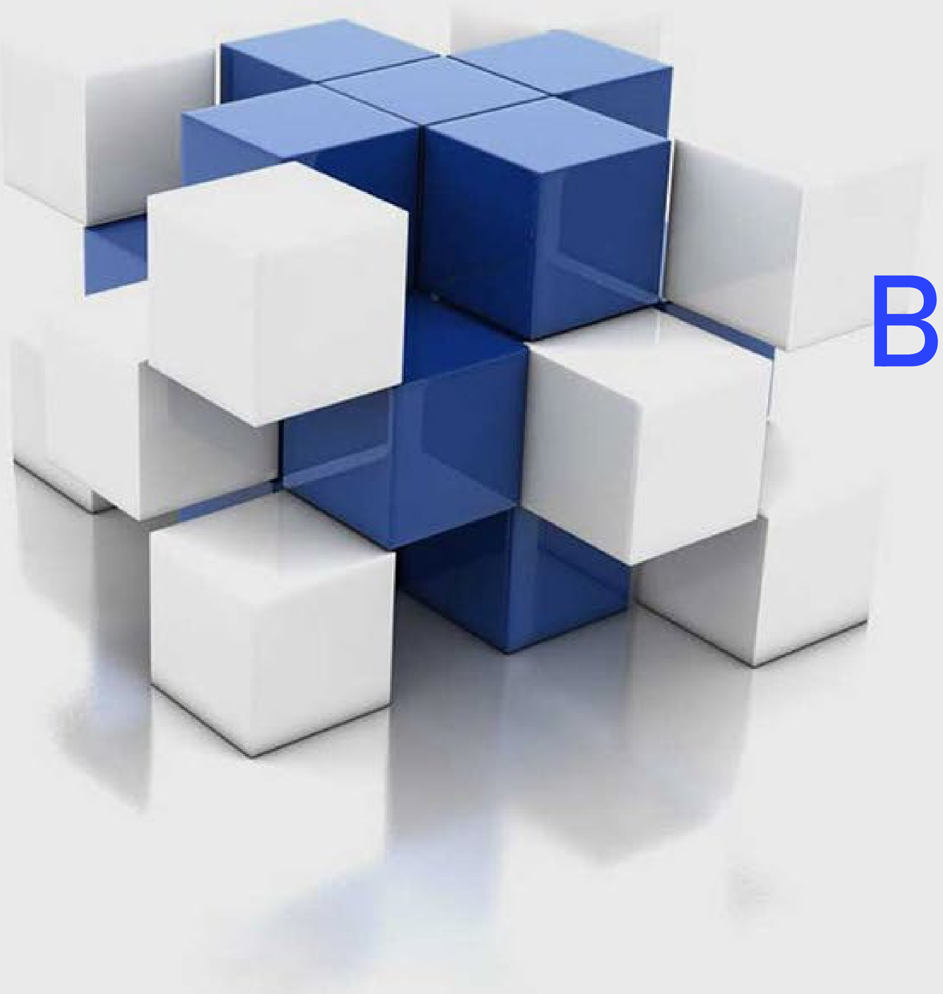
Electricity Markets Training

Provided by CPPA-G



(5th Session) Bilateral Contracts and Centralized Markets

Module Layout

- **Two Parts:**

  i. **Bilateral Contracts**

  ii. **Centralized Energy Markets**

Module Layout

- **Bilateral Contracts:**
  i. **Standardized and Customized Contracts**
  ii. **Advantages and Risks**
  iii. **Price Discovery and Price Reporting Agencies**
  iv. **Spot and Forward Markets**
  v. **Profitability**

Module Layout

- **Bilateral Contracts:**

  vi. **Spark Spread, Dark Spread, Market Heat Rate, Cost of Cover**

  vii. **Physical Transmission Rights**

  viii. **Price Duration Curve**

  ix. **Scarcity Pricing**

  x. **Supply Stack Model**

  xi. **Price Spikes, Time Varying Volatility, Mean Reversion and Locational Basis**

Introduction

Introduction

- Trading in Competitive Electricity Markets can be done through multiple means
- This module is only focused on Bilateral Contracts
- A Bilateral Contract is an agreement between two parties, to buy or sell different products such as Energy, Capacity or Ancillary Services.
- Typical parties that sign Bilateral Contracts include Generators, Traders, Retailers and Consumers.

Introduction

Bilateral Market:

- Trade privately negotiated between two parties
- Can coexist with a wide range of industry structures

Examples:

- State corporation negotiating a deal to cover a specific need
- Utility selling excess capacity to nearby regions
- Municipal utility outsourcing the supply of its power
- Neighboring countries with very different market structures trading power across the border

Benefits:

- **Buyer:** Price Stability
- **Seller:** Guaranteed Revenue

Types of Contracts

Types of Contracts

- **Structured Contracts:**
  - Often between a generation owner and a retail LSE
  - Long-term (20-30+ years)
  - Intricate negotiations
  - Comprehensive documentation for obligations and contingencies
  - Specifies operation based on demand and fuel availability
- **Standardized Contracts:**
  - Simple contracts for power or other products.
  - Specifies price, quantity, and location for delivery.
  - “Firm” power with limited contingencies.
  - Agreed verbally, through electronic means, or algorithms.
  - Involves standardized terms and commercial frameworks.

Standardized Contracts

Standardized Contracts

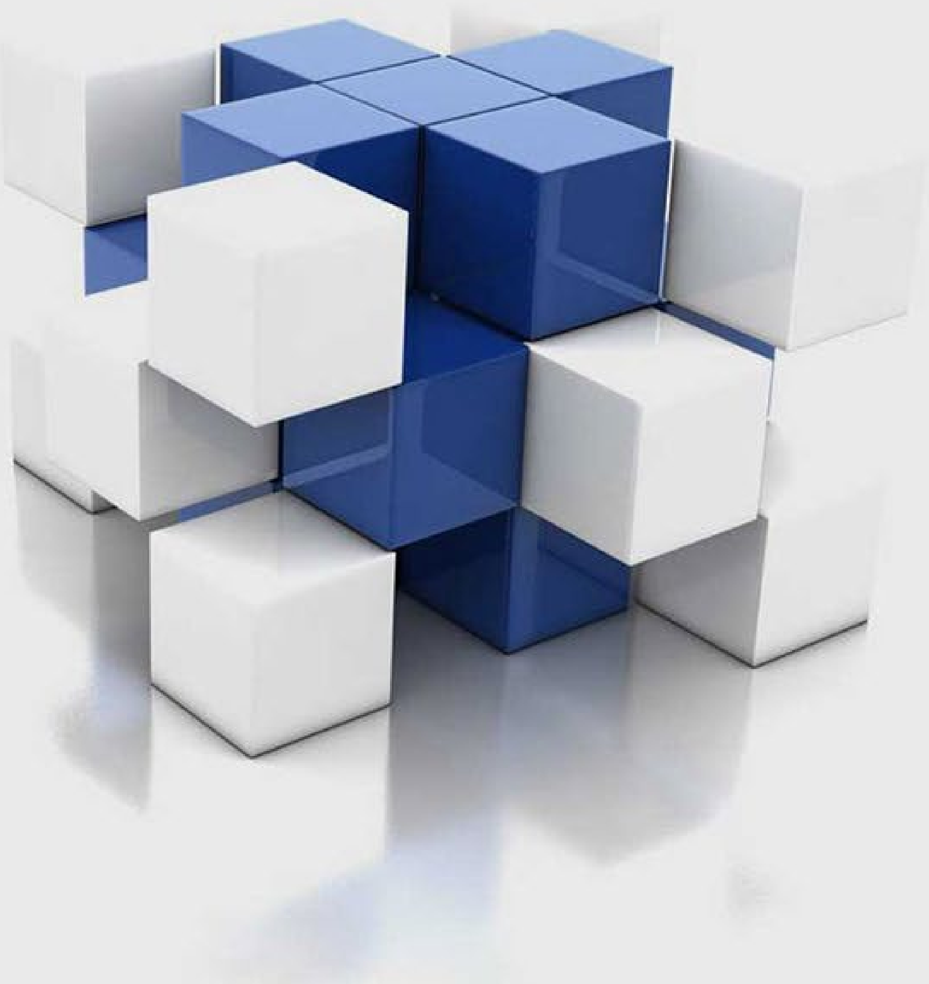
- Standardized contracts are pre-written contracts that are used by many different parties in a particular industry or market.
- Different countries have different customary practices

Benefits

- Increased liquidity
- Reduced costs
- Increased transparency
- Reduced risk

Challenges

- Limited flexibility



Price Reporting Agencies (PRAs)

Price Reporting Agencies (PRAs)

- **Price Reporting Agencies (PRAs)**
  - Provide buyers and sellers with market information
  - Help to make better pricing and trading decisions
  - Promote transparency and fairness in the market

- **Collection of Data**
  - Collect data from a variety of sources
  - Calculate **Price Assessments**, which are estimates of the prevailing market price

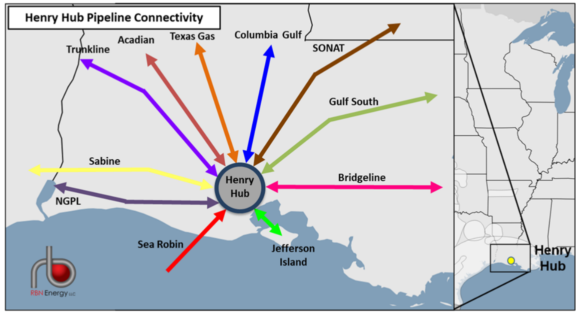
Price Reporting Agencies (PRAs)

- **Benefits of PRAs**
  - Improved transparency and fairness
  - Reduced information asymmetry
  - More efficient pricing and trading
  - Increased market liquidity
- **Challenges of PRAs**
  - Ensure the accuracy and reliability of price assessments
  - **Thick Markets** and **Thin Markets**
  - Develop and maintain a fair and transparent methodology for calculating price assessments

Price Reporting Agencies (PRAs)

Challenges of PRA

- Price reporting agencies need to select the right formula for summarizing data to reflect fundamental market trends.
- One solution is to calculate a price index, which is a formulaic average of other prices.
- A **Zonal Price** is a single price defined for power bought or sold anywhere within a defined region called a zone.
- A **Hub Price** is supposed to be indicative of the wholesale price most accessible to many diverse traders selling into a region.



Price Reporting Agencies (PRAs)

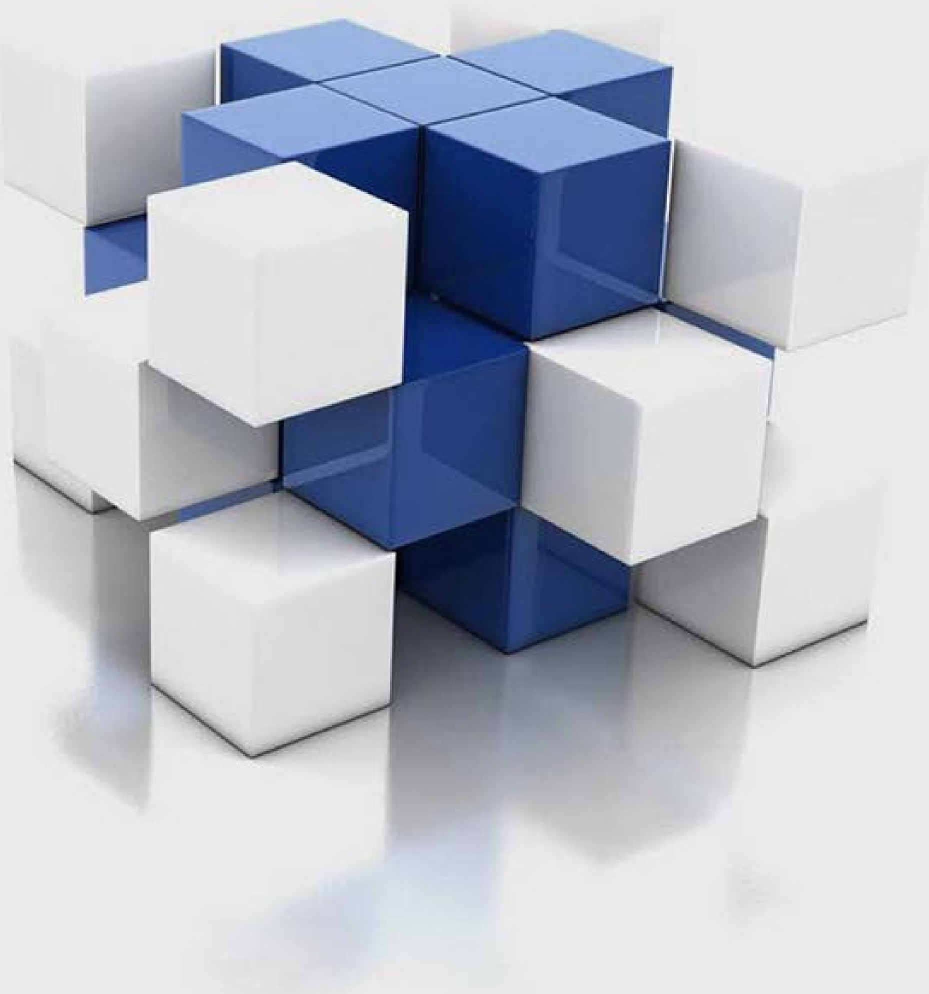
EUROPEAN POWER PRICES

At-a-glance year ahead baseload comparisons

Trade date: August 3, 2018	(Eur/MWh)	Change (%)
Platts UK	62.69	+0.55 ▲
EEX Germany	44.60	+1.13 ▲
EEX France	48.98	+0.57 ▲
OMIP Spain	56.35	+0.36 ▲
EEX Italy	60.25	+0.94 ▲

A Sample Price Assessment from a Price Reporting Agency

Source: S&P Global Platts. EEX, OMIP



Types of Markets

Spot and Forward Markets

Spot Market

- Contracts for immediate delivery
- The Market for Contracts for immediate delivery is called **Spot Market**
- The price in the Spot Market is called **Spot Price**

Forward Market

- Contracts for future delivery
- The Market for Contracts for future delivery is called **Forward Market**
- The price in the Forward Market is called **Forward Price**
- There are multiple forward markets and prices, distinguished by the date of future delivery

Spot and Forward Markets

Platts UK assessments (GTMA, GBP/MWh)

August 1, 2023					Euro equivalents	
	Base	Change	Peak	Change	Base	Peak
Day ahead	70.75	-0.85	71.00	-2.00	82.24	82.53
Day ahead, Block 1+2	65.00	+5.00			75.56	
Day ahead, Block 5			74.00	-6.25		86.02
Weekend	65.00	-0.75			75.56	
Sep	73.40	-3.80	83.15	-3.80	85.32	96.65
Oct	81.60	-2.15	96.65	-2.15	94.85	112.34
Nov	111.35	NA	141.55	NA	129.43	164.54
Q4 2023	106.30	-3.20	131.35	-3.20	123.56	152.68
Q1 2024	120.35	-3.25	143.45	-3.25	139.89	166.74
Winter 2023	113.30	-3.20	137.40	-3.20	131.70	159.71
Summer 2024	107.35	-4.30	114.80	-4.30	124.78	133.44
Winter 2024	124.80	-3.80	151.80	-3.80	145.07	176.45
Summer 2025	94.25	-0.95	105.75	-0.95	109.55	122.92
Winter 2025	112.45	-0.55	140.95	-0.55	130.71	163.84
Cal 2024	113.20	-3.90	129.70	-3.90	131.58	150.76

Baseload = 2300-2300, Peak = 0700-1900. For full details of assessments, indices and calendar roll dates see Platts methodology on spglobal.com/commodityinsights

A Sample of Price Assessments for Deliveries at Different Horizons.

Source: S&P Global Platts. EEX, OMIP

Spot and Forward Markets

Advantages of Spot Markets

- Liquidity
- Transparency
- Efficiency

Advantages of Forward Markets

- Price hedging
- Speculation

Factors to assess profitability of a Contract

Spark Spread

Introduction

- Measures the profitability of natural gas-fired power plants.
- It is the Gross Margin of a Generator on per unit of electricity sold in the wholesale market.
- Can be Negative or Positive.

Calculation

$$Spark\ spread\ (\$/MWh) = Electricity\ Wholesale\ Price\ (\$/MWh) - Marginal\ Cost\ of\ Gas\ (\$/MWh)$$

$$Spark\ spread\ (\$/MWh) = Electricity\ Wholesale\ Price\ (\$/MWh) - [Natural\ Gas\ price\ (\$/mmBtu) * Heat\ Rate\ (mmBtu/MWh)]$$

$$Spark\ spread\ (\$/MWh) = Electricity\ Wholesale\ Price\ (\$/MWh) - [Natural\ Gas\ price\ (\$/MWh)\ /\ Thermal\ Efficiency]$$

Spark Spread

Parameter	Value	Unit
Wholesale Electricity Price	51.35	$/MWh
Cost of Natural Gas	5	$/MMBTU
Plant Heat Rate	8530	BTU/KWh

Marginal Cost of Fuel	42.65	$/MWh

Spark Spread	8.7	$/MWh

Spark Spread

- **Operating Heat Rate:** The simple heat rate of the generation plant in terms of only fuel.
- **Economic Heat Rate:** It is a slightly higher number than the Operating Heat Rate that also takes-into-account the other variable costs.

$$Economic\ Heat\ Rate * Gas\ Price = Total\ Marginal\ Costs$$

$$Economic\ Heat\ Rate * Gas\ Price = Marginal\ Fuel\ Costs + Other\ Marginal\ Oeprating\ Costs$$

$$Economic\ Heat\ Rate * Gas\ Price = Operating\ Heat\ Rate * Gas\ Price + Other\ Marginal\ Oeprating\ Costs$$

$$Economic\ Heat\ Rate = Operating\ Heat\ Rate + \frac{Other\ Marginal\ Oeprating\ Costs}{Gas\ Price}$$

Spark Spread

- **Marginal Heat Rate:** It is the Heat Rate that sets the Spark Spread to Zero and is also called the **Market Heat Rate**. This term is typically reported in Price Assessments.

Spot and Forward Markets

NORTHEAST DAY AHEAD POWER PRICES ($/MWh)

Hub/Index	04-Aug	Marginal Heat Rate	Spark spread
On-Peak			
ISONE Internal Hub	35	11,287	13.21
ISONE NE Mass-Boston	35	11,478	13.79
ISONE Connecticut	34	10,865	12.17
NYISO Zone G	37	11,874	15.35
NYISO Zone J	43	14,488	22.24
NYISO Zone A	35	12,609	15.56
NYISO Zone F	36	12,165	15.34
Off-Peak			
ISONE Internal Hub	25	8,161	3.58
ISONE NE Mass-Boston	25	8,195	3.68
ISONE Connecticut	25	7,867	2.73
NYISO Zone G	25	7,927	2.92
NYISO NYC Zone	26	8,719	5.11
NYISO West zone	22	8,105	3.07
NYISO Capital Zone	25	8,247	3.70

A Sample Set of Spark Spreads and Marginal Heat Rates from a Price Reporting Agency.

Source: S&P Global Platts. EEX, OMIP

Other Types of Spreads

- **Dark Spread:** The Spread of the coal based Generation.
- **Clean Spread:** The Spread calculated when the cost of emissions is also considered
  - Clean Spark Spread
  - Clean Dark Spread

Cost of Cover

- The cost of the replacement when the Generator fails to deliver the contracted output

How is the cost of cover calculated?

- Subtracting the contract price of electricity from the market price of replacement power.
- Market price of replacement power is typically determined by the spot market price of electricity

Conclusion

- The cost of cover is a key element of firm power contracts.
- It is a mechanism that protects the buyer of electricity from the financial consequences of the seller's non-performance.

Cost of Cover

Example of the Cost of Cover for a Delivery Shortfall on a Purchase of Firm Power

Contract Quantity	Contract Price	Nominal Revenue	Produced Quantity	Shortfall	Unit Cost of Cover (Marginal Price)	Cost of Cover	Unit Cost of Cover, Net	Cost of Cover, Net
MWh	$/MWh	$	MWh	MWh	$/MWh	$	$/MWh	$
15	35	525	6	9	43	387	8	72

Cost of Cover

Example of the Cost of Cover for a Delivery Shortfall on a Purchase of Firm Power

Alternative # 1 - Deliver Contracted Quantity, incur Cost of Cover

Delivered Quantity	Contract Price	Contract Revenue Received	Cost of Cover	Revenue Net of Cover
MWh	$/MWh	$	$	$
15	35	525	387	138

Alternative # 2 - Deliver Production, paying Net Cost of Cover

Delivered Quantity	Contract Price	Contract Revenue Gross	Cost of Cover	Revenue Net of Cover
MWh	$/MWh	$	$	$
6	35	210	72	138

Profitability of a Contract

- Profitability depends on:
  - Contract Price
  - Fuel Cost
  - Economic Heat Rate
  - Spark Spread/Dark Spread
  - Cost of Cover

Transmission Rights and Curtailment

Transmission Rights

What are Transmission Rights?

- A way to manage the limited capacity of the electricity transmission system.
- They give generators and loads the right to use a certain amount of transmission capacity at a certain time.

How Transmission Rights Work?

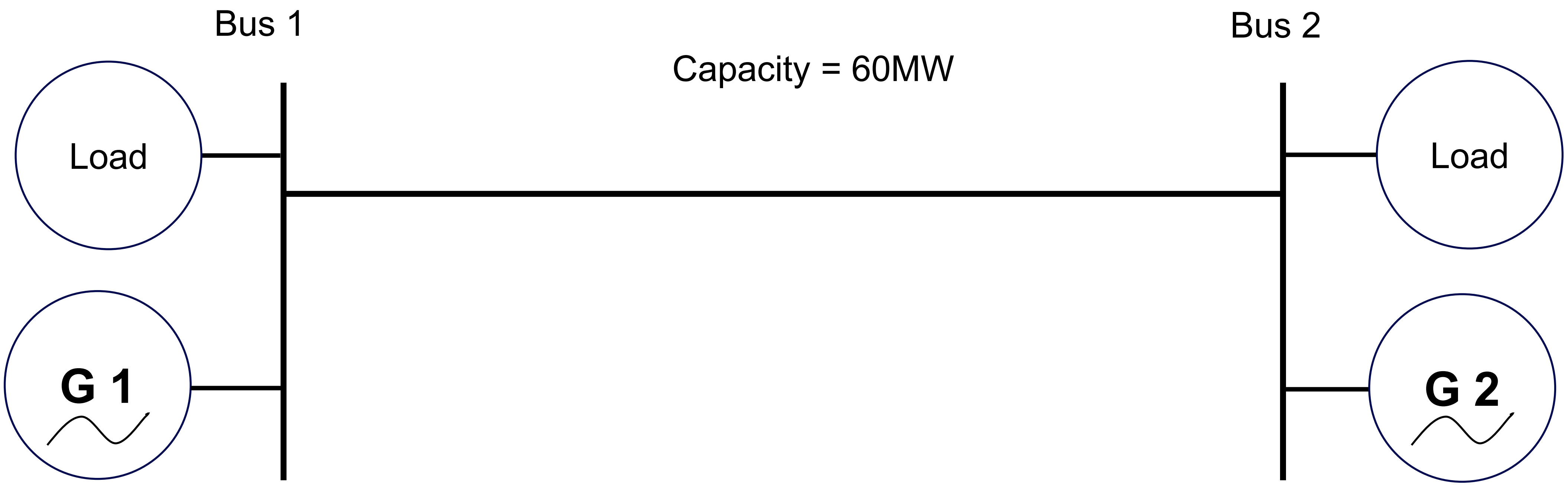
- Typically administered by the system operator.
- Generators and loads can buy and sell transmission rights on a spot or forward basis.
- Price of transmission rights will vary depending transmission capacity available and the demand for that capacity.

Transmission Rights

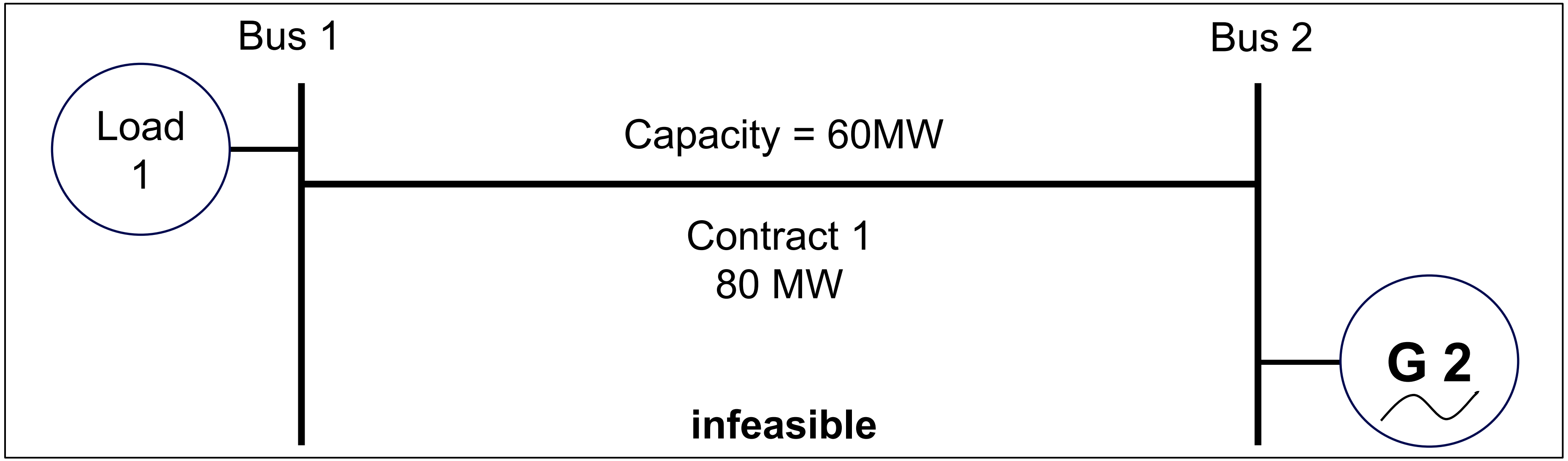
Challenges of Transmission Rights?

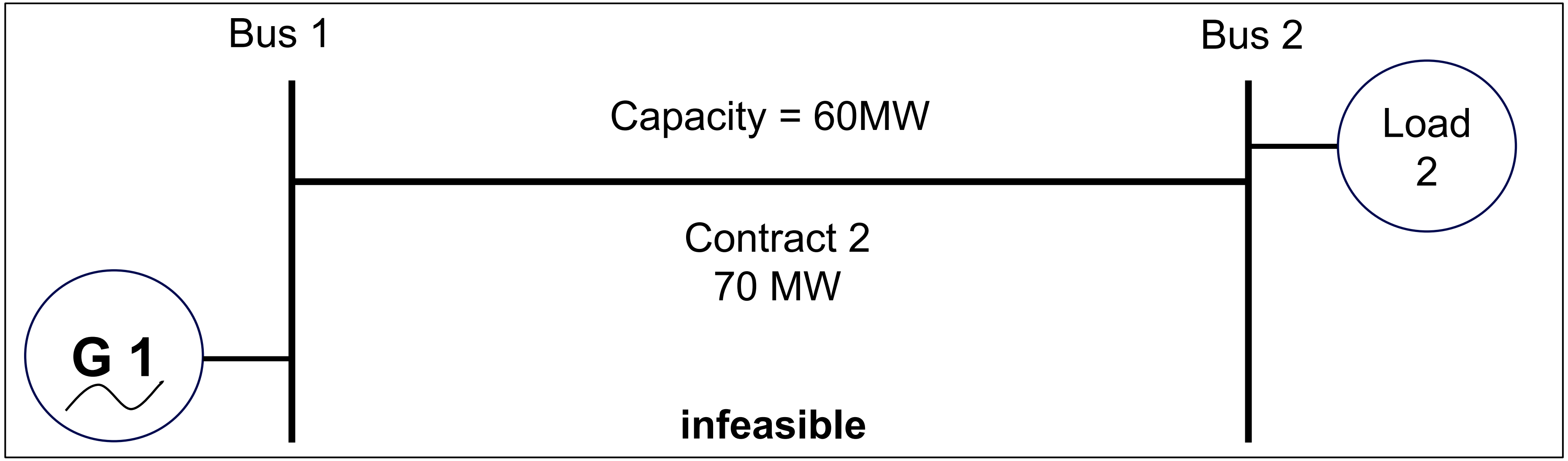
- Poses challenge due to their incompatibility with the laws of physics governing power flow.
- Power delivery capacity between a buyer and seller relies on all network power transactions.
- Issue is particularly troublesome in bilateral markets

Problems with Using PTRs



Problems with Using PTRs

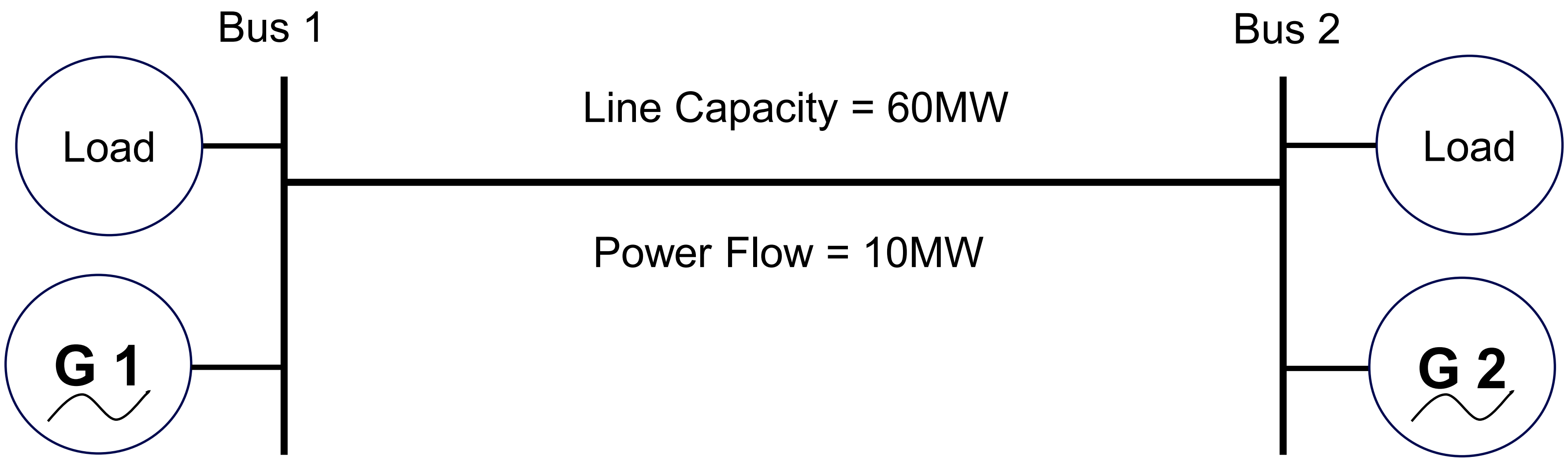




Problems with Using PTRs

Load 1 = 80 MW

Load 2 = 70 MW



feasible

G 1 = 70 MW

G 1 = 80 MW

Transmission Rights

Conclusion

- Many systems have transitioned away from PTRs due to their issues, opting for a centralized energy market system that allocates transmission access through market rules, eliminating the need for separate physical transmission rights markets.

Credit Risk

Credit Risk

Introduction

- The possibility of a loss happening due to the financial inability of one party to a contract to fulfill its obligations
- Credit risk is present in all contracts, both spot and forward

Market Value of a Contract

- Market Value: Difference between the Contract Price and the Market Price

$$\boldsymbol{market\ value\ to\ the\ seller = (contracted\ price\ - market\ price) * quantity * \frac{1}{(1+r)^t}}$$

At-the-money: Contract Price equals the Market Price

- **In-the-money:** Contract Price is above the Market Price
- **Out-of-the-money:** Contract Price is below the Market Price

Credit Risk

Current Exposure

- Current exposure is the potential loss that a party would face if the counterparty defaults immediately

  current exposure = max {market value, 0}

Potential Future Exposure

- Maximum of Potential Current Exposure throughout the deal.
- It is higher for longer-term contracts, as there is a greater chance that the market price will move in favor of the counterparty at some point.

Credit Risk

Case	Explanation	Power Delivered	Spot Price	Contract Price	Seller's Exposure	Buyer's Exposure
1	**Contract: 100 MW at $45/MWh**	Not Applicable	Not Applicable	$45/MWh	$0	$0
2	**Power delivered, payment not received**	Yes	Not Applicable	$45/MWh	$45/MWh or $4,500 (total)	$0
3	**Power not delivered, spot price: $35/MWh**	No	$35/MWh	$45/MWh	$10/MWh or $1,000 (total)	$0
4	**Power not delivered, spot price: $51/MWh**	No	$51/MWh	$45/MWh	$0	$6/MWh or $600 (total)
5	**Forward contract: 200 MW at $66/MWh**	Not Applicable	$67/MWh $65 (Forward Price)	$66/MWh	$1/MWh or $200 (total)	$0

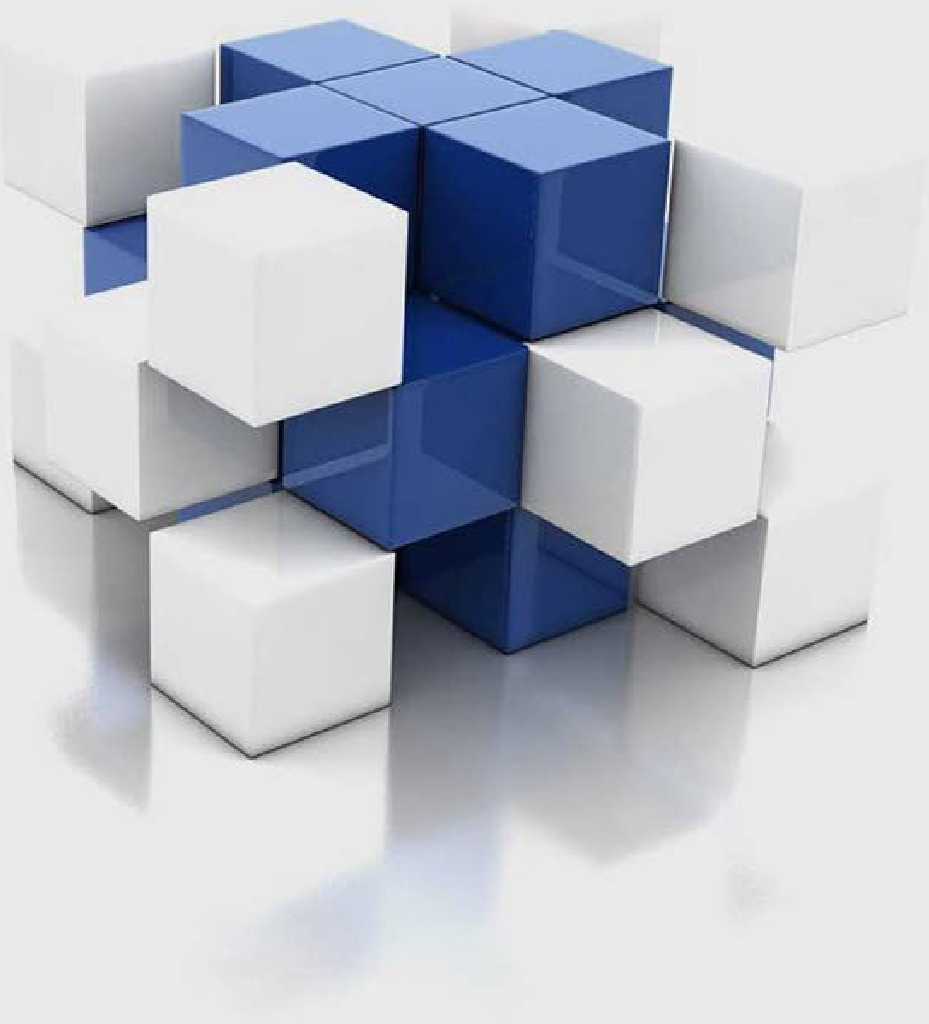
Credit Risk

Managing Credit Risk

- Choosing counterparties with good credit ratings
- Requiring counterparties to post collateral to cover their potential losses
- Netting out offsetting positions to reduce the overall exposure.
- Purchasing credit insurance to protect against counterparty default

Conclusion

- Credit risk is an inherent feature of all power markets
- Parties can reduce their credit risk by carefully selecting their counterparties



Structured Contracts

Structured Contracts

Introduction

- Designed to be customized to meet the specific needs of the two parties involved in a transaction
- Goal of customization is to tailor the contract to suit the unique requirements and preferences of both parties

Benefits

- **Flexibility:** Parties have the option to amend or create unique contract terms, providing flexibility while adhering to local legal requirements.
- **Reduced Risk**: Customization allows parties to create a precise, mutually agreeable contract, reducing the risk of disagreements or disputes.

Structured Contracts

Types of Structured Contracts

- Power purchase agreements (PPAs)
- Capacity sales
- Tolling agreements
- Full requirements contracts

Power Purchase Agreements

Power Purchase Agreements (PPAs)

Introduction

- Pre-negotiated contracts before constructing new power generation facilities.
- These agreements confirm demand and secure investment profitability.
- Long-term commitments, ranging from 5 to 20 years or more, are common.

Key Elements of PPAs

- Contingencies.
- Price Formulas.

Contingencies in PPAs

Managing Uncertainties in PPAs

- Contingencies determine delivery and non-delivery conditions.
- They define risk allocation between the seller and the buyer.
- Introduction to unit firm contracts and compensation for outages.

Unit Firm Contracts

- Unit firm contracts provide allowance for regular maintenance, improving plant efficiency.
- Responsibility for maintenance and operation shifts to the generator owner.
- Similar to utility ownership but with shared responsibilities.

Price Formulas in PPAs

Introduction

- Price formulas play a crucial role in managing future exposure and credit risk.
- Reducing credit risk is achieved by indexing the price, keeping it close to market rates.
- Various types of price formulas are used in structured PPAs.
  - Fuel-indexed PPAs link prices to the market prices of natural gas or coal.
  - Electricity price-indexed PPAs link prices to the market prices of electricity at well-known hubs
  - Publicly quoted prices are essential for observability.

Price Formulas in PPAs

Incentive-based Price Formulas

- Incentive-based PPAs establish a base price for each year.
- Premiums and discounts are applied based on the delivery during peak and off-peak hours.
- These formulas encourage project managers to maximize production during peak hours.

Conclusion

- Structured PPAs are fundamental in the power industry, offering predictability and investment security.
- Tailoring PPAs to specific projects and goals is crucial for sustainable power generation.

Capacity Sales

Introduction

- The purchase of capacity from generators to ensure that they have enough capacity to meet the electricity demand.
- Buyers purchase capacity to ensure that they have enough Capacity to meet their needs.
- Capacity Contracts are used to ensure Resource Adequacy.
- Resource Adequacy rules established by central entity responsible for the System and Market Operations
- A Capacity Contract is very specific about the particular generating unit, while an energy contract can be generic.

Capacity Sales

Introduction

- process of selling the ability of a power plant to generate electricity, even if that electricity is not actually produced.

How Does Capacity Sales Work?

- Capacity sales could be bilateral but typically work through a competitive auction process
- Capacity price is determined by the market and is influenced by a variety of factors

Capacity Sales

Importance

- Ensure that there is enough power generation capacity available to meet the system demand at all times.
- Promoting investment in new power plants

Tolling Agreements

What is a tolling agreement?

- A unique way for a power plant owner to sell the services of their plant, rather than selling the plant itself.
- The owner retains responsibility for maintaining the plant.
- The customer, referred to as the **"Toller,"** has the flexibility to decide when they want to utilize the plant to generate electricity and covers fuel costs while marketing the electricity.
- The toller takes responsibility for procuring fuel and marketing the electricity generated, allowing them to respond to market dynamics.

Tolling Agreements

Contract Heat Rate

- Tolling agreements typically specify a Contract Heat Rate, which establishes the relationship between the volume of fuel and the resulting electricity output.

- The Contract Heat Rate defines the toller's entitlement to a specified volume of electricity for a given volume of fuel.

- The Contract Heat Rate implies that the plant owner assumes the risk associated with the plant's operational efficiency, leading to variations in heat rates and operational costs.

Tolling Agreements

Capacity Charge

- The **Capacity Charge** represents the fee paid by the toller for securing access to the plant's capacity over a specific time frame.

- It ensures the availability of the plant's generating capacity when needed.

Toll Charge

- The **Toll Charge** is the fee paid per unit of electricity generated, typically based on the actual electricity output.

- It reflects the variable costs associated with fuel and operations.

Tolling Agreements

Dispatching in Tolling Agreements

- The toller's decisions on when to dispatch the plant are influenced by the **Spread**.
- Dispatch decisions depend on plant efficiency (heat rate), fuel price, and electricity prices.
- Maximizing profit requires monitoring and responding to these factors in real-time.
- The toller can benefit from both peak and off-peak hours, depending on market conditions.
- Shutting down during unfavorable conditions limits downside risks.

Tolling Agreements

Tolling Agreement Terms for 2 Month

Max Capacity	MW	500.00
Min Capacity	MW	200.00
Contract Heat Rate	Btu/kWh	7,500.00
Capacity Charge	€/kW-month	2.00
Tolling	€/MWh	3.00

Intrinsic Valuation for 2 Month

Electricity Price, peak hours	€/MWh	55.00
Peak hours in the month		352.00
Electricity gen	MWh	176,000.00
Gas use	MMBtu	1,320,000.00
Rev, gross	€	9,680,000.00
Nat gas cost	€	7,920,000.00
Rev net fuel cost	€	1,760,000.00
Capacity charges	€	1,000,000.00
Toll charges	€	528,000.00
Profit	€	232,000.00

Tolling Agreements

Extrinsic Value of Tolling Agreements

- Evaluating the full value of a tolling agreement involves
  - Assessing Contingencies
  - Optimizing Operating Strategy
  - Risk Discounting

Limitations

- Impact of Plant Operation on Costs
- Restrictions and Charges in Tolling Agreements

Tolling Agreements

Benefits

- Reduced Risk Exposure for the Generation Owner
- Ensures minimum income
- The Toller utilizes the skills of the generation owner in building and maintaining the facility.

Conclusion

- Tolling agreements offer flexibility, risk allocation, and financial stability for both plant owners and Tollers.
- Participants in the power generation industry should carefully assess the value and risks associated with tolling agreements and tailor their strategies accordingly.

Full Requirements Contracts

Introduction

- These contracts involve outsourcing power procurement for large-scale energy consumers.
- Large consumers entrust their power needs to wholesale marketers.

Components of Full Requirements Contracts

- These contracts cover both the capacity and energy and may also include the ancillary services in some cases.
- Contracts may set a fixed price for power or have pricing schedules that change by the hour or follow a specific formula.

Full Requirements Contracts

Challenges for Wholesale Marketers

- Analyzing load patterns and volatility.
- Accurate load forecasts over the contract term are essential.
- Knowledge of system protocols, market procedures, and back-office tasks.
- Understanding the wholesale market and the costs associated with sourcing power from different generators.

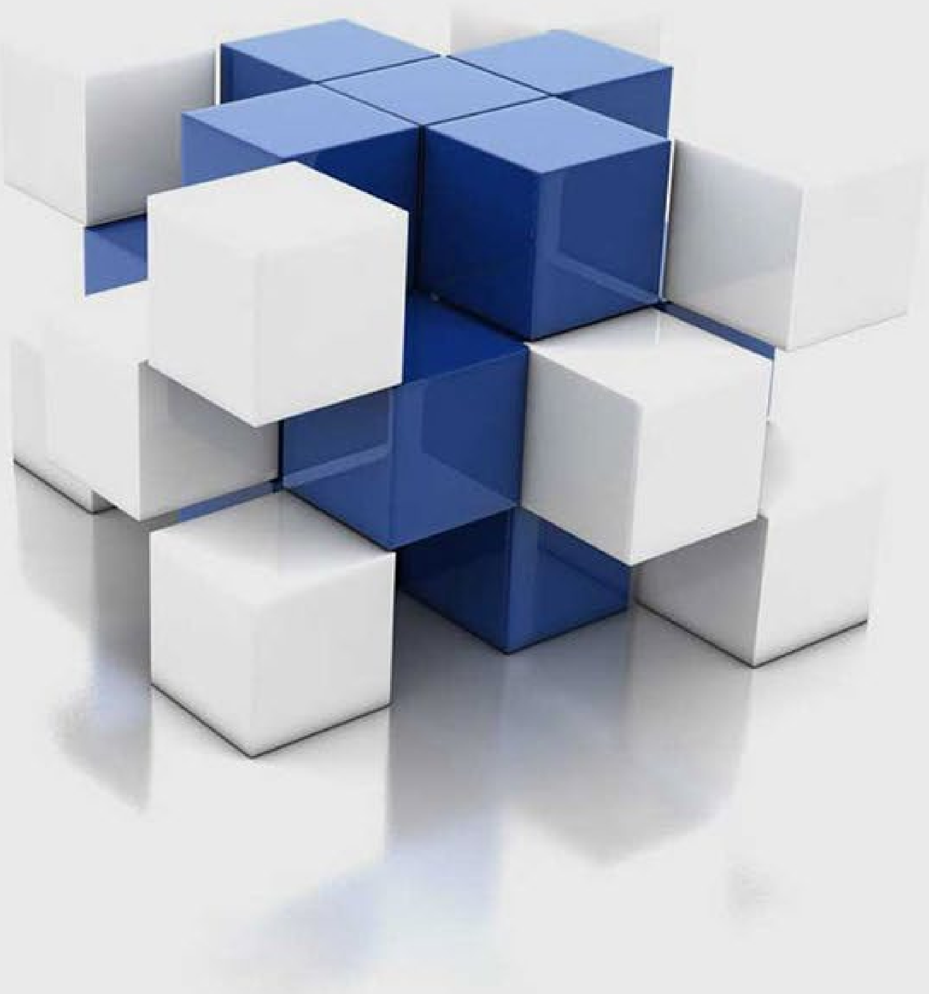
Risks in Full Requirements Contracts

- Market Price Risk
- Volume Risk
- Correlation between Load and Market Price

Full Requirements Contracts

Risk Management by Wholesale Marketers

- Signing matching contracts with Generators.
- Good understanding of the regulatory environment
- Striking a balance between market price and contract price to avoid customer migration



Market Fundamentals

Marginal Cost Pricing

Introduction

- Marginal pricing sets electricity prices based on the variable cost of the marginal plant.
- This mechanism is often illustrated with the “merit order curve”,
- The "Merit Order Curve" is a visual representation of power generation costs in the plant fleet.
- It's essentially the same concept as the conventional "Supply Curve."

Marginal Cost Pricing

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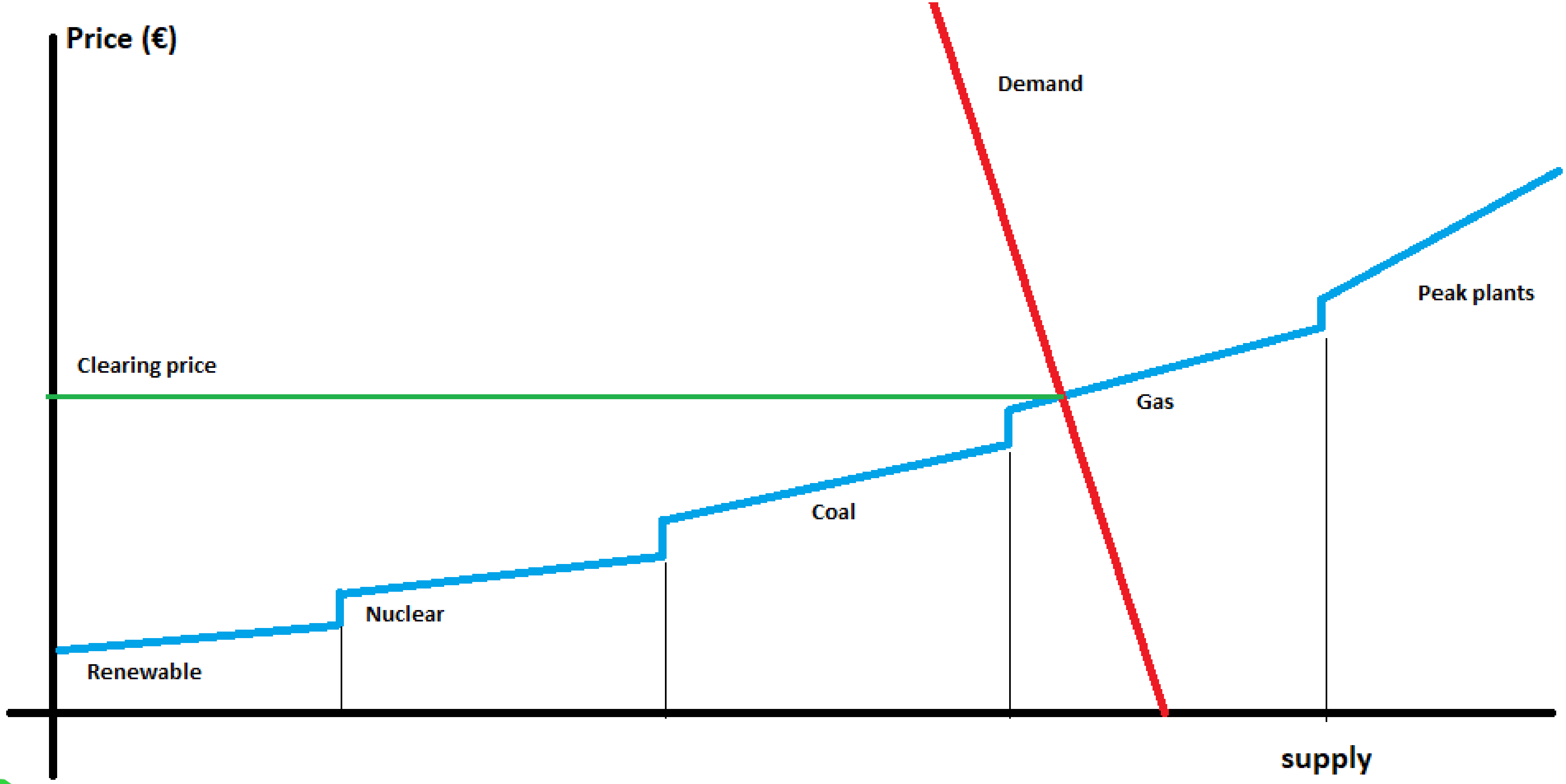
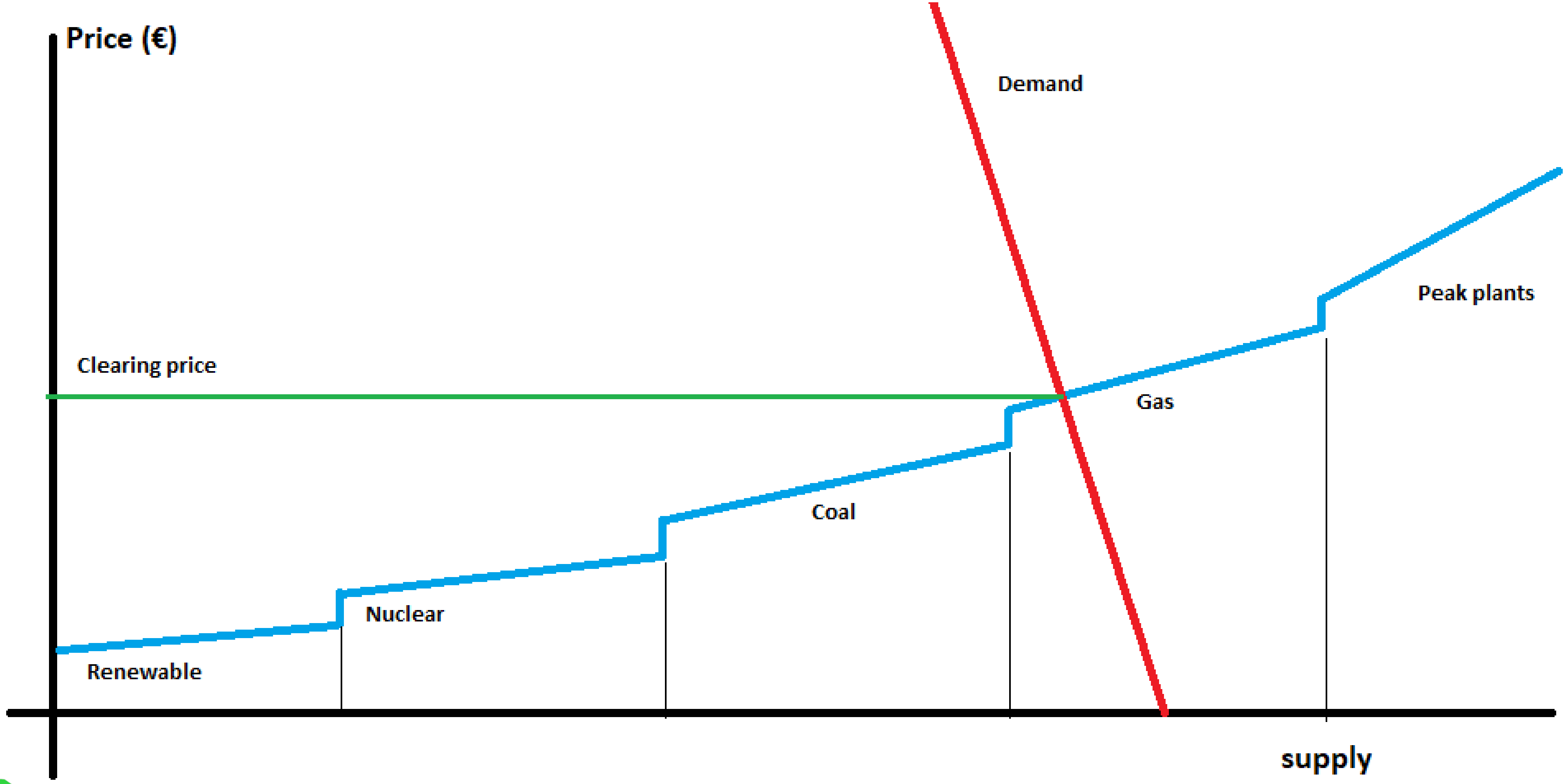
Marginal Cost Pricing



Marginal Cost Pricing

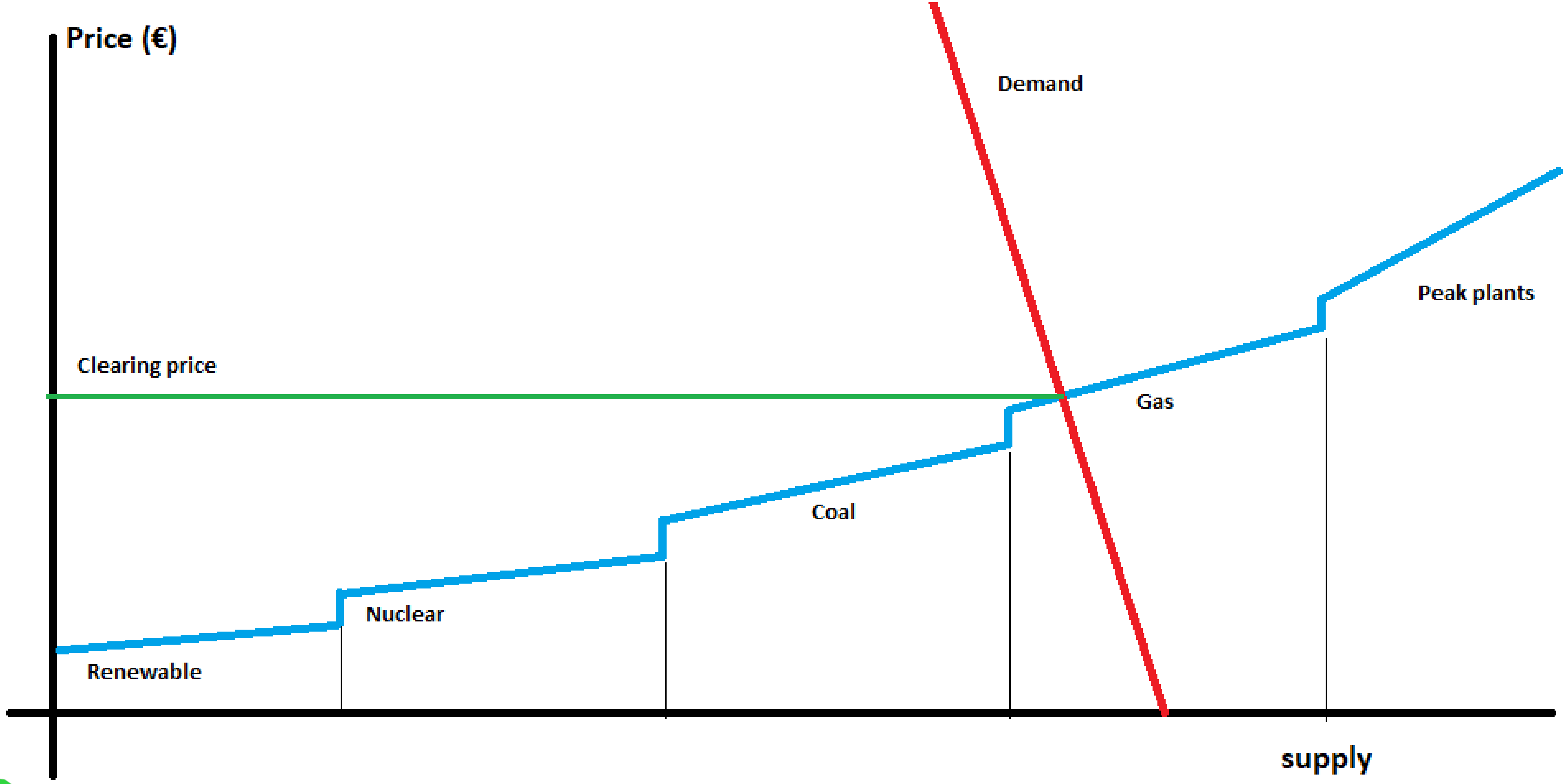


Marginal Cost Pricing

Key Definitions in Electricity Market Pricing

- The generator unit which set the marginal price is known as the **Marginal Generator.**
- The generation unit that operates below the marginal price is known as **Infra-Marginal generator**.

Marginal Cost Pricing



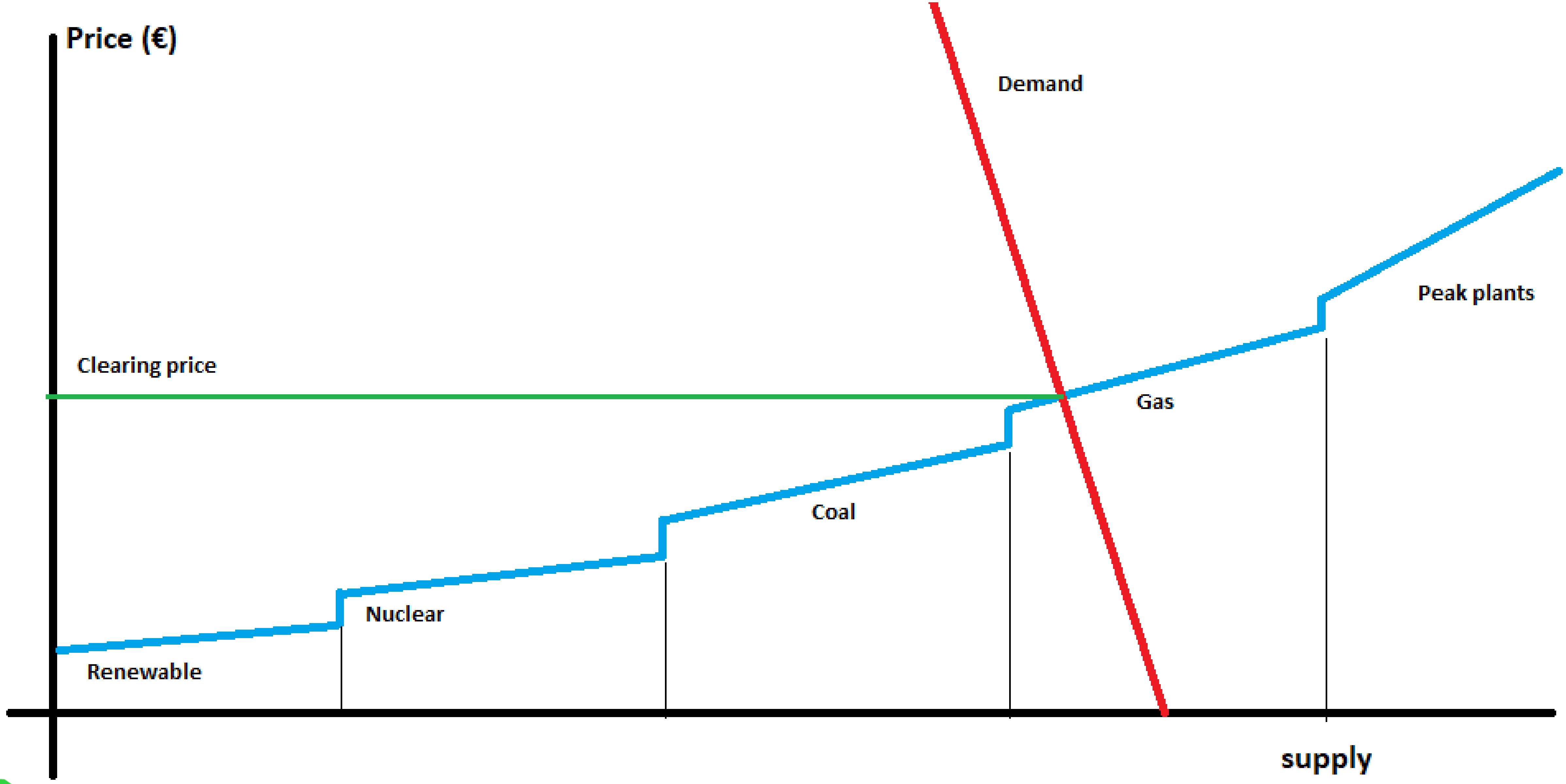
Marginal Cost Pricing

Key Definitions in Electricity Market Pricing

- When the price is no longer set by competition among generators, but instead is set by involuntary load reductions, we say there is **Scarcity Pricing**.

- The hours when this occurs are called **Scarcity Pricing Hours.**

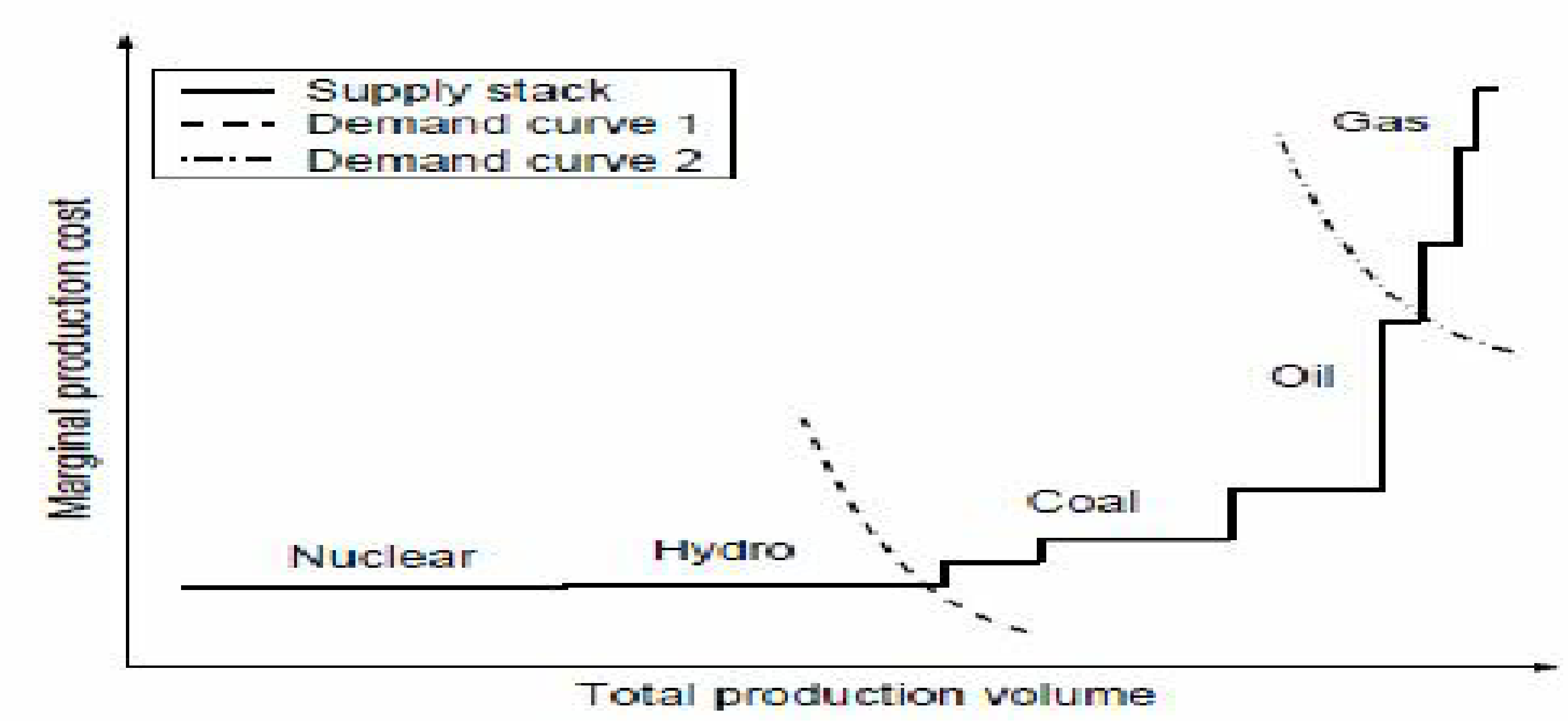
Marginal Cost Pricing



Supply Stack Model

Introduction

- Representation of the supply of a commodity, such as electricity, gas, or oil, arranged in order of increasing marginal cost of production.

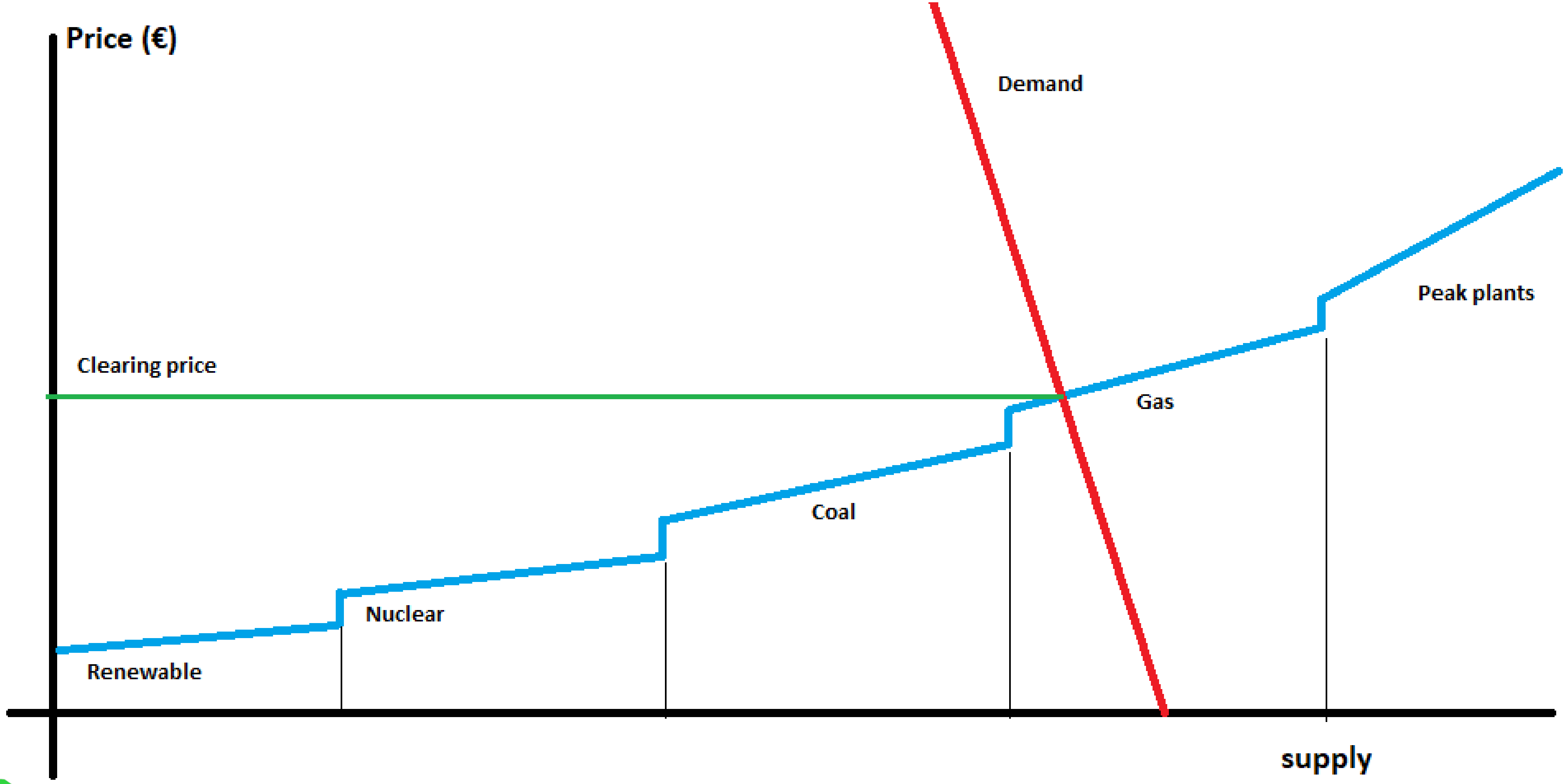


Supply Stack Model

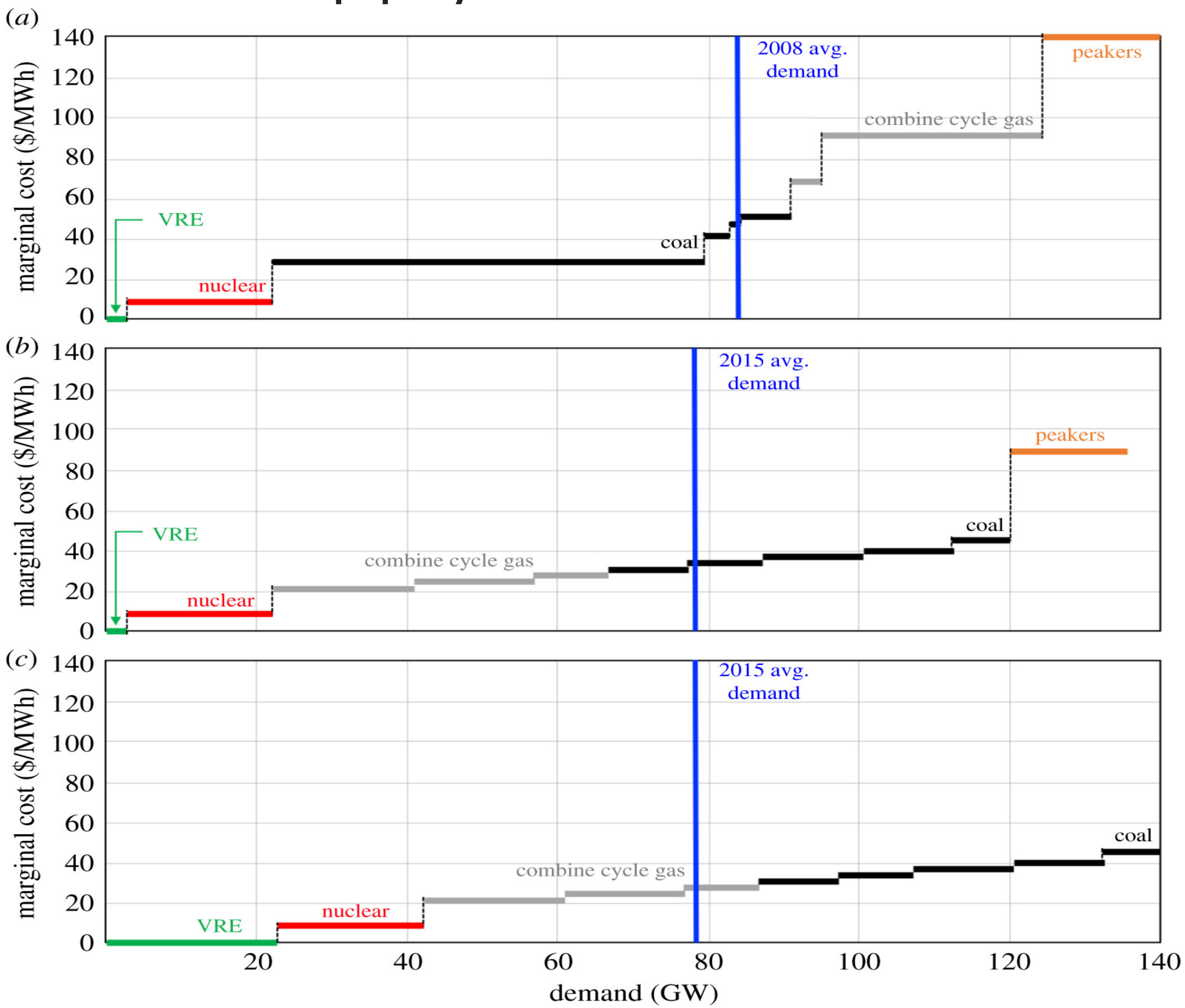
Applications of the supply stack model

- **ISOs**: to dispatch generation units and set market prices.
- **Energy companies:** to plan capacity investments and manage risk.
- **Policymakers:** to design and evaluate energy policies.

Marginal Cost Pricing



Supply Stack Model



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Distinctive Characteristics of Electricity Prices

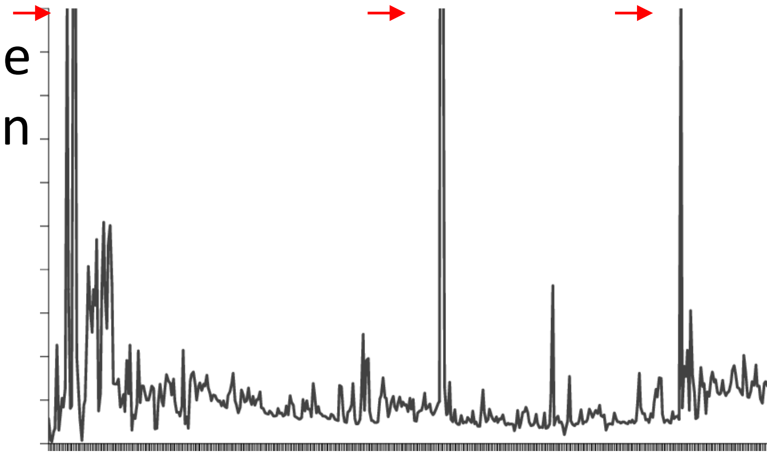
Distinctive Characteristics of Electricity Prices

1. Spikes and Time Varying Volatility
2. Mean Reversion
3. Locational Basis

Spikes and Time Varying Volatility

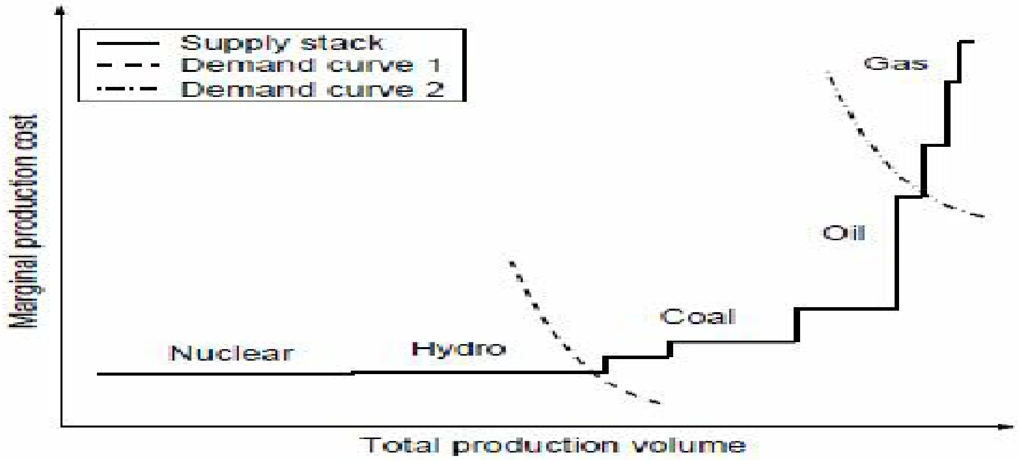
Introduction

- Electricity Price Spikes are sudden and extreme fluctuations that occur in the cost of electricity within short periods.



Factors Contributing to Price Spikes

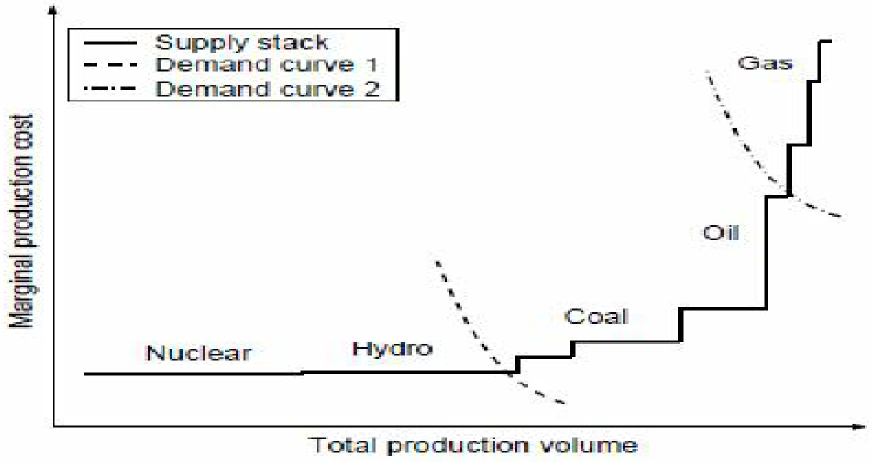
- Supply and Demand Imbalances
- Renewable Energy Variability
- Transmission Constraints
- Market Structure



Spikes and Time Varying Volatility

Time Varying Volatility

- Volatility in different periods is different i.e. periods of high volatility and low volatility.
- Predictable Periods: It is possible to predict whether volatility will be higher or lower.
- Unpredictable Periods: It is not predictable that how much and for how long the volatility will prevail.



Mean Reversion

Introduction

- The tendency for prices to return to their long-term average after temporary shifts in supply and demand.

Factors Affecting Mean Reversion

- Temporary Shifts in Supply and Demand
- Storage of Commodities
- Calendar Factors

Locational Basis

Introduction

- **Locational Basis** refers to the price difference between the same commodity at same time but in different locations.

- **Price Hubs:** The benchmark locations against which the locational basis is measure.

Factors Influencing Locational Basis

- **Congestion:** Occurs when load in one location requires more expensive local generators due to inadequate transmission capacity from lower-cost generators in other locations.

- **Losses:** Incurred during energy delivery can also contribute to price differentials, affecting the competitiveness of generators in different regions.

Conclusion

- Bilateral Contracts can co-exist with variety of structures
- Coordination Issues
- Centralization for realization of full potential