

Designing a Competitive Electricity Market

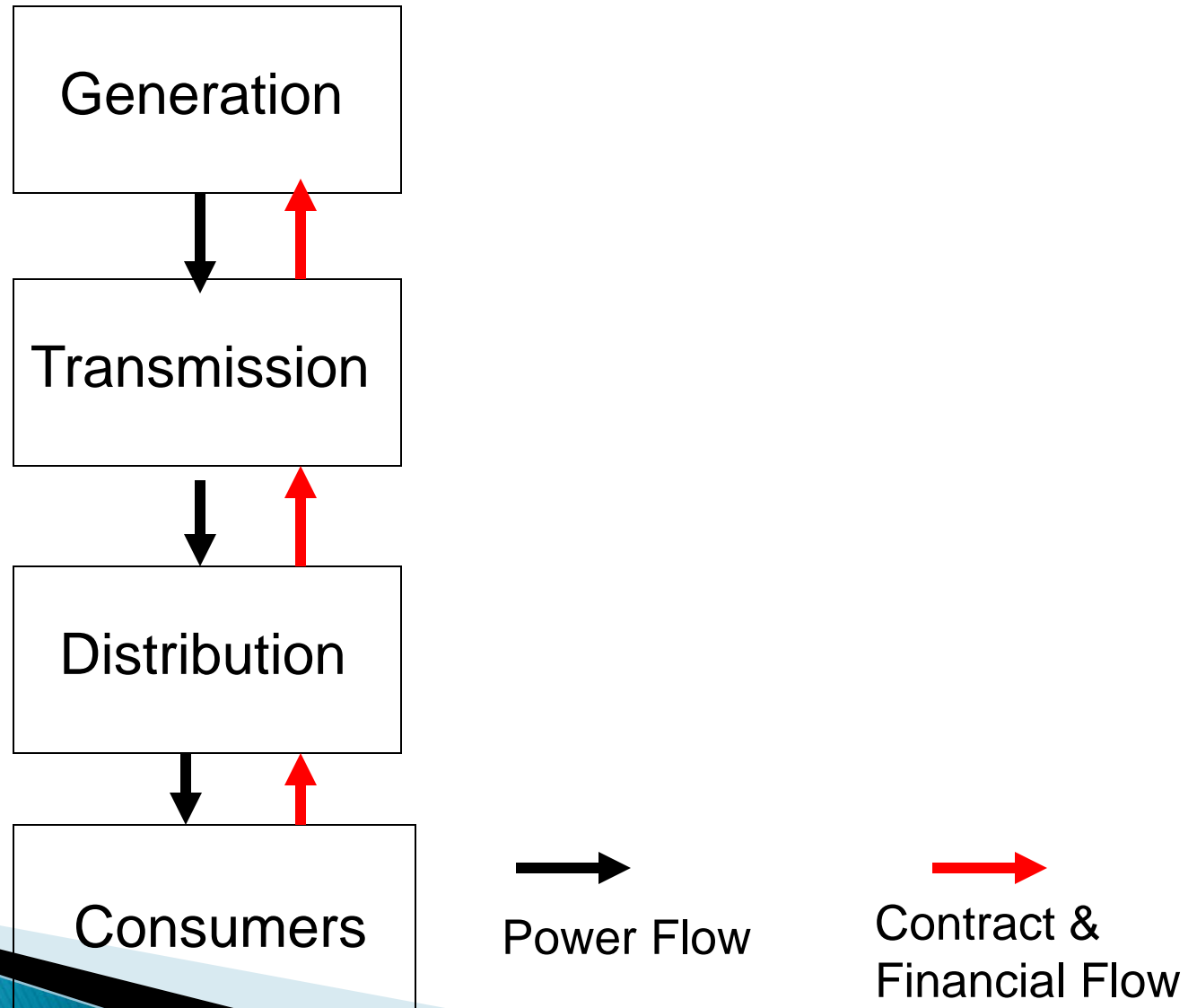
5 September 2014



Precedents

- ▶ December 2013: Meralco's generation cost of previous month reached P9.107/kWh, 66% higher than previous year's level
- ▶ Malampaya shutdown (11 Nov – 10 Dec 2013)
- ▶ 15 power plants went on outage at different times
 - Lowest recorded outage: 1,182 MW (22 Nov 2013)
 - Highest recorded outage: 3,505 MW (6 Dec 2013)
- ▶ Bayan Muna et al. blamed the price spike to regulatory capture
- ▶ 650-MW Malaya Thermal Power Plant was not operated to ease power supply condition
- ▶ MERALCO blamed it to market design: uniform price auction, gross pool, must-offer rule (MOR)

TRADITIONAL MARKET STRUCTURE



SCOPE FOR COMPETITION

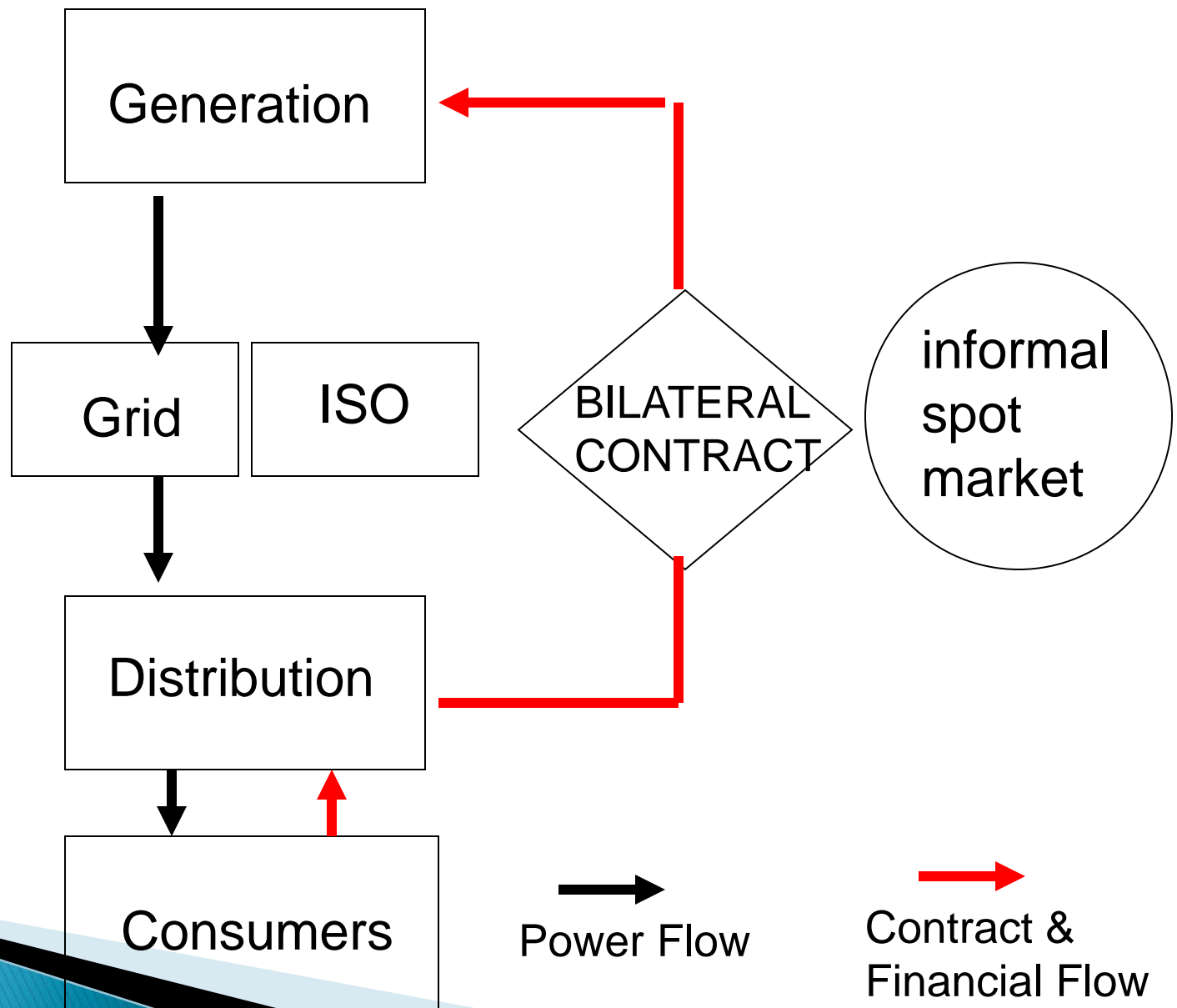
▶ Wholesale Competition

- All generators could sell power to distribution utilities and wholesale customers
 - BILATERAL CONTRACTING
 - SPOT MARKET

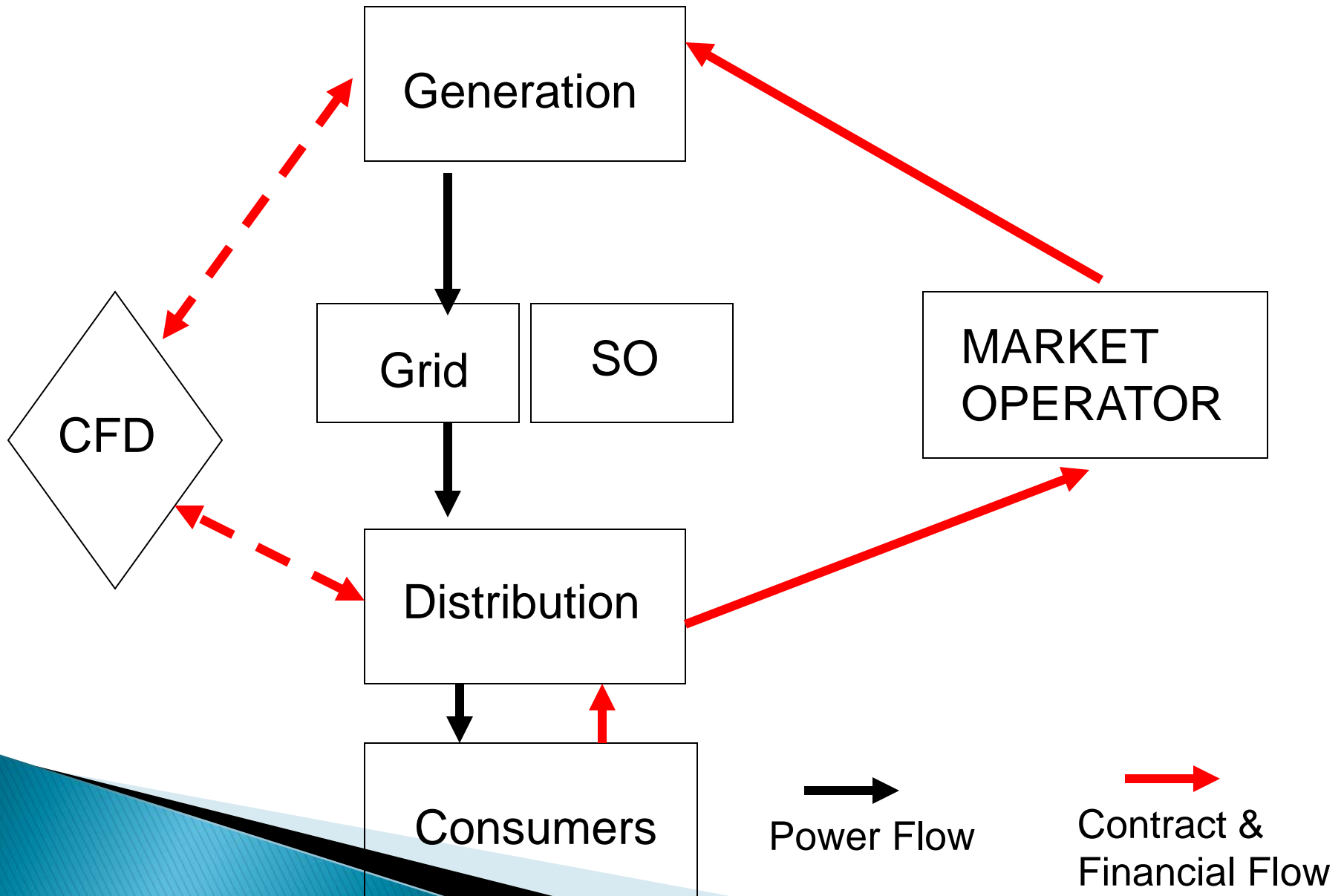
▶ Retail Competition

- Customers can choose to purchase electricity from power marketers or directly from generators

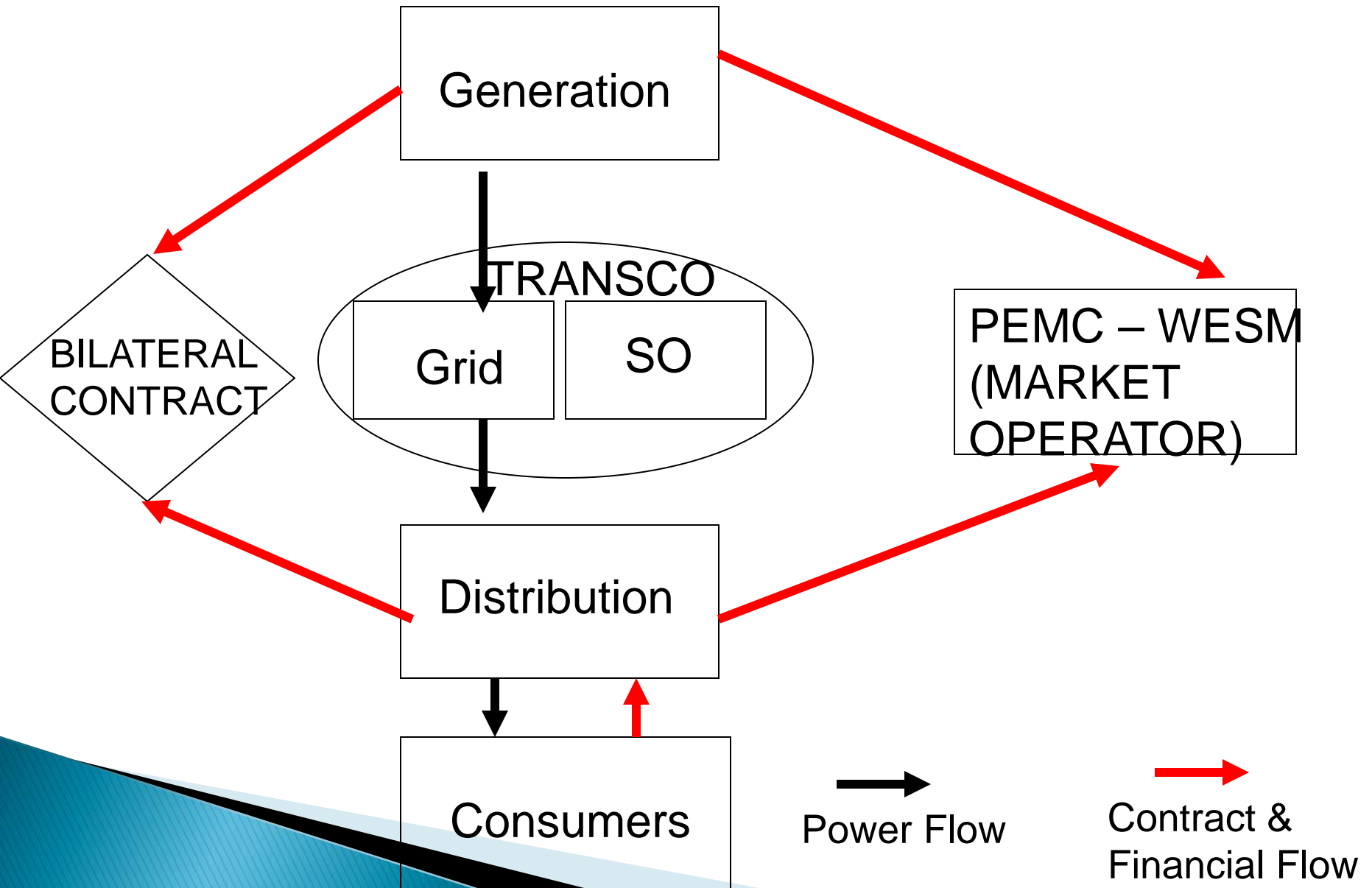
BILATERAL CONTRACTING



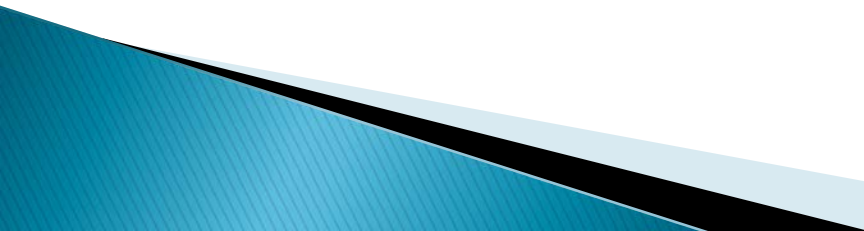
SPOT MARKET



PHILIPPINE POWER MARKET



WHOLESALE ELECTRICITY MARKET

- ▶ Official spot market
 - Accepts Offers to Sell from generators and Demand Bids from distributors and customers
 - ▶ Gross Pool
 - all energy transactions scheduled through the market
 - ▶ Net settlement
 - Bilateral contract quantities settled outside the market
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WHOLESALE ELECTRICITY MARKET

- ▶ **Locational Marginal Pricing**
 - one system marginal price but 390 nodal prices reflecting transmission losses and congestion
- ▶ **Self-governance**
- ▶ **Mandatory market**
 - Distributors must procure at least 10% of energy requirement from WESM until June 2011

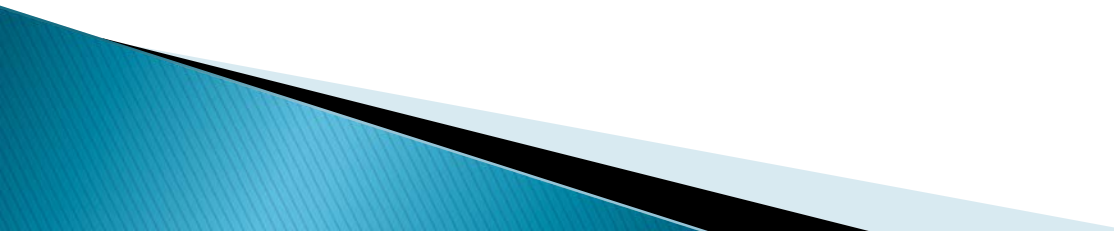
WHOLESALE ELECTRICITY MARKET

- ▶ Currently operated by the Philippine Electricity Market Corporation (PEMC)
 - Formed in August 2004 as the autonomous group market operator (AGMO) to undertake the preparations for and the initial operations of WESM
 - Section 30 of EPIRA:
 - “...**Not later than one (1) year** after the implementation of the wholesale electricity spot market, an **independent** entity shall be formed and the functions, assets and liabilities of the market operator shall be transferred to such entity ...”

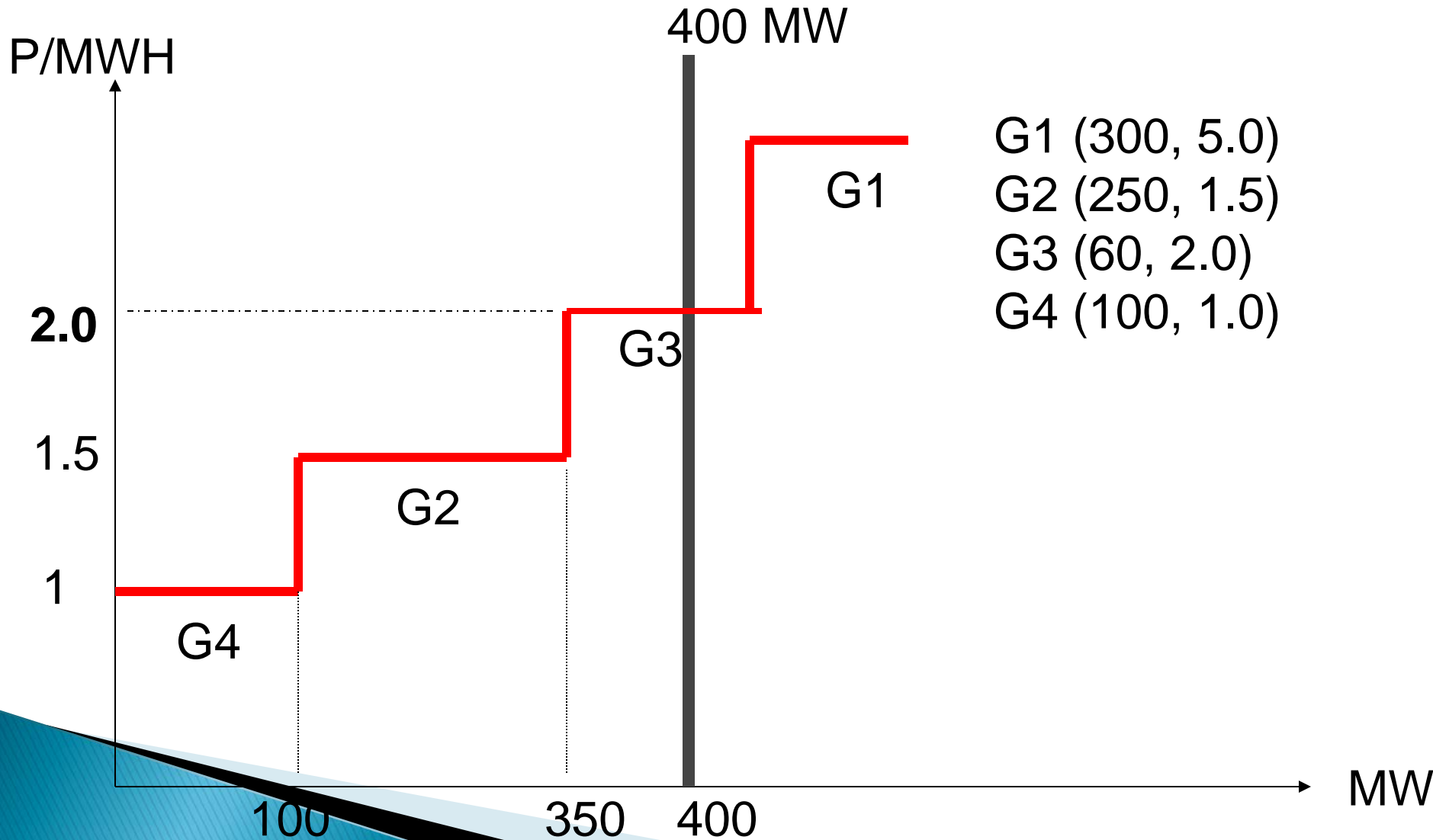
AUCTION PROTOCOL

- ▶ All generators must submit hourly offers of price and quantity
 - 7 days earlier up to 2 hours before the trading hour
- ▶ If no offer is received, MO uses standing (default) offers.
- ▶ Offers may contain up to 10 energy blocks
 - Min size = 5 MW
 - 1st block = minimum generation level (P_{\min})
 - Monotonically increasing prices

AUCTION PROTOCOL

- ▶ Negative offer prices allowed
 - Bid cap at P62,000/MWH – (now P32,000/kWh)
 - ▶ **MUST OFFER** all available capacity but not to exceed registered capacity
 - ▶ Seller must declare bilateral quantity and identify buyer
 - ▶ MO issues day-ahead and week-ahead projection of load demand
 - ▶ Uniform price auction
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PRICE DETERMINATION



PRICE DETERMINATION

- ▶ Market Dispatch Optimization Model (MDOM)
 - Maximize total surplus subject to limitations of the power system and transmission facilities

$LMP = SMP + \text{cost of line losses} + \text{cost of transmission congestion}$

- ▶ 2 prices calculated: ex-ante and ex-post

ADMINISTERED PRICES

- ▶ **Market intervention by the System Operator and market suspension by the ERC**
- ▶ **Conditions for market intervention (WESM rules 6.3.1.2)**
 - (a) Significant electricity supply capacity shortfall**
 - (b) Power system disturbance due to an outage**
 - (c) Significant environmental phenomenon**
 - (d) System blackout**
 - (e) Material damage to a distribution system**
 - (f) Government declaration of an emergency**

ADMINISTERED PRICES

- ▶ Conditions for Suspension of the Market
 - (i) Natural calamities;
 - (ii) National or international security emergency declared by the President

MARKET OUTCOMES

▶ Large Capacity Gap

- Of registered capacity, only 80% is available
- Of available capacity, only 60% is offered

▶ Wide price variations

- **Oct. 2007** LWAP ex-post
 - Maximum = 29,763.43
 - Minimum = -1.51
 - Average = 3,154.47
 - 75% of the time, less than 4,000
- **Nov. 2013** LWAP ex-post
 - Maximum = 64,950.00
 - Minimum = 1,024.58
 - Average = 17,515.59
 - 44% of the time, above 10,000

MARKET OUTCOMES

- ▶ **Frequent price errors**
 - caused by undergeneration and line congestions

- ▶ **Increasing share of bilateral contract transactions**
 - Share of bilateral contract quantity
 - Oct. 2006 : 55%
 - Oct. 2009 : 88%
 - Oct. 2012 : 92%
 - Nov 2013 : 88.5%
 - Dec 2013 : 85.9%

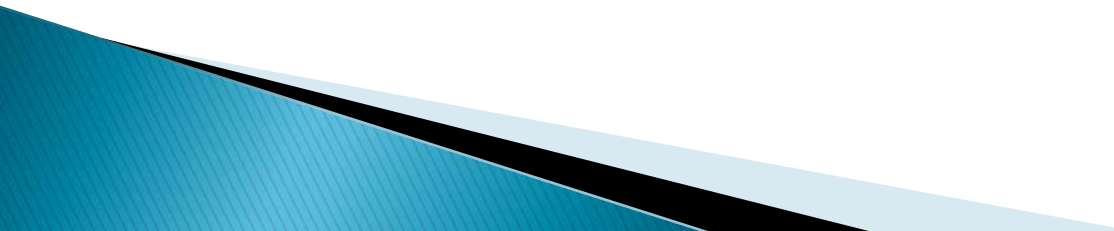
OPPORTUNITIES FOR STRATEGIC BEHAVIOR

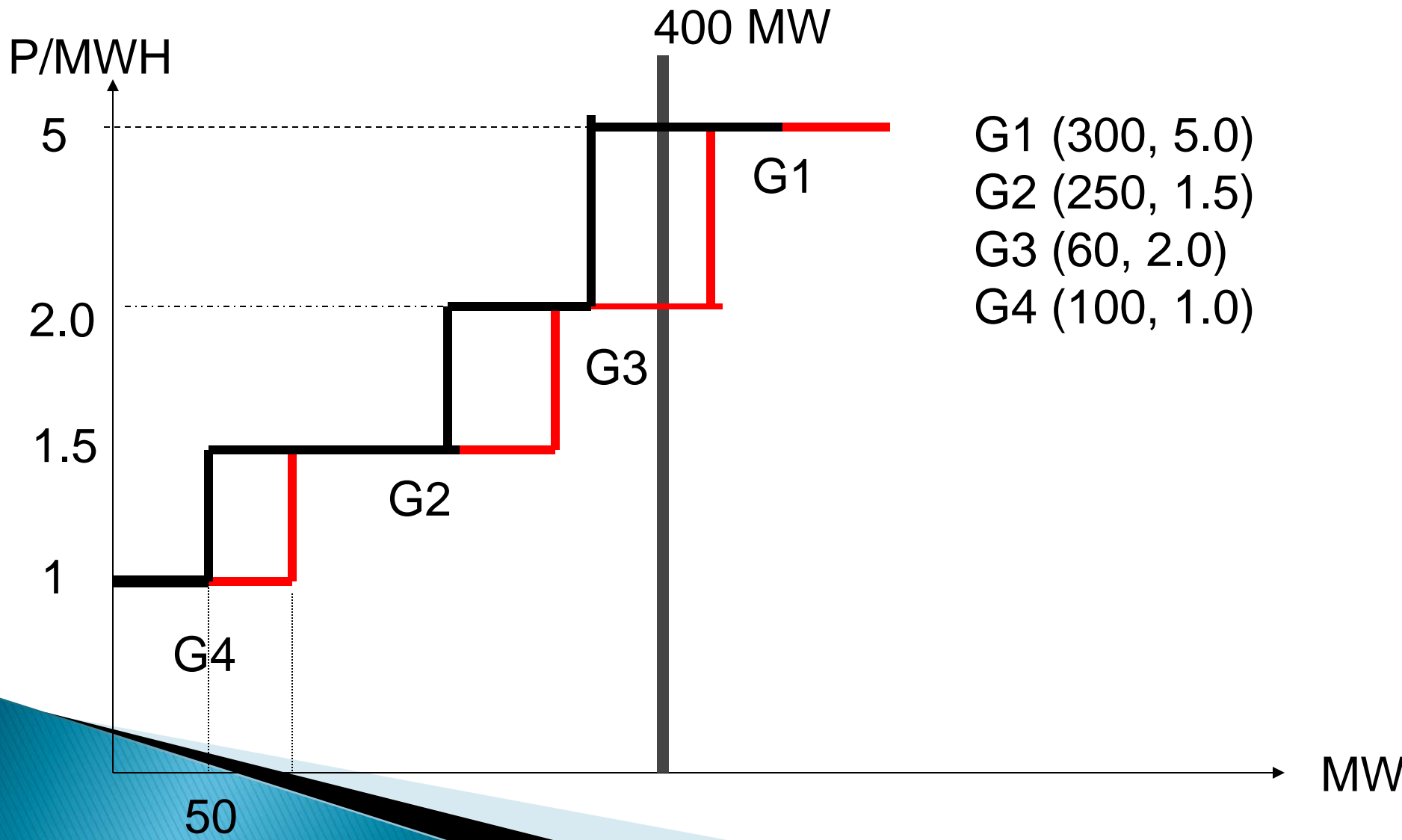
CAPACITY WITHHOLDING

- ▶ Physical withholding
 - Declare outages
 - Reduce output
 - Technical constraints (plant equipment–related failure)
 - Fuel constraints
- ▶ Economic withholding
 - Offering a block of electricity at a price sufficiently high so that it will not be dispatched

OPPORTUNITIES FOR STRATEGIC BEHAVIOR

BREACH DISPATCH ORDER

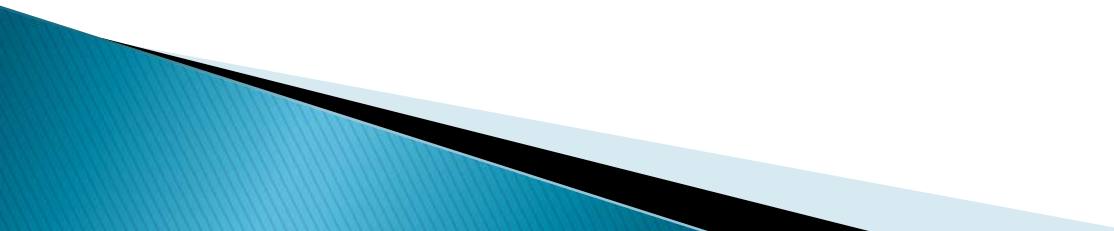
- Undergenerate when ex-ante SMP is low to raise ex-post SMP
 - Overgenerate when ex-ante SMP is high
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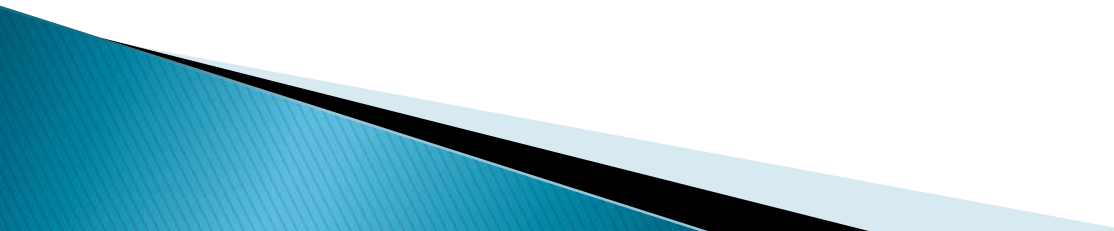
Why WESM prices rose

- ▶ Supply of power fell below the required contingency reserve level, but not enough to merit market intervention by the SO
- ▶ Market prices cleared at P62 /kWh even during off-peak hours
 - TMO (with bilateral contracts with MERALCO) offered at P62 /kWh during off-peak to avoid being dispatched due to the must-offer rule

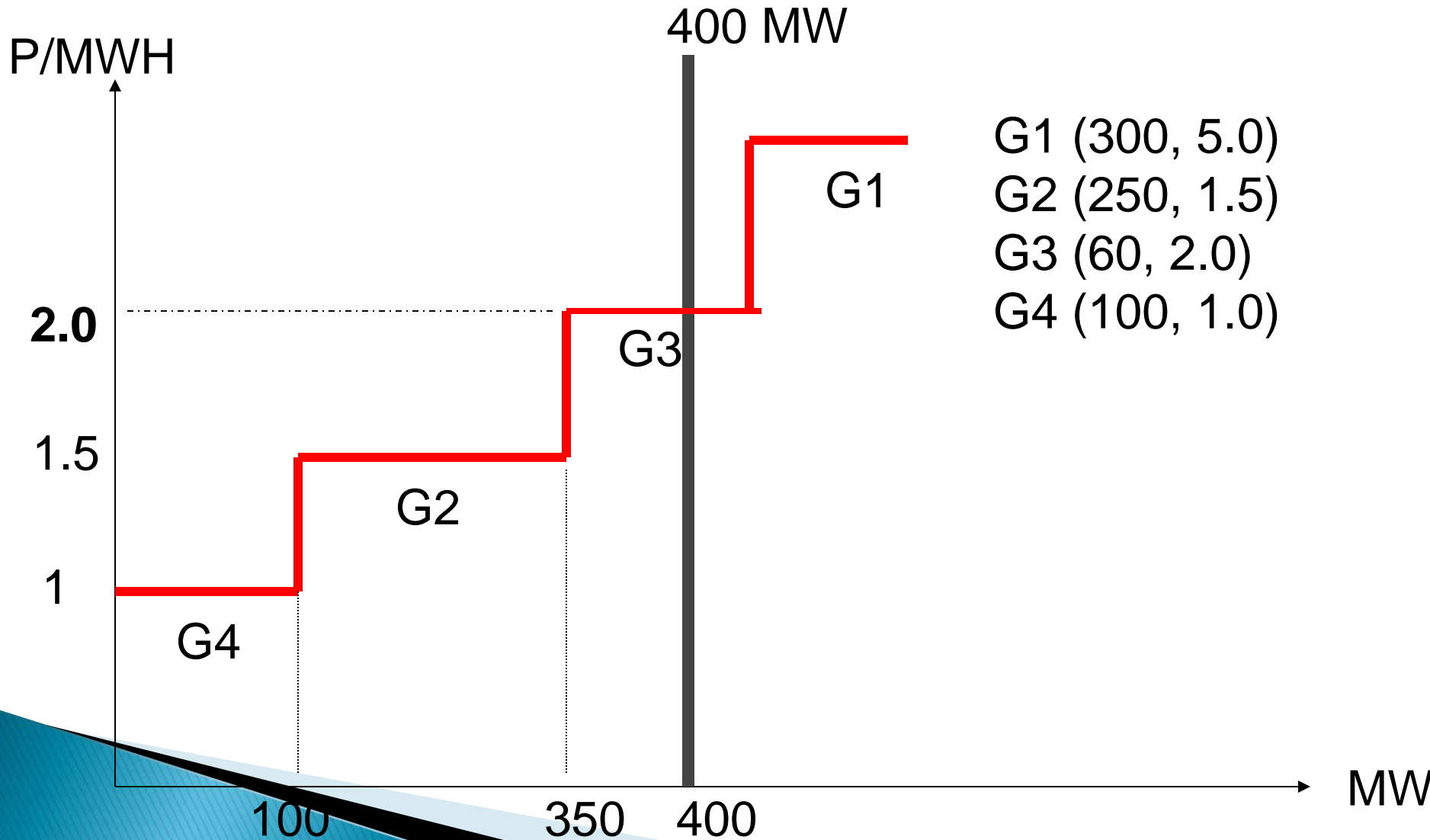
**Could a pay-as-bid scheme
avoided the price increase?**

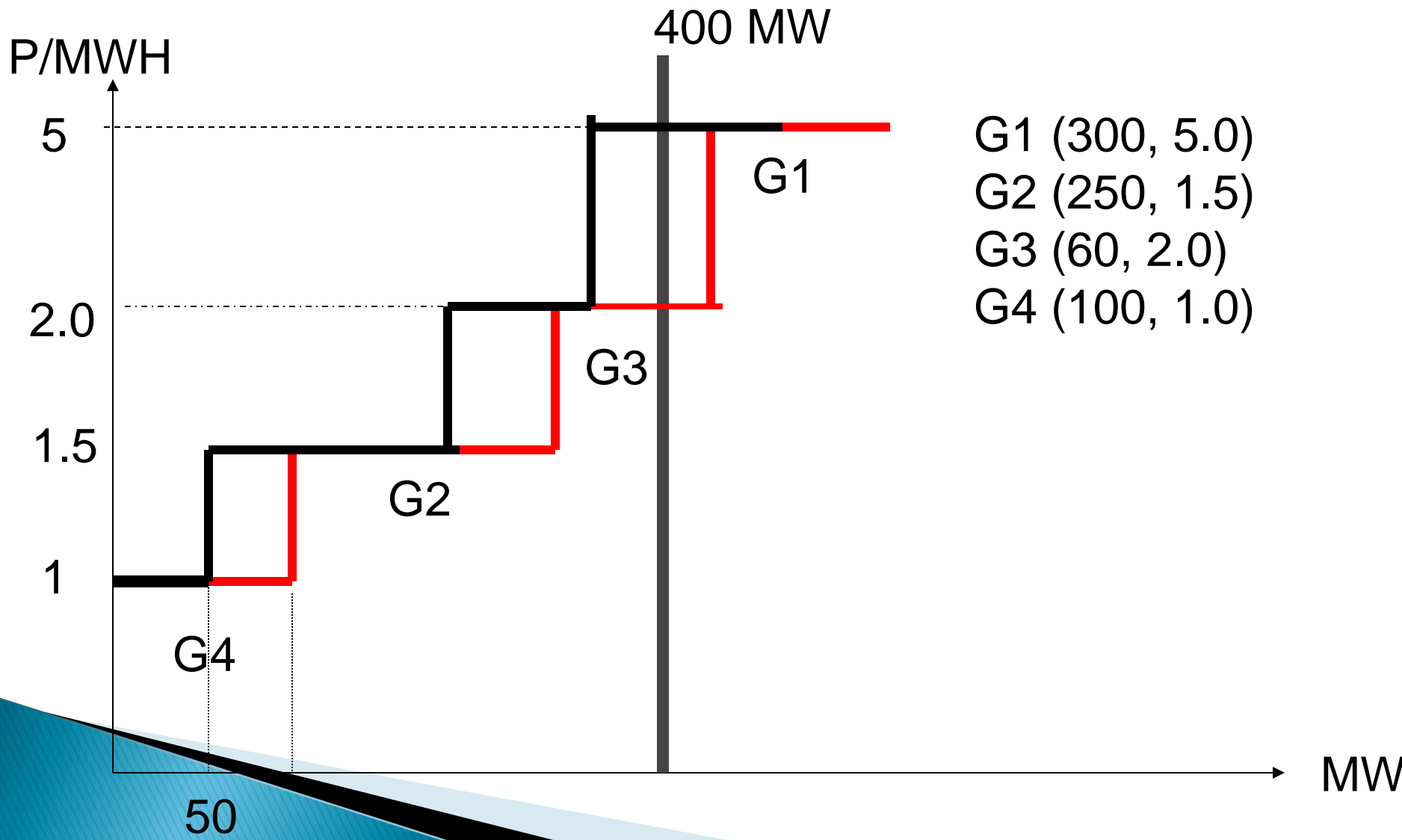


Claims

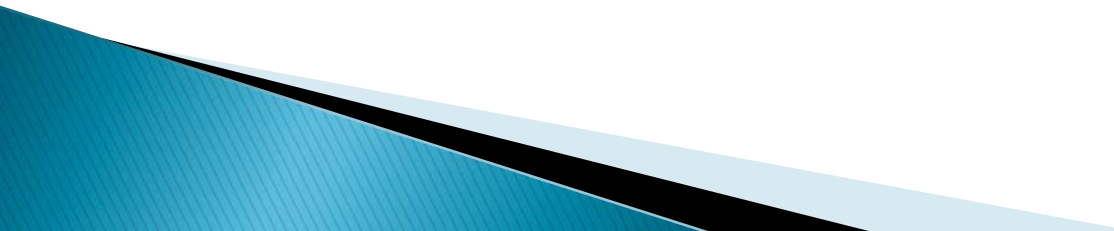
- ▶ Pay-as-bid scheme avoids the iniquity of making consumers pay more than the price generators are willing to accept.
 - ▶ Pay-as-bid scheme reduces the dominant suppliers' incentive to withhold capacity.
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PRICE DETERMINATION





Elements of a Competitive Market

- ▶ Adequacy of reserve margins and number of competing generators
 - ▶ Open access to transmission
 - ▶ Portfolio management by generators
 - Limited exposure to spot market
 - Bilateral contracts for resources of different types and duration
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Elements of a Competitive Market

- ▶ Customers capable of countering the market power of generators through demand responses
 - ▶ Effective market monitoring and surveillance to detect market power, reduce opportunities for capacity withholding and sanction breaches of market rules
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