

# **Network Pricing Models in Europe – From Normative Principles to Practical Issues**

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# Network Pricing Models in Europe

- No clear tendency towards a preferred network pricing model in Europe
  - E.g. application of generation / load split
  - E.g. application of different cost concepts
- Frequently different approaches for transmission and distribution
  - Different physical properties of electricity transmission and distribution
  - Different scope of provided services
    - Interrelations between transmission systems and wholesale markets

# Transmission Pricing – Examples

## Great Britain:

- Locational charges (ICRP)
- Payment liability : G&L

## Norway:

- Locational charges (SRMC)
- Payment liability: G&L

## Germany:

- Demand and energy charge by voltage levels
- Payment liability : L

## Ireland:

- Locational charges for G (reversed MW-miles)
- Payment liability : G&L

## Ukraine:

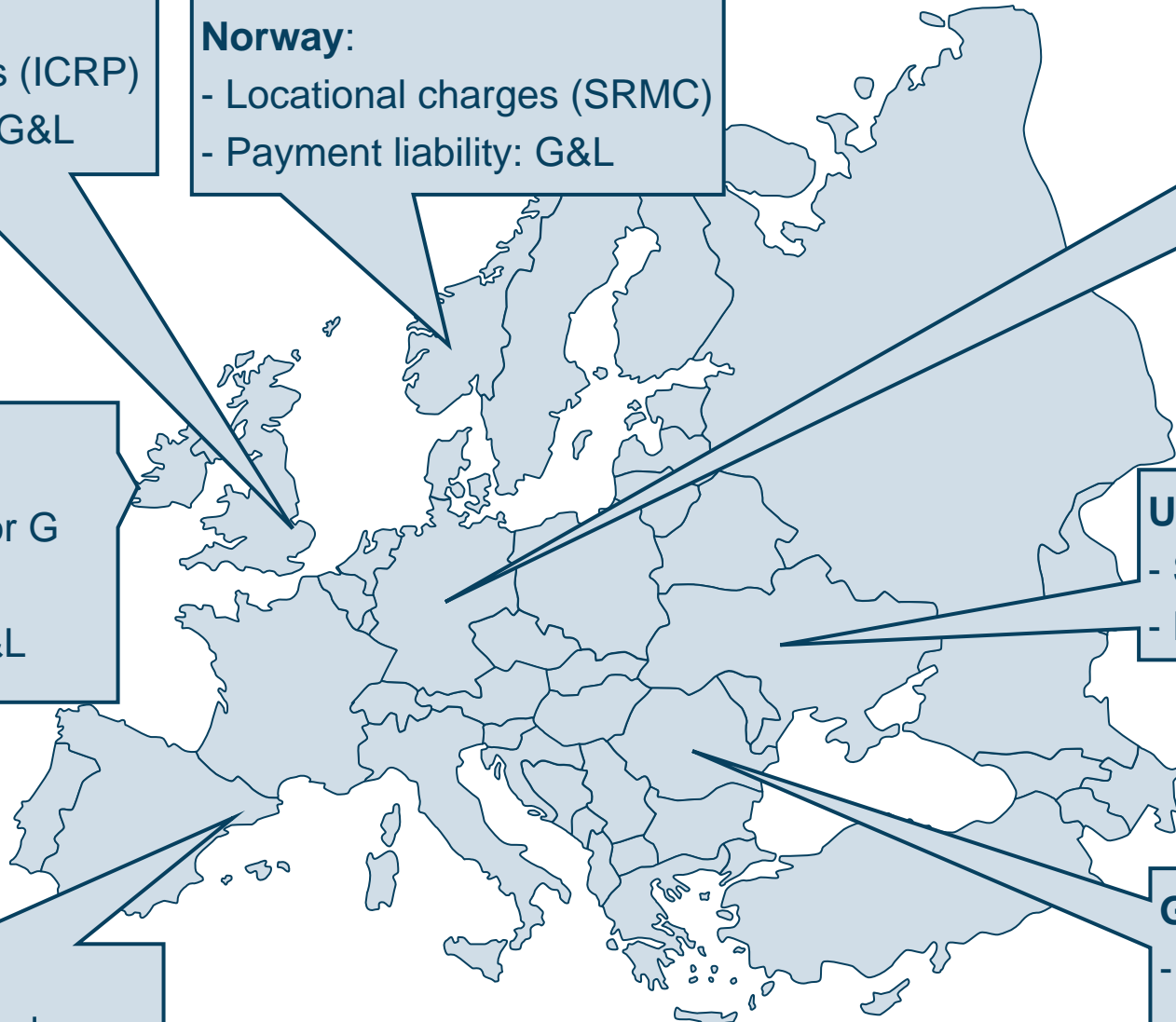
- Single energy charge
- Payment liability : L

## Spain:

- Energy and demand charge
- Payment liability : L

## Greece:

- Zonal charges
- Payment liability : G&L



# Differences in Transmission Pricing in Europe (1)

- Locational elements
  - Locational elements in Great Britain, Ireland, Norway
  - No locational elements in Germany
- Marginal versus average cost
  - Marginal cost used in Great Britain (LRMC) and Norway (SRMC)
  - Average cost used in Germany and Austria
- Tariff design (energy and/or demand charges)
  - Demand charge in Great Britain
  - Energy and demand charges in Germany
  - Energy charges in Bulgaria, Ukraine

# Differences in Transmission Pricing in Europe (2)

- Transmission losses
  - Excluded from transmission charges - in Great Britain and Ukraine
  - Included in transmission charges in Germany and Austria
  - Locational signals via transmission losses – Norway
- System operation cost
  - Explicit price control in Great Britain
  - Integrated in transmission price control in Germany
- Payment liability: load only or generation and load
  - Joint liability in Great Britain, Ireland and Norway
  - Only load in Germany and Spain

# Distribution Pricing – Examples

## Great Britain:

- Standing, demand and energy charge
- Based on LRMC (LRAIC)

## Germany:

- Demand and energy charge by voltage level
- Payment liability : L

## Czech Republic:

- Demand and energy charge by voltage level
- Payment liability : L

## Austria:

- Demand, energy and standing charge by voltage level
- Time-of-use energy charge (peak / off-peak period)
- Separate charge for network losses

## Portugal:

- Demand and energy charge by voltage level
- Payment liability: L

# Differences in Distribution Tariffs in Europe (1)

- Locational elements
  - Prices usually on regional basis
  - Differentiated by voltage levels but without further geographical differentiation
- Marginal versus average cost
  - Marginal cost used in Great Britain and Portugal
  - Average cost used in Germany and Austria
- Tariff design (energy and/or demand charges)
  - Demand and energy charges used elsewhere
  - Standing charges (Great Britain)

# Differences in Distribution Tariffs in Europe (2)

- Distribution losses
  - Included in distribution charges (Germany)
  - Included in distribution charges using a separate losses charge (Austria)
  - Excluded from distribution charges
- Time-of-use pricing
  - Elements of time-of-use charges in Austria and Portugal
  - No time differentiation in Germany
- Differentiation by voltage level of connection
  - Used elsewhere
  - Some countries in Eastern Europe apply single uniform charges across networks

# Network Pricing: Objectives

- Revenue recovery
- Economic Efficiency
- Efficient regulation
- Simplicity and Transparency
- Non-discrimination
- Social affordability and political acceptance

**In practice it is a challenge to ensure a trade-off!**

# Network Pricing – Major Questions

- Question 1: What should be priced?
- Question 2: What is the major pricing concept?
- Question 3: How to allocate costs for tariff setting?
- Question 4: What is the tariff structure?
- Question 5: Who should pay?

# What Should be Priced?

- Core network (network service including transport and security)
- Connection (connection service)
- Network losses
- For transmission services
  - Transmission constraints
  - System services

# What Should be Priced? Network and Connection

- **Connection charges**

- Shallow principle  
(up to connection boundary)
- Deep principle  
(including network reinforcement cost)

**Practice: Socialising  
of network  
reinforcement cost?**

- **Use of network charges**

- Network Service Principle  
(Point of connection)
- Point-to-Point Principle  
(Distance based pricing)

# Pricing Concept: Marginal versus Average Cost Pricing

- Average Cost Pricing (AC): allocates the total cost allocated to the total units (energy or demand) transported via the networks
- Marginal Cost Pricing (MC): measures additional (incremental) cost incurred to transport one additional kW or kWh via the networks
  - Short Run Marginal Cost (SRMC) – calculated with constant capacity stock and includes:
    - Cost of marginal transmission losses
    - Cost to manage network constrains
  - Long Run Marginal Cost (LRMC) – includes incremental cost of investments to cover additional demand

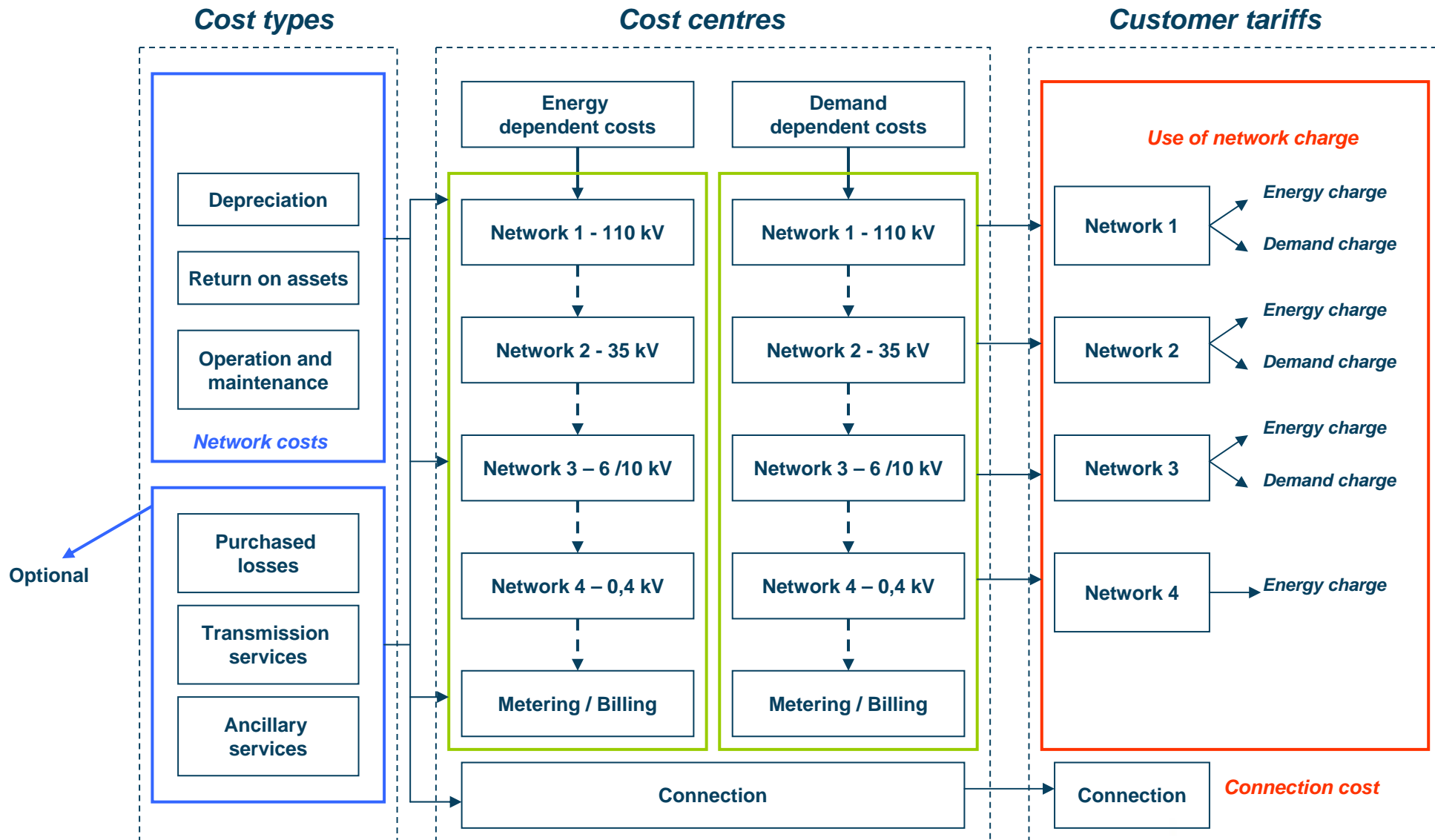
# Pricing Concept: Marginal versus Average Cost Pricing

	Marginal Cost Pricing	Average Cost Pricing
Economic Efficiency	High	Relatively low
Cost Recovery	Adjustments needed to MC tariffs to ensure cost recovery.	It results automatically from the cost allocation.
Efficient Regulation	Depends on the regulatory role in the tariff setting process. Administration and compliance cost of MC pricing may be relatively high.	Depends on the regulatory role in the tariff setting process.
Transparency and Simplicity	Low – MC pricing concepts usually apply sophisticated modelling.	High – AC pricing easily understood by users.
Non-Discrimination	High – but also depends on adjustments for cost recovery.	Variable – depends on the rules for cost allocation and tariff setting.
<b>Implementation in Practice</b>	Used to provide short and long-term locational signals. Usually requires sophisticated modelling.	Usually used with energy and demand charges differentiated by voltage level.

# Cost Allocation Aspects

- Geographical differentiation
  - Flat charges (post stamps)
  - Voltage level differentiation (applicable especially for distribution pricing)
    - Principles of cost cascading
  - Locational charges
    - Efficient operation of existing infrastructure
    - Infrastructure signals
- Time-of-use and contribution to system peak
  - Energy versus demand charges
  - Differentiation by time

# Example: Distribution Pricing



# Energy versus Demand Charge

	Energy Charge	Demand Charge
<b>Calculation</b>	<ul style="list-style-type: none"> <li>• Revenue requirements / Energy transmitted</li> </ul>	<ul style="list-style-type: none"> <li>• Revenue requirements / Relevant demand</li> </ul>
<b>Pros</b>	<ul style="list-style-type: none"> <li>• follows equity objectives</li> <li>• considers the fact that network is used also in off-peak periods</li> </ul>	<ul style="list-style-type: none"> <li>• reflects the network planning process (peak demand relevant for network design, hence causality between demand and cost)</li> <li>• compatible with peak load pricing: system value higher in the peak demand periods</li> </ul>
<b>Cons</b>	<ul style="list-style-type: none"> <li>• allocates sunk cost to energy quantities and dilute/distort signals</li> <li>• may affect negatively energy consumption and network usage</li> <li>• may undermine causality principles</li> </ul>	<ul style="list-style-type: none"> <li>• complete payment liability in one (or small number of periods) time period</li> <li>• may discourage network usage</li> <li>• network is used not only in peak hours</li> <li>• may lead to substantial differences in payments in case of different load profiles</li> </ul>

- **Practical solution:** demand / energy split

# Definition of Demand

- Coincident peak demand versus non-coincident system peak demand
- Non-coincident peak approach tends to over-allocate cost to off-peak users
- Coincident-peak strictly allocates costs to peak users
- In practice coincident demand used for higher voltage levels, frequently supported by several peaks rather than a single value measured over the year

# Application of Locational Charges

- Signalling function
  - In short-term reflect costs to manage network constraints and procure transmission losses
  - In long-term reflect cost of new infrastructure
- Practical issues
  - Interaction with connection charges
  - Integration of congestion cost
  - Synchronisation with payment liability generation / load split
  - Compatibility with equity objectives resulting from social goals of political constraints

# Conclusions Network Pricing

- Strives to find a trade-off of major pricing principles
- Applies network service (point-of-connection) model
- Exhibits different solutions in individual countries
- Major reasons for these differences consist in:
  - Different traditions
  - Different preferences
  - Different situation
- It remains questionable whether harmonisation is feasible

# Thank you!



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