Electricity Strategy Game: Profit-Maximizing Bid Report

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1 Market Analysis

To determine the optimal bidding strategy, we analyzed the intersection of the Residual Demand curve and the marginal cost of the Big Gas portfolio. The analysis assumes rational behavior from rival firms (bidding Marginal Cost + 10%).

1.1 Total Market Demand

The total market demand function is given by $Q_D = 18,341 - 5.69P$. At the identified optimal market-clearing price of **\$64.10/MWh**, the total demand is:

$$Q = 18,341 - 5.69(64.10) \approx \mathbf{17,976} \text{ MW} \tag{1}$$

1.2 Residual Demand Calculation

Residual Demand (RD) represents the portion of total demand left for Big Gas after accounting for all cheaper rival generation (S_{others}). At a price of \$64.10, the cumulative supply from rival firms (up to the San Bernadino unit) is 16,200 MW.

$$RD = Q_D - S_{others} = 17,976 - 16,200 = \mathbf{1,776} \text{ MW} \tag{2}$$

By supplying 1,776 MW, Big Gas clears the market at \$64.10, effectively undercutting the next most expensive rival unit (Contra Costa 4&5, priced at \$64.11).

2 Proposed Bid Function

The optimal strategy employs **Economic Withholding**. We bid our baseload units at their marginal cost to ensure they are dispatched. We bid our marginal unit (South Bay) at the strategic limit price of \$64.10. We withhold the remaining high-cost units by bidding them near the price cap to avoid depressing the market clearing price.

3 Visualization of Market Equilibrium

The figure below illustrates the Big Gas Marginal Cost curve (pink), and our strategic Bid Function (red).

Table 1: Profit-Maximizing Bid Schedule for Big Gas

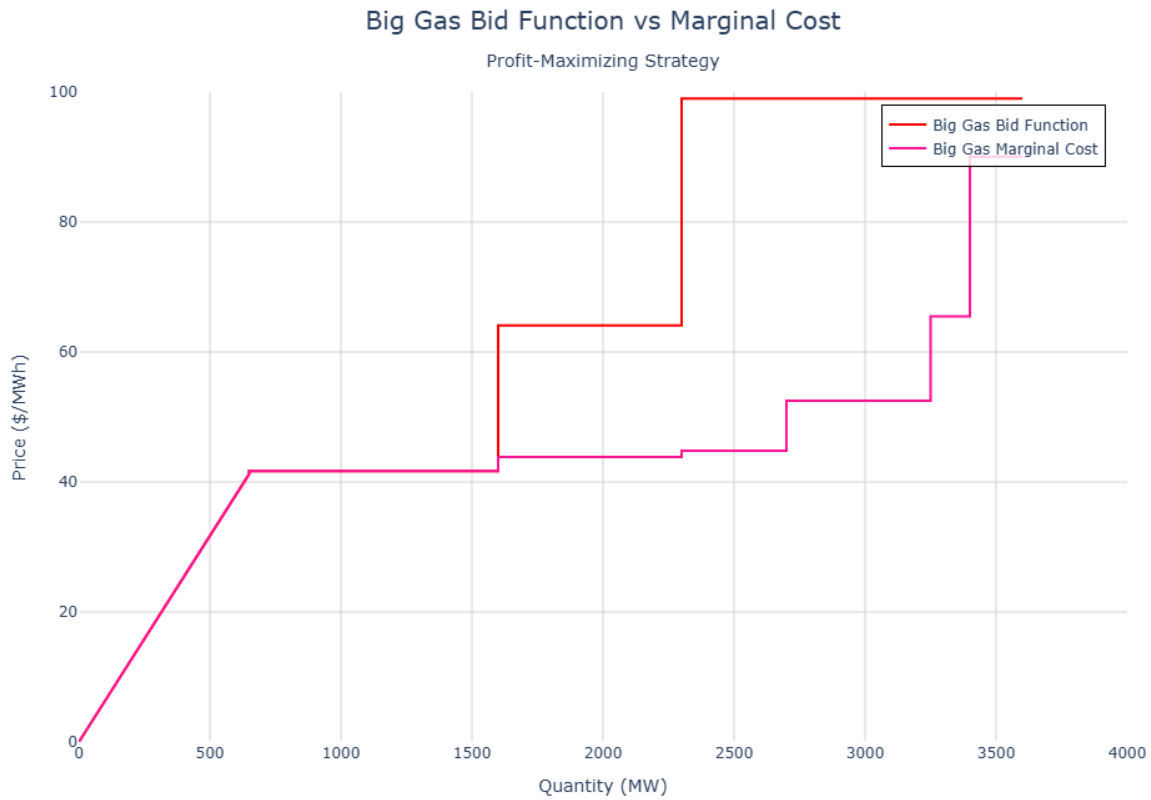| Step	Unit Name	Quantity (MW)	Bid Price ($/MWh)	Strategy
1	El Segundo 3&4	650	$41.22	Base Load (Bid Cost)
2	Encina	950	$41.67	Base Load (Bid Cost)
3	**South Bay**	**700**	**$64.10**	**Price Setting Unit**
4	El Segundo 1&2	400	$99.00	Economic Withholding
5	Long Beach	550	$99.00	Economic Withholding
6	North Island	150	$99.00	Economic Withholding
7	Kearny	200	$99.00	Economic Withholding

Figure 1: Market Equilibrium: Supply, Demand, and Strategic Bidding

4   Financial Projections

Based on this bid strategy, the projected hourly outcome is:

- **Total Revenue:** $1,776$ MW $\times$ $64.10/MWh $=$ $113,841$

- **Total Cost:** $74,093$

- **Projected Hourly Profit:** $\mathbf{\$39,748}$