National Grid

REPORT ON THE TENDER FOR 2001/2002 STANDING RESERVE SERVICE

From 1st April 2001 to 31st March 2002

Market Development
10th May 2001

Executive Summary

For 2001/2, a total of 103 valid NETA based tenders representing 2130MW of Standing Reserve service volume were received. Tenders were received from a variety of service providers including demand managers, non-Balancing Mechanism generation and Balancing Mechanism generation participants.

The tenders were analysed in terms of their economic value whilst taking account of the technical requirements of the system and the other categories of reserve available. The National Grid Company pursued some 61 contractual arrangements with 24 companies involving services provided from some 45 different locations around England and Wales.

The overall volume of successful Standing Reserve is 1623MW.

The volume of successful Standing Reserve from demand modification and non-Balancing Mechanism generation for this 2001/2 NETA tender is 481MW, a similar level to that seen in the previous Pool based tender round of 504MW.

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1. Introduction

1.1. This report describes the tenders received and the subsequent selection process that led to Standing Reserve contracts being entered into for the period 1st April 2001 to 31st March 2002. Standing Reserve services for this period are based on the NETA contract form as described in the tender documentation issued on 23rd October 2001 and available on the National Grid web site at www/nationalgrid.com

1.2. At the time of tender (November 2001), there was uncertainty as to when NETA would be implemented, and consequently two tenders were held to cater for either Pool or NETA arrangements.

1.3. Since the financial year 1993/4, the National Grid Company has carried out a tender process for the competitive procurement of Standing Reserve services as an economic alternative to reserve delivered from part-loaded generation. National Grid Company has prepared similar annual reports for each of the Standing Reserve tenders undertaken.

1.4. An advertisement was placed in the Financial Times during September 2000, informing potential providers of the tender process. In the past, the National Grid Company has conducted seminars, questionnaires and workshops to promote the tender process and its commercial opportunities, and to provide an opportunity for providers to offer feedback to the National Grid Company.

1.5. All tenders received were opened after the tender deadlines of 8th December 2000 for NETA based tenders, and 20th December 2000 for Pool based tenders.

2. Tender Process

2.1. This particular tender round has been undertaken to secure a new Standing Reserve service provision from 1st April 2001 to 31st March 2002, and therefore represents the first significant period of NETA based Standing Reserve contract operation. The service definitions, requirements, and contract terms may be found on the National Grid web site. Necessary changes to align the financial aspects of the contract with the mechanics of NETA (and in particular the Balancing Mechanism) have been made. This means that there is no longer the option to tender no-load or start-up prices, in addition to the (incremental) energy price £/MWh.

2.2. The defined Standing Reserve hours are substantially the same as for previous years, having five Seasons with Working Days and Non-working Days separately identified. These hours and service Seasons are shown in Appendix A.

2.3. Tenderers chose whether to tender for one or more Season (Working Days and/or Non-working Days). Providers who were successful for only some of the seasons tendered were offered a contract for those discrete seasons and day types in which they were successful. However, some providers chose to stipulate in their tender submission that they wish to be selected for all or none of the segments offered. Where this was the case, the overall annual cost/benefit of a given tender was considered to determine whether or not a contract should be offered.

2.4. Service providers also chose whether to tender to provide a 'Committed' or 'Flexible' service. Once a 'Committed' contract is entered into, providers undertake to make the service available in all contracted service periods within a particular service season. In return, National Grid Company purchases all the availability offered. With a 'Flexible' agreement, providers need not make the service available all the time, however the National Grid Company is not obliged to purchase availability so offered.

3. Tenders Submitted

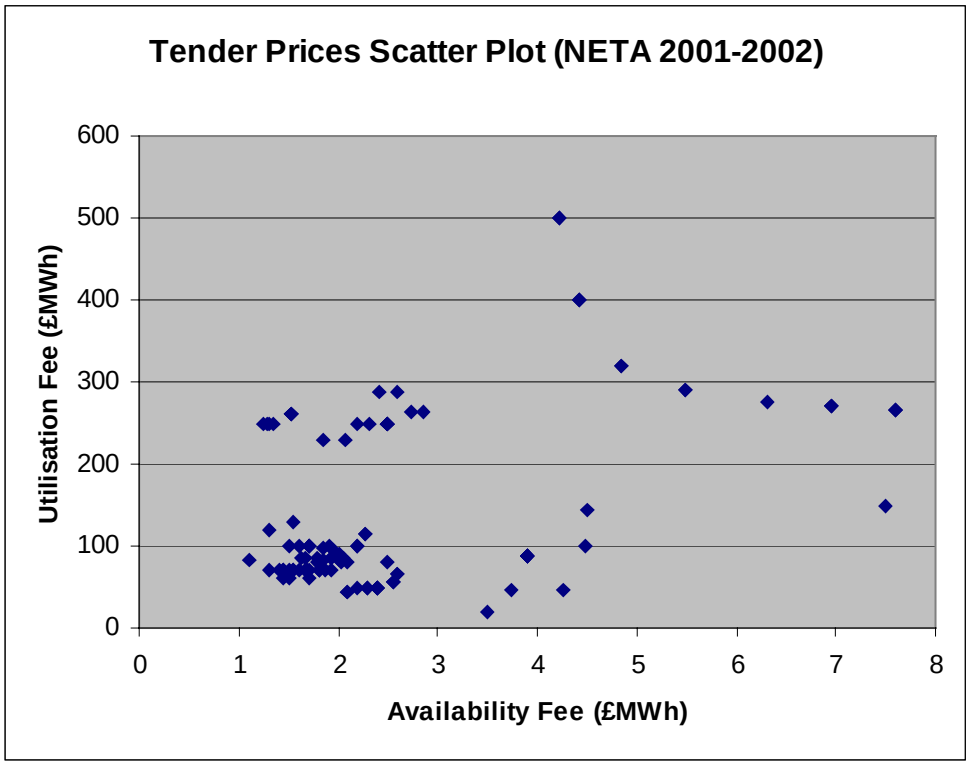
3.1 A total of 103 discrete tender submissions were received, representing 24 companies and 45 different sites. This translates into a volume of 2130MW, of which 481MW was from non-Balancing Mechanism providers.

3.2 The proportion of Committed/Flexible Standing Reserve service options was as follows:

Committed Only	1804 MW
Flexible Only	326 MW
Grand Total	2130 MW

3.3 All tenders were required to comply with certain criteria, and to provide certain information with regard to any service limitations. These parameters are discussed further in Appendix A.

3.4 A scatter plot of all Neta tenders received relating this tender round is shown below.



4. Economic Analysis

4.1. All tenders for each Season (sub-divided into Working Days and Non-Working Days) were evaluated separately. The objective of the economic analysis was to: -

- Identify the minimum cost solution in meeting the reserve requirement using the tenders received and other reserve alternatives for each Season;
- Re-optimise, if necessary, retaining any plant required to meet the system considerations outlined in Appendix A; and,
- To carry out sensitivity scenario testing.

4.2. As in previous years, a Mixed Integer Linear Programming model was used to select the economic reserve options for the service. This takes account of: -

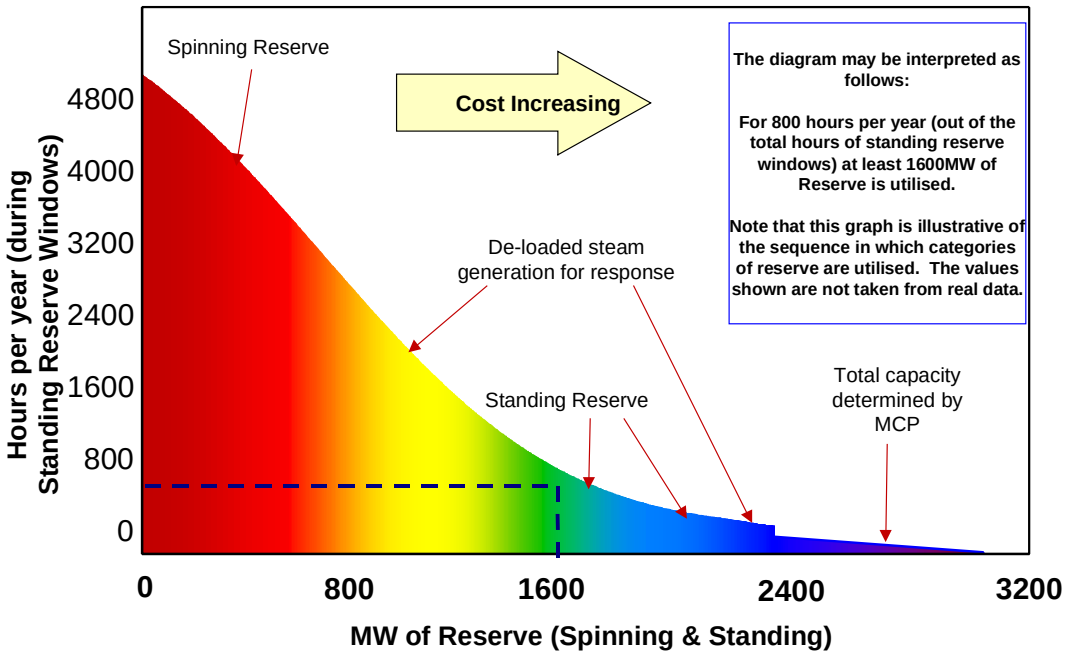
- forecast costs of spinning (synchronised) reserve by season;
- tendered data;
- the reserve utilisation forecast from statistical analysis (plant failures/shortfalls and errors in demand forecasting);
- historic and forecast service reliability statistics;
- any fixed costs associated with service contracts and monitoring systems; and
- the value assigned to the Maximum Contract Price (MCP) namely £2872/MWh.

4.3. Historic plant losses, generation shortfall statistics and demand forecast errors were analysed to forecast the system requirement for reserve against which tenders were evaluated. Spinning Reserve price forecasts under Neta contribute to the assessment and determine the optimal balance between Spinning and Standing Reserve options.

4.4. Tenders have been assessed, and their individual forecast Effective Costs compared to Maximum Contract Price (MCP). MCP is used in the same manner that Value of Lost Load was used for Pool based tenders, preventing Reserve energy from being contracted above this cut-off point.

4.5. Starting from the expected utilisation of each MW of reserve, the optimisation model was used to find the optimum combination of Spinning Reserve and tendered Standing Reserve to meet the requirement at minimum cost. For the purposes of the optimisation, a "dummy" source of infinite reserve having zero availability fee and a utilisation price of MCP (previously VLL), was used, to preclude the selection of tenders which produced an Effective Cost above £2872/MWh. The Effective Cost of a reserve option is the total anticipated costs incurred (including availability, utilisation payments and any fixed costs),

Utilisation of Reserve Energy



divided by the energy it is expected to deliver. Therefore, it can be seen that the tender assessment is not intended to secure a predefined service volume, but to identify tenders that offer reserve below a predefined price.

4.6. Figures 3 and 4 below illustrate the nature of forecast reserve requirement curves evaluated for Working Days and Non-working Days during each of the Seasons in question. Note that this representation reflects the number of hours in each Service Season. This data is revised annually, although the trends remain similar.

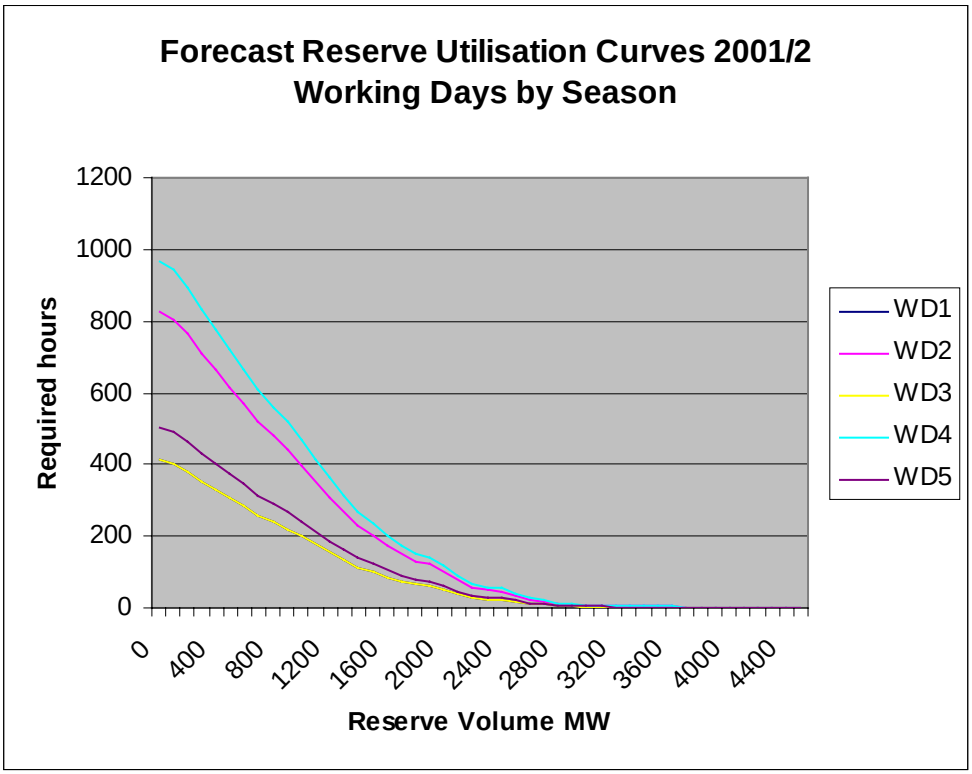


Figure 3

Figure 3 above can be interpreted as follows; the first reserve MW in Working days Season 4 will be required for 992 hours of the total 1296 hours of Reserve service in WD4, and the 1000th MW of reserve service will be required for some 540 hours of the 1296 total WD4 hours.

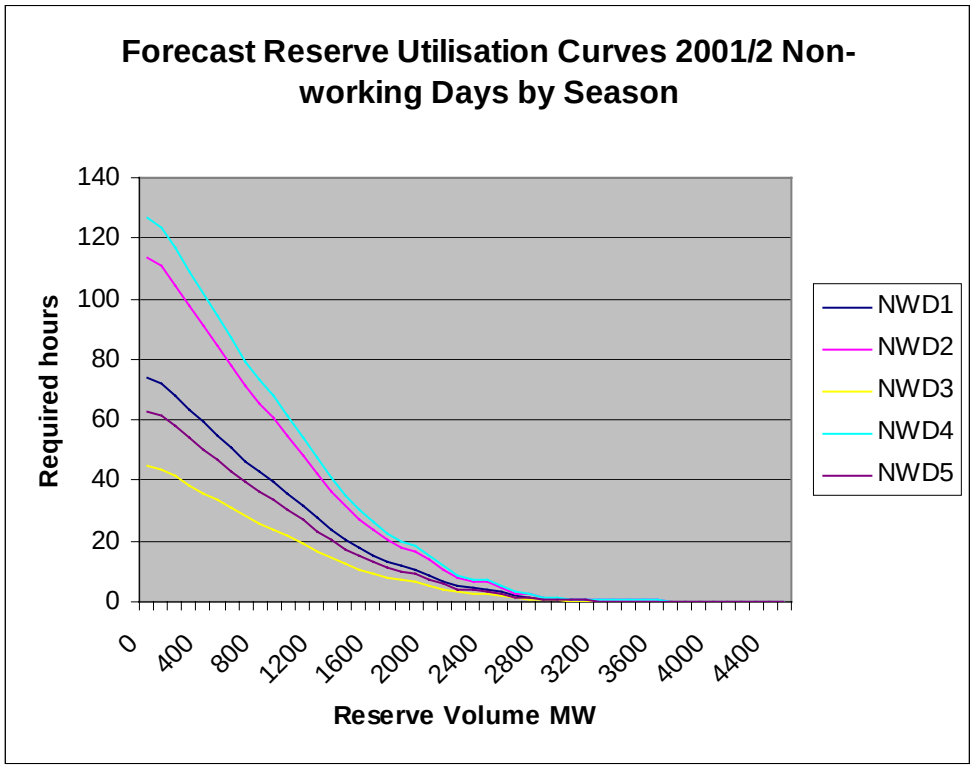


Figure 4

Figure 4 above can be interpreted as follows; the first reserve MW in Non-Working days Season 4 will be required for 128 hours of the total 170 hours of Reserve service during NWD4, and the 1000th MW of reserve service will be required for some 70 hours of the total 170 hours.

4.7. Appendix A includes an illustration of a supply/price curve which was drawn by plotting Standing Reserve volumes in the order in which they would be selected, against overall service costs. The maximum Contract Price (MCP) is also shown. The first MW can expect a high utilisation and so the availability costs are spread over a large energy use and hence the Effective Cost per MWh is low. The last MW of reserve held will only be utilised infrequently, so the availability costs are concentrated in a smaller energy use and the Effective Cost increases. As utilisation decreases, the overall Effective Cost eventually crosses and exceeds MCP. The economics then stipulate that reserve is contracted up to the point at which the two lines cross. 'Effective Cost' is defined in the Glossary of Terms.

4.8. Spinning Reserve and Standing Reserve options were evaluated simultaneously using forecast Spinning Reserve price curves, and tendered Standing Reserve prices.

4.9. The above analysis selects a list of tenders on the basis of Effective Cost. The analysis is then repeated against a range of sensitivities shown below. The final tender selection was robust against this range of sensitivities: -

- ♦ forecast Spinning Reserve prices;
- ♦ levels of plant shortfalls/losses/demand forecast error;
- ♦ likelihood of tendered services breaching their utilisation limits; and,
- ♦ possible non-completion of some contracts, particularly with new service providers, or failure of some providers.

4.10. The tenders contained a price for availability as well as energy price. Once a Committed reserve agreement is entered into, the availability payments can be regarded as 'spent'. Therefore the cost incurred by instructing such a contract is a function of its exercise price and the duration of the instruction. The average call duration of 1999/2000 Standing reserve tended to be around 45 minutes, although individual instances range from several minutes up to about four hours.

5 Neta Results

5.1. Economic evaluation of NETA based tenders took place across December 2000 and January 2001 and ultimately lead to tender success for the following Standing Reserve options in one or more Season:-

Main Generation Options 1206 MW
Embedded Generation and Demand Modification
481 MW
Total volume (economic for one or more seasons)
1687 MW

5.2. From this 1687MW service portfolio, the seasonal variation of successful Standing Reserve volumes can be seen in the table below. Since the maximum volume active in any one season is 1623MW, it may be deduced that some services are only tendered (or successful) for part of the year.

Service Season	Successful Neta Volumes (MW)	
	Working Days	Non-working Days
Season 1	1585	1612
Season 2	1578	1605
Season 3	1584	1611
Season 4	1586	1623
Season 5	1584	1621

5.3. Of this successful capacity, the majority of services have been contracted by the stated deadline of 5th March, in time for Season 1 service commencement. Some service provisions face possible delays to Season 2 commencement, following prolonged contract signing. Any shortfall may be made up with other Standing Reserve services or other reserve alternatives.

6. Appendices

Appendix A System Considerations for Selection of Reserve

1. The changes in generation and demand covered by reserve can occur at any time and therefore reserve must be provided at all times. In meeting this requirement economically, four main aspects must be considered: -

    (a) Any inherent reserve;
    (b) The strategic reserve requirements;
    (c) The cost of reserve options; and,
    (d) The operating parameters of the reserve plant.

2. Inherent reserve may arise, either because forecast demand exceeds actual demand, generators contract positions lead to part loaded generation, or other market effects. The despatch of Reserve and/or Balancing Mechanism services takes account of parameters such as:-

    (a) System requirements;
    (b) The dynamic parameters;
    (c) Commercial implications;
    (d) Minimum operating levels; and
    (e) Contingency planning.

3. The dynamics of generation can result in generation operating at reduced output through low demand periods, to meet the next peak demand point rather than shutting down and starting again later.

4. The demand profile and the parameters described above may result in times when the level of reserve required is inherently provided by generation operating part-loaded.

5. There are times when this inherent reserve is not present and other reserve options need to be identified, i.e. 'lead-in to' and at demand peaks. The logic of contracting for only limited hours of each day is borne out by recent utilisation of Standing Reserve. Monitoring shows that, of the total utilisation of Standing Reserve, more than 90% occurred within the service windows. Sensitivity analysis shows that the benefits of extending the service windows would be outweighed by the cost of extra hours of availability payments, even though revisions to the defined service windows are undertaken.

6. The tender submissions included information on a variety of parameters concerning the technical nature of the reserve service offers and other features relevant to the National Grid Company system. These parameters included factors such as the time required in order to initiate the service (Response Time), and the duration for which the service could be sustained (Maximum Utilisation Period).

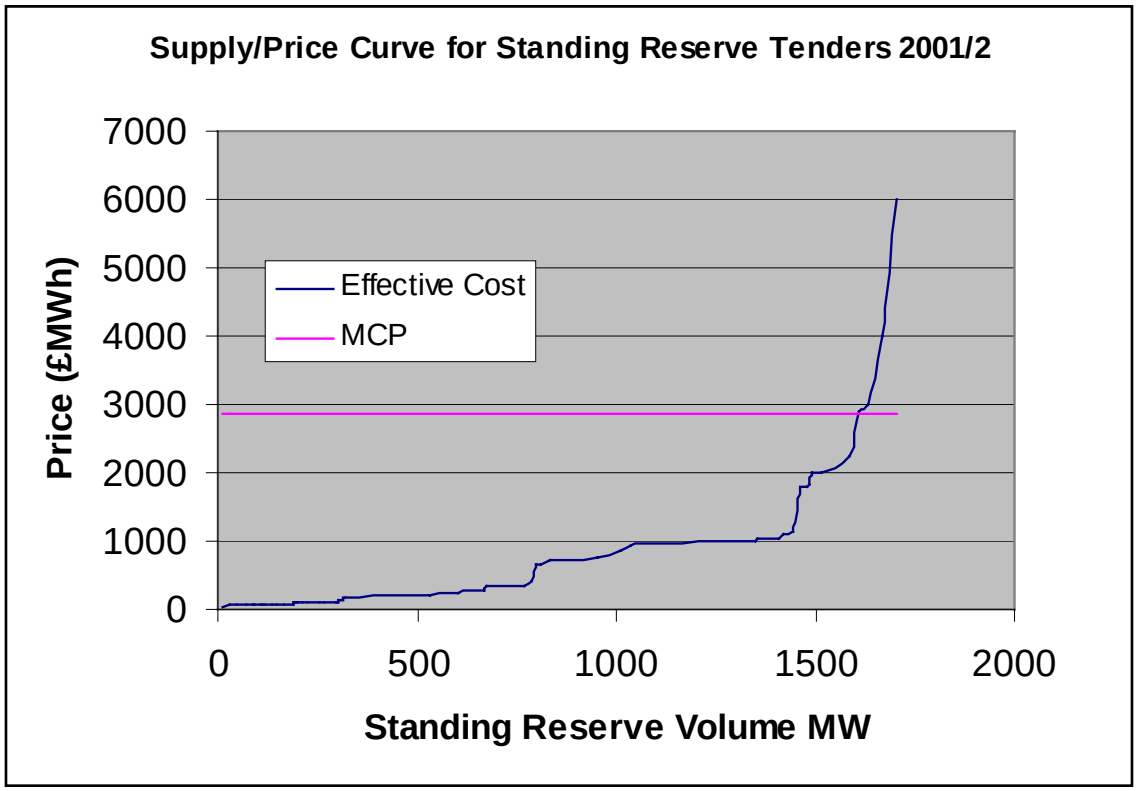
7. Standing Reserve service definitions stipulate that the maximum Response Time acceptable is 20 minutes. In fact it is desirable for the Grid Operator to have a certain proportion of the Standing Reserve fleet available with a Response Time of 10 minutes or faster. The spread of different capabilities of individual providers normally ensures that this 10 minute requirement is satisfied without using Response Time as a primary selection criteria.

8. Due to the limitations of a finite transmission system, there can exist geographical restrictions on the selection of reserve providers. However, as with the issue of Response Time, the natural variance in the geographical disposition of tendered services, means that this does not normally impinge heavily on the selection.

9. The minimum size of a discrete tender was set at 3MW. This was considered an appropriate compromise between a sufficiently low threshold in order to admit as many providers as possible, and the practicality/cost for the Grid Operator to utilise a large number of individual contracts in a short space of time. Given the large number of small contracts that the Grid Operator now has to deal with, a PC based monitoring and despatch system 'Utility Despatch & Monitoring Interface' (UDMI), has been introduced. UDMI will be updated with a replacement called 'Standing Reserve Despatch' (SRD), to satisfy NETA requirements during the course of this year. It will enable the Grid Operator to more efficiently manage service declarations, call-off the contracts and monitor performance against contract particulars.

10. The anticipated costs incurred by National Grid Company in the Standing Reserve Despatch (SRD) installation (where necessary) and other fixed costs (contract administration), are accounted for on a site (or tender) specific basis as appropriate.

Supply vs Price Curve for 2000/1 Neta Standing Reserve Tenders



Service Seasons and Hours

Service Seasons (inclusive)		Service Periods (inclusive)			
		Working Days		Non-Working Days	
1	1st April 2001 to 28th May 2001	I	07.00 - 13:00	I	10.30 - 13.30
		II	16.00 – 22:00	II	16.30 - 22.30
		III	N/A	III	N/A
2	28th May 2001 to 3rd September 2001	I	07.00 - 18:00	I	10.30 - 13.30
		II	20.00 - 22.30	II	16.30 - 23.00
		III	N/A	III	N/A
3	3rd September 2001 to 29th October 2001	I	07.00 -13.30	I	10.30 - 13.30
		II	16.00 - 21:00	II	16.30 - 21.00
		III	N/A	III	N/A
4	29th October 2001 to 4th February 2002	I	07.00 - 14.00	I	10.30 - 14.00
		II	14.00 – 20.00	II	16.00 - 19.30
		III	00.00 - 03.00	III	00.00 - 03.00
5	4th February 2002 to 1st April 2002	I	07.00 -14.00	I	10.30 - 13.30
		II	16.00 - 20.00	II	16.30 - 21.00
		III	00.00 - 03.00	III	00.00 - 03.00

Appendix B Historic Review of Standing Reserve Contracts

Contracted Standing Reserve Levels

1. The Standing Reserve tender process has been conducted each year since 1993. One of the major intentions of the tender was to introduce competition from a broad and diverse range of service provisions. The table below shows how the volume of successful service has changed year on year:

Service Volumes

Pool based

Financial Year	Centrally Despatched Generation Options (MW)	Non-Centrally Despatched Generation and Demand Modification Options (MW)	Total Contracted Volume (MW)
1993/4	2309 (1)	138	2447
1994/5	1854 (2)	222	2076
1995/6	1480 (2)	438	1918
1996/7	1796	505	2301
1997/8	1809	458	2267
1998/9	1503	617	2120
1999/0	1371	608	1979
2000/1	1675	504 (3)	2179
2001/2[4]	1429	493	1922

Post NETA

Contract Period	BM Generation Options (MW)	Non-Balancing Mechanism Generation and Demand Options (MW)	Total Contracted Volume(MW)
21st Nov 2000 - 1st April 2001	658	367	1025
2001/2	1206	481	1687

Note 1. This includes approximately 530MW of generation required primarily for local system security considerations.

Note 2. This includes approximately 300MW of generation required primarily for local system security considerations.

Note 3. This reflects several service providers moving to frequency response services.

Note 4. This Pool based tender round falls into disuse due to NETA implementation prior to 1st April 2001

2. The total contracted volume in any year will vary due to a number of factors including:-

- A range of alternative reserve price forecasts under NETA;
- Changes in tendered prices and volumes;
- Changes in statistical plant losses, shortfalls and demand forecast errors;
- Service reliability data from SRD (and other) monitoring systems; and
- The Maximum Contract Price (analogous to value of lost load VLL).

Glossary of terms

Agent	Certain companies act as agents for the procurement of reserve services. The Agent may provide assistance in the compilation of tender submissions and/or assist in the day to day management of reserve agreements.
Ancillary Services Agreement	A bilateral agreement between National Grid Company and a provider of ancillary services defining the services and payment rates.
Availability Reconciliation	A mechanism defined in Committed Standing Reserve Agreements. At the end of the contract term, the provider is required to pay back to the National Grid Company a proportion of the availability monies already received, *if* the number of hours of availability actually provided was less than 85% of the total contracted hours.
Balancing and Settlement Code (BSC)	the code of that title as from time to time amended.
Committed Agreement	Under this type of Standing Reserve Agreement, the provider undertakes to make the reserve service available in all contracted periods. In return National Grid Company is obliged to pay for all availability provided. National Grid Company has an expectation that the provider will achieve an availability performance of at least 85% of the total contracted hours. Failure to do so will invoke the Availability Reconciliation provisions.
Contingency Reserve	A margin of generation over forecast demand that is required ahead of real time and before Gate Closure to cover uncertainties in generating plant reliability and other unforeseen supply demand changes.

Effective Cost

The Effective Cost (£/MWh) of a tender is the total of all anticipated costs including availability, utilisation and any fixed costs, divided by the energy it is expected to produce during the term of the contract. Hence the Effective Cost is dependent upon a forecast of the expected number of hours of utilisation for a given tender. Effective Cost is compared with Maximum Contract Price (previously VLL) as part of the tender evaluation.

Effective Utilisation Price

The Effective Utilisation Price (£MWh) is a measure of the cost of utilising a Pool based reserve tender for a specified length of time. It takes into account all of the components of utilisation price that may be tendered (Start-up, no-load and incremental)

Equivalent Cost

The Equivalent Cost (£/kW per annum) is a measure of the cost of Standing Reserve capacity for a year. The Equivalent Cost is the total of the expected availability and utilisation payments made under all contracts during the year, divided by the time weighted average capacity of Standing Reserve available. Note that forecasts are based on anticipated running hours

Equivalent Price

The Equivalent Price (£/kW per annum) is a tender/contract specific measure and is the total of the anticipated availability and utilisation payments, divided by the capacity of the plant whilst under the contract. Note that forecasts are based on anticipated running hours

Flexible Agreement

Under this type of Standing Reserve Agreement, the provider need not make the reserve service available in all contracted periods. Unlike Committed Agreements, National Grid Company has no obligation to accept the offered availability. Availability payments are only made where the availability offered is accepted by the National Grid Company. Such providers give an indicative availability with their tenders and National Grid Company seek that the providers achieve 85% of the indicative availability. There is no Availability reconciliation.

Grid Operator	The organisation which operates the high voltage transmission system in England and Wales, and implements the provisions of the Grid Code - currently National Grid Company.
Maximum Contract Price	The limit beyond which no Standing Reserve contract will be offered. MCP was set to £2873 MWh for the 2001/2 tender round.
Maximum Utilisation Period	A tendered parameter adopted in reserve agreements. The maximum duration for which an individual instance of reserve provision can be maintained following instruction from National Grid Company. The Maximum Utilisation Period should be at least two hours, and preferably up to four hours.
Non-Working Days	Sundays and statutory bank holidays (excluding Good Friday) in England and Wales.
Operating Reserve	The additional output from generating plant and the demand modification available to ensure security of electricity supply and to control system frequency within statutory limits. This encompasses frequency response and reserve (Spinning and Standing).
Season	For the purposes of the Standing Reserve tender, the financial year is sub-divided into Service Seasons. Each season is further subdivided into Working Days and Non-Working Days and providers may tender for each discretely.
Response Time	A tendered parameter adopted in reserve agreements. It represents the time required from receipt of instruction to delivery of reserve energy and may be up to a maximum of 20 minutes. Provision of reserve is monitored against the contracted Response Time to confirm contract compliance.
Standing Reserve	Contracted Reserve generation and/or demand modification sources that can deliver reserve energy within 20 minutes of notification from the Grid Operator.

Standing Reserve Despatch (SRD) a series of inter-linked electronic equipment which, as a whole is capable of relaying and storing information, instructions and communications between National Grid Company and the service provider, and of providing an on-line monitoring capability.

Value of Lost Load (VLL) A Pool based defined term measured in £/MWh that is deemed to represent the maximum price consumers are willing to pay to avoid loss of electricity supply. This was set at £2000/MWh for 1990/91 and has been indexed annually by RPI thereafter. VLL is not a feature of NETA, and is replaced by Maximum Contract Price (MCP)

Working Days Monday to Saturday, including Good Friday, but excluding other statutory bank holidays in England and Wales.