural and residential markets, which are arguably not footloose anyway.

4. Transmission Conclusions

Decisions on transmission are perhaps the most important component of electricity market deregulation. Whatever the competitive structure in generation and distribution, unless all parties have fair and open access to the grid, competition will be frustrated. In this context, the rules under which the grid is operated are by far more important than the precise organizational structure instituted.

Since the capital cost of a new transmission project is a significant component in power station investment decisions in Iceland, and since the large power-intensive industrial customers form a much above average share of the total market, any transmission pricing regime that provides locational signals appears to have considerable merit. It appears to be feasible to combine this characteristic with whatever degree of cost equalization is deemed socially appropriate in the Icelandic context.

Chapter 6: Generation Issues

1. Radical -vs- Incremental Competition


It is possible to identify two basic options based on international deregulation experience – radical competition and incremental competition. The radical competition model requires breaking up Landsvirkjun’s generation activities into two or more independent competing companies. This is the approach that has been followed in the United Kingdom, Victoria and New South Wales. By contrast, incremental competition involves withdrawing any statutory monopolies and permitting new entrants to compete for existing and incremental business. Essentially this is the West Australian approach and is also, de facto, the approach in most European countries.

By way of preliminary comment, it must be pointed out that Landsvirkjun does not have a statutory monopoly of power generation in Iceland. In theory, the Minister of Industry can approve any project by any company. In fact, at the end of 1997 Landsvirkjun owned 93% of the generating capacity in the country, a figure that will decline somewhat as two new independent geothermal co-generation projects at Nesjavellir and Sudurnes come onstream in the next few years. Thus, in the Icelandic context we can redefine the term “incremental competition” to mean changes to reduce the difficulty faced by Landsvirkjun’s future competitors from a regulatory and market access perspective.


In considering the radical competition alternative, an initial issue is to determine the number of competitors that are required in order to create effective competition. Here international experience provides compelling evidence. The UK experiment suggests that two dominant generators with similar asset bases do not guarantee a competitive market but instead set up a form of oligopolistic competition in which price is driven by a company’s understanding of its competitor’s business strategy rather than by the classical marginal cost pricing that is characteristic of truly competitive markets. The Victoria experience suggests that with five or more firms a reasonably vigorous market will emerge.

The next consideration is technical in nature. In the hydroelectric system the divided management and development of a single watershed is a highly questionable proposition. Certainly it will require a complex regulatory system and an extensive dispute resolution mechanism in order to deal with the conflicts that will probably occur between independent managers of the same resource. The most likely practical solution, therefore, is to divide Landsvirkjun up by watershed. The following charts show the stations that are associated with each watershed, with thermal units being assigned to geographically convenient smaller companies. A subsequent table shows the breakdown of net assets.

Power Market Issues		The Watershed Approach	
<u>Watershed or Region</u>	<u>Generating Stations</u>		<u>MW</u>
Sog	Ljosifoss	15 MW	} 124 MW
	Irafoss	48 MW	
	Steingrimstod	26 MW	
	Straumsvik Thermal	35 MW	
Thjorsa / Tungnaa	Burfell	250 MW	} 610 MW
	Sigalda	150 MW	
	Hrauneyjafoss	210 MW	
Laxa (Akureyri)	Laxa	28 MW	} 98 MW
	Krafla	60 MW	
	Bjarnarflag	3 MW	
	Akureyri Thermal	7 MW	
Blanda	Blanda	150 MW	150 MW
TOTAL			982 MW

 Resource Strategies

Power Market Issues		Assets by Watershed	
<i>(figures in ISK billion at 31 December 1997)</i>			
<u>Watershed or Region</u>	<u>Revalued Cost</u>	<u>Accumulated Depreciation</u>	<u>Net Assets</u>
Sog	9.4	8.0	1.4
Thjorsa / Tungnaa	75.2	35.2	40.0
Laxa (Akureyri)	9.0	4.9	4.1
Blanda	16.4	2.2	14.2
TOTAL	110.0	50.3	59.7


 Resource Strategies

These two tables show that although Landsvirkjun can, in practice, be divided up into four companies, the one based on the Thjorsa/Tungnaa watershed would have 65% to 70% of the market and would therefore still be a dominant producer.

Another consideration is the impact of a break-up on the financial status of Landsvirkjun and, in particular, its access to international credit markets. The overall financial size of a corporation is a factor in addition to the basic strength of the balance sheet and the quality of its cash flow. The following chart shows the size of the electric utilities in the smaller European countries.

Power Market Issues		Size of Generation Companies in Small Countries	
<u>Country</u>	<u>Number of Companies</u>	<u>Market Share</u>	<u>Avg. MW per Company</u>
Austria	1	48%	7701
	9	31%	556
Belgium	1	95%	13456
Denmark	8	100%	690
Finland	2	60%	4140
Ireland	1	100%	4278
Luxembourg	1	97%	971
Netherlands	4	77%	3590
Norway	1	30%	8205
	5	33%	1805
Portugal	1	92%	7586
Sweden	1	52%	16872
	6	40%	2163

Landsvirkjun	
<u>Number of Companies</u>	<u>Avg. MW</u>
Today	982
2	491
3	327
4	246



This chart shows that Landsvirkjun is already at the low-end of the European spectrum. If two or more companies were formed, they would have less than 500 MW on average. This is equivalent to a modern-scale, combined-cycle gas-turbine project in the United States. If such a project was financed separately from any other corporate assets it would definitely not be able to obtain terms anywhere near as good as those that Landsvirkjun enjoys today. It will be viewed as a “project finance” proposition with an effective interest rate that is as much as 100 basis points over the current borrowing rate for Landsvirkjun.

A final consideration is the concentration of aluminum market risk. As noted, Landsvirkjun has already concluded that this risk needs to be managed after 2003. Clearly, the contracts with Isal and Nordural will have to be allocated to one or more of the surviving generators. Since it is not

technically possible to divide Landsvirkjun into units that are proportionate to these contracts, the result will certainly be a further concentration of aluminum market risk in several financially smaller entities. This could also significantly affect the credit market's view of the risk associated with these companies. It is, of course, conceivable that Isal and Nordural would want the government to guarantee the performance of the existing contracts after deregulation. In our opinion, this would set a very undesirable precedent. It is precisely the kind of activity that got the Victoria government into so much difficulty in the 1980s with Alcoa's Portland project.

These considerations lead Resource Strategies to the view that proposals to divide Landsvirkjun into two or three companies of significant size need to be questioned from the following perspective:

- 1.) It will probably not be possible to create enough entities to ensure genuine competition.
- 2.) The market will any way be dominated by one company containing 70% of the generation assets.
- 3.) The risks associated with reduced financial size may adversely affect the company's access to international credit markets.
- 4.) There may be a potentially dangerous concentration of aluminum market risk in one or more of the new companies.

These factors suggest, in our opinion, that deregulation strategies which focus on incremental rather than radical competition are likely to be more appropriate in the Icelandic case.

2. Potential Scope of Competition

In any deregulation process it is necessary to identify the potential participants on both the demand and supply sides of the market. Unless these are sufficiently numerous, the market will not be very competitive in practice.

As far as consumers are concerned, some jurisdictions (e.g. Pennsylvania) require every purchaser, even down to the individual household, to select a supplier. Others limit the access to larger customers with distribution companies negotiating for groups of smaller customers. Whatever the decision, a important result of competition is that there is a fundamental change in the relationship of supplier and customer. Specifically at present Landsvirkjun is a supplier of last resort to the ordinary market. In effect Landsvirkjun guarantees that "the lights will not go out" (excepting physical force majeure). If a customer fails to contract for enough power, Landsvirkjun supplies the extra power and, moreover, on the same terms. This public service obligation is not compatible with a competitive market.

Instead each customer (or distribution company on behalf of groups of customers) has to decide what contracts to enter into and what risks to take. An example of what this can mean occurred in the United States in summer 1998. A combination of hot weather, power station breakdowns and other circumstances, led to a situation where the demand for spot power (i.e. power over and beyond the contracted amounts) greatly exceeded the amount of uncommitted supply. Prices rose to \$7000/Mwh, a level that is approximately two hundred times the normal price. Although this situation lasted only a few hours, the losses to some companies have been so severe that dividends will have to be curtailed.

The point is that the difference between contracting for specific amounts of power and contracting for whatever power one happens to need has a potentially very large cost which is not presently apparent to ordinary market customers. As Landsvirkjun's open-ended obligation to supply everyone at the same price is ended and replaced by a system of contracts, it will become more apparent. There is, of course, nothing to stop a distribution company asking Landsvirkjun or one of its new competitors for an open ended call option. However, the price for this portion of the load will obviously be very much higher. In fact it may be so high that the ultimate customers do not wish to pay it and will accept an interruption to supply. For instance, the power intensive industries currently prefer to purchase a significant portion of their power on a secondary energy basis, because in effect it is less expensive for them to interrupt part of their operations periodically than for them to pay for the construction of extra storage dams to guarantee the delivery of this power at all times. Under deregulation, other consumers will be faced with making the same kind of decisions.


Customers who are capable of and willing to make such decisions and who install the necessary metering and control equipment are those who will find direct access to the market practical. Others who would rather continue with the present "on demand" service are probably better served by distribution utilities. Besides the power intensive industries, the customers that might benefit from direct market access are fish and agricultural processing plants, ports and airports, the NATO bases, large shopping malls, schools and hospitals and the like. It will be necessary for Iceland to decide who, precisely, can have direct access to the market. In many cases these customers will be taking power off the grid at less than 66kv. Therefore the distribution companies will need to ring-fence their medium voltage transmission activities from other parts of their business and the charges for these will need to be transparent and regulated as to reasonableness.

The move to a system of contracts would also have the beneficial effect of helping to resolve competitive disputes in the market place rather than in the regulatory system. An example of this can be seen in the Sudurnes project. At present, this project can under-cut Landsvirkjun's national average price, regardless as to whether or not the market requires the incremental capacity to come on-line at the time in question. If there was a contract regime in place and there was excess capacity, Landsvirkjun would presumably enter a very low bid to supply incremental demand for an initial period of time while it expected excess capacity to exist followed then by

quite a high bid for the period at which it would need to supply new capacity to meet the contract. If the Sudurnes project was truly the lowest cost incremental project then it would, of course, win the business eventually. However, the timing of the project would most likely be delayed until the point when the market really needed it.

If Iceland moves to a system of specific contracts, phasing out the role of Landsvirkjun as a supplier of last resort, then competition at the margin can be introduced without necessitating the break-up of Landsvirkjun. Because competition at the margin will be won by the company with the lowest cost incremental project, it is potentially a valuable way to put downward pressure on long-run marginal costs, which we have identified as a key strategic objective for Iceland.

If further measures are considered necessary to strengthen independent power producers, then one way to do this would be for Landsvirkjun to sell certain smaller units in the system to new entrants, specifically the Sog and Laxa systems and perhaps the thermal units. Given Landsvirkjun's current investment program, such a policy would not significantly reduce Landsvirkjun's generation capacity below the 1997 base. However, it could create a reasonably competitive general power market over a three to five year time frame as illustrated in the table below.

Power Market Issues	Potential Scenario -- Ordinary Market in 2003	
Competition could be created in the ordinary market . . .		
	GWh	Share
Ordinary Market (current)	2136	
Growth to 2003 (10%)	214	
Total	2350	100%
<u>Current Small Units</u>		
Sog, average	474	20%
Laxa, average	140	6%
<u>New Geothermal</u>		
Nesja, 66 MW, 5000 hours	330	14%
Sudurnes, 30 MW, 5000 hours	150	6%
Net Landsvirkjun Demand	1256	54%
. . . especially if Sog was operated competitively with Nesja		
		

3. Potential Forms of Competition

It is possible to envisage the following markets emerging in the case of Iceland:

- 1.) An ad-hoc long-term contract market for large industrial projects.
- 2.) Short-term and medium-term contract markets for distribution utilities and possibly for smaller industrial and commercial customers.
- 3.) A spot market for reconciling supply and demand on a continuous basis.

We shall discuss each of these topics in turn.

The large absolute size of projects like aluminum smelters means that it is inevitable that power supplies will be negotiated on a case-by-case basis. In any event, contracts of 10 to 25 years in duration are usually necessary in order for such projects to be financed. In a competitive power market, the developers of any such project would, of course, be free to self-generate or to negotiate with any potential supplier. In practice, we expect that Landvirkjun would win most of these contests because it is really the only generator with the size and financial strength to be an effective counterparty. However, other generators could still have a subsidiary role in such projects as sub-contractors for Landsvirkjun, assisting it with timing issues as in the case of the existing arrangements involving Nesjavellir and Nordural for an initial period of time. However, in this arrangement it is clear that Landsvirkjun will be responsible for managing the fundamental financial risk, including the aluminum risk.

The short-term and medium-term contract market would be the principal way by which smaller direct customers and distribution utilities would cover their power requirements. It is possible to envision a layer of contracts covering the requirements of such customers with durations varying from one to ten years. In our view it would be useful for the Icelandic authorities to attempt to standardize such contractual arrangements so as to facilitate secondary trade in an over-the-counter market.

Finally, because power supply and demand to a significant extent are a function of weather conditions, we will always need a spot market to reconcile flows on a continuous basis. This spot market could potentially work in a manner analagous to the Norwegian spot market. It might be sensible to institute a futures market for up to one year ahead to allow the participants in the spot market to manage their financial risk, but the feasibility of this step will obviously depend on the depth and liquidity of the market that develops and the number of players actively involved.

Chapter 7: Regulatory Issues

The deregulation of power markets clearly implies major changes in the regulatory environment in Iceland. At present, Landsvirkjun is subject to rather detailed controls. The Minister of Industry is responsible for approving all major long-term contracts, all new power station plant construction and all new transmission lines. The Ministry also appoints 3/7th of the Board of Directors, including the Chairman who has 2 votes and, therefore, in our opinion, effectively controls the company. The Minister of Industry is responsible for managing the government's shareholding. Any borrowings conducted by Landsvirkjun are reviewed by the National Debt Office. Other government agencies are involved with regulating Landsvirkjun's impact on the environment, its compliance with competition law (largely theoretical at present) and complying with national energy policy and priorities. Finally, Landsvirkjun does not have a normal tax-paying company status and key matters such as the selection of Directors and the determination of dividend policy are not conducted in the normal manner.

In addition to the influence of government on the commercial aspects of Landsvirkjun's core business, the current regime does not encourage the company to seek maximum leverage of its existing skills and other assets. A full discussion of the potential is beyond the scope of this report but Landsvirkjun may have international opportunities in engineering and other forms of participation in the development of low lead hydro resources based on its Icelandic experience and know-how. A more commercially-oriented structure of governance would probably seek out these and other opportunities more aggressively.

In our review of the regulatory environment we have identified two areas where there appear to be underlying conflicts of interest. The first of these is in connection with the role of the Ministry of Industry. As mentioned above, the Ministry must approve all new power projects, including those of independent power producers which under deregulation are going to compete with Landsvirkjun. At the same time the Minister of Industry is financially responsible for the government's majority stake in Landsvirkjun and for the appointment of the members of the board. Secondly, there is the role of the city of Reykjavik which holds a 45% ownership interest in Landsvirkjun. Not only is the city's 100%-owned distribution company a major ordinary market customer for Landsvirkjun, but the city also owns a competing electricity generation company. Furthermore, speaking of municipal owners generally, the dividend policy of Landsvirkjun that is required to satisfy the cash flow needs of these owners may soon come into conflict with Landsvirkjun's medium-term needs to retain earnings and pay down debt ahead of the next round of major investments which the company will be facing in 5 to 10 years time.

Deregulation provides an opportunity to rethink the scope of the regulatory function and the structure of Landsvirkjun's ownership. The international trend is certainly very strongly away from direct and detailed government management of electric utilities as far as fundamental

economic issues are concerned. Even in those countries where ownership of the utility is being retained by the state (such as West Australia), normal corporate structures are being adopted and the companies themselves are being expected to function as ordinary profit-making and tax-paying entities. This means that it is the companies themselves become responsible for the full range of economic issues including the following:

- 1.) Determining the technical and commercial feasibility of power projects
- 2.) Selecting generation technology and fuel sources
- 3.) Arranging financing
- 4.) Hedging and risk management
- 5.) Negotiating contracts
- 6.) Undertaking research into the availability of resources, new technologies and the like

As things are presently arranged in Iceland, these are all matters that currently involve one or another branch of government as well as Landsvirkjun.

In the deregulated environment the role of government will probably change, and in the Icelandic case the following appear to be the key issues that the government will need to address:

- 1.) Creating and administering rules for access to public assets such as land, water rights, steam reservoirs and so forth; such rules will need to provide an opportunity for Landsvirkjun's competitors or for customers seeking self-generation to obtain access to such resources on non-discriminatory and transparent terms while at the same time avoiding conflicts that result in sub-optimal resource development.
- 2.) Ensuring that fair competitive behavior takes place; in particular, this is likely to involve making sure that access to the transmission system is genuinely open and non-discriminatory and guaranteeing that Landsvirkjun does not abuse its dominant market position by engaging in predatory pricing to shut out competitors; Iceland already has an Institute of Competition whose mandate could probably be expanded to cover the power sector for this purpose.
- 3.) Compliance with the normal health, safety and environmental laws in the country; it is important that such laws be administered in an objective manner and not be used as a vehicle to dictate or influence choices of technology or scale, whether by Landsvirkjun or by any competing generator.