

# **Analysis of Pacific Power and SECV proposals for an electricity market**

**Prepared for the Department of Primary Industry and Energy**

**Hugh Outhred, John Kaye and Hugh Bannister**

**February 1993**

## **Executive Summary**

The terms of reference for this consultancy were to provide a critical and concise analysis of the electricity marketing/pooling systems being trialled by Pacific Power and the SECV, in the light of the National Grid Management papers on these systems. Particular concerns included the following:

- The compatibility of the pools with each other and with the protocol, and the technical and commercial impediments to their merging.
- The implications of a hybrid spot/capacity market, and associated issues such as regional pools, with a view to recommending to the Commonwealth a single preferred system for trading electricity in Australia.

The consultancy was to draw extensively on other countries' experiences in the development of electricity and market trading arrangements.

Our approach to the consultancy has been to assess the features of the Pacific Power and SECV pool proposals in the light of international experience and our own understanding of the technical and commercial requirements of a market-based electricity industry. Following from this assessment, we have proposed a scenario for developing a market-based electricity industry in Australia.

Our approach would be to build on the practical experience already gained with the internal Electricity Exchange pool (Elex) that was established by Pacific Power in 1992. This approach would also be consistent with very recent developments in New Zealand and the UK, where serious attempts are now being made to redress problems associated with the initial implementations of trading arrangements in those countries.

We propose that the Elex pool be extended to include distribution authorities and large consumers via linked nodal spot and forward markets. Such markets would have the following key features:

- A "pool" would be established at a particular location in the network (for example, a major Sydney region bulk supply point).
- Spot and forward markets would operate with regard to electrical energy at that location (initially on a half-hourly basis, subject to later review). An independent network operator would cooperate with an experienced financial organisation to implement the nodal spot and forward pricing arrangements.
- The network operator would determine nodal spot and forward prices for other locations in the network, based on projections of the future supply/demand balance.

- The network operator would enter into forward contract arrangements with participants at their point of connection, in the process accepting (only) the risks associated with network operation.

Similar pools with standard terms and conditions would be implemented in all states, possibly within vertically integrated supply authorities in the smaller states. Transition issues associated with sunk cost recovery would be dealt with by initial allocations of financial instruments, designed to give an efficient and equitable distribution of sunk costs in both generation and transmission and to provide a smooth transition to market-based trading over a period of several years.

Interties between states may be thought of as traders between the state pools, buying electrical energy at the cheaper end and selling at the more expensive end. Interties should be separately managed so long as they are "weak" compared with the state pools (that is, an intertie frequently operates at its transfer limit under market trading conditions). If and when an intertie is augmented to the extent that the transfer constraint is only very rarely reached, the two or more state-based pools concerned could be merged because the pool prices would exhibit similar behaviour at all times. This link augmentation would provide an evolutionary path towards a multi-state industry. It also provides a role for a future National Grid Corporation.

Because of its characteristics and location, the Snowy Mountains Hydro Electric Authority plays a special role in the South Eastern Australian electricity supply system. In particular, it is very effective in following short term variations in electricity demand and is strategically located between the NSW and Victorian networks. It will be an important participant in the NSW and Victorian pools, and should function as a separate trading entity, managing interchange between the pools in the process.

We have carefully considered and explicitly rejected the concept of a hybrid pool derived by combining the characteristics of the Victorian and NSW pools. The reasons for this are as follows:

- Capacity contracts are based on the performance of a particular generator and would not be readily tradeable. Thus their presence would reduce the liquidity of the necessary market in tradeable forward financial instruments.
- Financial instruments (e.g. the option or one-sided forward contract) can be structured to perform a similar function to a capacity contract, with the additional advantages of being highly tradeable and being responsive to system conditions at spot time rather than the performance of a particular generator.
- In the absence of affirmative action to establish a highly liquid market in tradeable financial instruments, individual participants would be forced to enter into capacity contracts or similar arrangements, both because of the need to manage their own risks, and society's need to manage the transition process.
- Under capacity contracts, the spot market may become distorted, which would deter financial traders from becoming involved in the forward market. For example, it would be quite inappropriate to use the energy components of long term capacity contracts to establish energy bid prices in the spot market.
- A pool process involving capacity contracts would take Australia in the direction of the US electricity industry. Experience has shown that the US

approach requires intrusive, heavy-handed regulation to achieve reasonable outcomes.

- The use of capacity contracts in the transition process would severely inhibit the development of a market-based industry. It is clear that an initial allocation of financial instruments, compatible with forward market trading, would provide a more efficient and more equitable way to manage the transition process.

The arrangements that we propose provide for efficient pricing of network services, alignment of technical issues and commercial arrangements, both strong incentives and the necessary tools for the network operator to manage the network efficiently, and an environment that would permit effective light-handed regulation.

The key steps for implementing our proposal are as follows, with timing that assumes an early decision to adopt this strategy:

- April 1993: Commence independent, adequately resourced and sustained studies of all technical, economic, financial, regulatory and social issues associated with implementing a market-based electricity industry. This study should continue, providing information, monitoring and evaluation services until the transition process is complete. The initial objective of these studies should be to develop detailed proposals for implementing the regional spot and forward markets and transitional arrangements, to apply from January 1994.
- July 1993: Implement internal, generation-only pools in all states other than New South Wales. Commence a trial extension of the NSW Elex pool with an independent wholesale trader undertaking the buying and wholesale supply role. Commence separation of generation, transmission and distribution functions in Victoria and Queensland, with optional arrangements of this type in the smaller states.
- January 1994: Commence a 3 year transition period in which distribution bodies and large consumers commence independent operation in the spot and forward markets in each state according to an agreed timetable. At the same time, competition in generation should be encouraged to avoid the distortions experienced in the UK, by setting appropriate limits to the ownership of generation. Each participant would be given an initial allocation of forward contracts on commencement of independent trading.
- Ongoing: The National Grid Management Council or its successor, suitably structured to represent all interested parties, should be responsible for an ongoing review process. State and federal governments should jointly develop efficient regulatory processes that provide consistency across the energy industry and incorporate effective public participation. We believe that an industry structure based on spot and forward markets provides a sound basis for such developments.

A summary follows of the main points in the arguments leading to this proposal. Expanded versions of these outlines can be found in the main document. Appendix A contains a summary of the basic principles of a market-based electricity industry. The associated report by OXERA provides an explanation and critique of the British electricity marketing arrangements and other European initiatives.

The Electricity Commission of New South Wales (now trading as Pacific Power) commenced trials with an internal pool in July 1992. It has the following features:

- The pool is internal to Pacific Power and the pre-existing bulk supply tariff remains in force for distributors (representing small consumers) and large consumers.
- Pacific Power's existing power stations have been separated into three business groups. These groups bid their power stations individually into the market on a daily basis for each half hour of the following day.
- Interstate interchange, the NSW share of the output from the Snowy Mountains Scheme, minor hydro and gas turbines are bid into the pool by a fourth business unit.
- All electricity is traded through the pool.
- Generators are centrally scheduled and centrally dispatched for both energy and quality of supply services.
- A pool input price is determined for each half hour (set one day ahead with energy and reliability of supply terms and explicit transmission pricing).
- This pool price applies at the "virtual centre" of the transmission grid and generators pay a transmission price (which may be negative) to "deliver" their energy to this point.
- The transmission price consists of a connection charge, a fixed use-of-system charge and a loss-based use of system charge based on SRMC principles. In principle, consumers would also pay transmission charges to deliver energy to their physical locations if they were allowed to participate in the pool.
- Pool settlements are handled centrally, based on day-ahead prices and actual energy flows with adjustments for QOS services and transmission constraints on power station operation.

While the ELEX pool is a very important innovation, the absence of distributor and large customer participation is a serious limitation for the longer term:

- At times of constrained supply conditions, the use of a reliability of supply term in electricity price is a poor substitute for direct consumer involvement in the electricity market. Demand-side responses at times of constrained supply may have a lower cost than the assumed cost of unserved energy. British experience [15] suggests that the use of a reliability of supply term in the pool price may over-reward generators and encourage excessive investment in generating capacity.

- Without customer participation in the spot market, it is not possible to establish a properly linked forward market to allow risk sharing between participants and to guide the operation of hydro units, distributed small-scale generators and energy storage systems, and in the longer term to coordinate investment decisions.

The basic problem is that effective market operation requires customer participation.

A "capacity-contract" based pool is to be introduced in Victoria with the following key characteristics:

- Customers will have the choice of being either tariff customers of the State Electricity Commission of Victoria (SECV) or other retailers, or (if sufficiently large) becoming members of the pool along with SECV Customer Services and other retailers.
- Pool members will contract for generating capacity to meet their supply obligations, which will be based on their firm demand plus additional capacity required to meet system reliability requirements. These contracts are to support the long-term fixed cost commitments of generators.
- Pool members might also trade generating capacity to meet their obligations.
- VicPool will schedule and dispatch all generating resources to minimise overall costs of supply, resulting in benefits compared with each member using only their own resources. These benefits are to be shared according to the relative contributions made by the contracted generating resources of each pool member.

Pools of the capacity-contract type have an inherent weakness deriving from the artificial separation of capacity and energy. This is perhaps easiest to see in the case of energy-limited hydro, where the ability to generate often depends more on the availability of water rather than on the installed capacity. However a similar problem arises in the case of coal-fired plant with a fuel shortage or a maintenance problem that temporarily restricts output. Also, with many types of generating unit, output can often be increased above nameplate rating at the cost of reduced conversion efficiency and/or an increased maintenance requirement. Similarly, on the demand side, there is often some discretion in the size and timing of consumption and thus there is no simple, accurate measure of peak demand or required level of reliability of supply. Finally, the use of "non-dispatchable" generation (such as wind or run-of-river hydro), stand-by generation or energy storage complicate the picture further.

When these problems are coupled with uncertainty about future demand and uncertainty about future performance of generating units and transmission systems, it is clear that simple concepts of demand and energy are insufficient to deal with the complexity of the situation. This is analogous to the criticism that large consumers have about demand charges which they often see as being simplistic and punitive in nature.

One improvement to the basic capacity-contract approach is to use short capacity contract periods of months, weeks or even days and to allow contract trading between pool participants. The shorter the time periods that are used, the more closely this arrangement approaches the combination of an energy-only pool and a forward market. However the latter has a firmer theoretical foundation and is likely to be less contentious in practice. Also the concept of "shared savings" that is used in VicPool to

distribute the pool benefits relies on an economically dubious (and potentially contentious) assessment of operation with and without pooling of resources.