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Electricity markets & public policy A necessary coexistence

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Markets & energy policy in a low-carbon economy

- ◆ A sustainable economy has to be based on a sustainable energy model, where the power sector is a key component
- ◆ The current regulatory paradigm has to be reconsidered in this new context, where public energy policy will play a major role
- ◆ This adds a new perspective to the present deliberation on the power sector regulatory model



The questions to be addressed

- ◆ In the context that can be anticipated of strong sustainability & security oriented policy measures
 - How to improve / redesign market regulation to facilitate that these policies reach their objectives efficiently?
 - How to make these policy measures compatible with the functioning of electricity markets?

See the special issue of The Energy Journal “The future of electricity: Papers in honor of David Newbery”, 2008, for a detailed elaboration on these issues



Some premises (1 of 3)

- ◆ Creating well functioning competitive wholesale & retail markets for electricity is very challenging, both technically & politically, & cannot be applied anywhere
 - Where properly implemented, wholesale markets have led to improved performance & have mobilized significant investments
 - Sound incentive-based regulation of distribution companies has reduced costs without impairing quality of service
 - Despite some failures & implementation difficulties, the general trend in most liberalized power sectors is to proceed with the process of reforms




Some premises (2 of 3)

- ◆ There is a serious (*& justified*) global concern about climate change & this will affect energy policy & power sector investments profoundly → intense **political oversight & interference** is anticipated
- ◆ **Security & sustainability** will have at least the same priority as **efficiency** in the regulatory design
- ◆ New & emerging **clean technologies** will be crucial in attaining a sustainable power system model, but their development & commercial deployment will typically need **regulatory support**




Some premises (3 of 3)

- ◆ It is anticipated a large penetration of renewable &/or **intermittent** &/or **distributed** generation in many power systems
- ◆ The availability of communication & control technologies plus current trends in regulation & consumer behavior signal a strong future **active demand response**
- ◆ Political developments, economic rationality & network reinforcements lead to an **integration of existing power systems & markets** into larger entities

A thick, horizontal yellow brushstroke that spans most of the width of the slide, positioned above the main text.

How to improve /redesign
market regulation to facilitate
the implementation of
sustainable policies?

A tentative list of regulatory challenges *(1 of 7)*



◆ The need for **adequate transmission & distribution networks**

- Establish proper remuneration of **distribution** networks with distributed generation & active demand response
 - Design, operation & control of distribution networks have to be adapted & costs will increase → need for new network models & regulatory schemes *(see detail in next slide)*
- Attain adequate investment levels in **transmission** networks with much intermittent/renewable generation
 - The existing network (e.g. in the US & EU) lacks adequate interconnection capacity among regions, a comprehensive approach to coordinated transmission expansion & the institutional capability for an effective implementation

Impact of DG on distribution network costs & losses under passive management in rural [®] & urban (U) networks (Source: EU project DG-GRID)

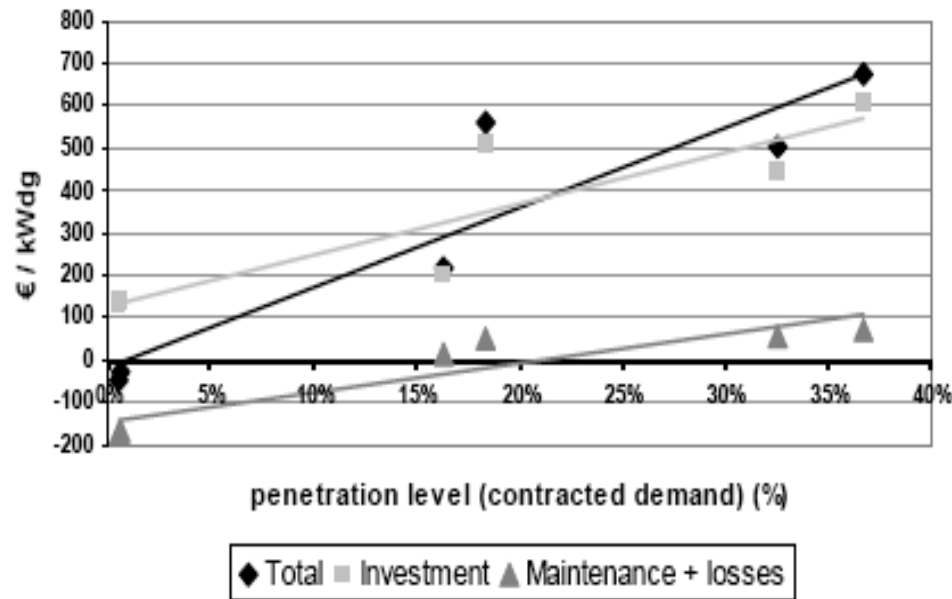


Fig. 5. Incremental costs per installed kW of DG. Germany

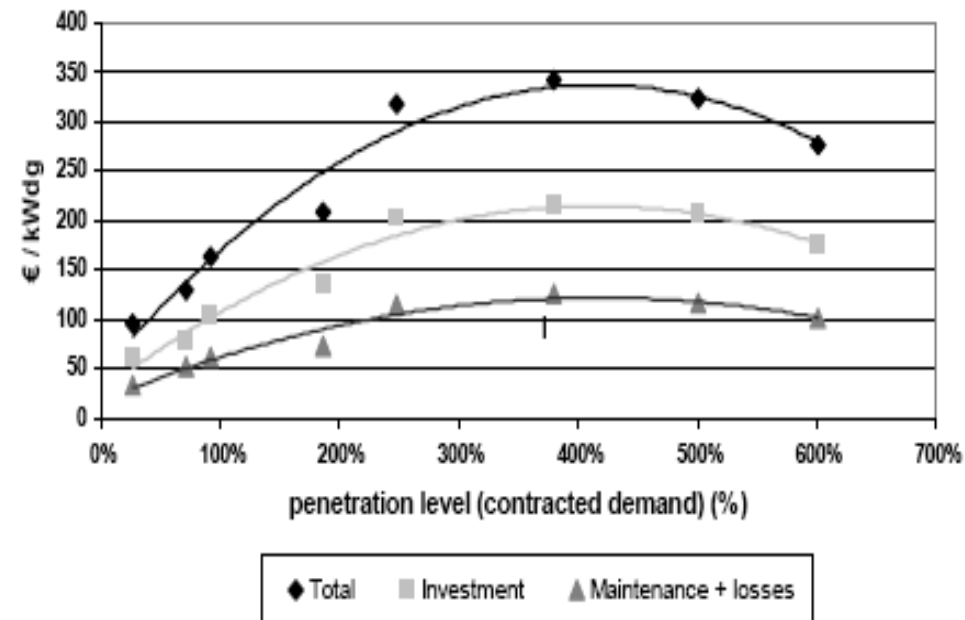


Fig. 3. Incremental costs per installed kW of DG. Netherlands

Detail

Ideas for a regulatory response

- Refine the **models of remuneration** of distribution networks, so that the extra costs/benefits of accommodating DG & efficiency measures are recognized & negative incentives are minimized
- Find instruments to incorporate deployment of effective **innovative** technologies in the remuneration schemes
- Transmission capacity expansion must be based on **comprehensive planning** studies & **responsibilities** for implementation should be clearly assigned
- Pricing & remuneration of transmission should be transparent, low risk & convey efficient **locational signals**

A tentative list of regulatory challenges (2 of 7)

- ◆ Efficient **locational signals** & constraints management
 - Locational marginal pricing (nodal energy pricing) is the preferred solution, although it will find political resistance in the EU (*not yet implemented in established markets; winners & losers*)
 - Locational transmission network charges (*very much talked about, but only implemented in few power systems*)
- ◆ Geographical expanse → **markets integration** (*needed to mitigate market power & to dilute generation intermittency*)
 - The inter RTO seamless problem (US)
 - Not attempted seriously yet
 - The regional initiatives (EU)
 - Still struggling at regional level

A tentative list of regulatory challenges (3 of 7)

- ◆ Changes in the generation **technology mix** induced by renewable / intermittent / distributed generation
 - Less “residual demand” / some impact on base-load technologies / more back-up capacity to provide operating reserves in the mix
 - Regulatory instruments to achieve generation investment adequacy
 - The case for support of peaking units (*although all generation units are affected*) becomes more apparent
 - A large variety of regulatory schemes is presently used or under consideration

A tentative list of regulatory challenges (4 of 7)

- ◆ Changes in **system operation** with strong presence of renewable / intermittent / distributed generation & active demand response
 - Present system operation is not adequate to deal with really large volumes of intermittent generation, integration of demand response & seamless coordinated congestion network management in large interconnected power systems \ new paradigms in system operation
 - Aggregators of active demand, micro-generation (including PHEVs) & distributed storage
 - New approaches & flexibility in provision of ancillary services
 - Perhaps security-driven hydro generation management



An additional thought

- ◆ If clean technologies (*e.g. intermittent renewable generation sources*) become competitive with the other generation technologies (*including any well-justified subsidies*), does it make sense to speak of
 - “the additional cost of traditional technologies to back up renewable/intermittent generation?”
 - “the cost of the additional network to evacuate the generation output of renewable/intermittent generation?”

A tentative list of regulatory challenges *(5 of 7)*

- ◆ **Active demand response:** taking advantage of it & making it possible
 - Efficient deployment of advanced metering, real-time tariffs & behind-the-meter load management
 - Meeting the objectives of energy efficiency & savings → Competitive & focused retail companies (energy service providers) → adequate design of default tariffs, unbundling, compatibility standards, design of smart grids
 - Additional challenges: electrification of mobility
 - Efficient integration of active demand response is a major component in the new paradigm for system operation

Detail

Ideas for a regulatory response

- ◆ Technologies & economic signals resulting in energy conservation & efficiency (ECE) improvements from the consumers' side typically lead to reductions in the regulated revenue of distributors & uncompensated demand destruction for retailers
- ◆ As with DG penetration, these measures may not be welcomed by distributors & retailers, unless
 - the efficiency gains are shared with distributors & retailers
 - the remuneration of the distribution activity is more precisely computed & made less dependent on the simplistic "distributed energy" metric

A tentative list of regulatory challenges *(6 of 7)*



- ◆ Other obstacles or barriers that markets do not solve by themselves *(or fast enough)* without external intervention
 - Increment the regional / spatial dimension
 - Fix market structural problems (vertical integration, excessive concentration)
 - Political resistance to accept needed regulatory changes

A tentative list of regulatory challenges (7 of 7)

- ◆ Lack of access to electricity in developing countries (DCs) is a key component of the lack of sustainability of the present energy model
 - Rural electrification
 - Has to be explicitly considered an energy policy in DCs
 - Has always needed support schemes
 - Specific financial & organizational models are needed to attract private investment
 - Regarding CC a key issue is to promote large-scale grid-connected renewable deployment
 - Issues: new hydro developments, adapt support schemes, financing



How to make markets &
public energy policies
compatible?



First, indicative planning

- ◆ What is intended to accomplish? (*national & supranational energy policies require long-term analysis with sustainability criteria*) → **indicative planning** (IP)
 - The IP procedure is meant to characterize meaningful energy development paths that meet any prescribed high level (*sustainability & others*) targets, in order to facilitate political decisions
 - Note that, once one path is chosen, IP
 - is more than just **prospective** analysis (*find what could happen*)
 - has **normative** character (*identify what has to be done to make sure that a future with some desirable features happens*)

EU Electricity Directive, 2009

Art. 2: “... In relation to security of supply, energy efficiency/demand side management and for the fulfillment of environmental goals and goals for energy from renewable sources, ... Member States may introduce the implementation of long-term planning, taking into account the possibility of third parties seeking access to the system.”

Art. 7.2: “Member States shall lay down the criteria for the grant of authorisations for the construction of generating capacity in their territory. In determining appropriate criteria, Member States shall consider: ... (j) the contribution of the generating capacity to meeting the overall Community target of at least a 20 % share of energy from renewable sources in the Community’s gross final consumption of energy in 2020... and (k) the contribution of generating capacity to reducing emissions.”

Art. 10: “Member States shall implement measures to achieve the objectives of social and economic cohesion and environmental protection, which shall include energy efficiency/demand-side management measures and means to combat climate change, and security of supply, where appropriate. Such measures may include, in particular, the provision of adequate economic incentives...”

A tentative list of regulatory challenges *(1 of 4)*

- ◆ **Choice of instruments** to develop & deploy **clean technologies** (electricity generation & energy efficiency & conservation, ECE) to meet IP targets
 - Use **market prices** (*of energy, emissions, green or white certificates*) with as much internalization as politically possible
 - **BUT** while full internalization of sustainability implications is not achieved → use **additional regulatory instruments** (*quotas, standards, incentives, cross-cutting policies*) while trying to minimize market distortion


A tentative list of regulatory challenges (2 of 4)

- ◆ Choice of instruments to make possible a **clean technology mix** in electricity generation
 - **Nuclear**: if politically acceptable, it might need some regulatory commitment to reduce financial risks
 - **Clean coal (CCS)**: presently only viable with regulatory support (*until sufficiently high & stable CO2 prices exist*)
 - **Renewables**: same; support scheme should depend on level of maturity of technology, cost & rules for integration in the market (*which affect the economic viability of other plants*)
 - **Peaking plants**: economic viability strongly depends on regulation of security of supply & intermittent generation
- ➔ *Reduced, but not negligible, space for the market*

A tentative list of regulatory challenges (3 of 4)

- ◆ Choice of instruments to make **energy efficiency & conservation (EEC)** (*technology with largest potential & most cost-effective*) possible at a required level
 - Here energy prices, even with full internalization, might not be sufficient to achieve the desired consumer response (*lack of information, high consumers' discount rates, uncertainty in investments' results, weak incentives, principal-agent problem, rebound effect*) use additional instruments & target energy savings rather than efficiency, plus information
 - Make use of standards or of other measures also directly seeking a net reduction in energy consumption (still, danger of free riding, inefficiency)
 - It is OK to use a mix of regulatory instruments in this "second-best" world

A tentative list of regulatory challenges *(4 of 4)*



◆ Other regulatory concerns

- Transitory arrangements (windfall profits)
 - Windfall profits: consumers must be protected in different ways; this is a side effect of the application of CC-related instruments
- Regulatory stability
- Role of independent regulators: These issues should be explicitly included within the responsibilities of energy regulatory agencies
 - Governments should set the high level targets & approve an “indicative” sustainable plan
 - Regulators should design the regulatory instruments to make this possible within a market environment

Thank you for your
attention