



Directed Contracts: Quantification Methodology

Market Power Group Meeting
9th October 2006

Agenda



- Review draft consultation paper
- Review favoured quantification methodology, and rationale for this choice
- Review sample results

Consultation Paper



- Introduction/ executive summary
- Interactions
- Criteria for a good quantification method
- Alternative methods for consideration
- Evaluation of these alternative methods
- Selection of favoured approach
- Implementation Issues
- Sample results from favoured approach
- Summary of consultation topics

Introduction & Executive Summary



- Why is a market power quantification method needed?
 - A. By repeatedly modelling the SEM with a different level of directed contracts in each iteration, the RAs can estimate residual market power as a function of the quantity of directed contracts
 - B. The RAs can define a maximum acceptable threshold for residual market power
 - C. By combining A) and B) we can then find the minimum necessary quantity of directed contracts
- Question for this consultation: What is the best modelling method for Step A)?

Introduction & Executive Summary



- We evaluate Cournot, Bertrand, Supply Function Equilibrium (SFE), simplified behavioural models, and models based on market concentration measures
- Recommend a market concentration model
- Reason: we place a high weight on using a model that is relatively simple, stable, has international precedent, and has a minimum susceptibility to manipulation

Interactions



- Bidding principles
 - The DC quantification method is not required to solve market power in isolation
 - Enforcement of bidding principles will prevent egregious market power abuse, and so the DC quantity method should take this into account

Interactions



- Generation ringfencing review
 - NERA conducted a ringfencing review and recommended that affiliates could be treated as independent entities
 - (This treatment is dependent on all affiliated generators complying with new independent bidding requirement license conditions)

Interactions



- Trading & Settlement Code
 1. A unit offer must be the same across all hours of a day
 2. A unit offer cannot be changed after gate closure
 - These 2 provisions mitigate market power & the DC quantity method should take these into account

Criteria



- Efficacy
- Transparency and ability to be replicated
- Simplicity and stability
- Ability to sunset automatically
- Objectivity

Criteria



- Efficacy
 - Better at finding the minimum required DC quantity
 - International precedent
 - Focuses on market concentration/ doesn't confuse scarcity with market power
- Transparency and ability to be replicated
 - Participants should know what to expect

Criteria



- Simplicity and stability
 - The model should be easy to implement
 - It should not produce “knife-edge” solutions. Changes in results should be proportionate to changes in inputs.
- Ability to sunset automatically
 - DC quantities should fall away with divestiture and new entry
- Objectivity
 - All models require some subjectivity, but it should be minimised

Alternative Quantification Methods



- Cournot
- Bertrand
- Supply Function Equilibrium (SFE)
- Simplified behavioural models
- Models based on market concentration measures

Alternative Quantification Methods



- Cournot
 - Market players compete in quantity: each supplier in the market independently chooses a quantity to bring to market, and the price is calculated as that price at which the demand curve crosses the aggregate supply.

Alternative Quantification Methods



- Bertrand
 - Market players compete in price: each supplier in the market chooses a price, and then supplies as much output at that price as consumers demand.

Alternative Quantification Methods



- SFE
 - SFE models assume that each player chooses a supply curve, i.e. for each price it specifies how much output it is prepared to supply
 - SFE searches for equilibria, where each player can do not better by further modifying their supply curve

Alternative Quantification Methods



- Simple behavioural model
 - Cournot, Bertrand & SFE are relatively complex behavioural models
 - A simple behavioural model would look at each of the incumbents in turn, and simulate their possible bidding strategies into the SEM without considering responses to those bidding strategies by other strategic players

Alternative Quantification Methods



- Concentration models
 - Rather than predict behaviour, simply measure concentration
 - HHI models are commonly used for merger screening

Evaluation of Alternative Methods



- Cournot models tend to have unrealistic price spikes and result in “worst case” predictions of market power
- Bertrand tends to produce “best case”
- SFE is more sophisticated, but requires a subjective decision of how to treat multiple solutions. Is also complex to implement.

Evaluation of Alternative Methods



- Simple behavioural model
 - Can produce great insights
 - Can be customised to the SEM interactions
 - Relatively easy to develop
 - But, needs many parameters, can produce “knife-edge” solutions, & might be subject to manipulation

Evaluation of Alternative Methods



- Concentration
 - Do not capture any complexities of the market or market rules
 - Thresholds are arbitrary
 - But, are effective in that they are directed at concentration, and do not overlap with scarcity
 - Very simple, transparent & stable
 - DC quantities would sunset as a smooth function of divestiture/ new entry
 - International precedents for regulatory use

Evaluation of Alternative Methods



	Cournot	Bertrand	SFE	Simple Behavioural	Concentration Measures
Efficacy					
Transparency/ Ability to be Replicated					
Simplicity/ Stability					
Ability to Sunset Automatically					
Objectivity					



Favoured Approach



Concentration Model

- Might score less well than some on efficacy
- But scores highest on all other criteria
- Benefits of scoring highly on these other criteria outweigh any efficacy disadvantages, particularly given the overlap between scarcity and market power in behavioural models
- A simple behavioural model is proposed for the MMU “toolbox”

Implementation Issues



- Data sources
- Choice of market power thresholds
- Treatment of PSOs
- Availability of data and model to market participants
- Hardware & software requirements

Sample Results



- **ESB PG**
 - An average of 542 MW under contract (5 TWH)
 - About 350 MW around the clock
 - About an extra 250 MW in shoulder periods
 - About an extra 300 MW in evening peaks
- **NIE PPB**
 - No directed contracts

Sample Results



Preliminary Runs of Appendix A Model

Sensitivities to HHI Requirement

% Above SMP	HHI Target	Average HHI Before DC	ESBPG DC (MW)				Average ESBPG	ESBPG Percent of
			All Hours	Baseload	Mid-Merit	Peak	Available MW	Available Capacity in DC
5%	1,200	1,953	933	736	1,014	1,336	2,880	32%
5%	1,500	1,953	542	368	612	905	2,880	19%
5%	1,800	1,953	209	56	269	534	2,880	7%

Sensitivities to % Above SMP

% Above SMP	HHI Target	Average HHI Before DC	ESBPG DC (MW)			Average ESBPG	ESBPG Percent of	
			ESBPG DC (MW)	Baseload	Mid-Merit	Peak	Available MW	Available Capacity in DC
0%	1,500	1,880	460	259	544	857	2,711	17%
5%	1,500	1,953	542	368	612	905	2,880	19%
10%	1,500	2,015	615	456	679	954	3,027	20%

Note: All capacity is considered available so long as its cost is \leq the threshold cost of X% above SMP. That is, planned and forced outages are not presently considered in determining the HHI of available capacity. The SMPs used are from PLEXOS, and are affected by outages.

¹ Calculated as average contract size divided by average available capacity.

Sample Results



Scenario:	Status Quo
Percent above SMP:	5%
Target HHI	1,500

Average HHI with No DC

Month	Baseload	Mid-Merit	Peak	Average
Jan-07	2,053	2,333	2,480	2,202
Feb-07	2,036	2,336	2,494	2,193
Mar-07	1,819	1,848	1,970	1,812
Apr-07	1,890	2,163	n/a	2,000
May-07	1,815	1,879	n/a	1,810
Jun-07	1,793	1,869	n/a	1,788
Jul-07	1,793	1,846	n/a	1,776
Aug-07	1,801	1,993	n/a	1,873
Sep-07	1,830	2,038	2,124	1,920
Oct-07	1,827	2,231	2,324	2,048
Nov-07	1,806	2,188	2,348	2,021
Dec-07	1,832	2,177	2,357	2,018
Average	1,856	1,973	2,297	1,953

ESBPG Required DC MW¹

Month	Baseload	Mid-Merit	Peak	Average
Jan-07	569	910	1,075	786
Feb-07	551	924	1,114	788
Mar-07	316	387	513	368
Apr-07	404	767	n/a	609
May-07	313	425	n/a	373
Jun-07	289	408	n/a	352
Jul-07	288	381	n/a	336
Aug-07	297	562	n/a	449
Sep-07	327	626	694	507
Oct-07	365	855	941	665
Nov-07	340	813	1,001	643
Dec-07	371	805	1,011	649
Average	367	612	905	542

Sample Results



Scenario:	Status Quo
Percent above SMP:	5%
Target HHI	1,400

Average HHI with No DC

Month	Baseload	Mid-Merit	Peak	Average
Jan-07	2,053	2,333	2,480	2,202
Feb-07	2,036	2,336	2,494	2,193
Mar-07	1,819	1,848	1,970	1,812
Apr-07	1,890	2,163	n/a	2,000
May-07	1,815	1,879	n/a	1,810
Jun-07	1,793	1,869	n/a	1,788
Jul-07	1,793	1,846	n/a	1,776
Aug-07	1,801	1,993	n/a	1,873
Sep-07	1,830	2,038	2,124	1,920
Oct-07	1,827	2,231	2,324	2,048
Nov-07	1,806	2,188	2,348	2,021
Dec-07	1,832	2,177	2,357	2,018
Average	1,856	1,973	2,297	1,953

ESBPG Required DC MW¹

Month	Baseload	Mid-Merit	Peak	Average
Jan-07	687	1,040	1,209	910
Feb-07	669	1,056	1,252	913
Mar-07	427	512	639	485
Apr-07	520	905	n/a	735
May-07	423	552	n/a	490
Jun-07	398	532	n/a	467
Jul-07	397	504	n/a	450
Aug-07	407	693	n/a	569
Sep-07	437	761	826	629
Oct-07	488	992	1,078	795
Nov-07	462	951	1,143	773
Dec-07	495	945	1,153	779
Average	483	738	1,040	664

Sample Results



Scenario:	Status Quo
Percent above SMP:	5%
Target HHI	1,300

Average HHI with No DC

Month	Baseload	Mid-Merit	Peak	Average
Jan-07	2,053	2,333	2,480	2,202
Feb-07	2,036	2,336	2,494	2,193
Mar-07	1,819	1,848	1,970	1,812
Apr-07	1,890	2,163	n/a	2,000
May-07	1,815	1,879	n/a	1,810
Jun-07	1,793	1,869	n/a	1,788
Jul-07	1,793	1,846	n/a	1,776
Aug-07	1,801	1,993	n/a	1,873
Sep-07	1,830	2,038	2,124	1,920
Oct-07	1,827	2,231	2,324	2,048
Nov-07	1,806	2,188	2,348	2,021
Dec-07	1,832	2,177	2,357	2,018
Average	1,856	1,973	2,297	1,953

ESBPG Required DC MW¹

Month	Baseload	Mid-Merit	Peak	Average
Jan-07	812	1,178	1,350	1,041
Feb-07	794	1,195	1,397	1,044
Mar-07	544	645	772	609
Apr-07	645	1,051	n/a	869
May-07	542	686	n/a	615
Jun-07	515	664	n/a	589
Jul-07	513	635	n/a	572
Aug-07	524	833	n/a	697
Sep-07	555	905	966	759
Oct-07	619	1,138	1,221	932
Nov-07	592	1,098	1,292	910
Dec-07	626	1,093	1,302	917
Average	605	871	1,183	794

Sample Results



Scenario:	Status Quo
Percent above SMP:	5%
Target HHI	1,200

Average HHI with No DC

Month	Baseload	Mid-Merit	Peak	Average
Jan-07	2,053	2,333	2,480	2,202
Feb-07	2,036	2,336	2,494	2,193
Mar-07	1,819	1,848	1,970	1,812
Apr-07	1,890	2,163	n/a	2,000
May-07	1,815	1,879	n/a	1,810
Jun-07	1,793	1,869	n/a	1,788
Jul-07	1,793	1,846	n/a	1,776
Aug-07	1,801	1,993	n/a	1,873
Sep-07	1,830	2,038	2,124	1,920
Oct-07	1,827	2,231	2,324	2,048
Nov-07	1,806	2,188	2,348	2,021
Dec-07	1,832	2,177	2,357	2,018
Average	1,856	1,973	2,297	1,953

ESBPG Required DC MW¹

Month	Baseload	Mid-Merit	Peak	Average
Jan-07	944	1,323	1,500	1,179
Feb-07	926	1,343	1,550	1,184
Mar-07	671	788	915	743
Apr-07	779	1,207	n/a	1,013
May-07	669	830	n/a	750
Jun-07	640	805	n/a	721
Jul-07	638	776	n/a	703
Aug-07	650	982	n/a	834
Sep-07	682	1,060	1,116	899
Oct-07	759	1,292	1,374	1,077
Nov-07	731	1,253	1,451	1,057
Dec-07	766	1,249	1,461	1,064
Average	736	1,014	1,336	933

Sample Results



Scenario:	Status Quo
Percent above SMP:	5%
Target HHI	1,100

Average HHI with No DC

Month	Baseload	Mid-Merit	Peak	Average
Jan-07	2,053	2,333	2,480	2,202
Feb-07	2,036	2,336	2,494	2,193
Mar-07	1,819	1,848	1,970	1,812
Apr-07	1,890	2,163	n/a	2,000
May-07	1,815	1,879	n/a	1,810
Jun-07	1,793	1,869	n/a	1,788
Jul-07	1,793	1,846	n/a	1,776
Aug-07	1,801	1,993	n/a	1,873
Sep-07	1,830	2,038	2,124	1,920
Oct-07	1,827	2,231	2,324	2,048
Nov-07	1,806	2,188	2,348	2,021
Dec-07	1,832	2,177	2,357	2,018
Average	1,856	1,973	2,297	1,953

ESBPG Required DC MW¹

Month	Baseload	Mid-Merit	Peak	Average
Jan-07	1,087	1,479	1,659	1,328
Feb-07	1,068	1,501	1,715	1,333
Mar-07	809	943	1,071	888
Apr-07	924	1,377	n/a	1,169
May-07	807	987	n/a	896
Jun-07	776	959	n/a	863
Jul-07	774	929	n/a	845
Aug-07	787	1,145	n/a	983
Sep-07	821	1,228	1,278	1,051
Oct-07	910	1,456	1,536	1,233
Nov-07	880	1,420	1,621	1,214
Dec-07	917	1,417	1,631	1,222
Average	878	1,168	1,499	1,083

Sample Results



Scenario:	Status Quo
Percent above SMP:	5%
Target HHI	1,000

Average HHI with No DC

Month	Baseload	Mid-Merit	Peak	Average
Jan-07	2,053	2,333	2,480	2,202
Feb-07	2,036	2,336	2,494	2,193
Mar-07	1,819	1,848	1,970	1,812
Apr-07	1,890	2,163	n/a	2,000
May-07	1,815	1,879	n/a	1,810
Jun-07	1,793	1,869	n/a	1,788
Jul-07	1,793	1,846	n/a	1,776
Aug-07	1,801	1,993	n/a	1,873
Sep-07	1,830	2,038	2,124	1,920
Oct-07	1,827	2,231	2,324	2,048
Nov-07	1,806	2,188	2,348	2,021
Dec-07	1,832	2,177	2,357	2,018
Average	1,856	1,973	2,297	1,953

ESBPG Required DC MW¹

Month	Baseload	Mid-Merit	Peak	Average
Jan-07	1,241	1,646	1,832	1,487
Feb-07	1,222	1,672	1,892	1,495
Mar-07	963	1,114	1,243	1,049
Apr-07	1,085	1,564	n/a	1,340
May-07	962	1,160	n/a	1,057
Jun-07	927	1,128	n/a	1,021
Jul-07	925	1,097	n/a	1,003
Aug-07	939	1,324	n/a	1,148
Sep-07	975	1,414	1,458	1,219
Oct-07	1,075	1,634	1,711	1,403
Nov-07	1,043	1,600	1,804	1,385
Dec-07	1,082	1,599	1,814	1,393
Average	1,035	1,336	1,677	1,248

Sample Results



Scenario:	Status Quo
Percent above SMP:	5%
Target HHI	1,600

Average HHI with No DC

Month	Baseload	Mid-Merit	Peak	Average
Jan-07	2,053	2,333	2,480	2,202
Feb-07	2,036	2,336	2,494	2,193
Mar-07	1,819	1,848	1,970	1,812
Apr-07	1,890	2,163	n/a	2,000
May-07	1,815	1,879	n/a	1,810
Jun-07	1,793	1,869	n/a	1,788
Jul-07	1,793	1,846	n/a	1,776
Aug-07	1,801	1,993	n/a	1,873
Sep-07	1,830	2,038	2,124	1,920
Oct-07	1,827	2,231	2,324	2,048
Nov-07	1,806	2,188	2,348	2,021
Dec-07	1,832	2,177	2,357	2,018
Average	1,856	1,973	2,297	1,953

ESBPG Required DC MW¹

Month	Baseload	Mid-Merit	Peak	Average
Jan-07	456	785	947	668
Feb-07	439	797	983	669
Mar-07	212	269	395	257
Apr-07	293	637	n/a	490
May-07	208	306	n/a	262
Jun-07	186	290	n/a	243
Jul-07	185	264	n/a	227
Aug-07	194	438	n/a	335
Sep-07	222	498	570	391
Oct-07	247	723	811	542
Nov-07	223	680	866	519
Dec-07	253	673	876	524
Average	258	492	776	425

Sample Results



Scenario:	Status Quo
Percent above SMP:	5%
Target HHI	1,700

Average HHI with No DC

Month	Baseload	Mid-Merit	Peak	Average
Jan-07	2,053	2,333	2,480	2,202
Feb-07	2,036	2,336	2,494	2,193
Mar-07	1,819	1,848	1,970	1,812
Apr-07	1,890	2,163	n/a	2,000
May-07	1,815	1,879	n/a	1,810
Jun-07	1,793	1,869	n/a	1,788
Jul-07	1,793	1,846	n/a	1,776
Aug-07	1,801	1,993	n/a	1,873
Sep-07	1,830	2,038	2,124	1,920
Oct-07	1,827	2,231	2,324	2,048
Nov-07	1,806	2,188	2,348	2,021
Dec-07	1,832	2,177	2,357	2,018
Average	1,856	1,973	2,297	1,953

ESBPG Required DC MW¹

Month	Baseload	Mid-Merit	Peak	Average
Jan-07	348	666	824	555
Feb-07	332	676	857	555
Mar-07	112	157	282	152
Apr-07	188	513	n/a	376
May-07	109	192	n/a	156
Jun-07	88	178	n/a	139
Jul-07	87	153	n/a	124
Aug-07	95	319	n/a	227
Sep-07	123	376	451	281
Oct-07	135	597	687	424
Nov-07	112	554	736	400
Dec-07	141	545	746	406
Average	154	378	653	314

Sample Results



Scenario:	Status Quo
Percent above SMP:	5%
Target HHI	1,800

Average HHI with No DC

Month	Baseload	Mid-Merit	Peak	Average
Jan-07	2,053	2,333	2,480	2,202
Feb-07	2,036	2,336	2,494	2,193
Mar-07	1,819	1,848	1,970	1,812
Apr-07	1,890	2,163	n/a	2,000
May-07	1,815	1,879	n/a	1,810
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Nov-07	1,806	2,188	2,348	2,021
Dec-07	1,832	2,177	2,357	2,018
Average	1,856	1,973	2,297	1,953

ESBPG Required DC MW¹

Month	Baseload	Mid-Merit	Peak	Average
Jan-07	245	551	707	447
Feb-07	229	560	737	446
Mar-07	17	50	174	52
Apr-07	87	394	n/a	268
May-07	14	83	n/a	55
Jun-07	0	71	n/a	42
Jul-07	0	47	n/a	28
Aug-07	1	206	n/a	124
Sep-07	28	259	338	176
Oct-07	28	476	567	310
Nov-07	6	432	612	286
Dec-07	34	423	622	292
Average	56	269	534	209

Summary of Consultation Topics



- The choice of models to be evaluated and criteria to use
- The RAs' preference for concentration as opposed to the other models set out in the paper
- The concentration measures (target HHI level) proposed by the RAs
- Detailed methodology and data sources
- Alternate proposals including, if desired, behavioural approaches

Next Steps



- Consultation closes
 - 20th October
- Decision paper
 - Early December