



Integrating DG: DSO view

A tale about incentives

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DSO attitudes toward integration of DG

Where are we now?



What does a DSO do?

- develops and maintains its (high) medium and low voltage distribution network
 - tree like network
- connects customers to the distribution network
- distributes electricity to customers
 - unidirectional power flow
- „fit and forget“ management policy

DSO business

Costs

- natural monopoly
 - large fixed cost: network and equipment
 - variable cost: depends on usage, network quality and network loss
 - strong economies of scale for volume of electricity

Revenues

- regulated tariffs – incentive regulation (efficiency and quality)
 - connection charges
 - use of system charges (multipart tariffs)

Normally a stable predictable business with some risk

- regulatory risk:
 - too tight regulation
 - asset base, cost of capital, regulatory accepted cost
 - extremely paternal consumer protection (concerning disconnection and debt)
- market risks – but only in exceptional cases happens to be high, like in a recession:
 - lower than expected demand,
 - customer insolvency

DSO past experience

Peaceful past

- stable vertically integrated utility business
 - production – transmission – distribution - supply
- steadily growing demand
- low level of technological change

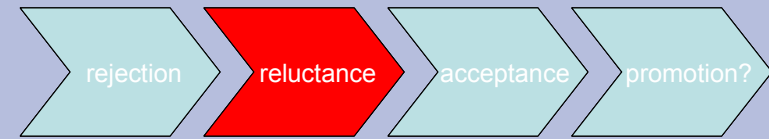
Turbulent recent times

- liberalization shock
 - unbundling: separation of the regulated distribution business from the competitive production and supply
 - a lot of changes in the regulatory environment
- climate change mitigating EU policy
 - distributed generation: CHP and RES demand for connection to the distribution network
 - energy efficiency goals: negative effect on demand
- economic recession
 - decreasing or more uncertain demand
 - growing amount of customer liabilities
 - tariffs have become politically more sensitive

It is not surprising that DSOs are rather in defensive mood now

Why reluctance?

Where are we now?



- Up until now DSOs have been doing almost the same thing for a century
 - there were no production connected to the distribution network
 - there were no need for active management of the network
 - system operation was the task of the transmission operator
- DG integration is a challenge (if not a threat)
 - complicates life from the very beginning – it is a demand for change
 - imminent and obvious cost and effort
 - uncertain future benefits
 - may be a conflict of interest if there is fossil production plant in the group portfolio

Rejection or reluctance is a normal reaction without clear benefits and incentives

DG characteristics

- small size
- connecting to the distribution network
- distributed/scattered location
 - far from the point of consumption, but usually closer than the large plants
 - location is many times not optimal to the distribution network and sometimes it is at the weakest part of the network
- intermittent/volatile production
- forecasting problems
- balancing needs
- not centrally controlled operation

a lot of
challenging
things have to
cope with

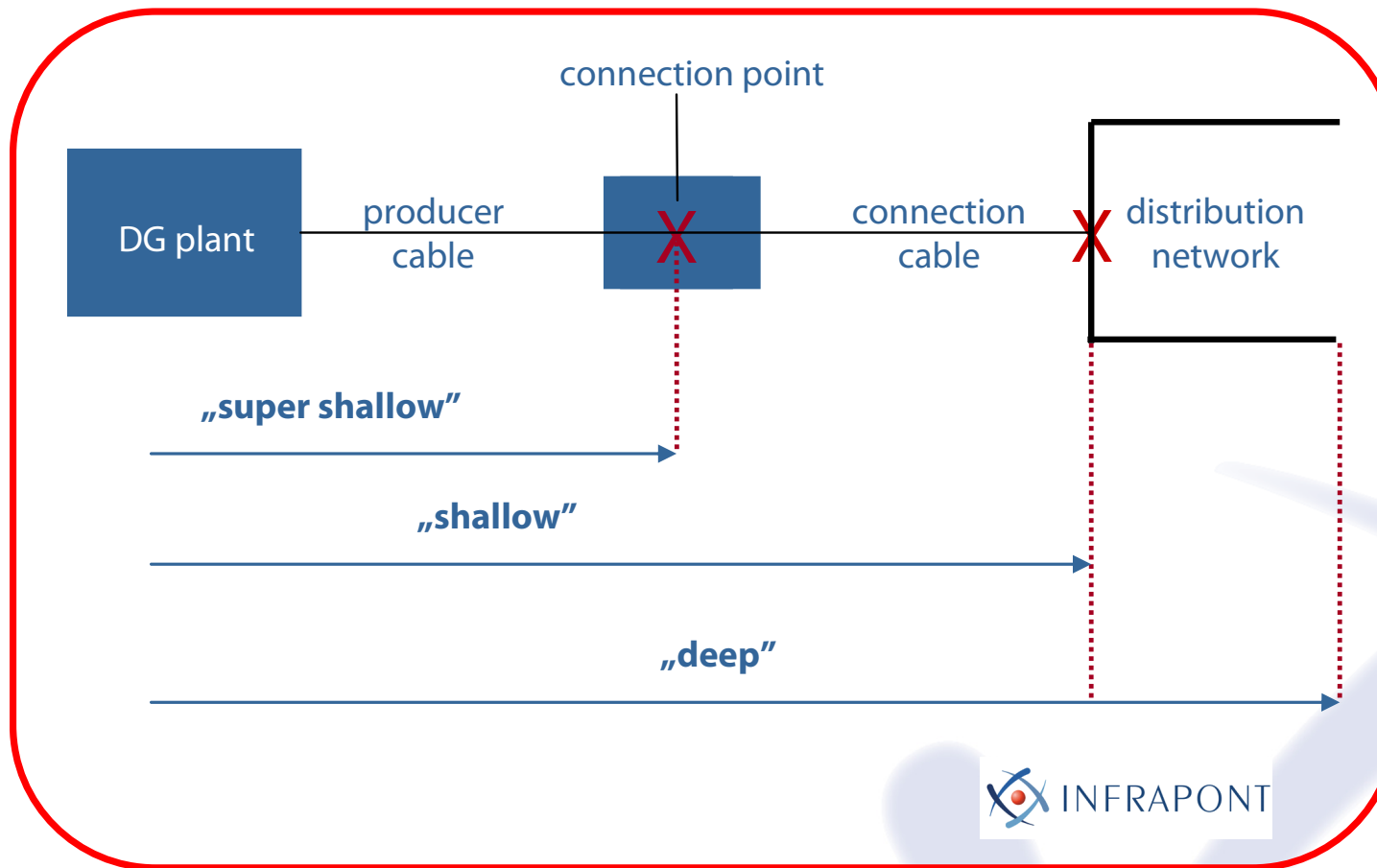
Connection process

- handling the requests for DG connection
 - approval and administration of the requests
 - how serious it is? (around 20% expected to be built in the end)
 - case by case modeling the effects on the network: sometimes considerable amount of work
 - and preparation of the connection offer
 - negotiations if needed
 - planning
- connection contract
- construction
 - strengthening the network if needed
- establishing connection
- operation of the DG plant starts

Costs of connection for a DSO

- Costs are mostly certain
- administrative
 - staff /time
 - test (sometimes fake) requests,
 - withdrawn requests are waste
 - direct cost of outsourced work
- construction cost
 - imminent investment outlay in case if it is not to be fully financed by the DG (in case of shallow connection cost),
 - recouped through long term via amortization with the accepted rate of return (which is exposed to regulatory risk)

Connection charge regimes for DG



Long term cost effects of integrated DG

- O&M costs are usually higher with considerable DG penetration (which should be reached in the end)
 - because of more intensive use of the network,
 - bidirectional flows,
 - balancing needs
- reliability and quality concerns
 - increased complexity – need for active management (an incentive for making the grid smarter)
 - increased volatility of the network
- but cost reduction is also possible
 - if DG is substitute for reinforcement
 - but the lifetime is shorter than the network investment
 - operation is the discretion of the owner of the plant
 - reduces network cost if the location is optimal to the DSO network
 - shorter distance to the customer – smaller network loss
 - provision of ancillary services by DG plants
 - voltage support and reactive power

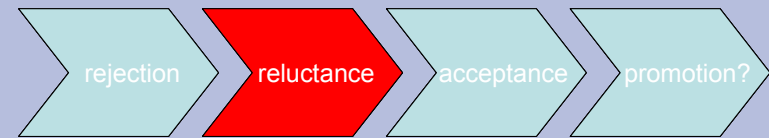
Long term benefits of integrated DG for DSO

Benefits are less certain, may be ambiguous and usually longer term

- reduced network investment
- reduced network loss
- enhanced reliability
- better power quality
 - especially in those locations where there were quality deficiencies
- provision of ancillary services

DSOs are afraid of

Where are we now?



- increasing work load
- increasing complexity
- increasing vulnerability of the network
- reliability and quality degradation of the service
- increasing costs
- change which is however unobjectionable

Reluctance or rejection is usually veiled by an engineering argument

How can the DSO attitudes be changed to be more receptive?

How can DSOs' attitudes be changed to more receptive?

- incentives are the key
- we need to understand the system of economic incentives in the whole setting
 - DG connection regulation
 - DSO regulation
- than we need to change the incentives providing more favorable results
 - carrot and stick approach
 - incentive design
 - ongoing learning from errors

How to support the connection of DG to DSO networks?

Hungarian case study

The study

- commissioned by the Hungarian Energy Office, the regulator, 2011
- project goal:
 - studying the process of connection of DG
 - identifying obstacles, and problems concerning the connection of DG*
 - propose remedies
- partners:
 - Infracapont: economic and regulatory expert
 - GEA EGI: technical expert

*DG is <10MW (except 0.5MW < wind)

Problems for DG developers

- rural networks are usually weak, therefore:
 - either the connection requires extensive network development,
 - or the connection point offered is much farther than the distance to the closest substation
 - or the connection is offered only to high voltage network (with connection cost with one order of magnitude higher than to the middle voltage)
- there is no public information about where and what size of capacity is available for connection on the distribution network
 - practically there are no location signals
- legal background of obligations of the parties is not in favor of connection, many aspects of connection is regulated by the DSOs operation code of conduct
- the connection procedure is complex and not uniform throughout the country
- DSOs are sometime opportunists, and using connection cost to finance anyway necessary network enhancements
- the calculation of connection cost (which is deep cost in Hungary) is not always transparent

Problems of DSOs

- every request is to be managed case by case
- requests handled to the same connection point in order of submission and connection offer may differ according to the position in the queue
- there are too many non serious (test, strategic) connection requests, and the workload and costs of handling them is the same as for real ones
- the recoupment of preparation and administrative costs is not granted
- recoupment and return on investments may also be uncertain

Points of DSOs

- network planning and modeling is almost the same for small DG from engineering point of view than for large customers
- reliability and service quality is the key point
- in principle: no state of operation (start, stop, outage) of DG is allowed to cause quality degradation to customers.
- defer introducing active network management practice as long as possible

Sharing of connection costs

- connection cost sensitive to:
 - voltage level
 - network reinforcement needs
 - distance/location
- connection charge regime is deep, and around 3-8% of the total project
- RES plant is entitled to ask discount up to 50%
 - the other half have to be financed by the DSO
 - study finding: the discount is not widely asked for by RES developers
 - there is another way: connection charge can be a part of the total investment, recouped through the feed-in tariff for the period approved by the regulator
 - negotiation power of the DSO – does it mean market power?

Current regulatory incentives are DG neutral

Only efficiency and quality incentives

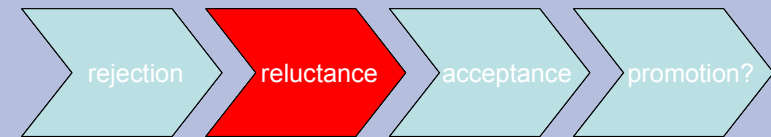
- 4 years DSO price cap regulation: $CPI-X \pm \dots$
 - allowed revenue: based on calculation of rate of return on accepted rate base
 - use of system tariffs for customers are based on cascading cost apportion according to voltage level
 - quality regulation is based on the actual yearly performance compared to minimum required quality (+ rewarded, - penalized)
 - correction of asset base with net change in assets if net of investment-amortization is positive
- no direct positive incentive to connect DG or invest in network enhancements supporting present or future DG
- no penalty of resisting DG

Other incentives

- lack of commercial incentives
 - no revenues from DG connection (though the regulation guarantees the recoupment and return on investment)
 - no granted recoupment of administrative cost and effort
- risks
 - technical difficulties, reliability and quality risks
- lack of knowledge and calculation of potential gains
 - no experience or history record
 - lack of knowledge, communication and imagination
 - lack of estimates of benefits
- cautiousness

Where are we now?

Balance sheet of incentives

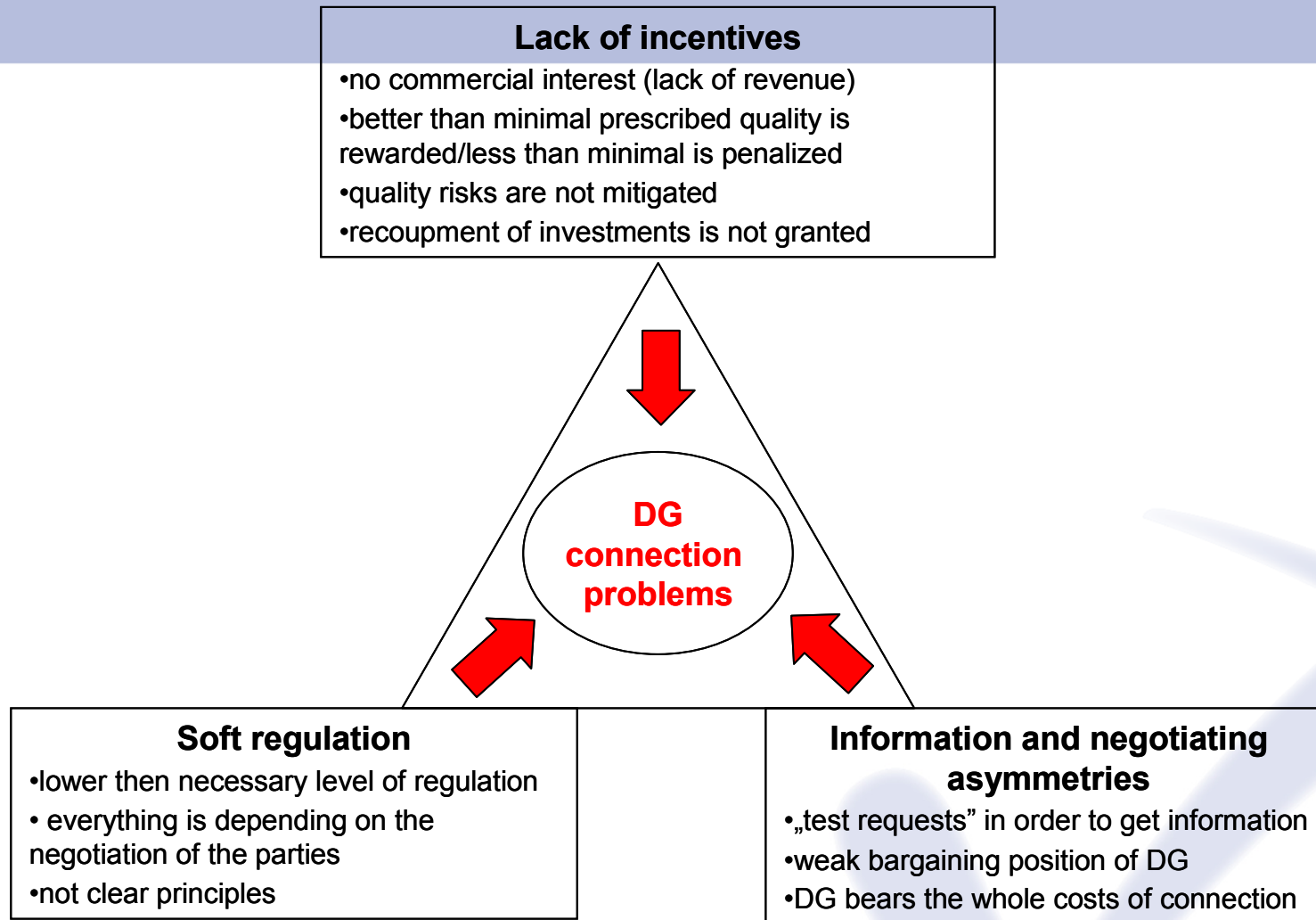


- regulatory incentives: ~ 0
- commercial incentives: ~ 0
- risks: -
- expected gains: ~ 0
- cautiousness: -

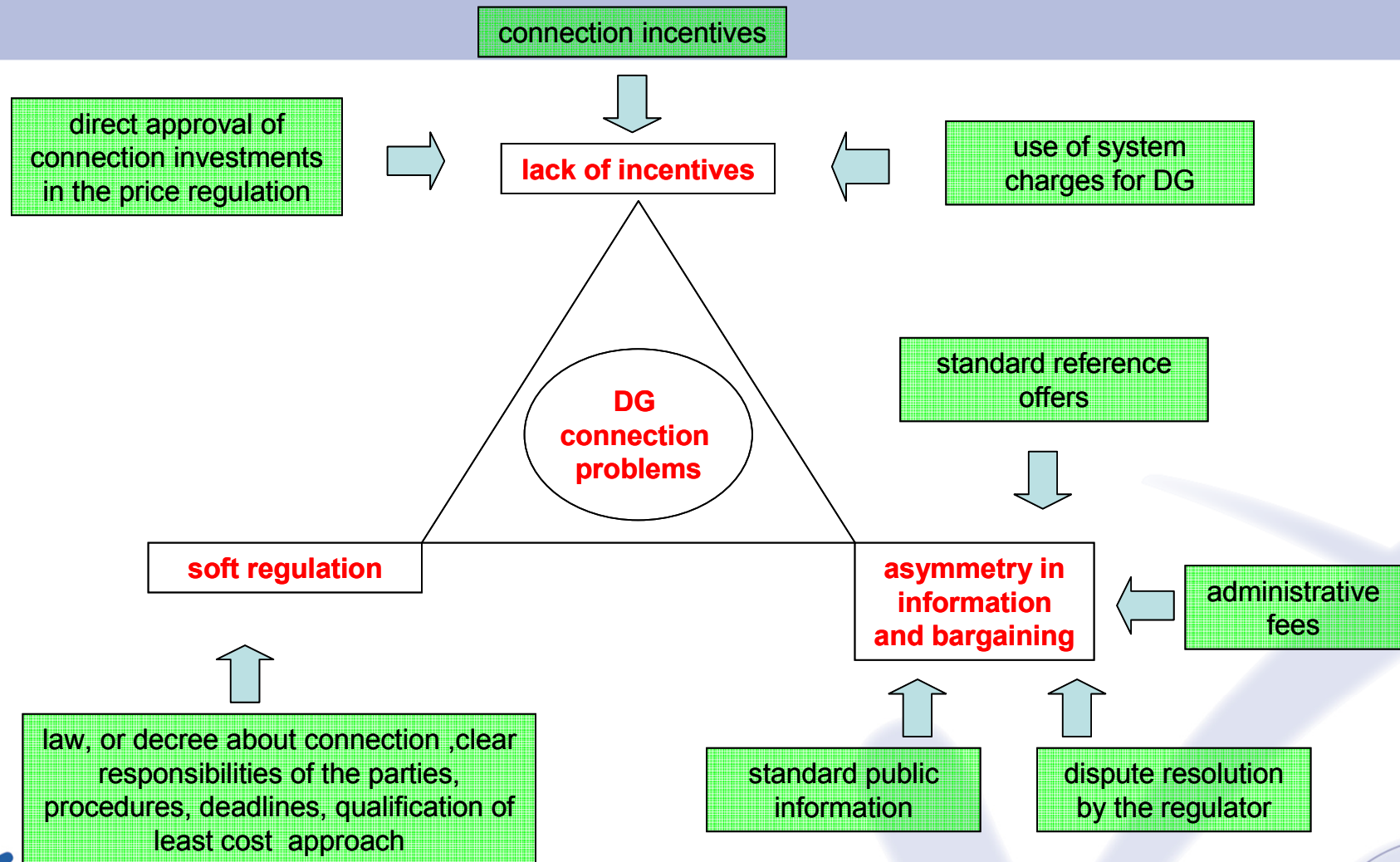
The result is a very conservative = reluctant attitude

Can we change the incentives?

Identified problems



Potential remedies



Tightening regulation

- Clear regulation of important aspects of connection:
 - procedures,
 - procedures and responsibilities concerning technical solutions
 - cost sharing principles
 - connection right validity in time, and other terms of this right
 - queue rules
 - rules of cooperation of the parties
 - legal remedies
- application of least cost principle
- further potentially regulated elements:
 - deadlines for procedures,
 - maximum or normative fees,
 - information obligation
- monitoring
- sanctions

Costs

- Connection costs and use of system charges are interdependent
 - shallow connection charge is compatible with producer use of system charges
 - deep connection charge is compatible with 0 producer use of system charges
 - but it has to be kept in mind that in the end consumers bear all of the costs
- calculation of least cost must be the least cost to society, not to DSO

Information provision

- DSO must provide information about costs and technical parameters on order to support planning of DG
- industry consensus is needed about the content to be shared and with whom should be shared

Administrative fees

- introducing fees covering the cost of administration and planning for DSO
- it helps:
 - reducing the volume of non serious requests
 - providing direct incentive for DSOs

Connection reference offer?

- standard technical and commercial terms of connection
- applies only where technical and cost parameters can be standardized
 - size limit?, location?
 - no consensus on viability, further discussions necessary

Regulatory dispute resolution

- in case if there is no agreement on technical or economic terms
- it can help balancing against the more powerful DSO
- can be an industry body?

Granting connection cost recoupment directly in regulation

- investment incentives are weak in the beginning of a regulatory period
- direct approval of the connection investment in the rate base
- regulatory oversight is required

Low connection charge + positive producer use of system fee

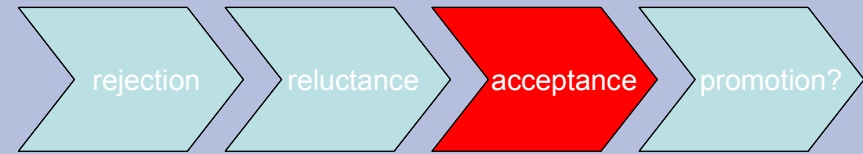
- it is relevant at shallow (and supershallow) connection fee
- currently only customers pay use of system charges
- direct positive financial incentive for DSO
- EU studies propose it but not widely used
 - good for location signals
- calculation of the fee is complex and should be managed by the regulator

Direct incentives for DG connection in the price regulation

- direct positive and negative incentives in the price regulation rewarding better than prescribed performance or reaching predefined connection targets, and penalizing misbehavior
 - deadlines
- against:
 - there are other remedies if deadlines are not kept
 - makes the complex incentive regulation more confusing

Changing DSO incentives toward acceptance

Where we would like to be?



- solid legal framework, clear requirements
 - less place for conflicting interpretation
- balancing negotiation asymmetries
 - enhancing transparency
 - providing information
 - reference offer
 - dispute resolution
- high powered incentives for DSOs
 - collect administrative fees
 - shallow connection charges & producer use of system charges or deep connection & 0 use of system charges
 - direct/guaranteed reward/acceptance for DG connection investment

Promoting and enhancing the penetration of DG

Where we would like to be in the future?



regulation is not enough, more

- knowledge sharing
- discussion
- experience
- exploitation of benefits
- and innovativeness

are needed



Thank you for your attention