ABOUT ELECTRICITY MARKETS

Power Markets and Trade in South Asia: Opportunities for Nepal

February 14-15, 2011

Models can be classified based on different structural characteristics.

Characteristic	**Model 1** Monopoly	**Model 2** Single buyer or Purchasing Agency	**Model 3** Wholesale competition	**Model 4** Retail Competition
Definition	Monopoly at all levels	Competition in generation-Single buyer model	Competition in generation and choice for Discoms	Competition for generation and choice for final consumers
Competing generators	No	Yes	Yes	Yes
Choice for retailers	No	No	Yes	Yes
Choice for Final consumers	No	No	No	Yes

Indian markets incorporate partial choice. Still largely PPA driven

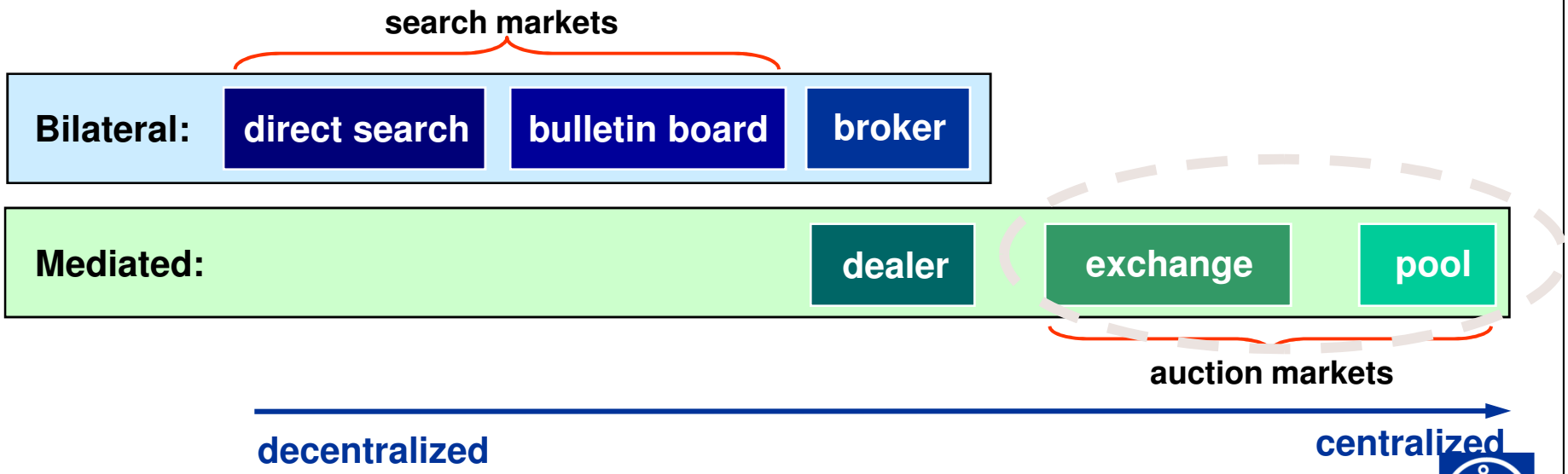
Increasing Market Power

Increasing Choice Competition

Forms of Market Mechanisms

Market Types

- Two basic ways to arrange trade between buyers and sellers:
  1. They can trade directly (bilateral trade)
  2. Producers can sell the product to an intermediary who sell it to the end-customer (mediated trade)
- Trading can take various forms, and use several platforms



Comparison among market types

Centralized

- **Lower transaction costs**
- **Quicker transactions**
- **High Liquidity**
- **Publicly observable prices:**
  Greater price transparency
  Easier monitoring

Decentralized

- **More flexible**
- **Need little design**
- **Low transaction speed but higher choice**
- **Higher transaction costs**
  search costs, evaluation of the counterparty credit risk

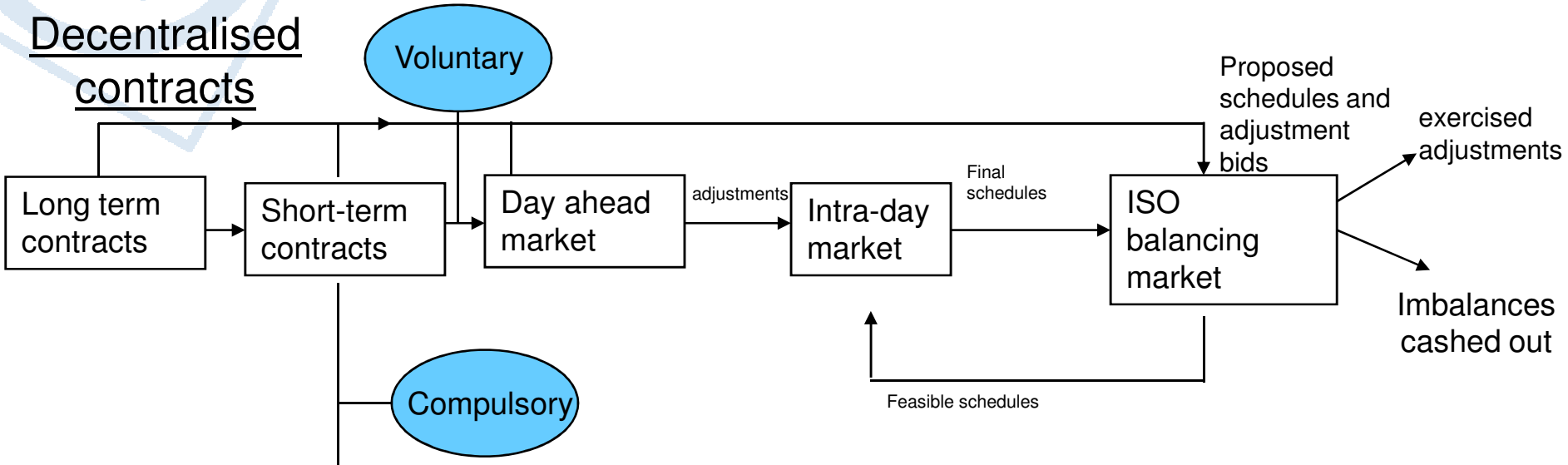
The entire market can be a mix of markets types

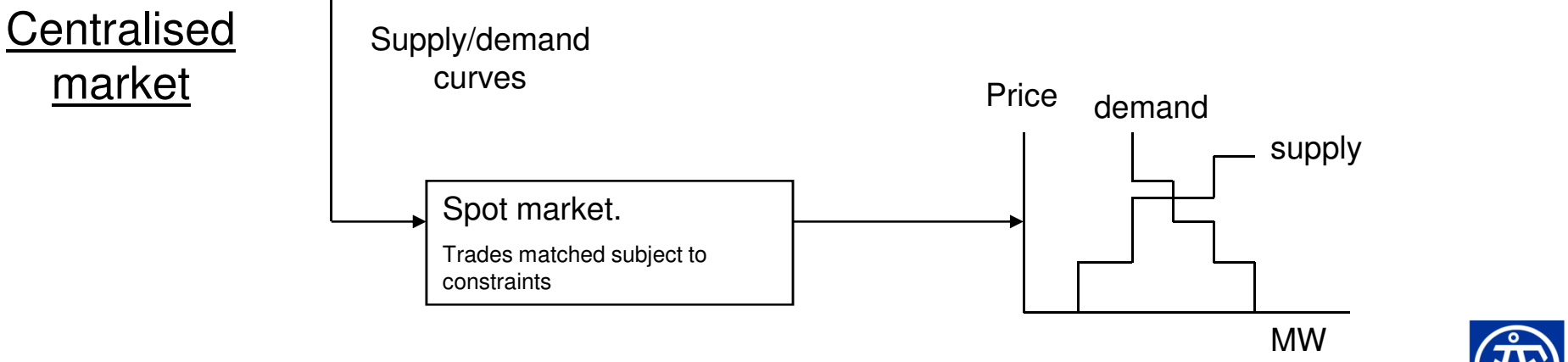
Example: in the long-term energy market, a bilateral forward markets and a centralized futures exchange that trades standardized contracts can co-exist

Trading Vs. Conventional Contracting

- Product differentiation occurs under trading arrangements since buyers value electricity delivered according to,
  - Peak and off-peak product
  - Seasonal product
  - Firm and non-firm product
  - Long term and short term product
- Conventional arrangements under a long term contracting regime does not normally allow for this kind of differentiation thus preventing the economic value being derived
  - Long term generation contracts do not directly differentiate between peak and off-peak availability either by time of the day or the season
  - Rates for consumers are rarely differentiated on seasonal or time of day basis. This is unlikely to change unless the changes occur on the supply side

How do you ensure that all willing buyers are matched with all willing sellers in the face of network constraints?





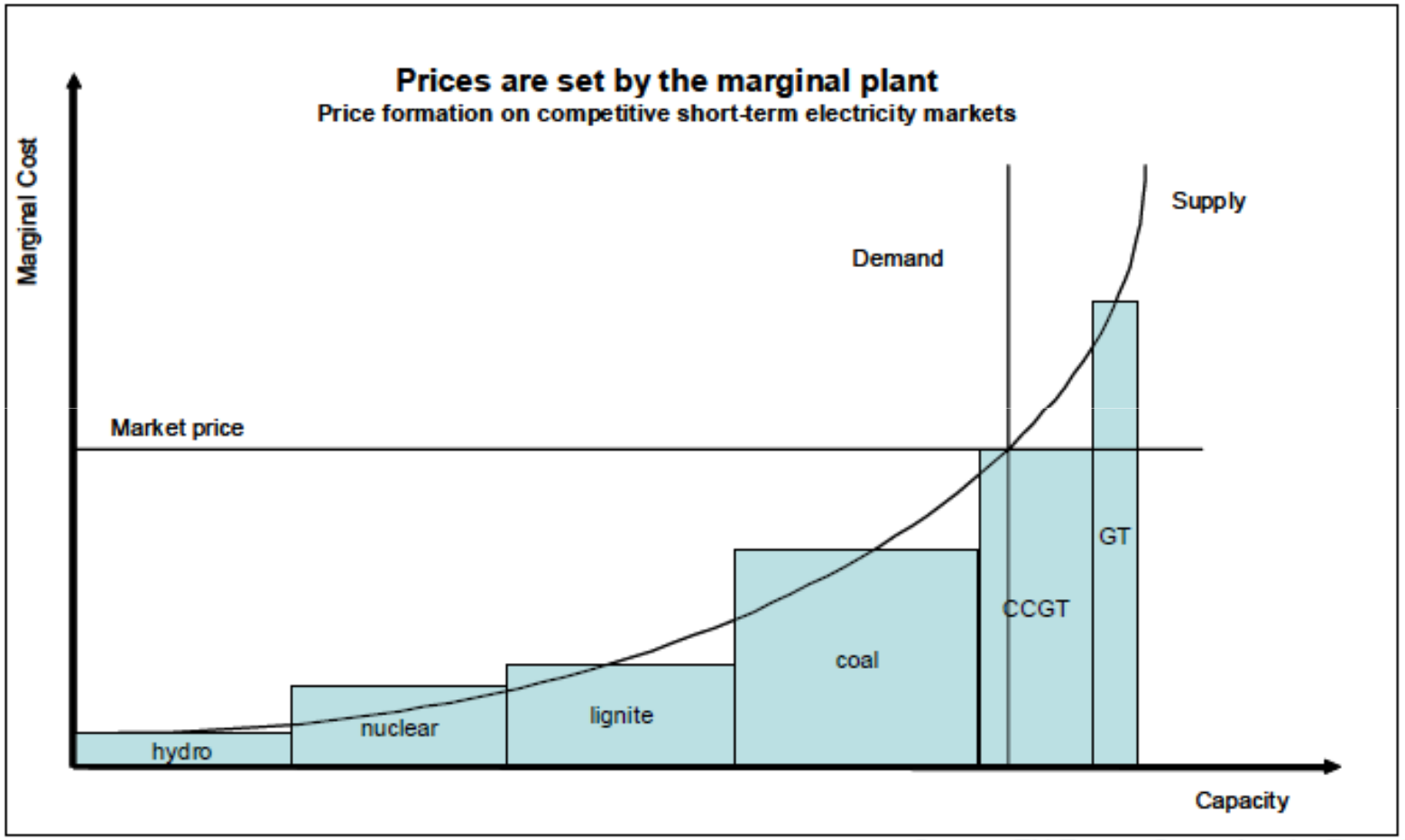
Important features that determine Market behaviour

- **Degree of horizontal concentration**: The greater the horizontal concentration, the more the possibility of the pool to be affected by exercise of market power. Depends not only overall market share but also the portfolio composition (base load, mid load, peakers)
- **Degree of vertical dis-aggregation:** Vertical concentration can affect market prices significantly
- **One way or two-way market structure:** Two way market observed to aid better price formation
- **Degree of privatisation**: The lesser the government ownership of pool participants the greater the incentive to maximise profit
- **Mandatory or voluntary pools**: Mandatory pools increase short term market power and increase need for regulatory oversight

Containing market power of firms is a key concern in market design

- Lack of depth often makes electricity markets – especially spot markets – extremely susceptible to market power
  - Demand and supply must be matched at all times in every part of the network
  - Most, if not all electricity must be delivered through the transmission network
  - Electricity is not storable and demand varies through the day
  - Production of electricity is subject to severe technical constraints
  - In real time operations the price elasticity of electricity consumption is nil
- By implication generators can exercise enormous amount of market power in a very short time
  - The current real time markets in India (based on ABT) and other regulations address this concern to some extent, but not entirely

Technology plays an important role in market price determination and capacity signalling…….



Source: EU Energy Sector Inquiry Report

* note: due to regulated fuel markets Indian marginal costs tend to be different from international benchmarks

Power Exchanges - Market Forms

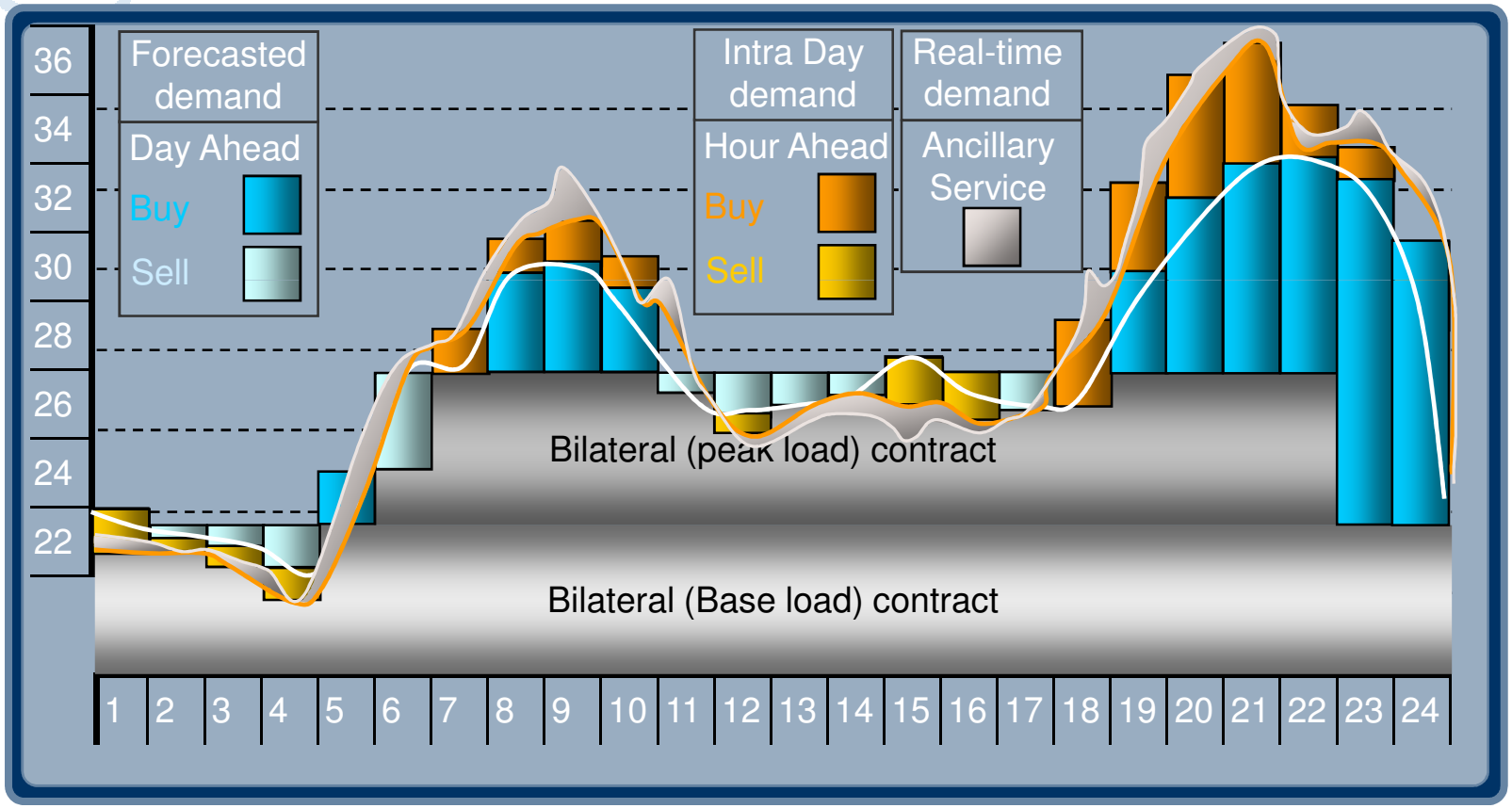
There are two basic forms of markets:

- **The physical market:** trades correspond to actual power flows
- **The financial market:** delivery of power is optional, only financial commitment

Market Forms	Spot/Term Market	Derivatives Market
Physical Market	Nordpool, APX, EEX, IEX, PXIL	
Financial Market		Nordpool, EEX

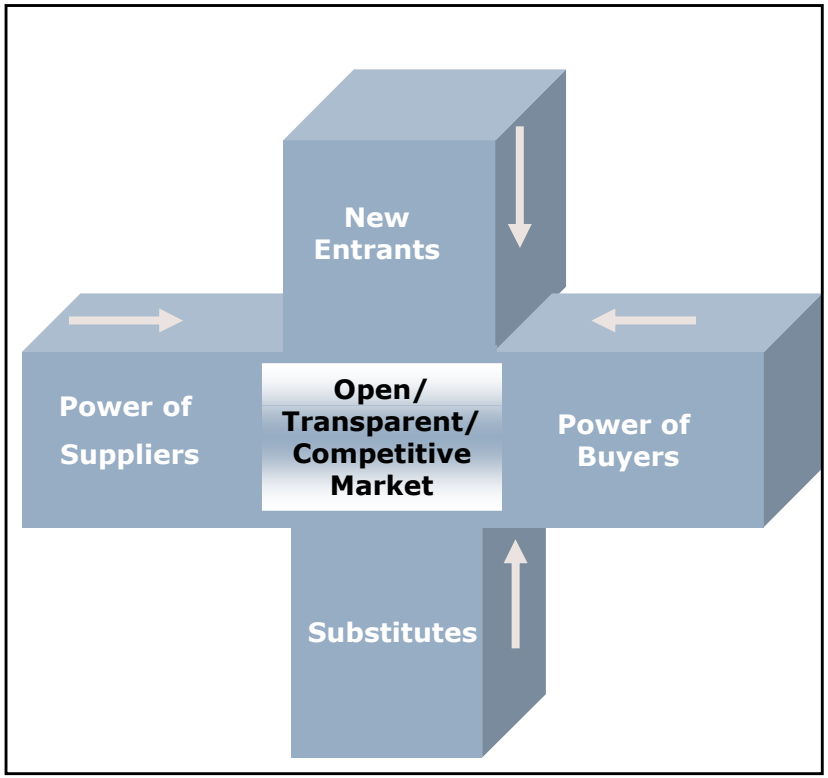
Power Exchanges help in maximizing efficiency

➔**Surpluses/Deficits** - Balance physical supply and demand



Typically, an exchange facilitates the following

- Price Transparency
  - Ability to know the price of electricity now and in the future (up to 15-18 months)
- Index based Trading
  - Buy/ Sell +/- Index
- Risk Management
  - Manage price/ delivery risk
  - Secure and Regulated market
- Guaranteed performance of trades
  - Credit tracking mechanism
  - Default Mitigation mechanism
- Lower Transaction Cost
- Flexibility
  - Term of delivery
  - Time of Closure
- **Access to a wider/ larger market spectrum**



Power Exchanges facilitate greater options

Market	Advantage	Drawback
Term	Known price over an extended period (determine a base level)	May prove to be price sub-optimal
Short Term Bilateral	High flexibility	Reported pricing
Day Ahead	Attractive pricing	Risky to source all volume here
Balancing Pool	Use to advantage in smaller percentages	Could be punitive

Why did competition come so late in electricity?

- Electricity traditionally considered to be “Natural Monopoly”
  - Scale economies perceived in generation/transmission
  - Highly interconnected transmission system. Difficulty exists in defining property rights and clear markets.
  - Many entities, few standard rules
- Technical issues make definition of rights and markets difficult
  - No real storage. Production must equal consumption “instantaneously”
  - Network externalities are pervasive and complex
- Maturing of generation technologies has happened only recently
  - CCGT in particular has negated increasing returns to scale
  - Information technology has permitted greater flexibility
  - Transmission has become more robust

Thank You