

Electricity Market Training Course CPPA-G

DAY 1

Your Commodities Risk Management Partner

Benefit from **25 years** of experience in the commodity industry

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Kasper Walet

- 25 +Years of commodity expertise
- Board Member of the Amsterdam Commodity Futures Exchange and Clearing House (1987-1997)
- Founder of Maycroft, Amsterdam (1997)
 - ~ We teach companies how to save money by managing their energy commodity and emission risks

Maycroft

- Since 1997
- Strategic Consulting
- Energy Trading and Risk Management
 - ~ Oil, Power, Gas, Coal, Weather, Emissions
- Active on global level
- Best Practice
- Services
 - ~ Maycroft Risk Scan
 - ~ Carbon Management

Global Electricity Market Trends driving PPA investments

Energy Transition

The falling cost of solar PV

Prices for solar PV modules have **fallen over 80 per cent** since 2008.

Solar PV will be at **grid parity in 80 per cent of countries** in the next 2 years.

Solar PV is already **cheaper than grid electricity** in 42 of the 50 **largest US cities**.

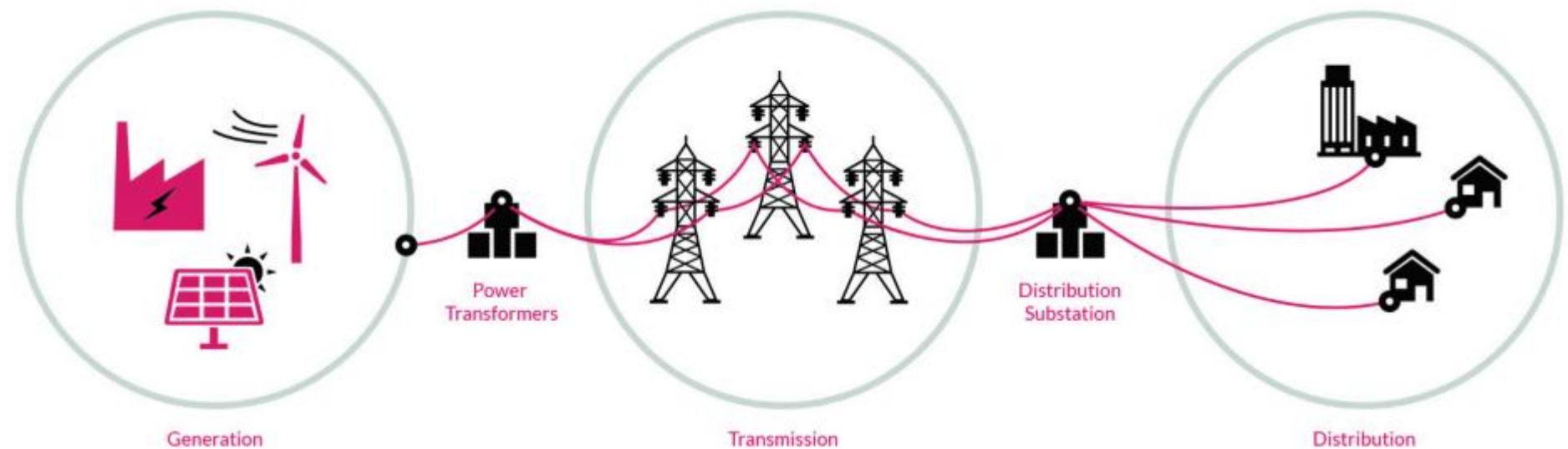
Technologies with proven track record

Industrial applications of **energy efficiency can deliver 100 per cent payback** in five years.

Modern wind turbines produce **x15 more electricity** than the typical wind turbine in 1990.

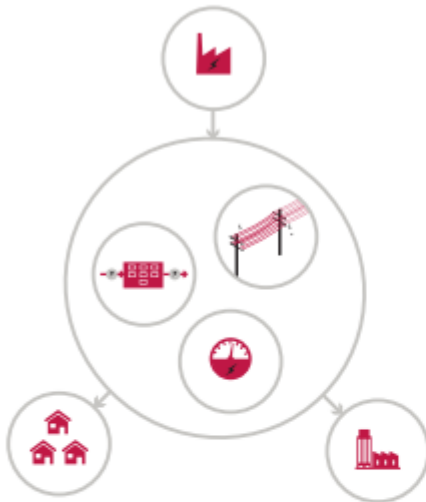
The **cost of energy storage** is expected to drop to **US\$100 per kWh** in the next five years, against US\$250 now.

Power Generating Markets

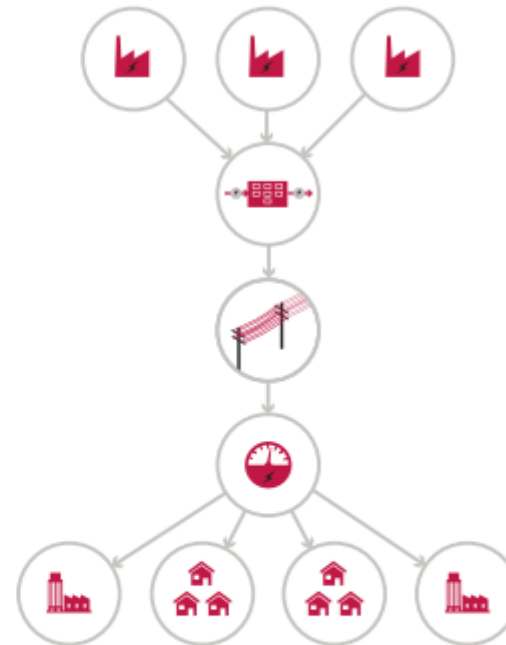


Bundled vs Unbundled

Bundled Distribution
+ Transmission



Unbundled Distribution
+ Transmission



Generator



Utility



Transmission



Distribution



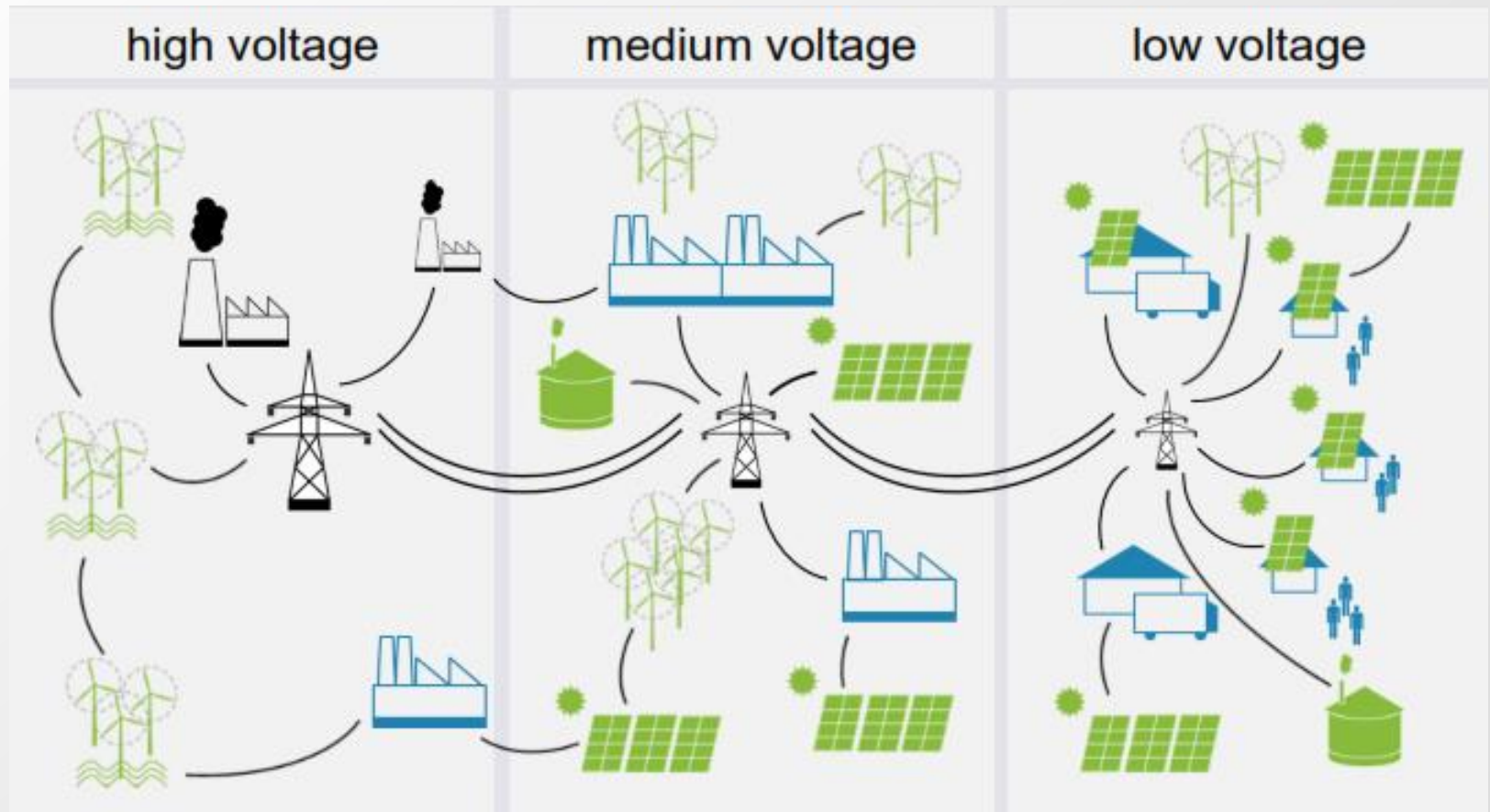
Factory



Consumer

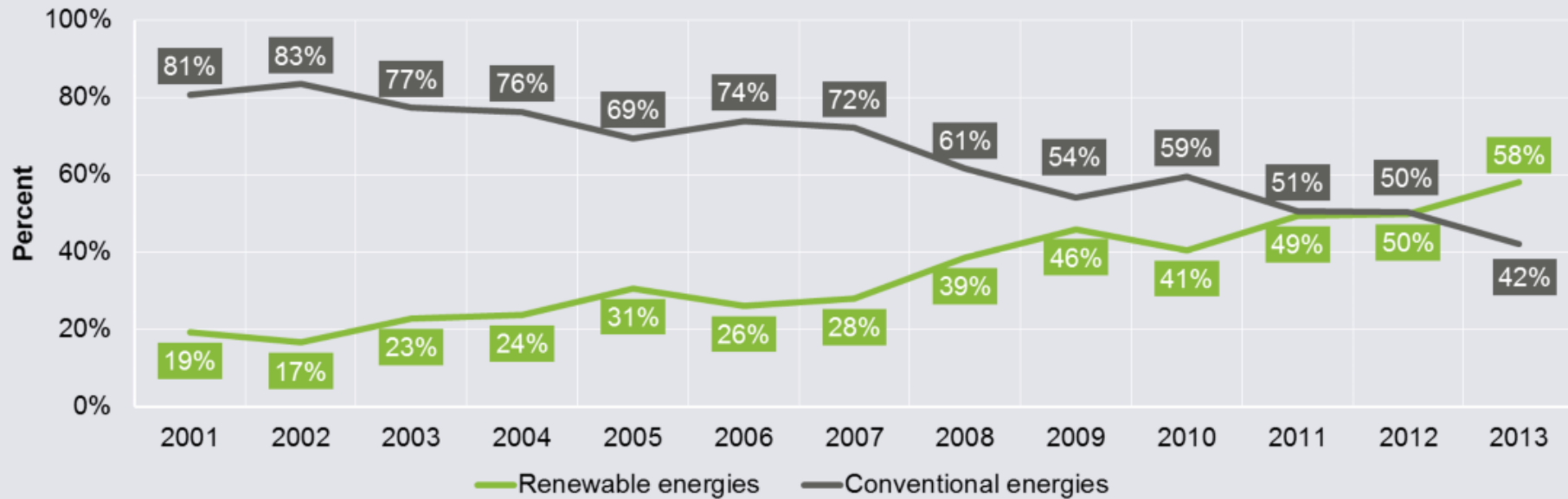
New Investments

- Flexibility, decentralized structures and a wide variety of actors



Global Renewables

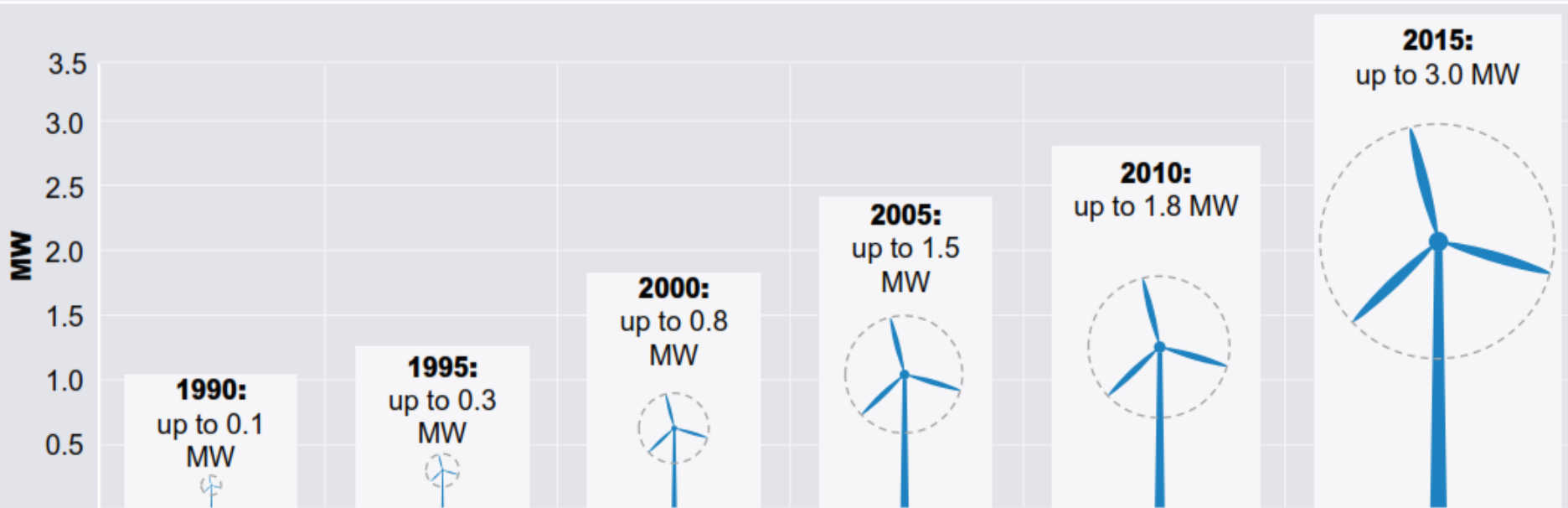
Share in global capacity additions 2001- 2013



Wind

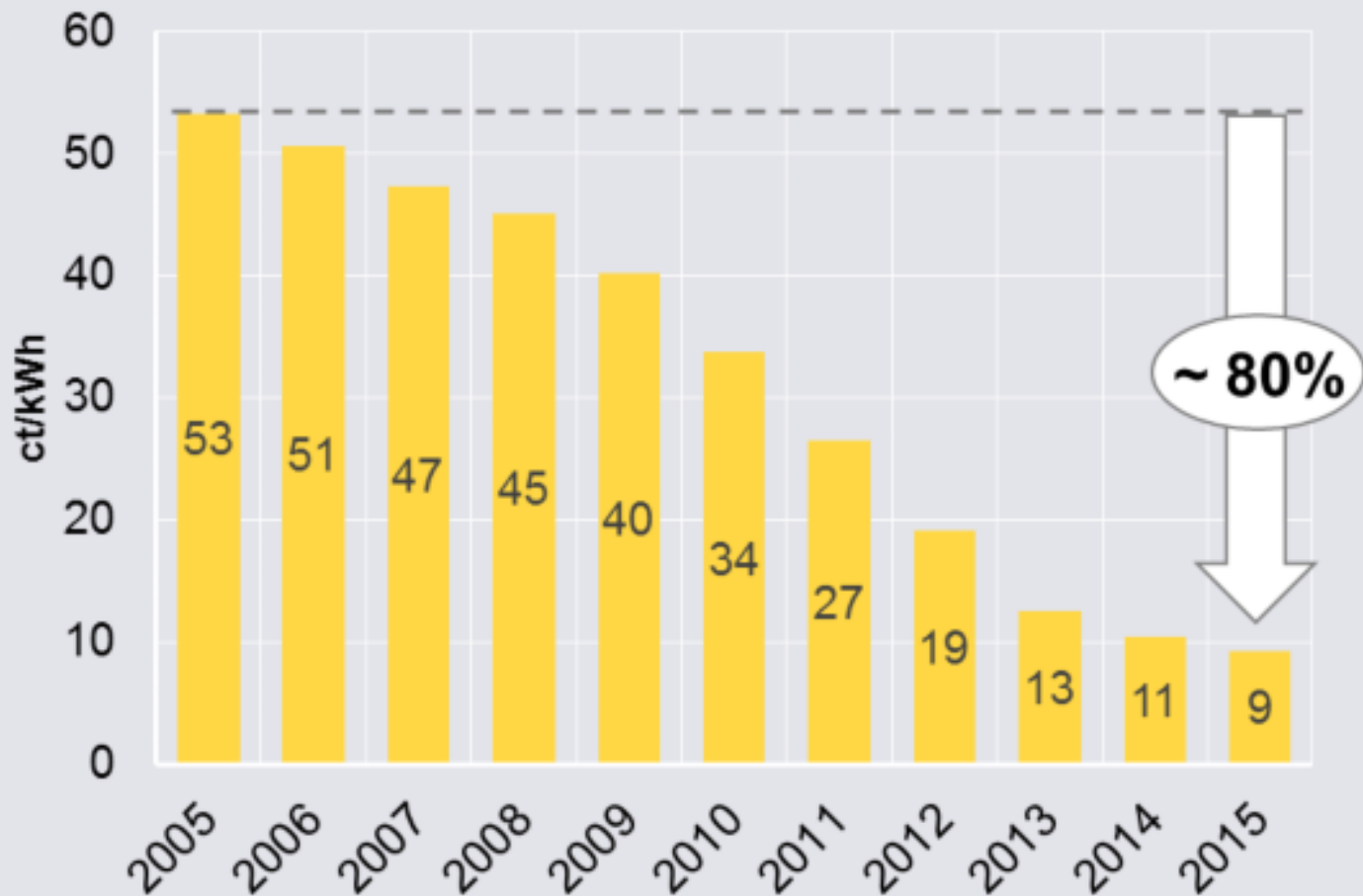
- Wind Energy mature technology
- Windmills of 2 - 3 MW being standard

Size development of wind turbines 1990 - 2015



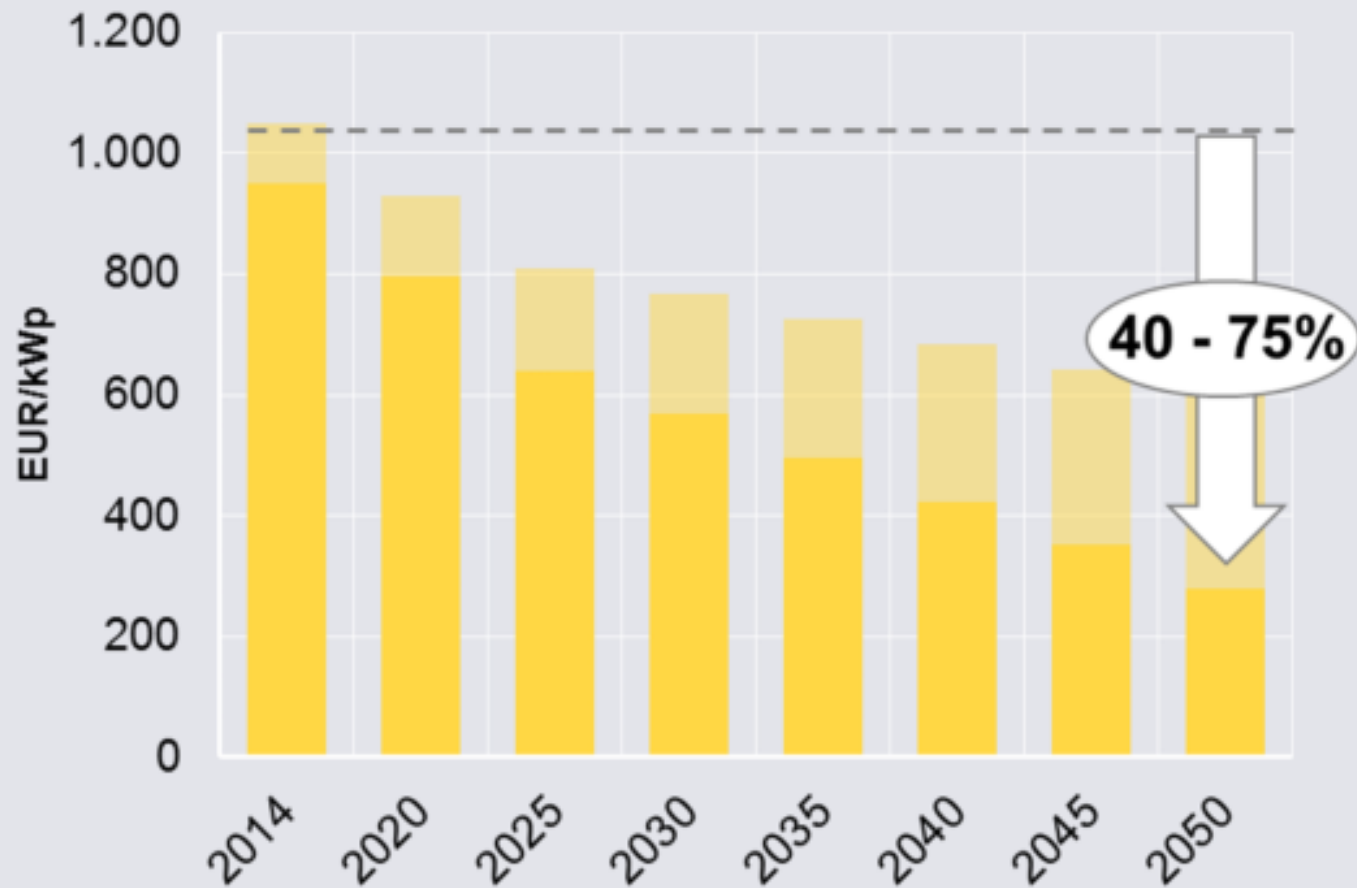
Solar

Average PV feed-in tariff for new installations 2005 - 2015

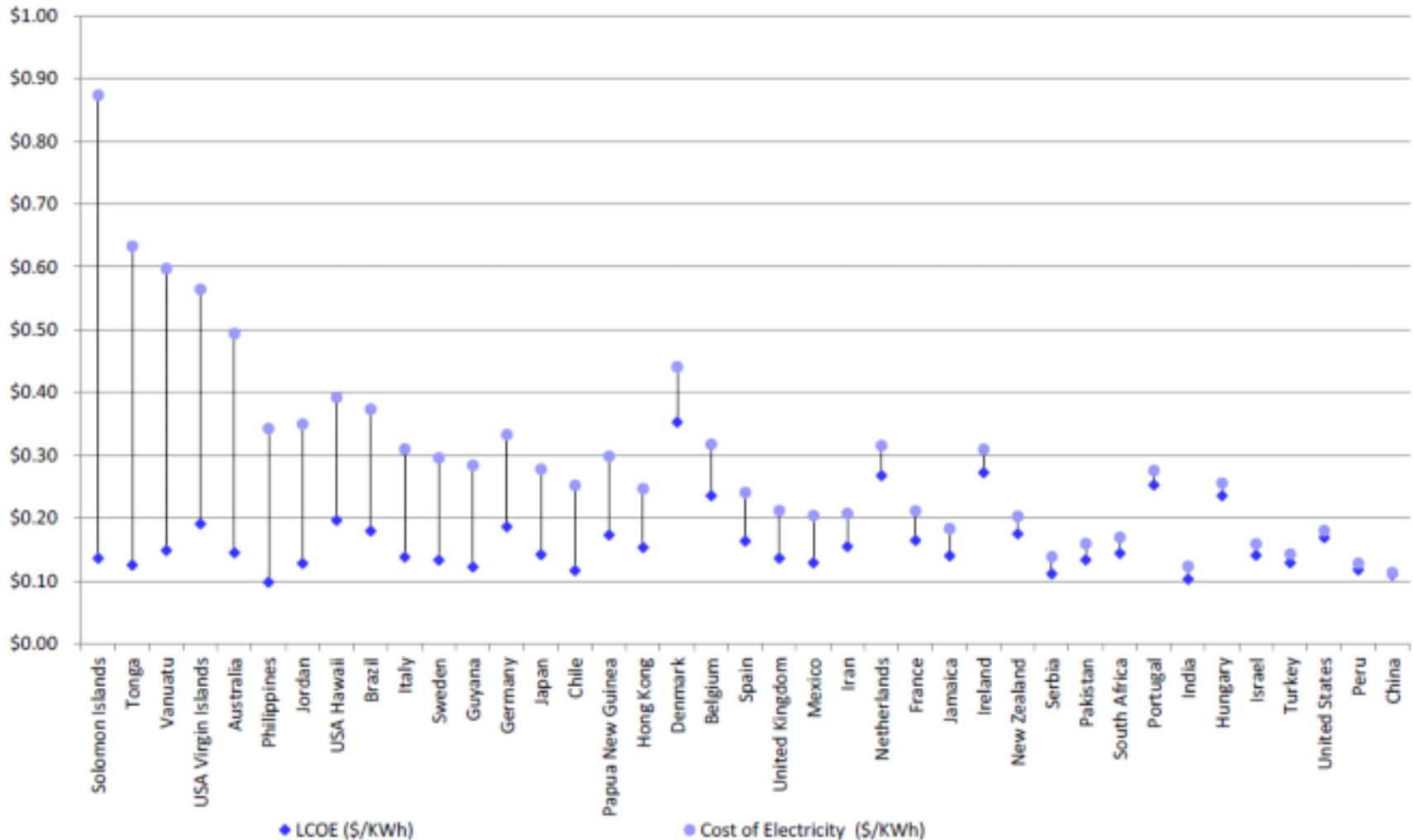


Solar

Expected cost digression for large-scale PV systems 2014 - 2050

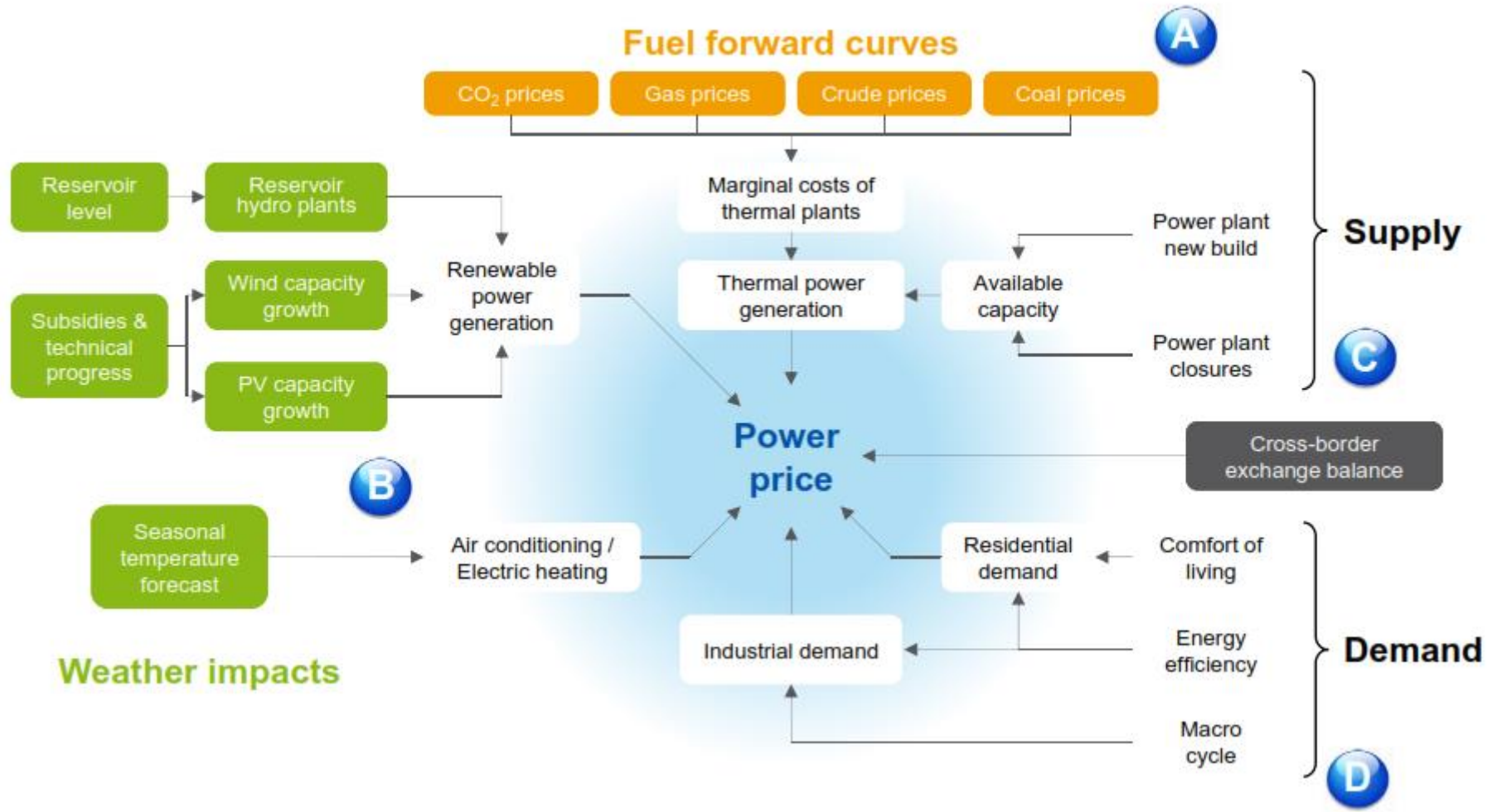


Countries with Solar Grid Parity

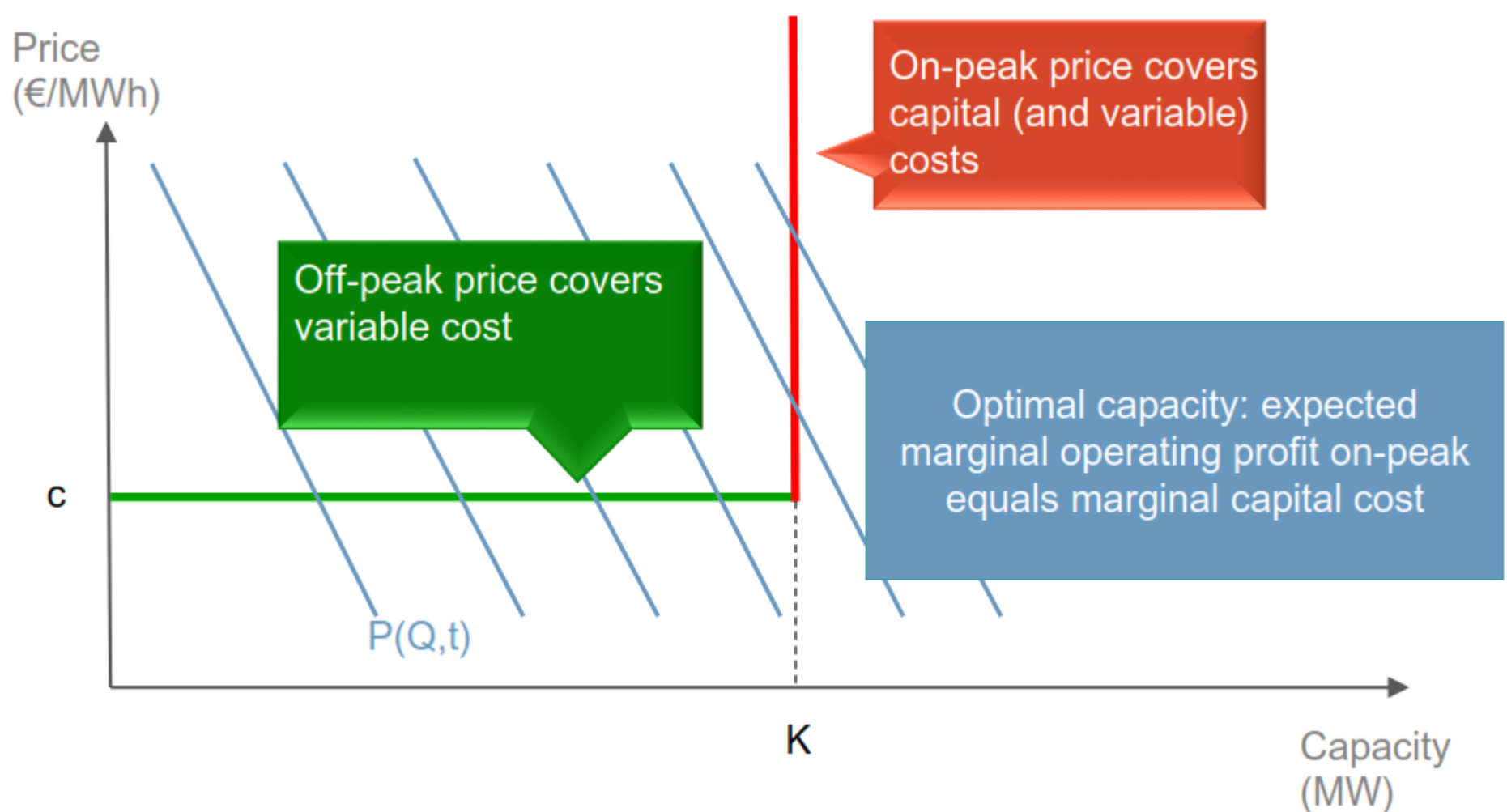


Pricing Dynamics

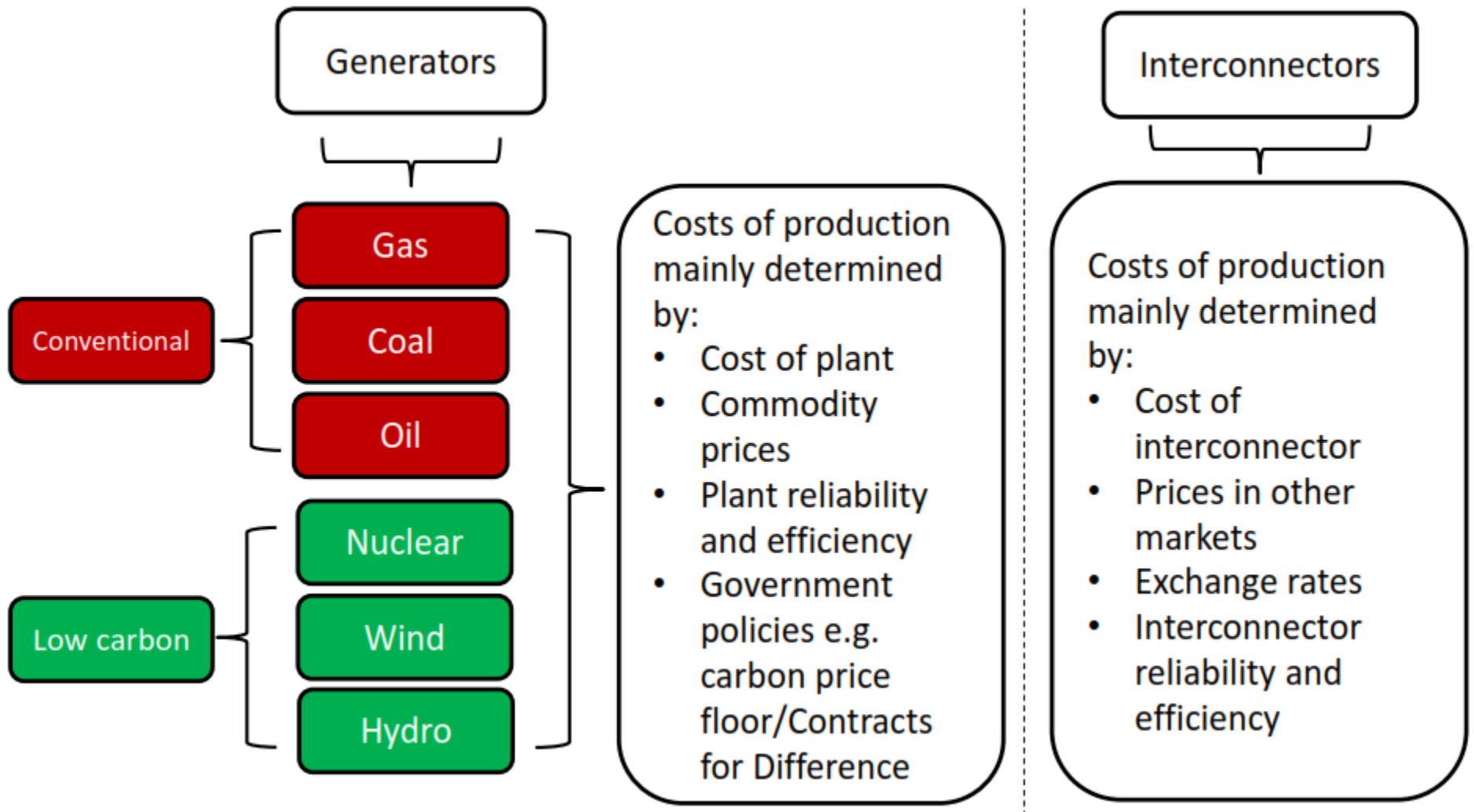
Power Prices Trading Market



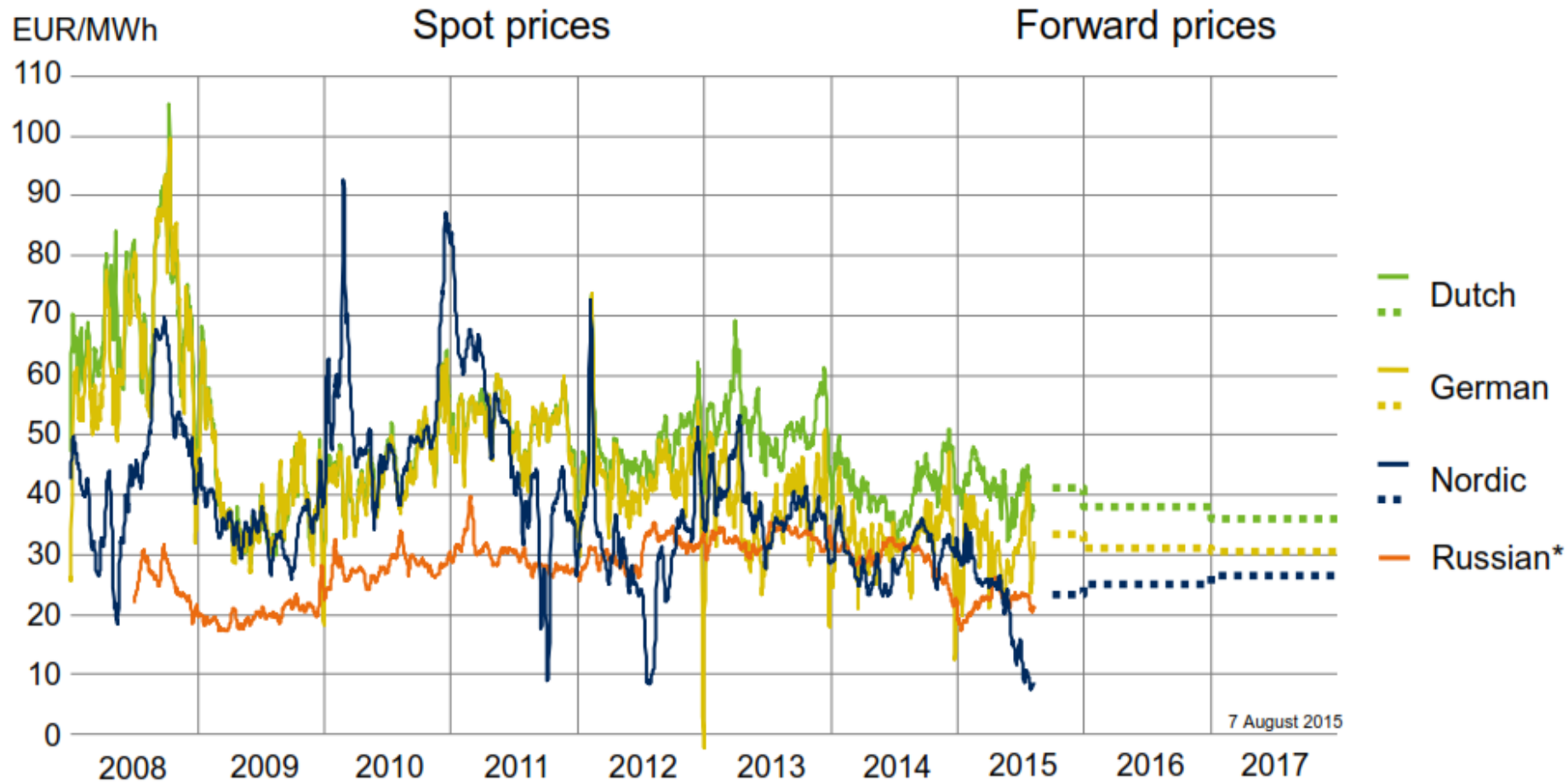
Power Prices



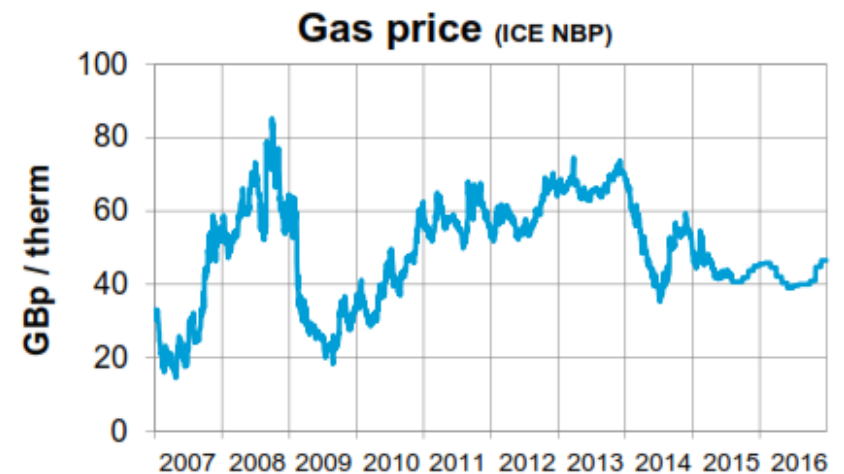
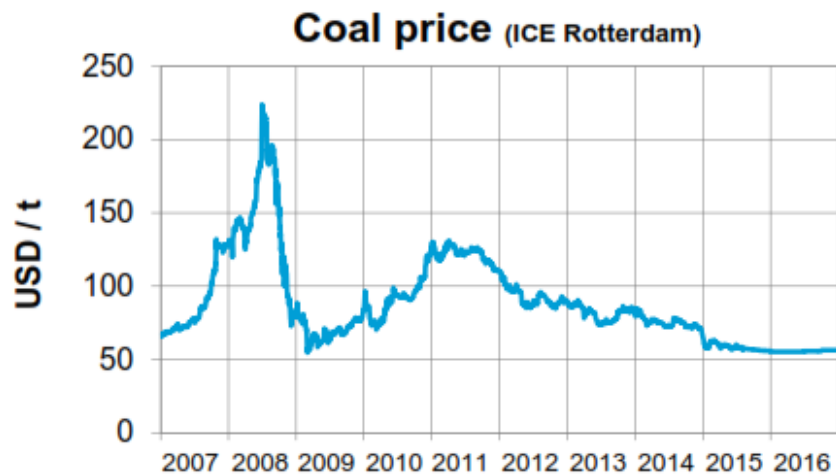
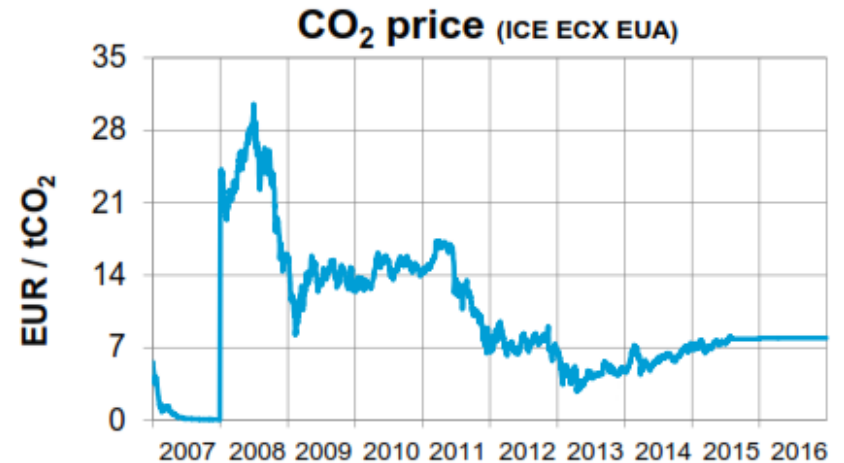
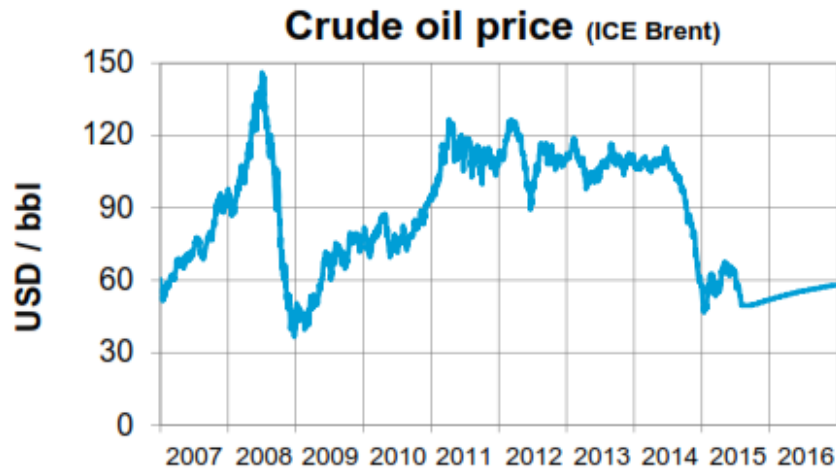
Price Formation



Wholesale Prices



Fuel and CO₂ Prices



Power price is SRMC power plant to fulfil certain demand

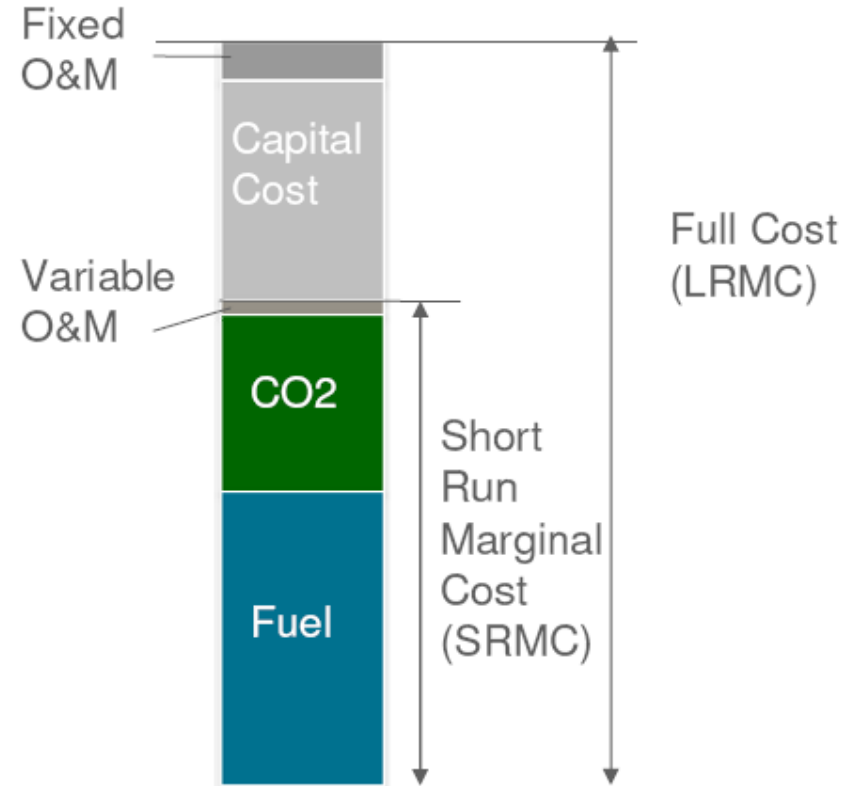
- The power stack or [Merit Order](#) defines the marginal cost of each plant at each time

- The short-run marginal cost (SRMC) includes:

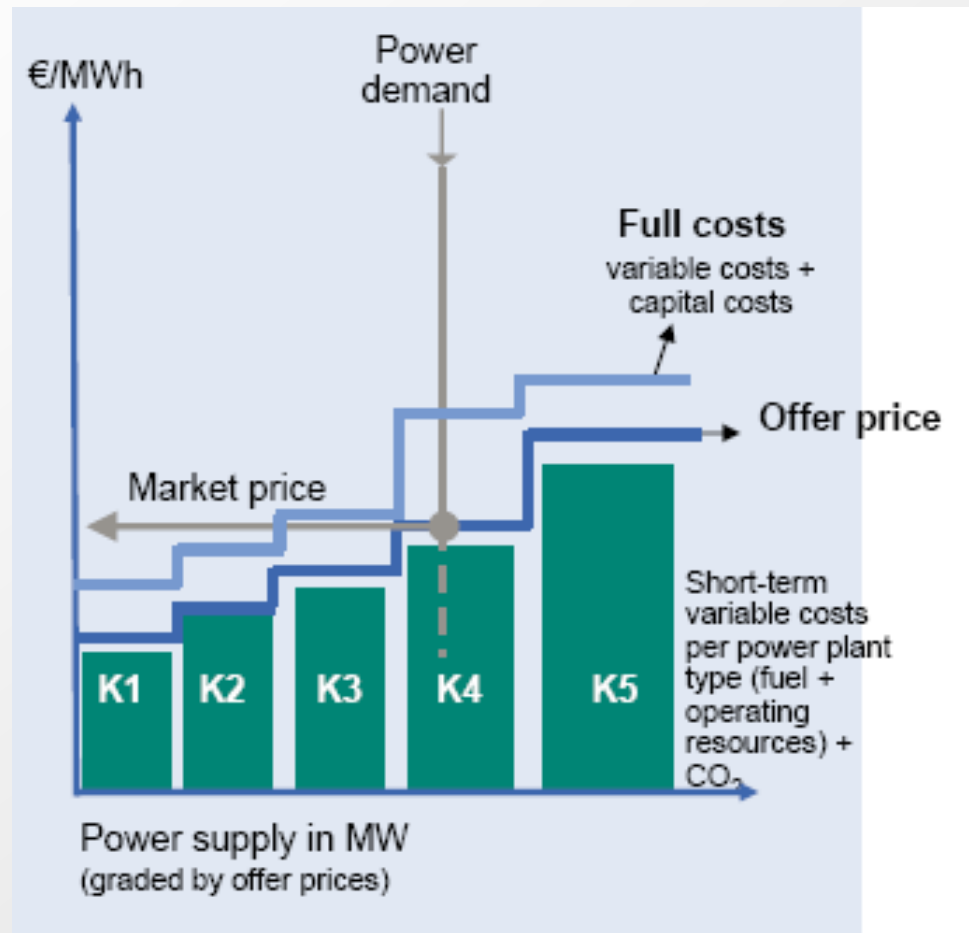
- Operations & Maintenance costs
- Fuel price
- CO₂ exhaust

But not:

- Labour expenses
- Investment costs
- Fixed Maintenance costs

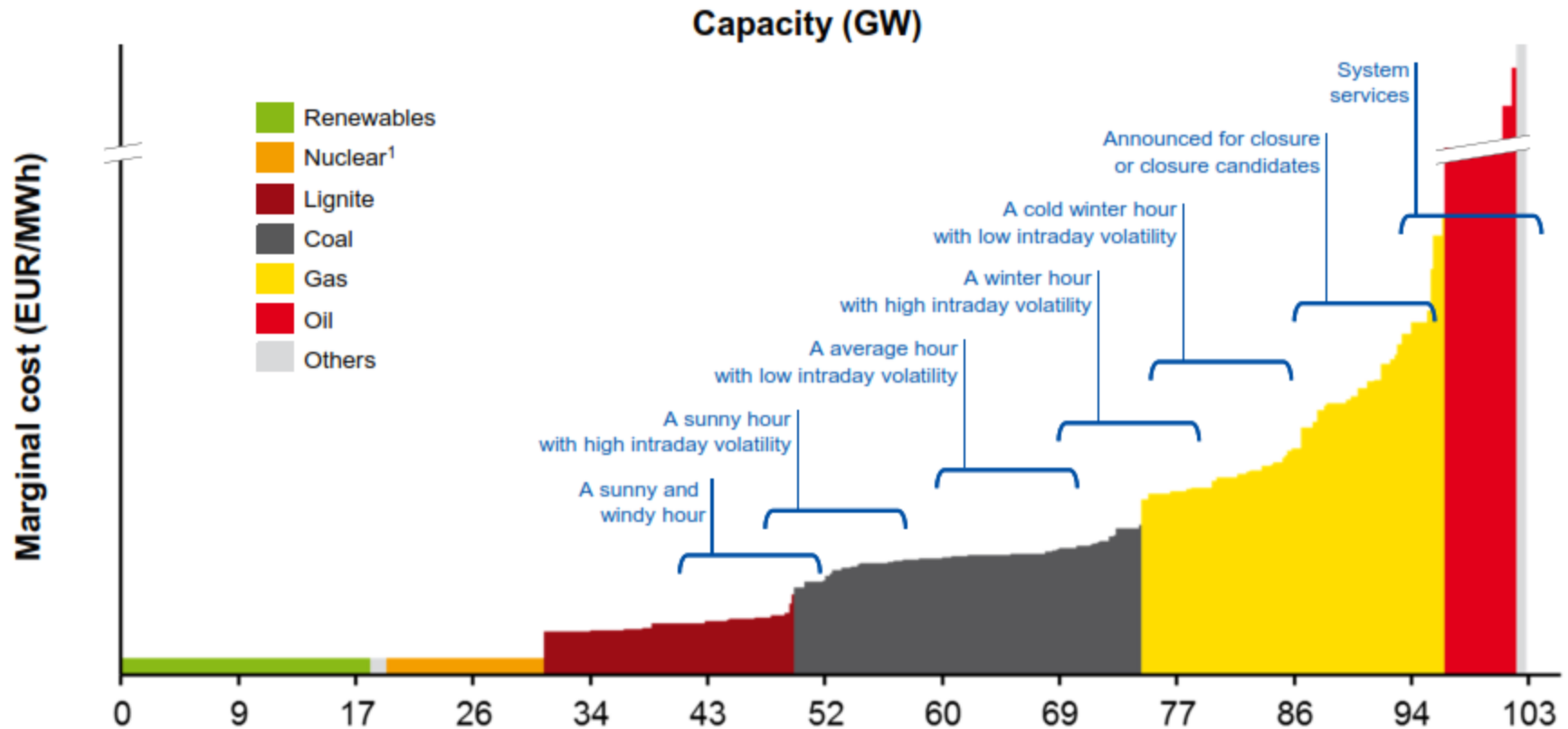


Wholesale Price marginal power plant



Example Merit Order

Germany



Seasonality

- Because of time-varying demand, supply inelasticity and non-storability:
 - ~ Prices higher during working days
 - ~ Prices higher during working hours
 - ~ Prices higher in Summer (air-conditioning) or Winter (electric heating), depending on the region
- Customers have different load shapes

Mean reversion

- Mean reversion: the tendency of a price to revert back to a long run average
- After a spike we expect prices to return within hours, days or weeks to bounce back
- Consequences:
 - ~ High short term volatility
 - ~ Relatively limited long term volatility
 - ~ Term structure in volatilities

Volatility

- Day Ahead > 500%
- Week-ahead > 100%
- Quarter ahead > 50%
- Year ahead > 10%

Development Electricity Wholesale Markets

Power Sector Reform

- To attract private investment both domestically and from abroad, a more transparent and competitive electricity market is vital
- Host governments, sponsors, and financial communities need to develop a coordinated mechanism to streamline the investment approval process and accelerate the development of public-private partnerships

Power Sector Reform

- Real market reform needs to reflect the cost of fuel
- Price subsidies send incorrect market signals, drain state budgets, and hamper investment
 - ~ 80% of current subsidies go largely to medium- and high-income groups
- While there is no single model for successful power sector reform, there are steps that are essential
 - ~ Unbundling”—the separation of the industry into three components: generation, transmission, and distribution—is a key first step

Power Sector Reform

- Rural electrification is a critical priority for policymakers in developing countries to raise standards of living and improve the economy
- Rural electrification programs face number of challenges
 - ~ Investors must recover capital to fuel long-term expansion plans
 - ~ Recovering investment through tariff design is essential for long-term success

Restructuring and Competition

Vertically
integrated,
publicly or
privately
owned



Vertically
Integrated,
but with
business
units



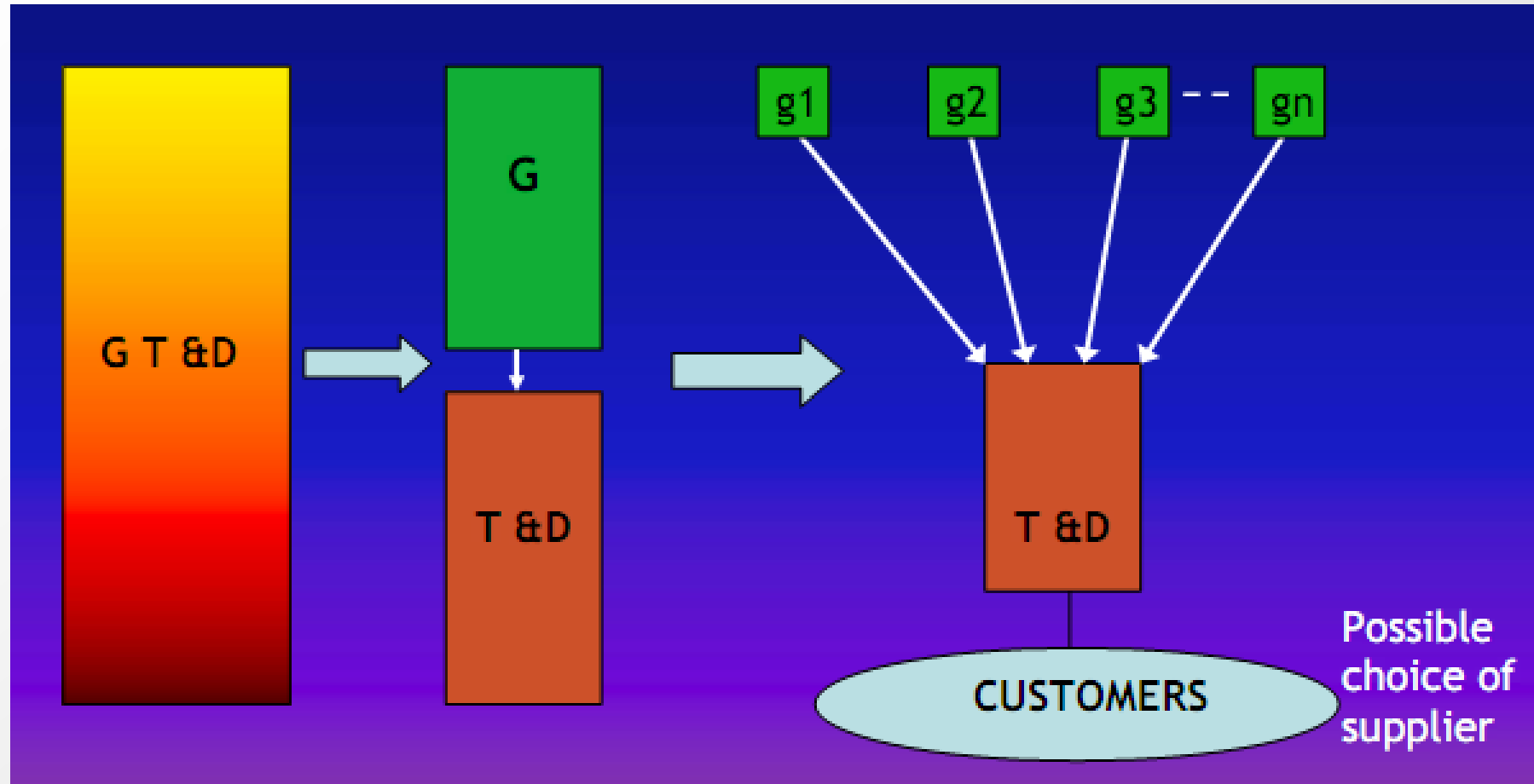
Vertically
unbundled
with
Monopoly
Single Buyer



Vertically
and
Horizontally
unbundled
with full
competition
in
Generation
and Retail
Supply

INCREASING POSSIBILITIES FOR COMPETITIVE
FORCES

Separate generation from transmission and distribution functions



Separate generation from transmission and distribution functions

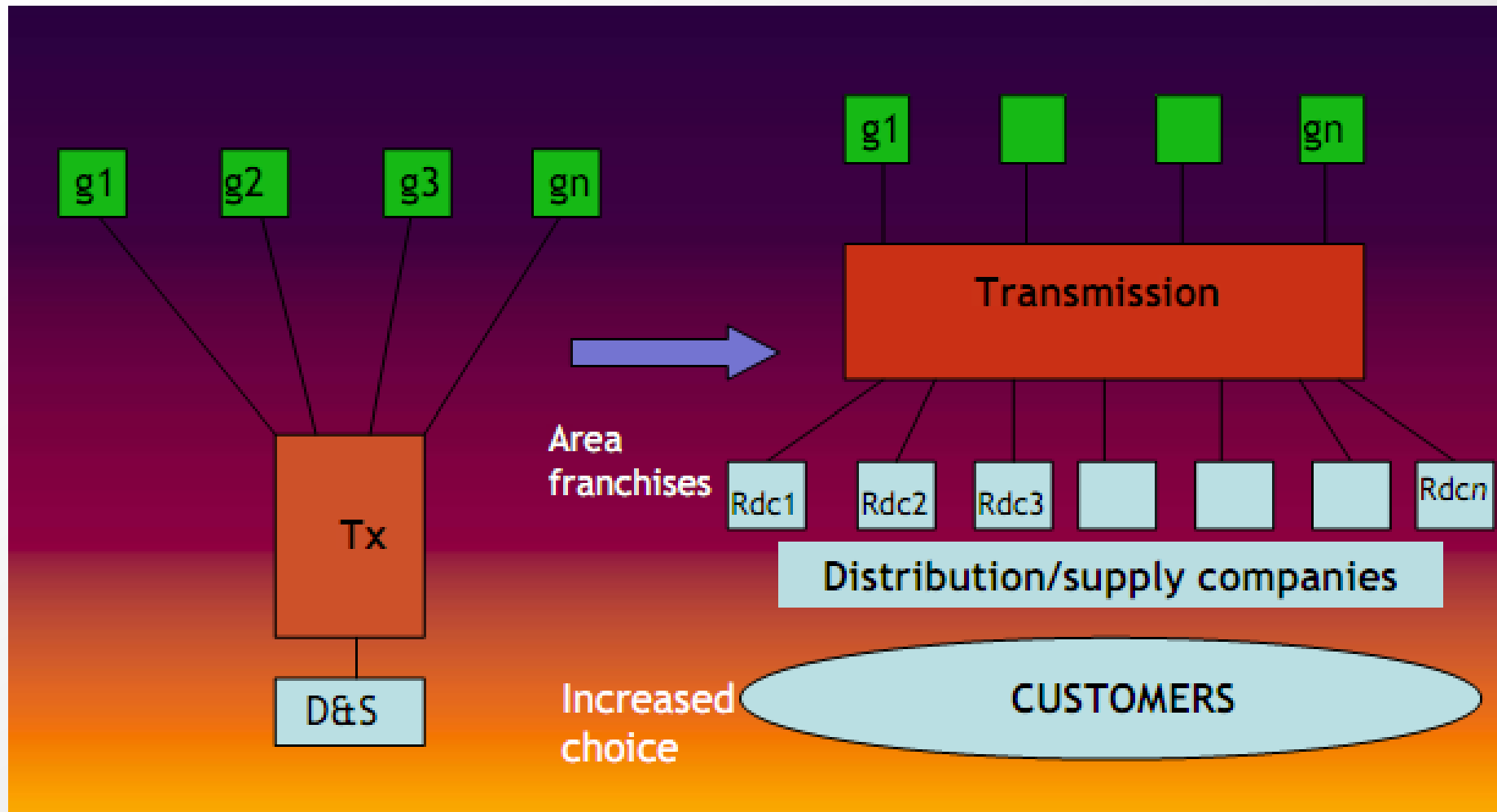
- Challenges

Market dominance through size and ownership

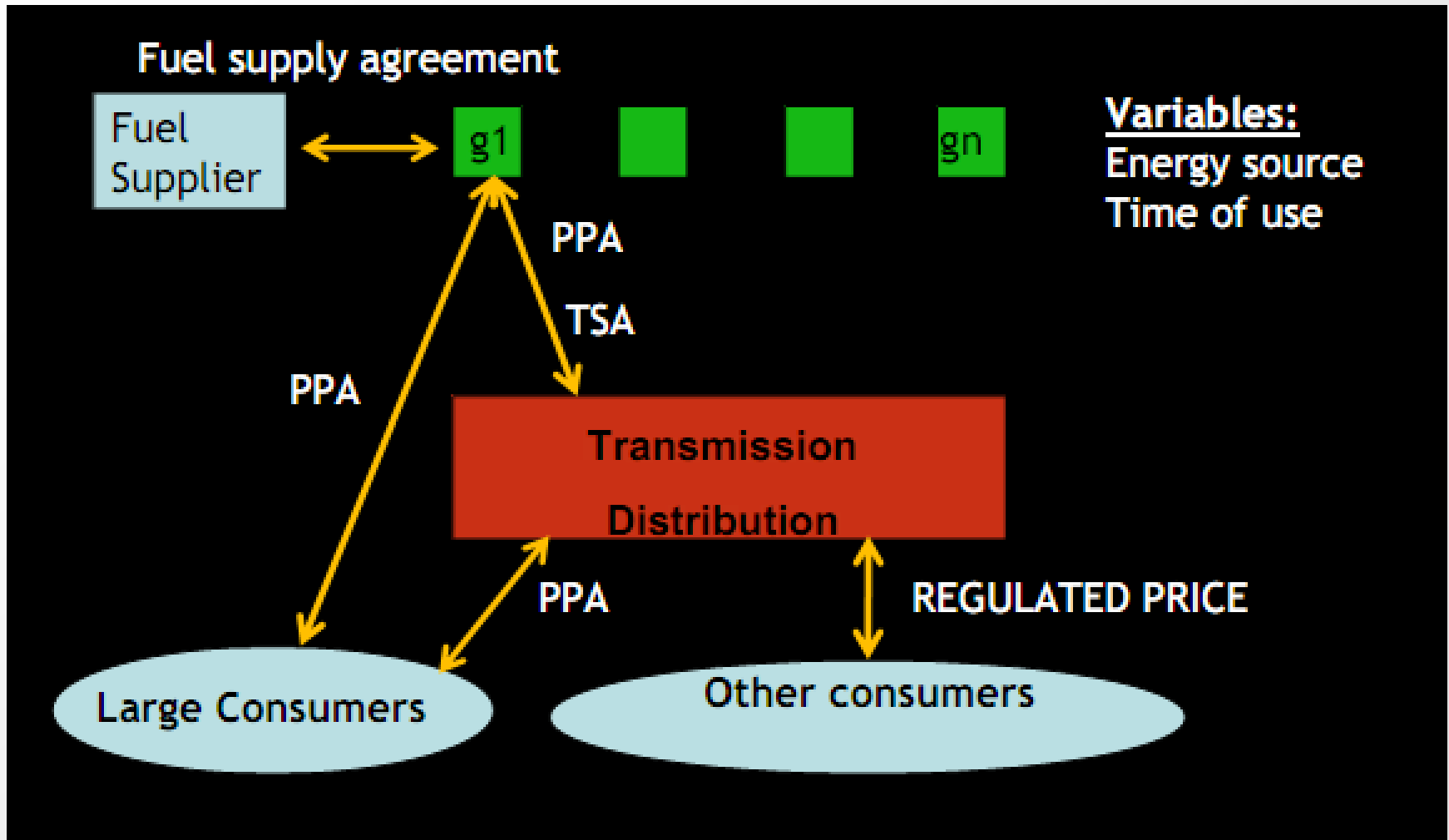
Resource mix: competition works best with diversity - hydro, gas, coal, other

Separation of ownership of T&D from generation – privatization unpopular

Distribution and Supply



Market Structure and Commercial Arrangements



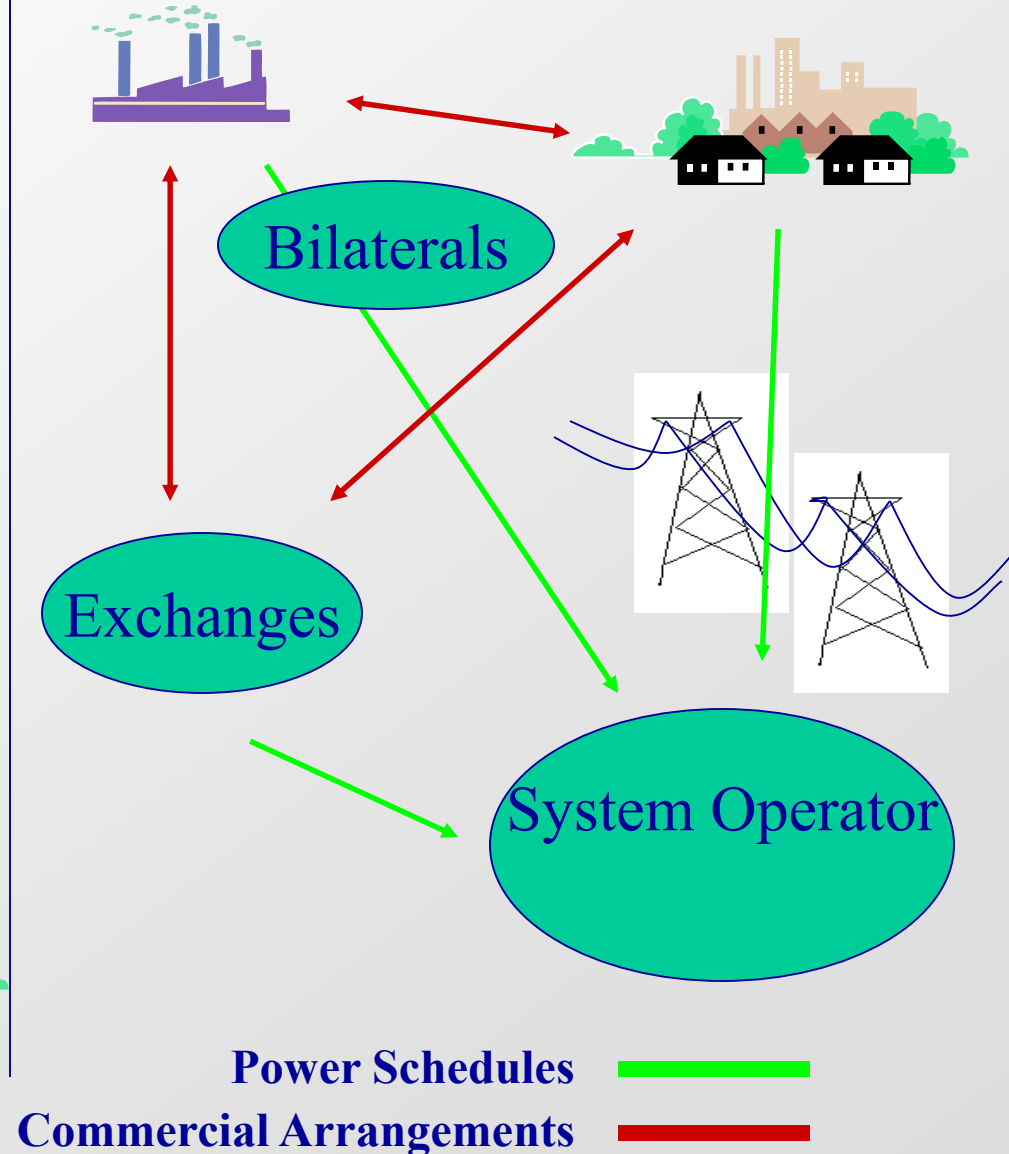
Power Pool and Exchange

TWO BASIC SPOT MARKET MODELS

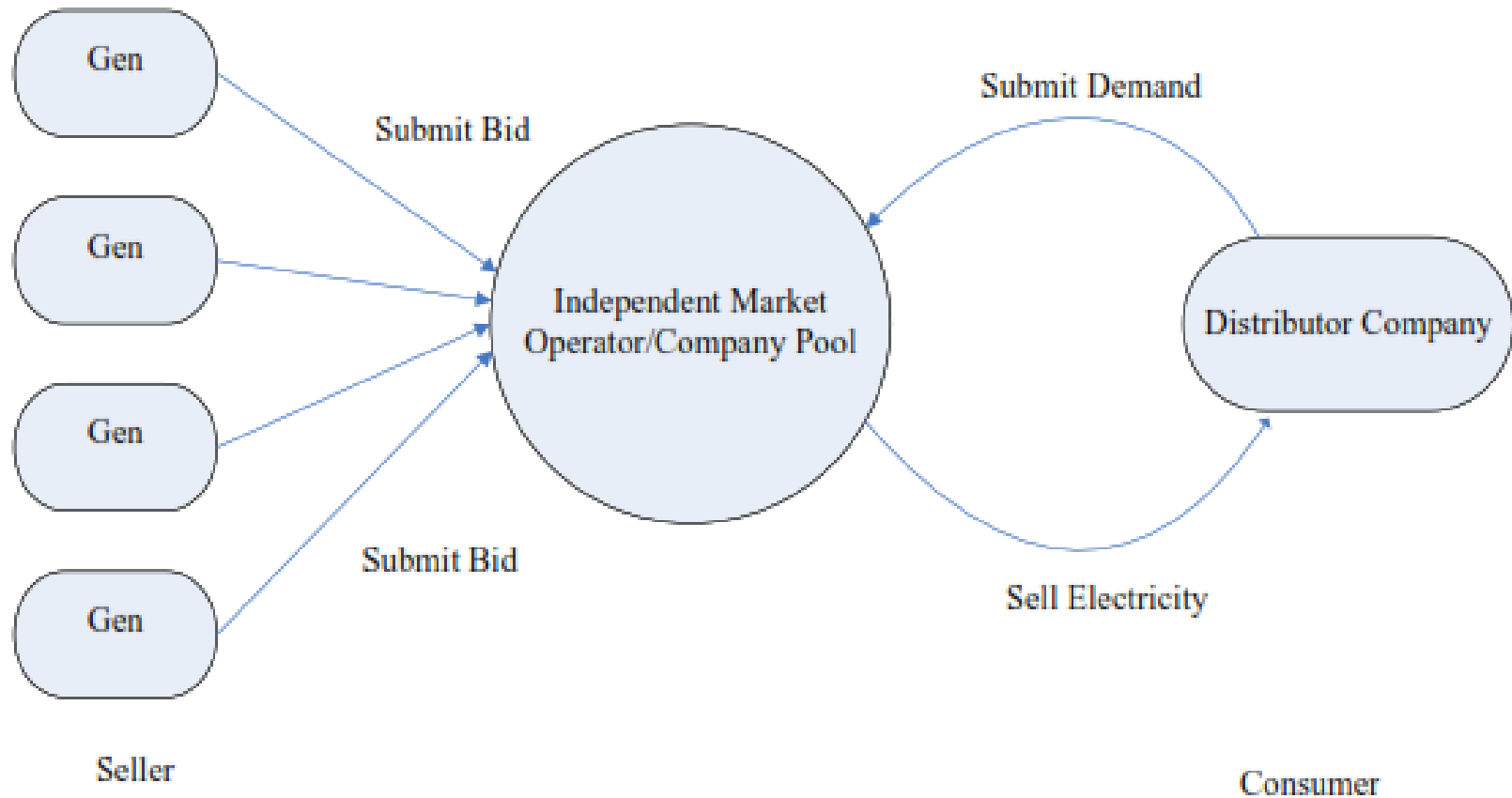
Mandatory Pool



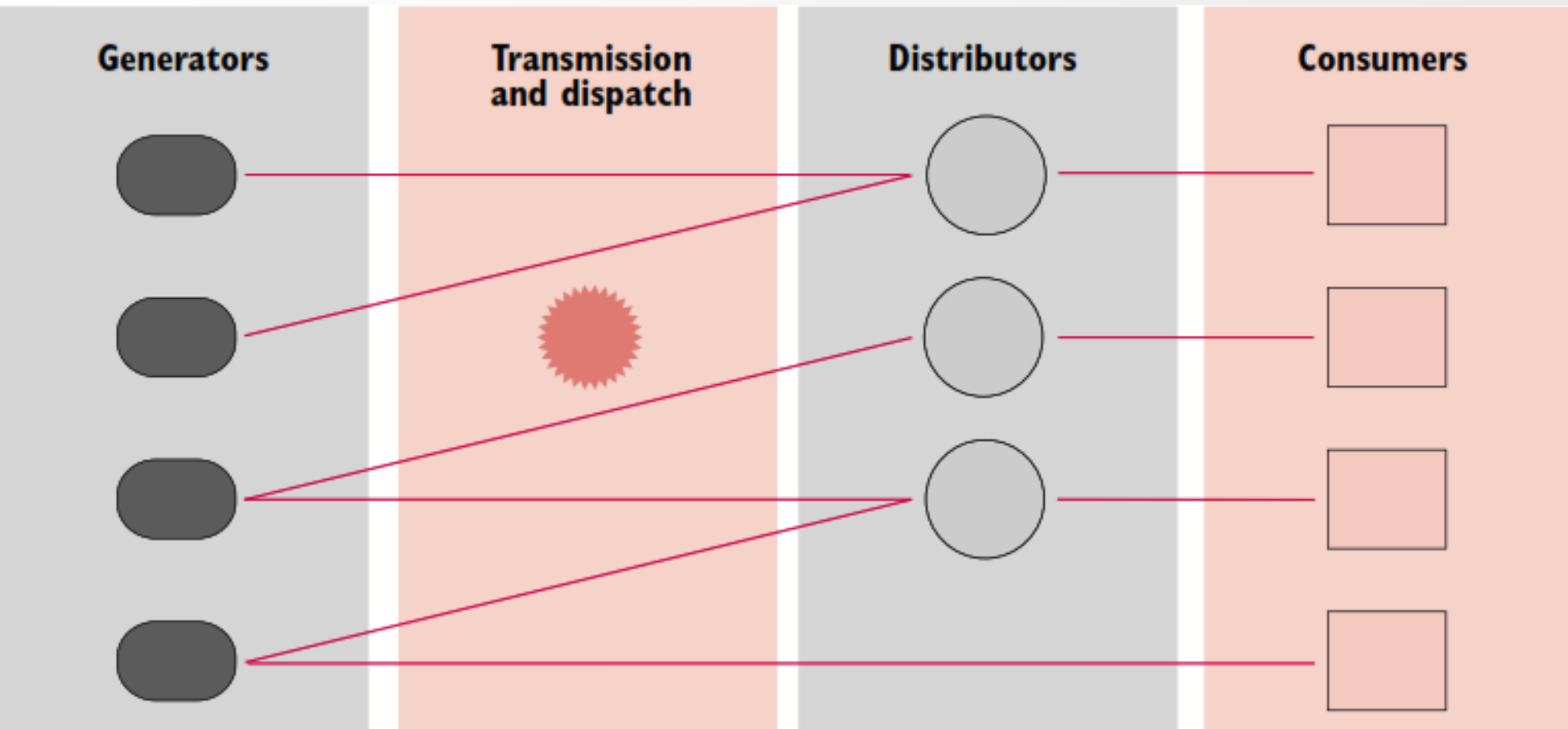
Voluntary Pool



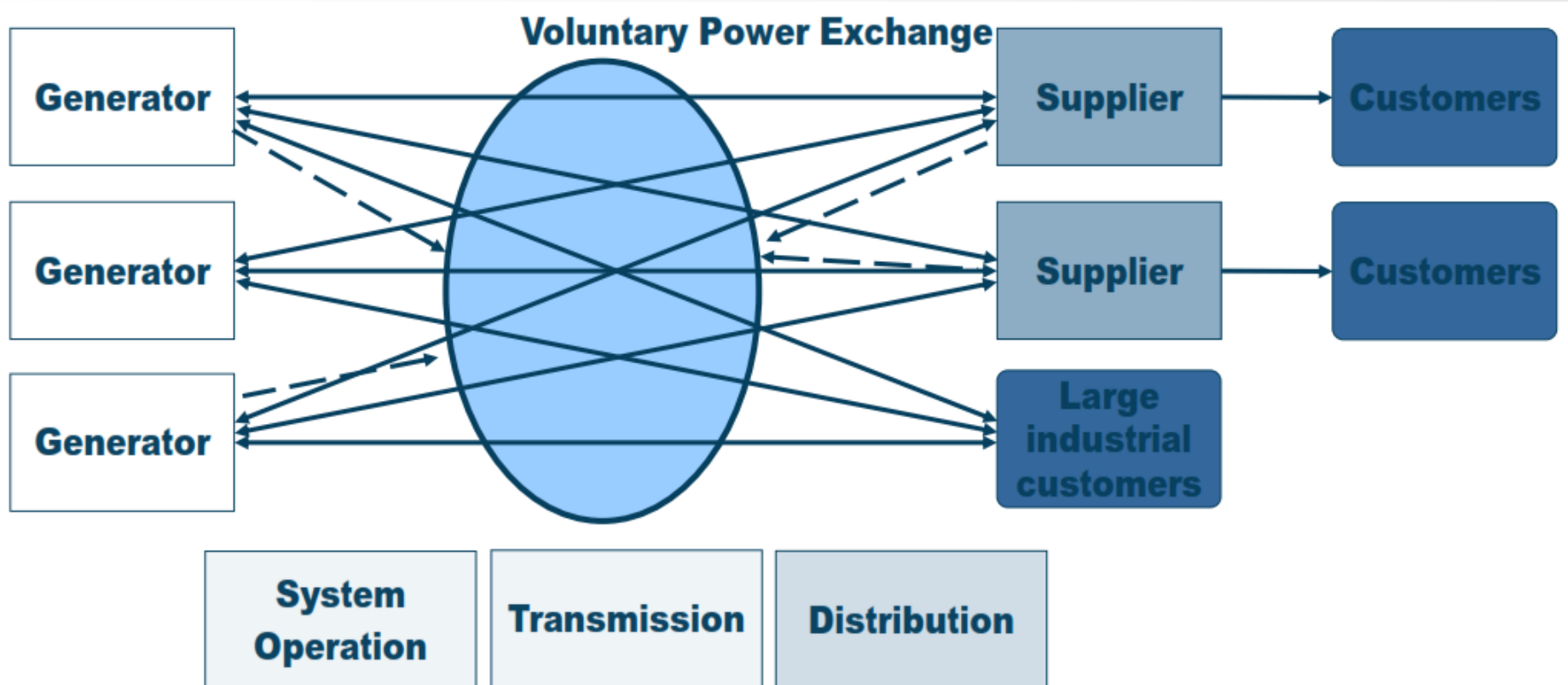
Pool Trading Model



Bilateral Trading Model

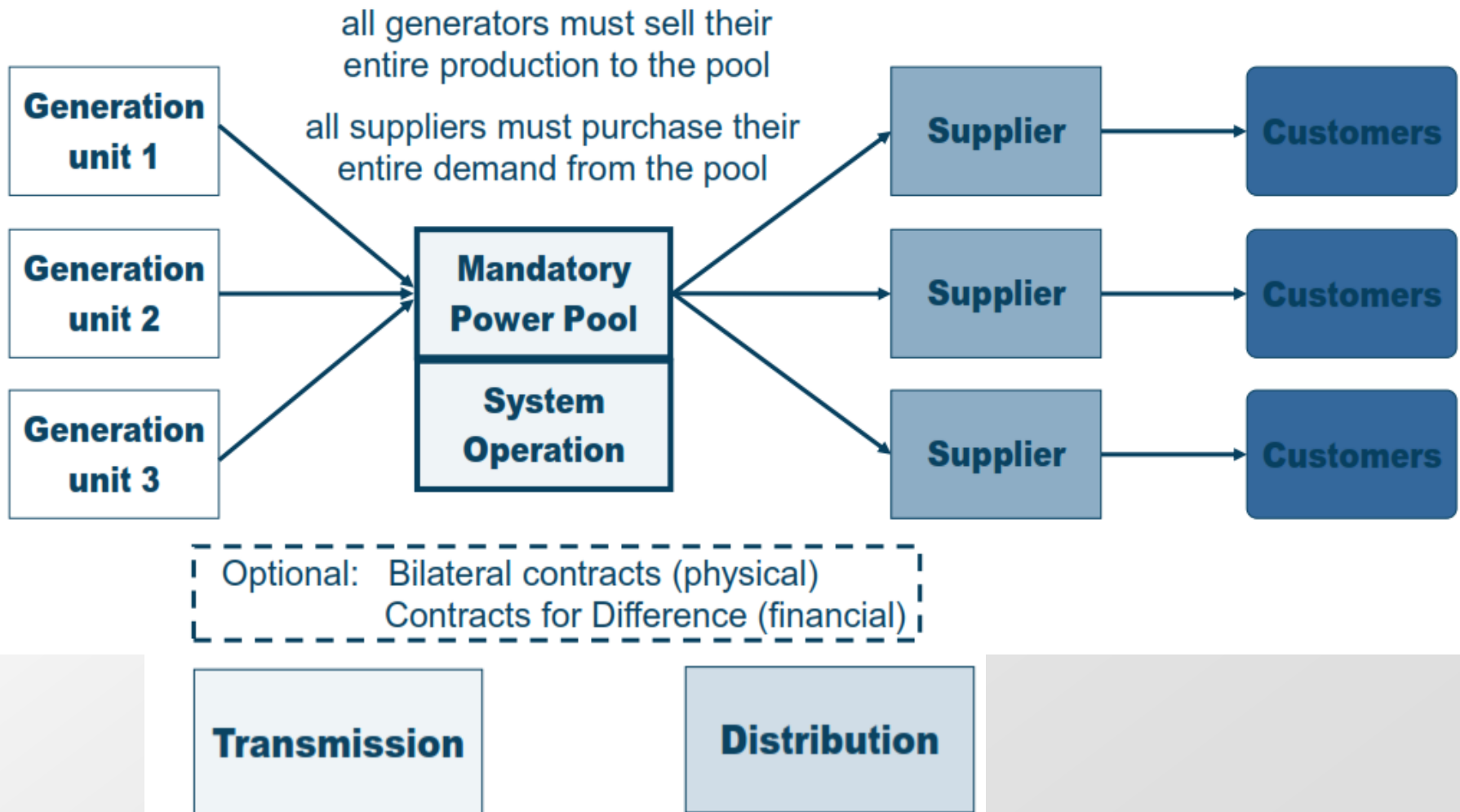


Competitive Power Markets



Decentralized scheduling, company based

Power Pool



Centralized scheduling, unit based

Generation Bidding for Dispatch

- Marginal pricing applied under good competition
- Operational costs determines ranking order of individual plants' bids, i.e. their competitiveness
- Highest required bid to determine the market price

Fuel costs

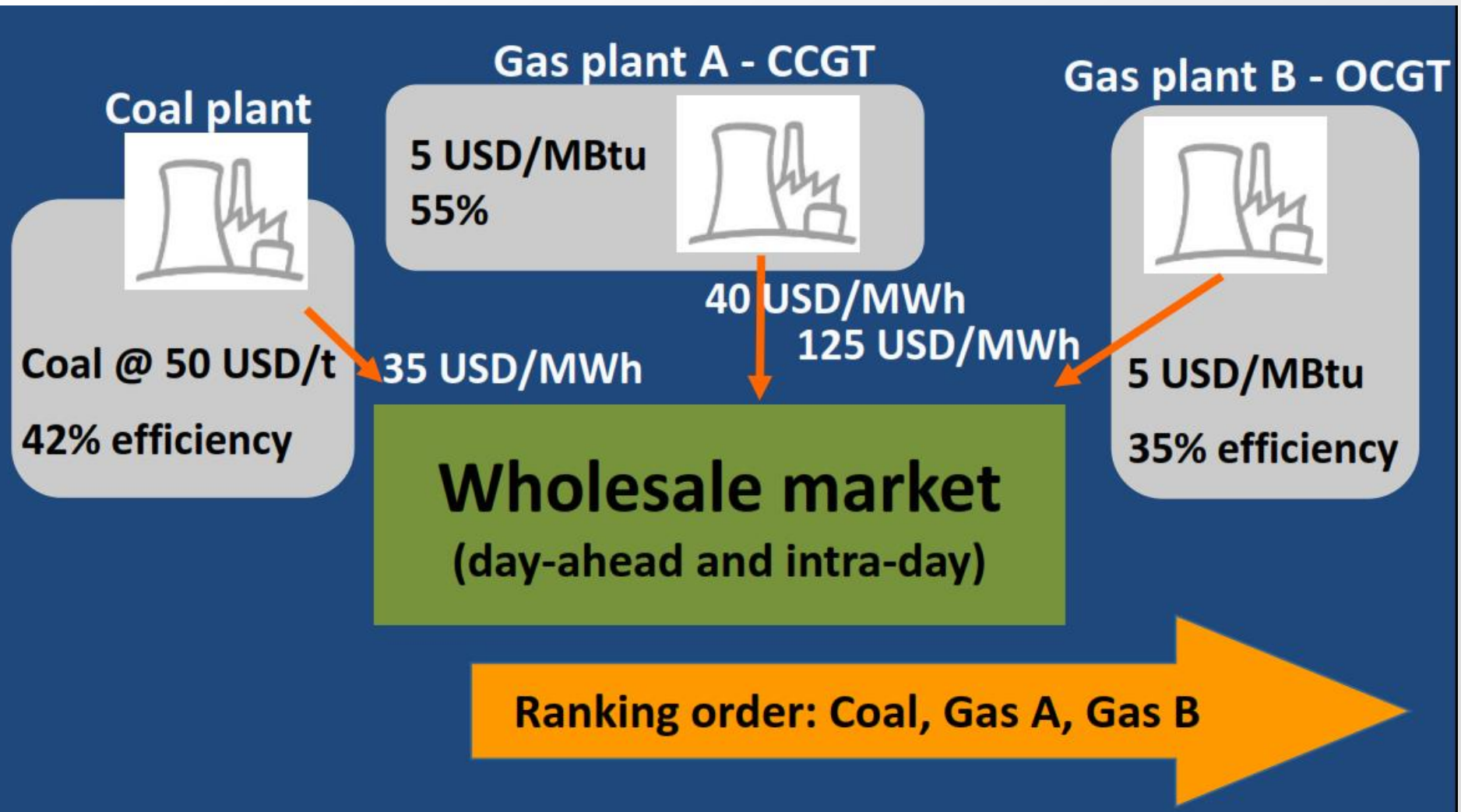
O & M



Efficiency

Price per MWh

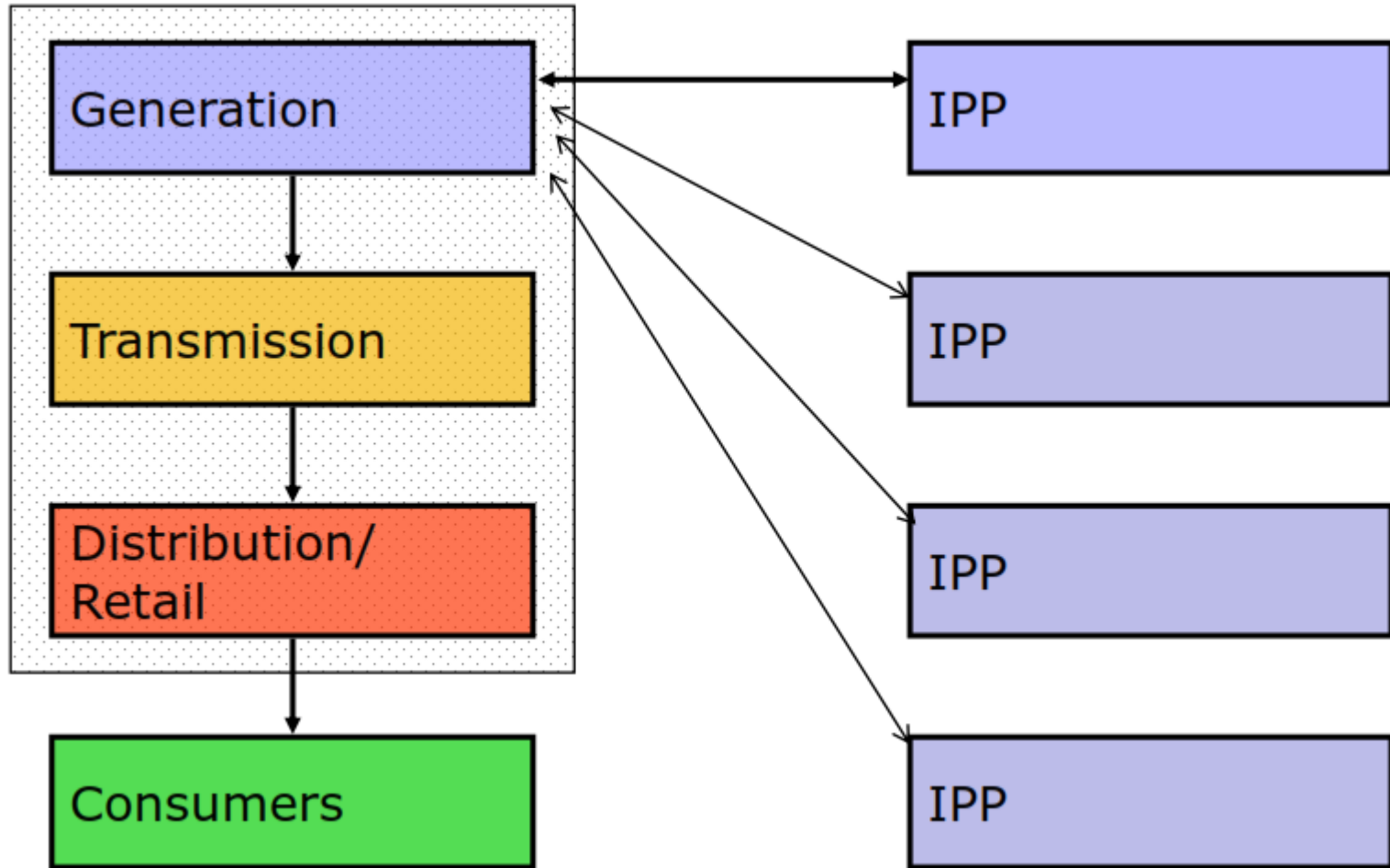
Generation Bidding for Dispatch



Competitive Power Markets

- Generators, suppliers and large customers trade electricity bilaterally, conditions and prices not public
- Planned delivery and consumption schedules notified to system operator
- Voluntary power exchanges (PX) for day-ahead and intra-day trading
- Balancing markets to ensure energy balance in real-time
- Costs of imbalances allocated to parties that caused the imbalances

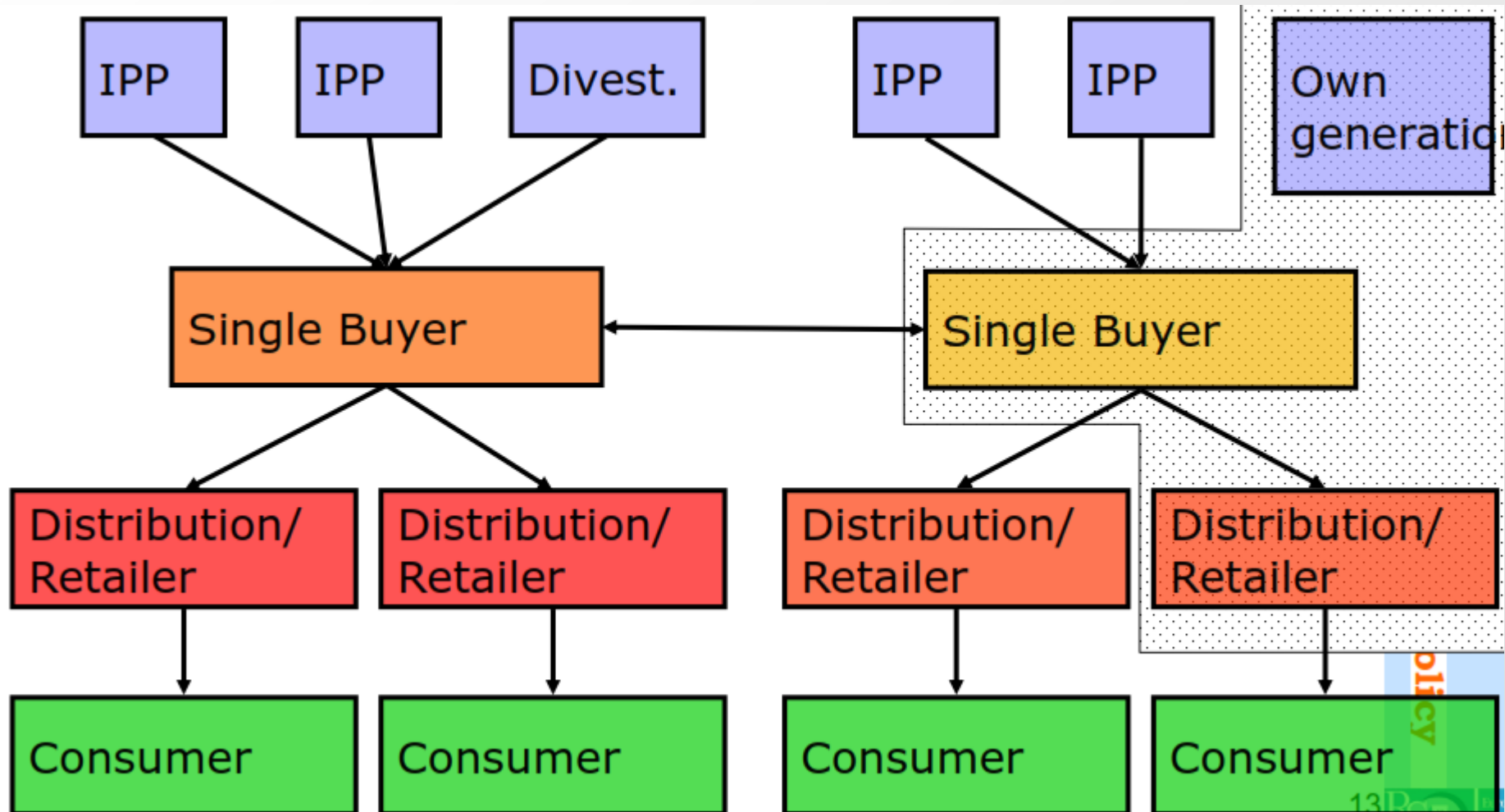
Monopoly with franchised IPPs



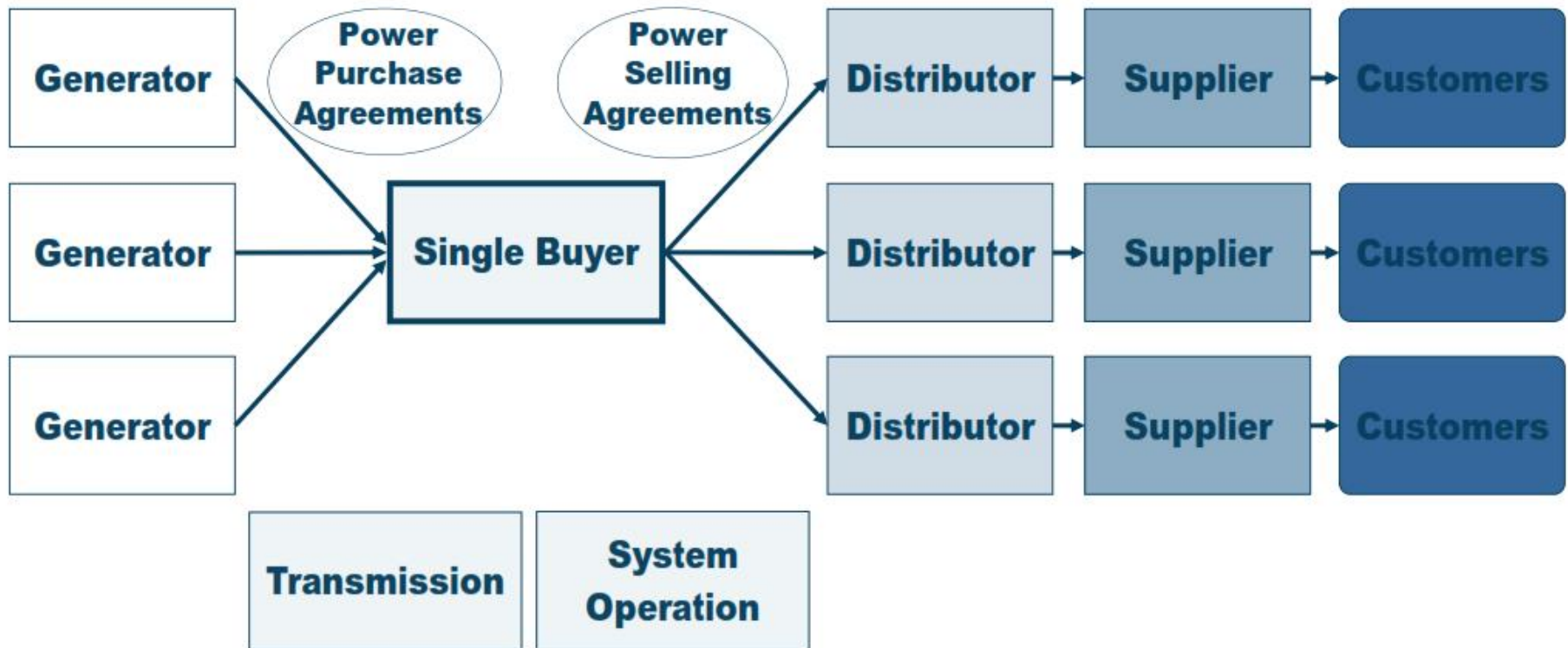
Monopoly with franchised IPPs

- IPPs compete to get the “monopoly power” at generation stage
- “LT contracts” give them Franchise: “quasi vertical integration”
- Central planning of generation & network is kept by incumbent monopoly. Bad planning & bad contracting are major risks
- Limited Reform because wholesale transactions implemented by incumbent integrated Monopoly (but Chinese trick: price guaranteed; not volume dispatched)
- Costs of competitive bidding of IPP Franchise → regulated tariffs (risks passed to consumers as in Monopoly model)
- Some incentive regulation is possible (performance based contract & profit sharing; etc.)

From <Monopoly + IPPs> to Single Buyer + Wholesale Market



Single Buyer System



Single Buyer

- Less vertical integration than model 1 & 2
- Independent Power Producers (IPPs) compete to sell to the single buyer
 - a/ Ex Ante competition (e.g. bids) in construction, operation & negotiation of contracts (PPAs) with the single buyer
 - b/ Ex Ante & Ex Post competition: Single Buyer buy Wholesale Market with no LT contract with IPPs
- Is Single Buyer responsible for generation adequacy? LT contracts? Capacity Options?
- Some economic incentives with LT contracts
 - “availability” payments; indexation of variable costs

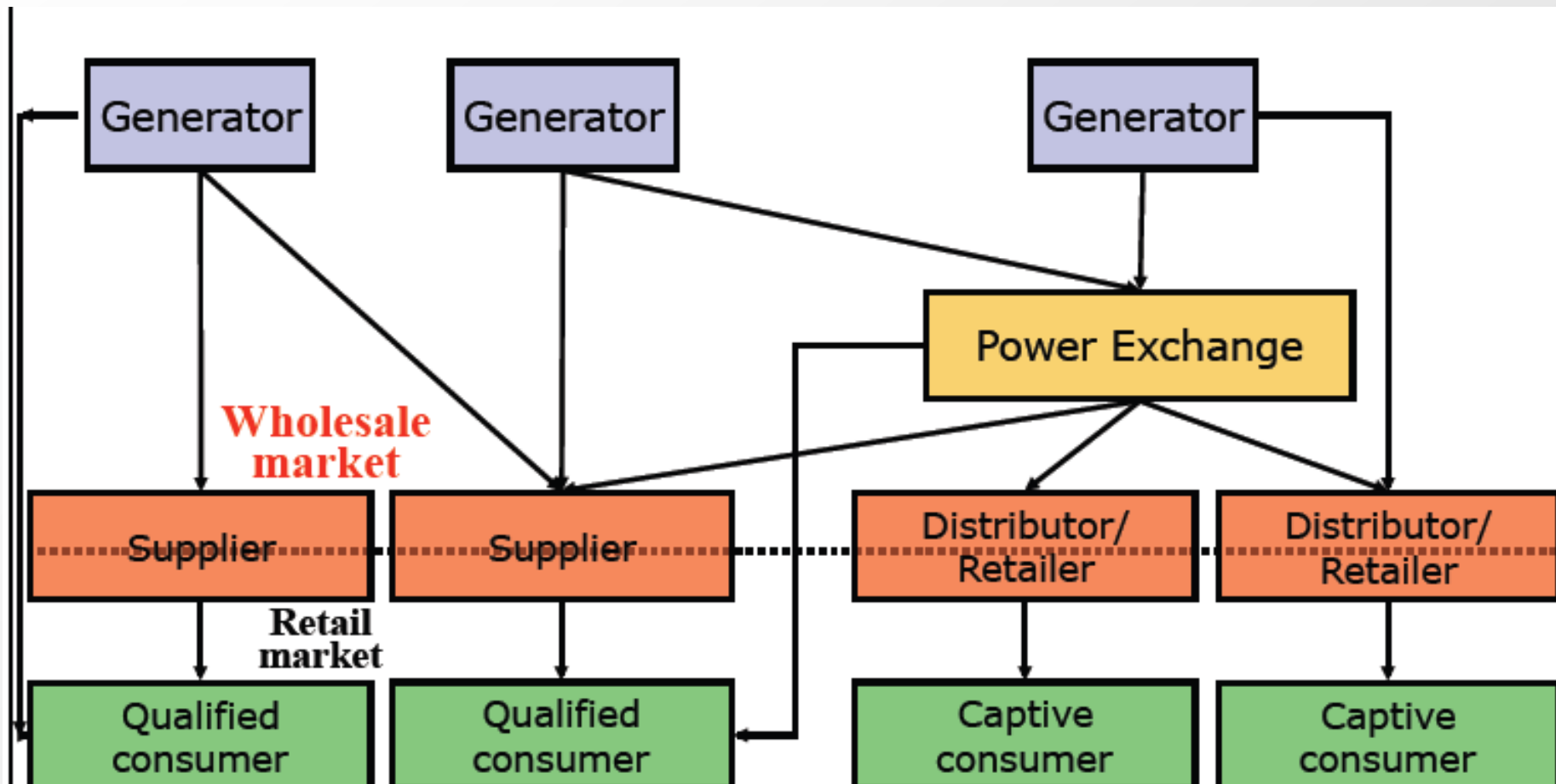
Single Buyer

- Various degrees of competition on the generation side, while the purchasing agency can keep centralized strategic control (capacity adequacy & technology mix; merit order)
- But if Single Buyer controls it keeps typical drawbacks of centralized planning
- Risk of IPPs being made LT contracts is passed to consumers
→ lower capital costs & easier to raise capital
- If LT contracts used it requires effective control of contracting & implementation is needed (corruption likely)

Single Buyer

- Cost-of-service, PPA contracts & social policy obligations → regulated tariff
- Access to consumers: as in model 1. IPPs do not have retail access
- Single Buyer (via consumers' tariffs) can take the generators' risk in LT contracts
- Independence of the Single Buyer becomes a critical issue (Merit Order & economic dispatch of IPPs)
- The transmission grid becomes key implementation

Retail and Wholesale markets



Overview of Energy Markets Deregulation

Supply (Retail) The Basics

- Supply: Buy wholesale & sale electricity to end consumers
 - Generators could sell energy directly → suppliers are intermediaries
 - Narrow profit margins (*typically*) but large volumes
 - Various formats of supply
 - Competitive, Regulated, Default tariffs
 - & different kinds of intermediation: retailers, traders, brokers
 - Also: just electricity vs. multi-utilities
 - In most markets the supply activity has been gradually liberalized (*progressive eligibility of consumers*)
 - The convenience of extending eligibility to all consumers has been frequently questioned

Supply: the Technical Process

- Some are common to regulated & competitive supply (*e.g. metering*), others are required to change supplier
- **Customer database**
 - Consumer data are typically collected & controlled by the incumbent distributor
 - This provides a commercial advantage to the retailer that is associated to that distributor, although in most jurisdictions the information has to be shared with any competing retailer
 - An option that has been adopted in some systems (*e.g. UK, Spain*) is an independent agency that centralized all the information & controls/performs the switching process

Supply: the Technical Process

- **Metering equipment & load profiles**
 - The “obvious” solution: Hourly meters
 - Are they economically justified for small consumers?
 - The crude but pragmatic solution: Load profiles (*representing the “normal” consumption pattern of a class of consumers*)
 - Result in cross-subsidies among consumers
 - Suppliers may take advantage (*cherry picking, if better metering is then used*)
 - Loss of efficient economic signals
 - Static (*not updated*) versus dynamic profiles (*adjusted using real time data*)
 - Need for reconciliation of total load with standard profiles & actual aggregated demand → delays in definitive billing

Supply: the Technical Process

- **Billing & collection**
 - Billing: compute charges & issue the bill
 - Diversity of markets and market prices plus existence of hourly meters → large volume of information to handle
 - Actual processes of billing & collection are equivalent to the traditional approach
- **Other services**
 - Energy-related advice or support
 - Multi-utility offerings
 - Improvement of metering or control equipment

Supply: Energy Purchases and Sales

The analysis to be performed by the supplier:

- Customer analysis: Obtain load to be supplied
 - It may be given by the sales contract itself
 - Alternatively, demand estimates may be needed (*based on historical data or on in-depth customer's activity analysis*)
 - Energy cost analysis
 - Once demand to be supplied is forecast → estimate the market price (*in general a basket of prices*) & the corresponding purchase costs
- Risks & risk hedging for suppliers

Supply: Energy Purchases and Sales

- Risks & risk hedging for suppliers
 - Price risk (*difference between estimated price & actual price*): Hedge by contracting with generators (*or own generators*) → reflect the incurred risk in sale price
 - Quantity risk (*difference between estimated demand & actual demand, in volume or profile*): This risk is typically passed to large consumers, but it is not currently possible for small ones
 - Collection risk (*the buyer may not pay*): Ask for some type of guarantee
 - Regulatory risk (*arbitrariness of regulator*): Send regulator to a good training course

Regulated Tariffs

Default Tariff

- How is procured the electricity that is sold by the retailers to the consumers at a regulated tariff? This is typically specified by the regulator
 - Option 1: From the spot market (*typically hourly prices of day-ahead market, as initially in California or Spain*)
 - Option 2: From competitive procurement in different processes, typically public auctions
 - Option 3: Any prescribed mix of 1 & 2
 - Option 4: The regulated retailer may have degrees of freedom in the procurement
 - In order to incentivise an efficient procurement, the regulator may acknowledge as regulated cost $x\%$ of the actual purchase costs of the retailer & $100-x\%$ of the average purchase cost of all retailers (*as in The Netherlands*)

Frameworks for procurement electricity supply for retail customers

Electric Industry Structure	Divestiture of Power Plants	Procurement Framework/Product Solicited	Supply Portfolio Management	State Examples
Traditional	None	Incremental supply- typically for resources from a specific power plant obtained through requests for proposals (RFPs)	Utility	CO, GA, LA, OK
Restructured, no retail choice	None or partial	Incremental supply (via RFP)	Utility	CA, MT
		Full requirements service (FRS) (via auctions or RFP to provide retail supply for basic service customers)	Market	MA, MD, ME, NJ
Restructured, with retail choice	Full (or near full)	Hybrid FRS frameworks : <ul style="list-style-type: none"> ▶ Long-term contracts (with FRS procurement) ▶ Utility ownership of generation, with some degree of portfolio management by the utility ▶ Public power authority ▶ Specialized procurements (e.g., renewable power supply or renewable energy credits) 	Variously assigned to market and to utility	CT, DE, IL, OH, PA

Regulated Tariffs

Default Tariff

- Retail competition & the **potential interference from default tariffs**
 - Default integral tariffs are at least needed when there are not enough bidders to supply some consumer groups (*perhaps only in certain areas*)
 - Default tariffs protect consumers who have high transaction costs to change supplier
 - Unless there is a complete pass-through of the energy market price (*or an equivalent risk hedge*) the default tariffs may unfairly compete with retailers

Regulated Tariffs

Default Tariff

- **To avoid interferences of any default tariff** on retail competition → the basic rule is the **pass-through of the energy market price** to the default tariff
 - **How to define the price of energy** in the default tariff?
 - From any prescribed combination of purchases with transparent transactions in the long-term &/or short-term
 - Any incentives to purchase wholesale energy efficiently?
 - **Is an extra charge justified** in the default tariff to promote the change of supplier?
 - If a **transition period** between old & new default tariffs is needed → manage to maintain a level playing field between default tariff & market prices during the entire transition

Regulated Tariffs

Default Tariff

- **Do consumers need extra protection?** Is it reasonable that the regulator establishes conditions that limit the clauses that are freely agreed in a private contract?
 - Maximum duration (e.g. one year)?
 - Freedom to cancel a contract (*such as the 28-day rule in the UK allowing consumers to cancel any contract with 28 days notice*) without any charges?
 - May these “protection measures” backfire?

Regulated Tariffs

Last Resort Tariff

- The need to define a “last resort tariff” as different from the “default tariff”
 - The “default tariff” is an option that the regulator decides to keep available for those consumers who do not want to bother to search for a retailer, or as a protection against insufficient competition from the supply side, or to protect any energy-poor consumers
 - It may exist or not
 - The “last resort tariff” is the regulated tariff that is assigned to the consumers whose retailer disappears (typically because of bankruptcy) and they have to be transferred to or find another retailer
 - It has to exist anyway

Regulated Tariffs

Last Resort Tariff

- The existence of the last resort tariff should be mandatory, at least for small & medium consumers
- Meaningful approaches
 - Since the new retailer acquires an unexpected obligation & it will have to purchase additional energy on short notice → this tariff will typically be higher than the default tariff and it will be typically computed when needed, not in advance
 - The procedure has to be completely specified a priori
 - Whether the consumers may choose supplier by themselves individually & when, if this is the case (*note that a larger portfolio of consumers can normally be allocated to other retailer at a better price*)
 - The last resort tariff may last for a limited period of time, after which the individual consumers may wish to stay (at the default tariff) or to leave for another supplier
 - An *ex ante* auction may decide which retailer will be the last resort retailer in any given zone in case it is needed

Competitive Retailing Electricity Prices

Static prices (*prices change infrequently*):

- **Flat rate** (*prescribed uniform price per kWh*)
 - The supplier absorbs the full risk of market price uncertainty (*assuming purchase price is not hedged*)
 - Frequently used with small consumers
 - It may include a capacity (\$/kW) component, applied to the amount of contracted capacity (*this concept does not even exist in many countries*)
- **Time-of-Use (ToU) prices** (*a long time in advance prices are pre-set for predetermined time periods*)
 - Same as above; the economic signals to consumers are better, although they may deviate significantly from reality

Competitive Retailing Electricity Prices

Dynamic pricing (*prices can change on short notice*):

- **Critical peak pricing (CPP)** (*the retailer can occasionally declare an unusually high retail price for a limited number of hours*)
 - CPP is able to send economic signals that correspond to actual instances of scarcity of production in the power system
- **Real-time pricing (RTP)** (*charge the actual price of each hour to the actual consumption in that hour*)
- ToU, CPP & RTP require increasingly more sophisticated electricity meters

Competitive Retailing Electricity Prices

Pricing schemes with discounts to provide reliability services:

- **Interruptible rates** *(the utility may interrupt the service to consumers with these tariffs within a short notice and up to a maximum number of times per year)*
- **Real-time Demand-reduction** programs *(the utility may contact the consumer to offer a payment in return for the consumer reducing consumption below a prescribed baseline)*
- Participation of demand in **forward capacity markets**
 - The case of ISO New England
- *Note that this is different from “demand side bidding”, which is a typical feature of wholesale markets*

Competitive Retailing Electricity Prices

RTP pricing schemes with hedging mechanisms:

- **Two-part RTP** programs with a **customer baseline load (CBL)**
 - There is a Contract for Differences (CfD) for a baseline consumption (*agreed with the regulator*) at a regulated price (*some ToU price, for instance*)
 - In parallel the consumer is fully exposed to RTP for the entire demand
- **Two-part RTP** with **build-your-own (BYO) baseline load**
 - Same as above, but the consumer fully decides how much demand he wants to hedge

Retailers with or w/o own generation

- The **difficult life of the independent** (*i.e. without own generation*) **retailer**
 - Provider of some useful services: liquidity, arbitrage, risk hedging instruments, tailor-made tariffs (*instead of all-purpose default tariffs*) or contracts, additional services (*efficiency audits & advice, sales of appliances, etc.*)
 - Extra difficulties in risk hedging & often discriminatory treatment in market rules (*e.g. operating reserves, balancing*)
 - Questionable survival (*why not the generator?*)

Is retail justified for small consumers?

- Retail competition for **small** consumers: **is it worth it?**
 - Retail competition *versus* well designed (*even including some risk hedging*) default retail tariffs
 - While default tariffs must adopt a given general structure, retailers may offer ad hoc risk hedging structures that are best suited to each end consumer and also additional services
 - Small potential savings
 - Smaller consumers are less price responsive
 - Metering & billing costs are not negligible compared to savings & they become a complex task
 - Without hourly meters (*& the use of profiles*) gross errors will happen in settlement for individual consumers
 - The threat of arbitrage stimulates retail competition

Hurdles to retail competition

- **Interference of default retail tariffs**
 - Tariffs below *(also above, to promote that consumers may go to the market)* market prices
 - For large industrial consumers
 - For other consumers
 - Unfair ex post adjustments to tariffs *(as in the allocation of the “tariff deficit” in Spain: flat allocation to **all** consumers)*
- **Lack of adequate procedures to switch supplier**
 - Insufficient development of procedures to exchange information between distributor & retailers
 - Lack of precision in the specification of deadlines in the required tasks in the switching process
 - Abusive commercial practices by retailers when trying to get new customers

Hurdles to retail competition

- **Irregular practices** that are possible by an **insufficient unbundling** of distribution & retailing
 - Asymmetry in the access to commercial information of consumers by all retailers
 - Publicity or commercial offers that make use of services by other companies within the same holding
 - The use of quality of service of distribution as a commercial advantage
 - Sometimes just a threat, but also actual ex post discriminatory practices
- **Abusive practices** in the procedure to sign the **contract** for access to the distribution grid
 - New requirements regarding the contracted capacity or others
 - Request of financial guarantees

Hurdles to retail competition

- **Discriminatory practices** in relation with renting, installation & maintenance of **metering equipment**
 - New requirements because of the change of supplier
 - Impediments to the customer to access the information in its own meter
 - Excessive charges for the metering service
- Anomalies in the process of **invoicing**
- **Discriminatory charges** *(for instance: reactive power)*

Hurdles to retail competition

- **Inertia** of the consumers (*fidelity to traditional brands or previous supplier → not a “regulatory” issue*)
- **Common ownership of gas & electricity** distribution networks (*to be developed next*)
- **Demand-side management (DSM)** could be a component of retail competition (*which would then encompass a wider range of activities*), however
 - lack of incentives to promote an active demand participation
 - & inadequate regulation & metering to promote DSM activities

Joint Power and Gas Retail

- When choosing supplier, electricity consumers seem to have a **preference for their electricity distribution company** &, in 2nd place, for their gas distribution company. Same with **gas** retailing
- **Most competition** happens between the **distributors of gas & electricity**
- When **ownership of gas & electricity** distribution networks **overlaps**, **retail competition weakens**
- The prestige of the **brand** is a strong factor in retail competition

Unbundling Distribution and Retail

- Many problems with retail competition would disappear with the **ownership unbundling** of distribution + DSO & retail (*in general not an easy measure to apply*)
- **Assuming that only legal unbundling exists**, the following regulatory measures should **at least** be adopted
 - **Legal unbundling** of the normal retailer from the distributor (*& any retailer-for-tariff-customers that may exist*)
 - **Minimum quality standards** in attention to customers by the distribution companies (*on top of the usual minimum standards of quality of service*)
 - Clear definition of the **responsibility of** the activity of **metering** the demand of end consumers (*e.g. frequently assigned to the distribution company*)

Unbundling Distribution and Retail

- Clear procedures of **access to commercial information** about consumers by all existing retailers
 - At least: **decentralized** scheme whereby all retailers have equal access to the same basic information
 - Otherwise: **centralized** switching agency (*disadvantage: new institution & extra costs*)
- Clear procedures to switch supplier with **specified deadlines**
 - If it does not work in a decentralized format → centralized switching agency
 - Use ad hoc rules to **prevent gaming** by consumers with opportunistic switching (*taking advantage of different prices at different times of the year & imperfect contracts or default tariffs*)

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Unbundling Distribution and Retail

- **Strict supervision** by regulatory agency
 - Irregular practices by retailers & distributors should be banned & prosecuted
- **More drastic measures** have been proposed &/or tried in some systems
 - Consumers cannot choose the supplier that belongs to the same holding as the corresponding distribution company
 - Retailing-to-tariff-consumers could be auctioned to retailers other than the one associated to the corresponding distribution company
 - And, finally, ownership unbundling of distribution & retailing

Ownership client information

- Who owns / controls / has access to the **consumer database**?
 - Design options: Centralized, with an independent administrator, *versus* administered by the incumbent distributor or another local entity
 - Key issue 1: whether data have to be transferred between databases or stay where they are & just change the supplier's name
 - Key issue 2: prevent supplier malpractices (*enlist consumers or keeping them without their explicit consent*)
 - Key issue 3: whether meter reading is required when supplier changes (*to prevent gaming by consumers*)

Ownership client information

EU Unbundling

- Directives 2003/54/EC (electricity) & 2003/55/EC (gas) require the distribution system operator (DSO) to be independent (*at least legally, in the organization & decision-making*) of any other activity in the respective sector
- The solution commonly adopted has been to legally unbundle any kind of retailing from distribution, which retains the DSO function
- *Does **legal separation** provide the adequate level of independence of the supply activity, therefore guaranteeing against the risk of discrimination of competing suppliers?*

Active Demand Participation

- Regulation should
 - Promote the **active participation of demand** in energy markets
 - with adequate pricing schemes
 - and other direct procedures
 - **encourage retailers** to engage into demand-side management (DSM) activities
- Most of these activities require **advanced metering**
 - Careful specification, planning & standardization are needed, before massive deployment
 - Look for flexibility in the adaptation to any future requests & technological progress (*e.g. making use of Internet*) rather than deploying very smart but inflexible meters

Role Retailers energy efficiency programs

- Although, in principle, it should be enough if all consumers could experiment **energy market prices** in real time (*either directly, via contracts or under default tariffs*)
- However, there are several **shortcomings**
 - Market prices do not reflect the true cost of electricity & gas (*most externalities are ignored: diverse environmental impacts, long-term scarcity of resources, inequalities in energy access*)
 - Poor design of access tariffs & default integral tariffs
 - Lack of advanced metering systems
 - Short-term energy prices are not experienced by most consumers

Role Retailers energy efficiency programs

→ **Additional measures** are necessary

- Promote existence of **energy service companies**, whose business is energy efficiency, without conflicts of interest
- Direct demand-side measures (*standards, command & control, publicity of efficient appliances, direct control of appliances by utility, interruptibility contracts, etc.*)
 - With the support of **advanced metering & tariffication** schemes
- Interesting experiences using market-based mechanisms
 - White certificates (e.g. Italy, France)
 - Energy efficiency resource standards (EERS) in the US

Regulatory support Retail competition

- **Main factors for the success** of retail competition
 - Functioning & reliable wholesale market
 - Easy access by consumers to information about the available choices, their pros & cons, & the procedures to switch supplier
 - True competition among suppliers without significant barriers or discrimination
 - Absence of default tariffs or other regulated options that compete with advantage with retailers
 - Adequate metering equipment & data processing to support market transactions
 - Working institutions to protect consumer rights & to curb irregular commercial practices
 - Complete, correct & stable set of rules

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Retail and Wholesale markets

- Free transactions between distributors & generators, thus sharing risks
- Distributors (now multiple purchasing agencies) maintain a monopoly over final consumers → regulated tariffs
- Social policy obligations must be charged via regulated tariffs
- No central planning of generation, free entry
- Generation stranded costs & benefits appear

Retail and Wholesale markets

- Trading arrangements
 - open access & ancillary services → system operator
 - organized markets (spot, derivatives) → market operator (not a single buyer, but an auctioneer)
 - bilateral wholesale contracts
 - IPPs may choose between contracts & the spot market
 - regulated network access charges

Retail and Wholesale markets

- IPPs may / may not be vertically integrated with distributors (risk of self dealing)
- Issues of market power are now relevant
- Long term guarantee of supply is in principle left to the market: *will it work?*
- Strong incentive to efficiency in generation
- Any pressure from consumers to arrive at retail competition : *depends level regulated tariffs*