

Electricity sector introduction

History of liberalization

Market design

Laurens de Vries

24-6-2011

PART 1: THE CHALLENGE

Policy goals

AAA:

- Available
- Affordable
- Acceptable

Challenges to availability

- reliability – international cooperation between EC, national governments, regulators, TSOs, market operators, companies...
- security of supply
 - sufficient investment in generation, transmission, distribution, metering, innovation
 - Where will the gas be coming from?
 - Where to invest?
 - (Total volumes of fossil fuels are not a restriction yet.)
 - How fast can renewable energy be developed?
 - Transition technologies: necessary, or undesired path dependence?

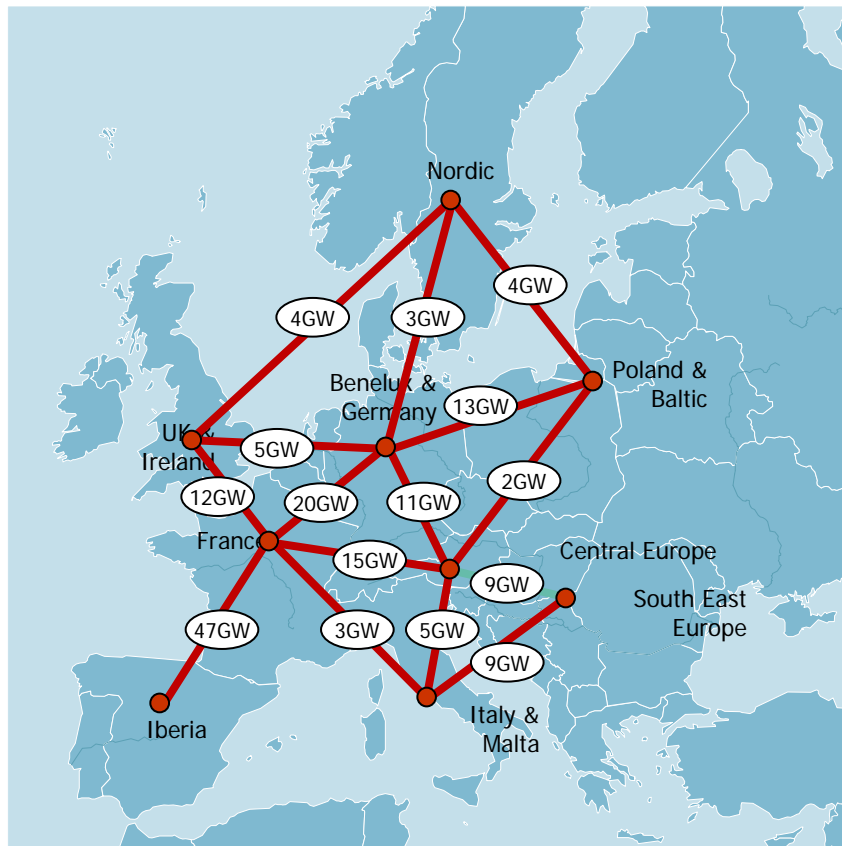
Challenges to affordability

- Competition is not effective everywhere → market power
- Restructuring → decentralization → coordination problems, transaction costs
- Rising fuel prices
- Limited investment during past decades → limited capacity for certain kinds of investment (nuclear, wind)
- Limited optimization across national borders

Challenges to acceptability

- Greenhouse gas emissions need to be reduced quickly
 - European Climate Foundation
 - 80% CO₂ reduction in 2050 only possible with *zero-carbon power supply*
 - long-run costs not so high?
 - but who pays the large upfront investments?
- Nuclear power, CCS

Massive transmission investments needed



Source: European Climate Foundation, Roadmap 2050

PART II: RECENT HISTORY

Timeline

- Reforms in Chile and Argentina in the 1980s showed that competition in electricity was possible
- Telecom reforms in the UK (1983) demonstrated the possibility of competition in a network sector
- UK: The Gas Act (1986) and the Electricity Act (1989) intended to create competitive markets
- 1988 “The Internal Energy Market” (European Commission)
- These developments lead to Directive 96/92/EC (electricity) and Directive 98/30/EC.
 - liberalization of European electricity and gas markets

Why liberalize: to improve economic performance?

- Ideology: To increase efficiency by introducing competition where possible
- Specific motivations vary:
 - Overinvestment in many Western countries (especially in Europe)
 - In NL: to stop excess investment, which resulted from a combination of central planning and stimulation of small-scale CHP
 - Less than optimal reliability (e.g. California)
 - Insufficient investment/low quality (in developing countries)

... Or for other reasons?

- In Europe: also to improve cohesion between countries by creating a single internal market
- In the UK: to break the coal unions (Thatcher)
- To qualify for loans (e.g. World Bank or IMF requirements)
- To attract private investment (developing countries)

Principles of liberalization

- 'Unbundling' of competitive and monopoly functions
- 'Level playing field' between competitors
- Regulation of residual natural monopolies

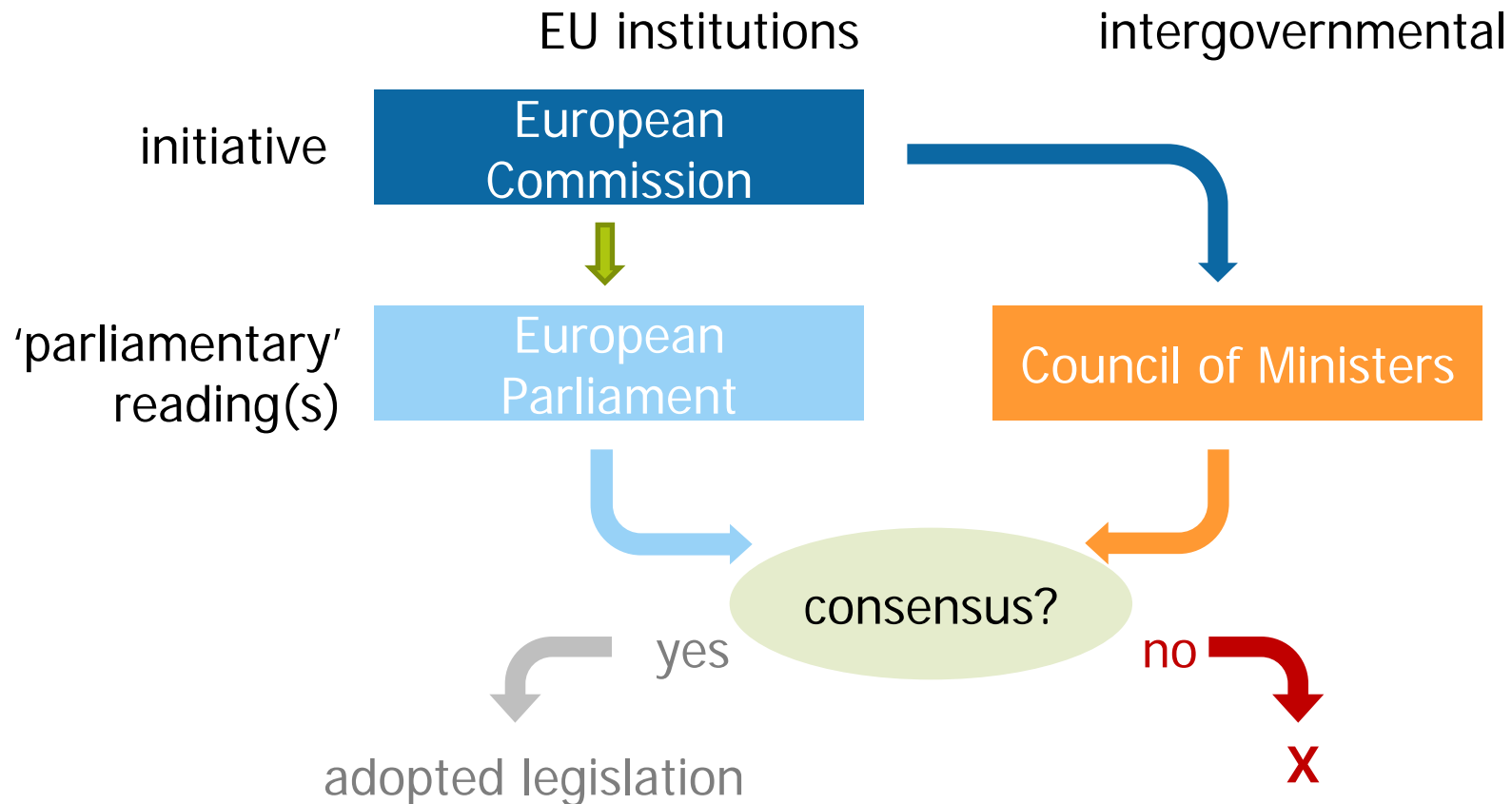
Expectations

- State ownership/private monopolies → poor incentives
 - attempts to improve efficiency had failed
- Introducing competition appeared possible and effective, why not in electricity and gas?
 - static efficiency: competition would drive down prices to cost level
 - dynamic efficiency: competition would lead to
 - an optimal generation mix
 - innovation

EU: legal instruments

- Regulation: general application, binding
- Directive: addressed to member states, needs implementation
- Decision: addressed to specific case, binding

EU: Co-decision procedure



1996/1998: First electricity and gas Directives

Basic outline of market: competitive activities should be free, networks regulated, but:

- Choice between nTPA/rTPA
- Government tendering of capacity allowed
- Gradual phasing in of competition
- No regulator required
- No detailed market design decisions (no harmonization!)

1998 Electricity Act

- Implementation of the Directive
- Affected only monopoly tasks: networks
- CPI-X regulation of network tariffs
- Permit requirement for supply to small customers (rule added later)

Gas Act (2000)

- Implementation of the Directive
- Focus on networks and supply: production is regulated by the Mining Act
- Initially nTPA, recently changed to rTPA

OEPS: transition act electricity production sector (2000, 2003)

- Sunk costs
 - Demkolec
 - import contracts
 - district heating projects
- TenneT to the state

The Electricity Directive 2003/54/EC

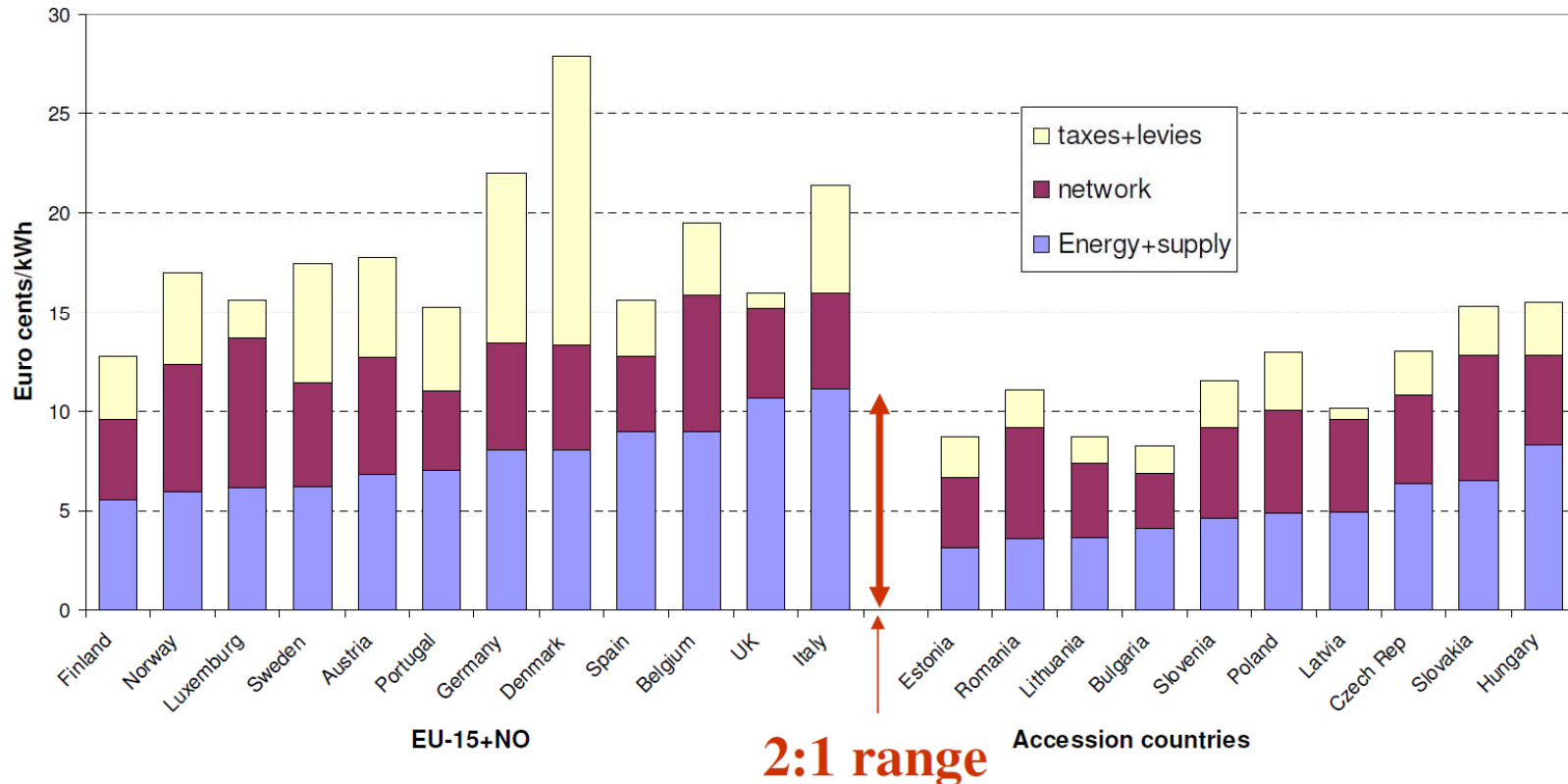
(Successor of 96/92/EC)

Principles:

- networks regulated monopoly, rest free market activity
- network and system managers independent
 - juridical unbundling, separate bookkeeping
- regulated access to the networks (rTPA)
- generation free, but license may be required
- supply: free after July 1st, 2007
- public service obligation for small consumers

No single energy price in the SEM

Domestic electricity prices 2008



Source: ERGEG (2009) Status Review

The EU's Third Package

- Replacements for Directives 2003/54/EC
- New regulations replacing nos. 1228/2003
- Creation of European-level agencies:
 - ACER (Ljubljana)
 - ENTSO-E and ENTO-G
- Adopted in 2009

Third Package: Unbundling transmission network operators

Compromise: three options

- Ownership unbundling
- Independent system operator (ISO)
 - operation is independent, transmission vertically integrated
- “Independent transmission operator” (ITO)
 - networks remain vertically integrated
 - but subject to stricter regulation, a.o. with respect to investment

Third Package: Requirements for regulators

- Independent from other public agencies and politics
- Full budgetary autonomy
- Extension of powers of national regulators
- Harmonisation of powers of national regulators

Third Package: Creation of ENTSO

- European Network of Transmission System Operators
- Annual plan
- European net code
- Every two years:
 - 10-year plan for network development (not binding)
 - annual forecast of summer and winter generation adequacy
- Coordination of research
- If requested: recommendations regarding binding guidelines

Third Package: Creation of ACER

- EU Agency for the Co-operation of Energy Regulators
- Advisory, monitoring and reporting roles
- Involved with preparing European net code and regulating ENTSO
- Replaces ERGEG as platform for the cooperation among national regulators
- Discretionary power with respect to cross-border transmission capacity *in case involved countries cannot agree*
- Staff: +/- 40-50 persons

Third Package: Consumer protection

- Consumers need to receive all relevant consumption data (→ smart meters!)
- Customer service requirements (switching, billing, contracts)
- Member states need to create independent agents for handling complaints (e.g. ombudsman, consumer authority)
- Protection of vulnerable consumers against being disconnected

PART III: CONCEPTUAL FRAMEWORK

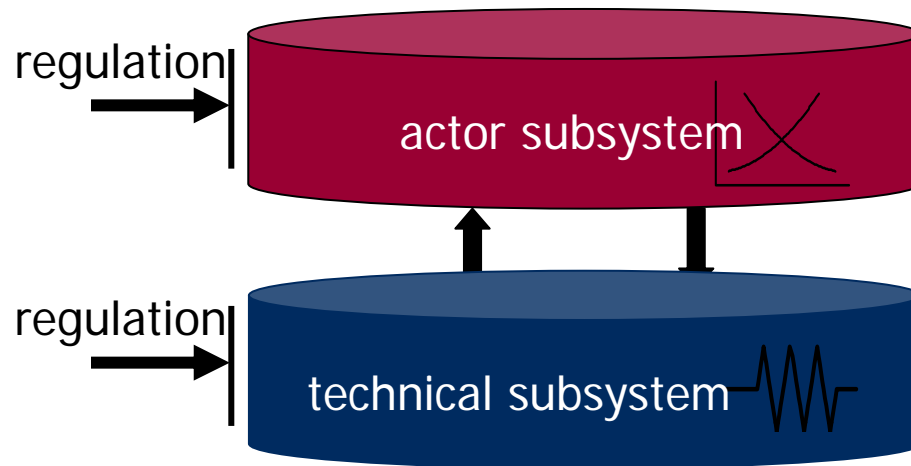
Learning goal

- to learn a framework for understanding the relations between the physical value chain, the actors in the sector and regulation.
- 'Market design': how regulation of the market affects system performance.
 - Ideology: the market can be 'made' to lead to a specific performance.

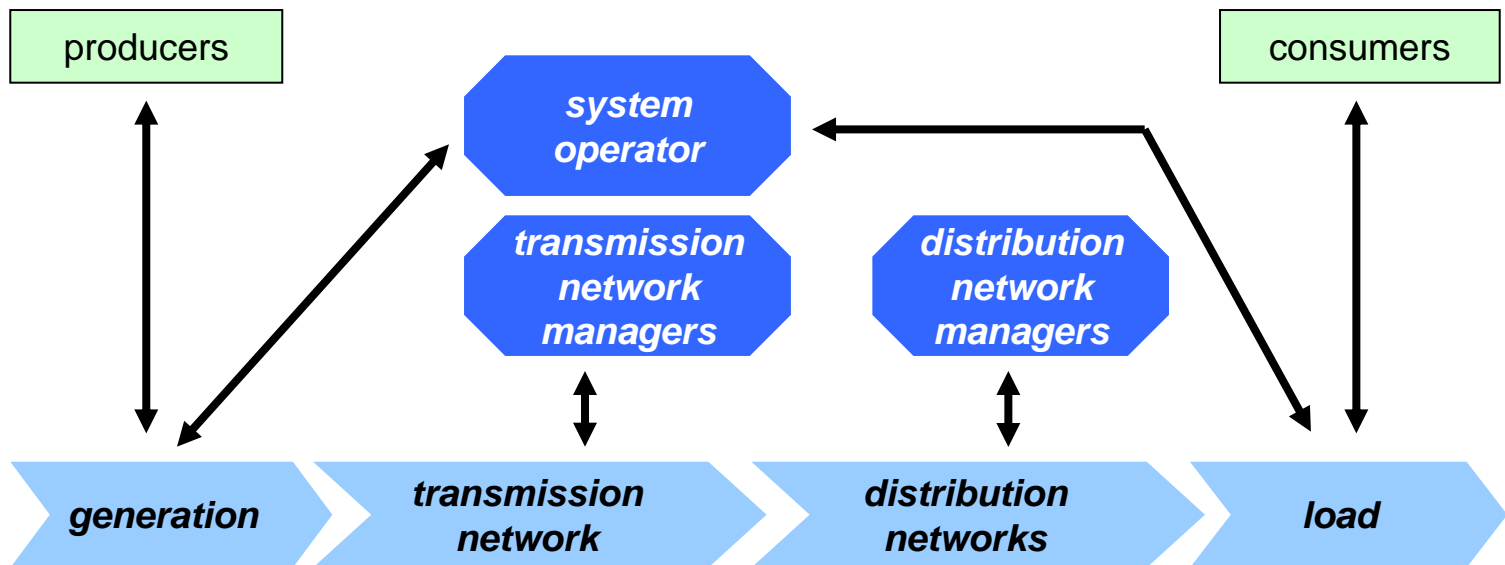
System description

Principle: division between

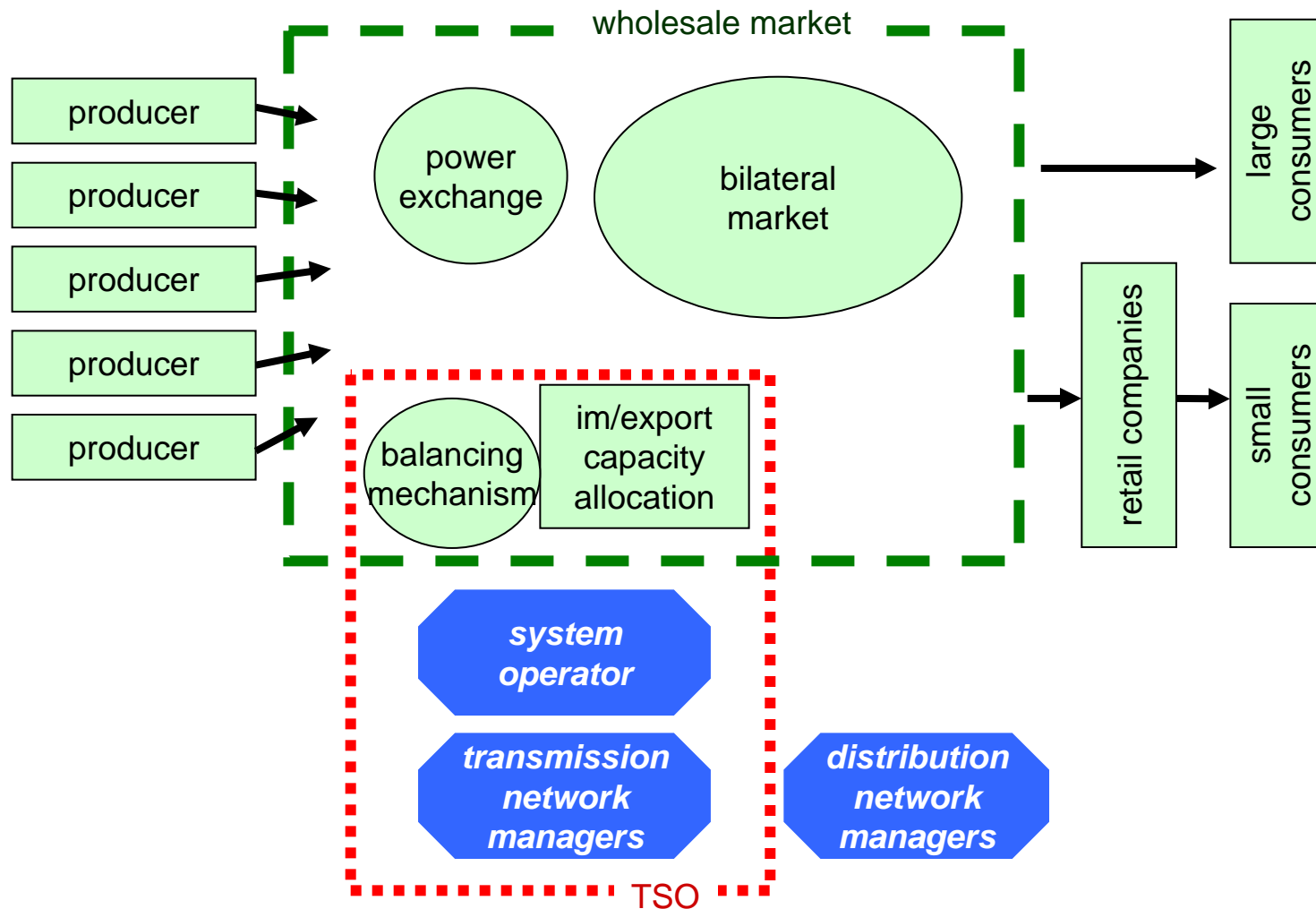
- physical system (technical)
- economic system (actors, institutions)



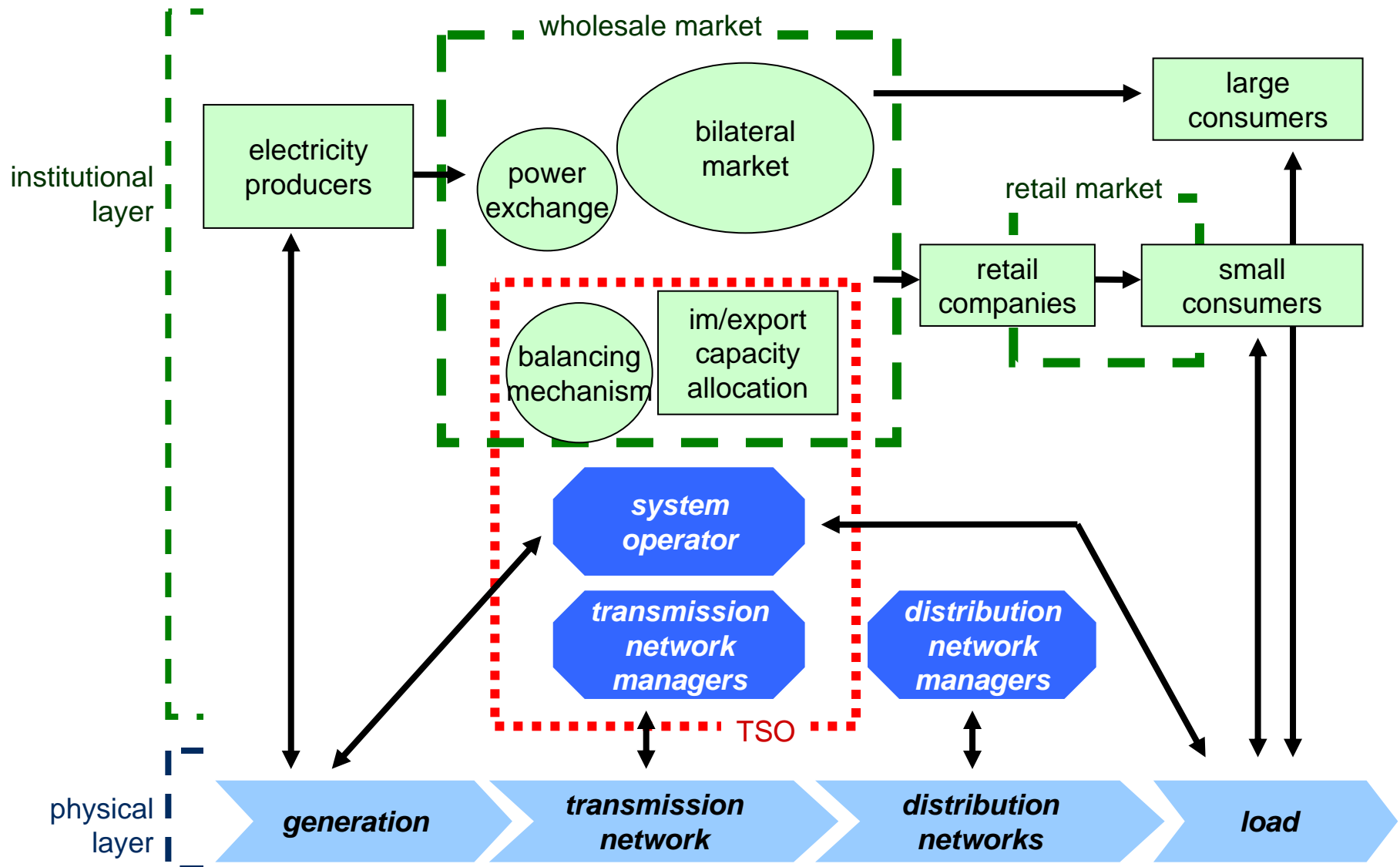
Electricity - physical layer



Electricity – actor layer



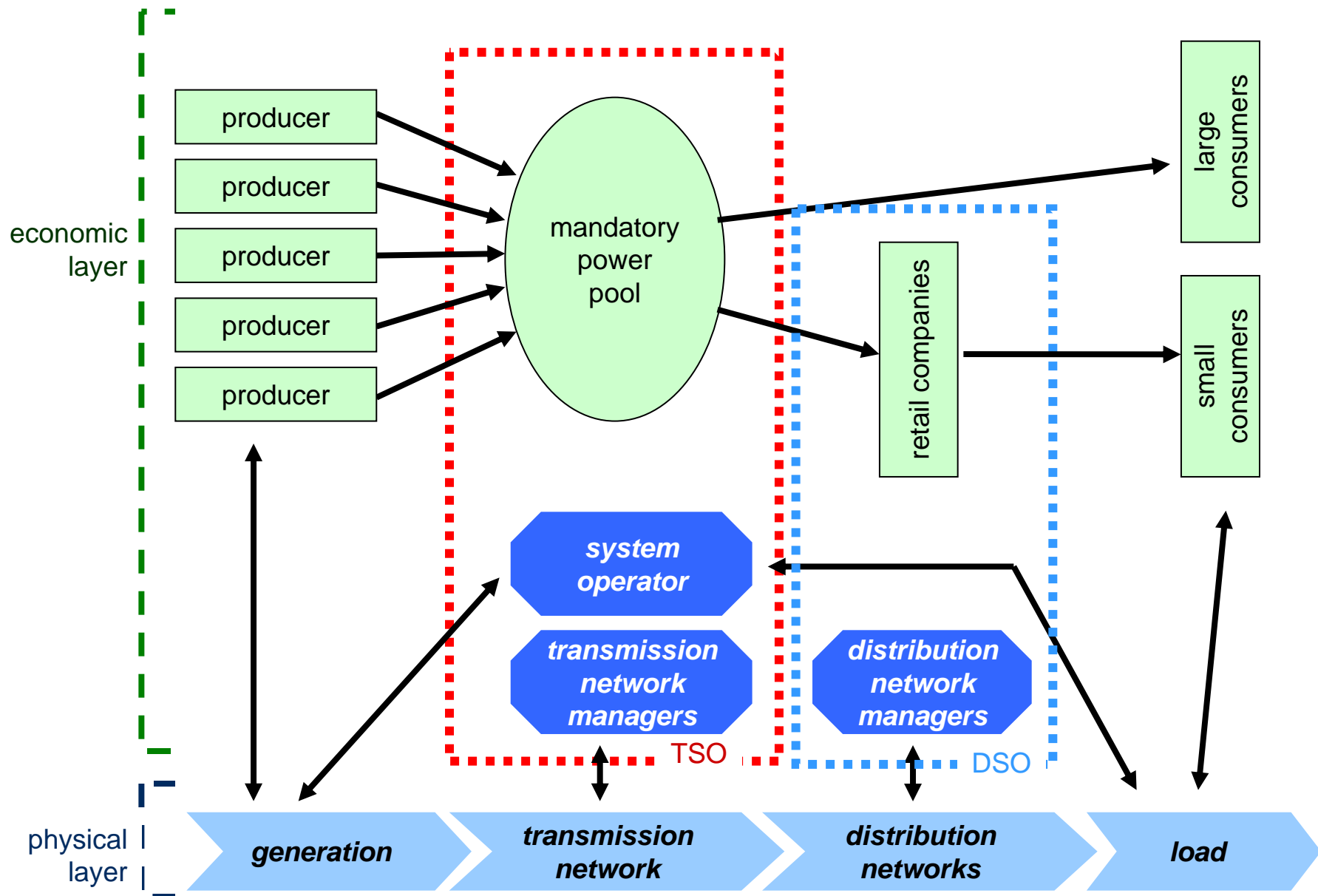
Conceptual framework



Integrated market

- Combination of a spot market and the former central optimization algorithm.
- Main feature: mandatory *power pool*
 - the pool operator knows all supply and demand bids
 - there is no need to clear the market in advance
 - possibility to incorporate congestion management as *nodal pricing*

Q: using the same framework, what would an integrated market look like?



THIS CLASS

The challenges vs. class topics

- investment
 - theory vs. practice: risk of under investment
 - capacity mechanisms
 - impact of low-carbon technologies on the market
- renewable and carbon policy
- network congestion management
- gas system
 - how does it work
 - historic development
 - investment: dilemmas for regulation and for the industry
- energy system: the interrelations between policy, external factors and system development