The German Energy Sector under Liberalization Pressure – Sector Structure, Chances for the Diffusion of Energy Efficiency Technologies and Services, and Sector Persistency

7th International Summer Academy on Technology

„Transforming the Energy System: The Role of Institutions, Interests & Ideas“, Deutschlandsberg, Austria, August 27-31, 2007

Dorothea Jansen (FÖV Speyer)

Content

1. Structure of German Energy Sector and Market Liberalization
2. Changing Role of Municipal Utilities
3. Local Utility Study - Their Role in Diffusion of Energy Efficiency and Climate Change Mitigation Innovations

   3.1Design and Research Questions

   3.2 Results: Factors Driving Changes of Actors

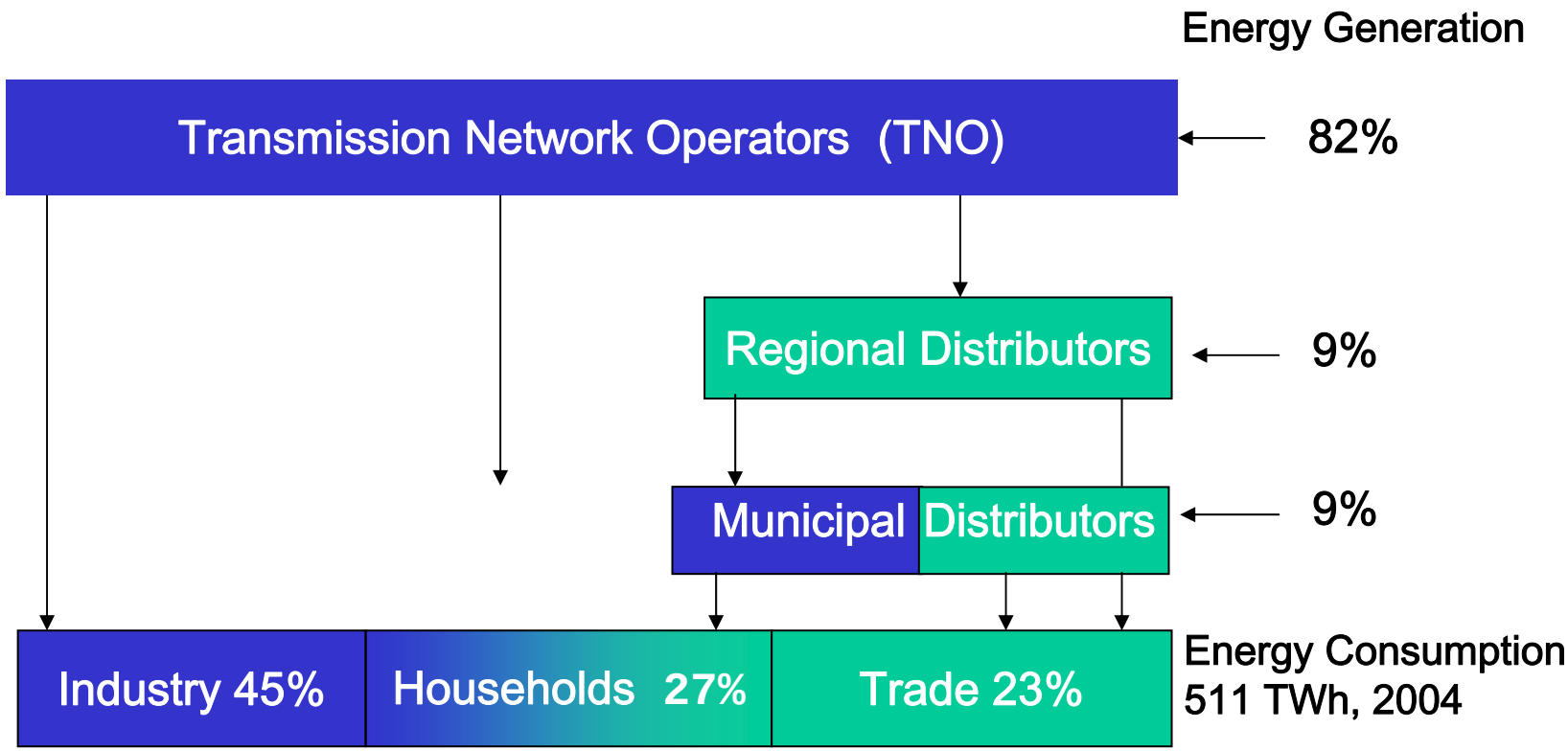
   3.3 Results: Socio-technical, Structural and Institutional Factors Driving Meso and Macro Level Changes
4. Conclusion – Chances and Risks for the Transformation of the German Energy System

Structure of the German Electricity Market (1)

	1990	2005	Trends
Transmission System Operators	8	4	Vertical Integration and of Electricity and Gas
Regional Distributors	100	60	Regional/ Local cooperation & integration
Municipal/ Local Distributors	> 800	800	New Alliances in Generation, Grid, Services
(New) Actors in Generation, Services, Distribution	50	200	Market Consolidation

Sources: Schiffer 2002, 2005

Structure of the German Electricity Market (2)
Figure 1



Sources: Schiffer 2002, 2005

Important Trends in Liberalization (1)

- EU Common Market Directives on Electricity of 1996 and 2003
- Implementation by the First Amendment to the German Energy Act (of 1935) in 1998, and follow-up to the speed-up directive in 2005
  - Opening of former monopolistic markets and end-user eligibility
  - Free entry for electricity generation
  - Negotiated third party access to the grid, changed to ex ante regulation in 2005
  - Information and accounting unbundling, added by operational and legal unbundling in 2005
  - 2005: Foundation of a new regulatory agency, the Federal Network Agency to oversee ex ante access, unbundling, net fees
  - Change from cost regulation to revenue cap and finally yardstick competition

Important Trends in Liberalization (2)

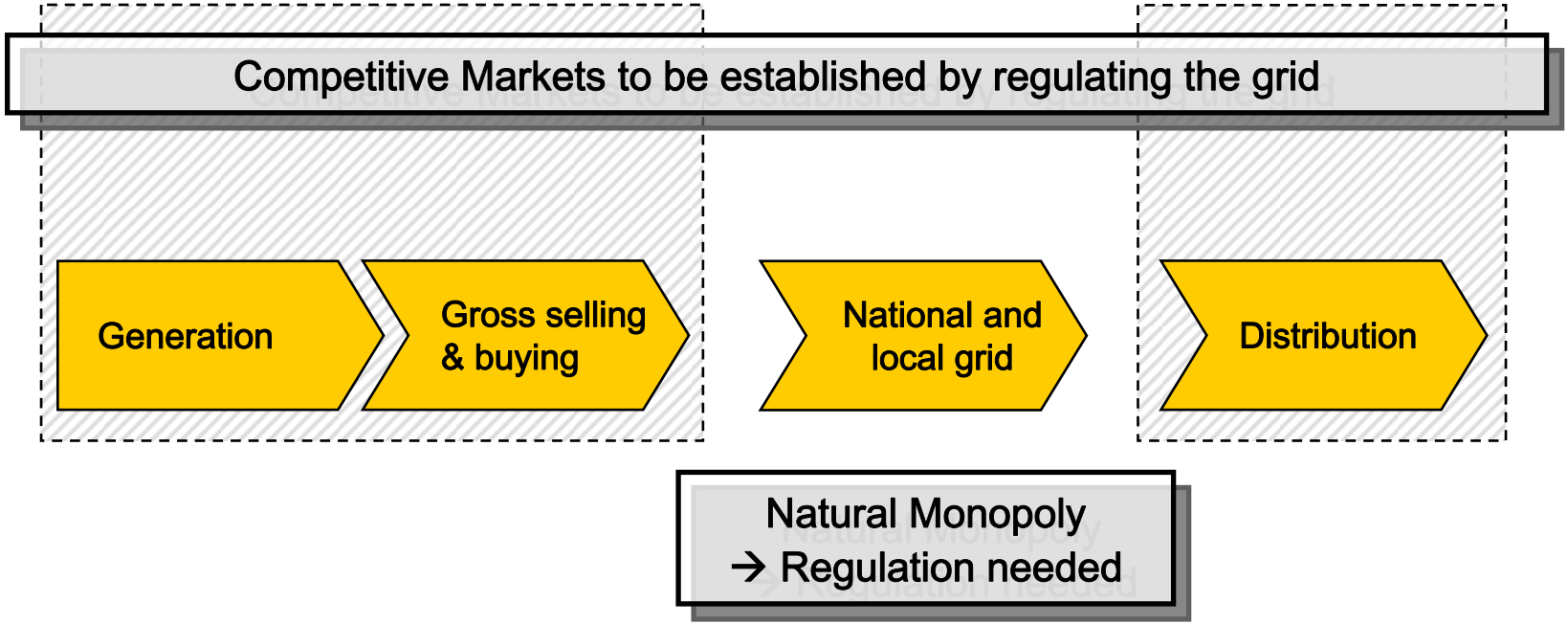


Figure 2: Value Added Chain

(Adapted from Frenzel 2006)

Changing Role of Municipal Utilities: Potentials and Risks(1)

- In 1998, experts and politicians expected many municipal utilities not to survive the market liberalization
- They survived on the basis of their traditional strengths: multi utility, contracting, ownership of the last mile, strong customer relationship
- Potential to profit from market correcting regulation such as CHP act (2002) and RES act (2002, 2004) which open longterm guaranteed sales opportunities, and from EU Emission Trading
- Reduction of net fees (by 10-15%), the cash cow of local utilities
- Unbundling will end the options for cross-subsidies
- Pressure to become more efficient in generation, distribution, services
- New tasks: regulatory duties due to net regulation/ unbundling.
- Problems of lack of flexibility of organizations, smallness, lack of economies of scale to respond to new tasks and business options

Changing Role of Municipal Utilities: Recent Trends and Chances (2)

- Local utilities increasingly make use of their new opportunities
- Most of the power plants under construction are run by local utilities (6 out of 8, all cogeneration, appr. 40% of new capacity, Kearny 2005).
- 78% plan a new power plant
- New alliances of local utilities are emerging in generation, grid maintenance, distribution and value-added services, gross selling and buying
- **Thus,** potential of local utilities for the diffusion of energy efficiency and climate change mitigation is central issue of a collaborative research project of my research group and a group from ISI Karlsruhe

Local Utility Study: Design and Research Questions (1)

- Mailed questionnaire to all local utilities (628) active in electricity distribution in spring 2006, response rate of 20,4%, n=128 responses to the general management questionnaire
- In addition, four special parts for the subfields RES, CHP, Contracting and EU ETS with special addressees if appropriate. Responses of n=97 (CHP), n=73 (Contracting), n=66 (RES) and n=55 (EU ETS)
- Additional analysis of a data base on business information (Marcus DVD) on size, shareholding, business domains, and of DEHST on eventual allocation of emission allowances
- Two customer groups matched to the utilities were studied, 30 hospitals (expert interviews) and 55 butcheries (expert interviews and mailed questionnaire)
- Several in depth interviews (utility alliances, TNO, independent power producers, energy counsels, etc.) still going on

Local Utility Study: Design and Research Questions (2)

- Sector transformation means change of actors and their interests/ preferences/ values/ resources
- And change of structures (organizational and technical) and institutions (ideas, organizational and legal norms)
- Actor level: Factors that may change interests, values and resources of local utilities are drawn from Rational Choice Theory, Actor-oriented Institutionalism and Sociological Neoinstitutionalism
- Meso & macro level of the energy system: changes in opportunities and barriers that actors encounter
- Socio-technical system – sunk cost and path dependencies (NIE, Sector Systems of Innovation)
- Social and economic structures – Theories of Regulation and Market Behavior, and Social Network Theories, Power and Influence Theories

Results: Changes of Actors (1)

- Local utilities take up the opportunities as market oriented actors. The more they do so, the better they can cope with liberalization.
  - The more they follow innovative strategies in distribution, the better they fare on the open market (figure 3)
- Size of local utilities is a limiting factor (lack of economies of scale)
  - Smaller utilities less often enter new business fields. They less often are engaged in cogeneration, the traditional field of local utilities (figure 4)

Results: Changes of Actors (2)

- What is the effect of old values (Supply security, Sustainability) and the new concept of a market oriented actor on engagement in innovative generation technologies (RES, Micro-Cogeneration)?
  - Traditional communal values as well as environmentalism have a positive effect on innovative generation.
  - Openness for liberalization opportunities and knowledge in conventional generation have a positive effect on innovative generation (figure 5)

Results:
Socio-technical, Structural and Institutional Factors (1)

- Innovative generation portfolios depend on knowledge in generation in the first place (figure 5)
  - Next to environmentalism existing knowledge in conventional generation has the strongest positive effect on engagement in innovative generation
- Sunk cost and technological path dependency may lower the engagement in decentralized technologies. Local utilities profit from large synergies with technical knowledge and local relations in multy utility and services
  - Investment into local gas networks or district heatings is seen as impeding CHP and contracting. Customer relationship and technical knowledge are much stronger factors for the decision to invest in contracting, CHP or renewables (figure 6)

Results:
Socio-technical, Structural and Institutional Factors (2)

- Market regulation has a positive effect on the probability of local utilities to invest in energy efficient generation technologies and/or in RES.
  - High importance of feed-in fees and boni for decisions to invest in RES and CHP. Most important are RES long-term guaranteed feed-in fees, next is the bonus for CHP cogeneration (feed-in bonus and bonus in EU ETS) (figure 7)
- Collaborative networks partly overcome lack of economies of scale and help small utilities to enter conventional generation business.
  - Figure 8-1 shows those with horizontal collaboration in generation are more often active in conventional generation. This effect is much more distinct for the subgroup of small utilities.

Results:
Socio-technical, Structural and Institutional Factors (3)

- Private shareholdings tend to hinder local utilities to engage in conventional generation
  - Figure 8-2 shows that the postulated negative effect needs to be differentiated. We see an overall negative effect, but there is a profound interaction with size. For the subgroup of small utilities the effect is strong and positive.
  - But for the large utilities there is a moderate positive effect of shareholdings, which can deliver access to knowledge here.
- Collaborative networks partly overcome lack of economies of scale and of knowledge also in emerging domains, allowing even smaller utilities to enter these.
  - Horizontal collaboration in generation has a positive impact on engagement in innovative generation technologies. This effect is strong for small utilities, not relevant for larger ones (figure 9-1)

Results:
Socio-technical, Structural and Institutional Factors (4)

- Hierarchical networks have a negative impact on engagement in innovative generation (percentage difference of 20). This effect is particularly strong for those utilities who are active in conventional generation (percentage difference of 30).
- Even larger is the negative impact of private shareholdings on engagement in innovative generation.
  - Figure 9-2 shows utilities with shareholdings overall display a probability of 37% to be active in innovative generation while those without have a probability of 72%. The effect is much stronger for small utilities, but still relevant for large ones.

Conclusion (1)

- Liberalization and environmental regulation successfully changed the value chain (interests) and self concepts (values) of local utilities.
- Utilities fare the better, the more they take up the chances of liberalization.
- Size and resources of utilities are limiting factors. Small decentralized technologies such as RES offer even small utilities good chances.
- Both, a self concept as a market orientated actor and adherence to local values and environmentalism support engagement in innovative generation.
- Path dependencies in knowledge creation and lack of economies of scale limit innovative generation.
- Lack of economies of scale and knowledge in conventional generation can be overcome by horizontal collaboration networks of local utilities.

Conclusion (2)

- Local utilities profit from strong synergies of technical know-how and stable customer relationship in multi utility, as well as from market correcting regulation supporting renewables and cogeneration.
- Horizontal collaborative networks are important drivers for the diffusion of innovative generation.
- Sector persistency is not restricted to technological factors such as sunk cost and competing technologies. It is built into networks and market structures such as hierarchical cooperation networks with large suppliers in conventional generation and shareholdings.
- A policy of opening and transforming the energy system might further develop the potentials of local utilities by supporting collaborative horizontal networks, by strengthening their market and service orientation and by safeguarding their independence.

Thank you for your attention!

http://www.foev-speyer.de/diffusion

Figure 3: Sales Trends for Utilities More or Less Prone to Take Up Liberalization Chances

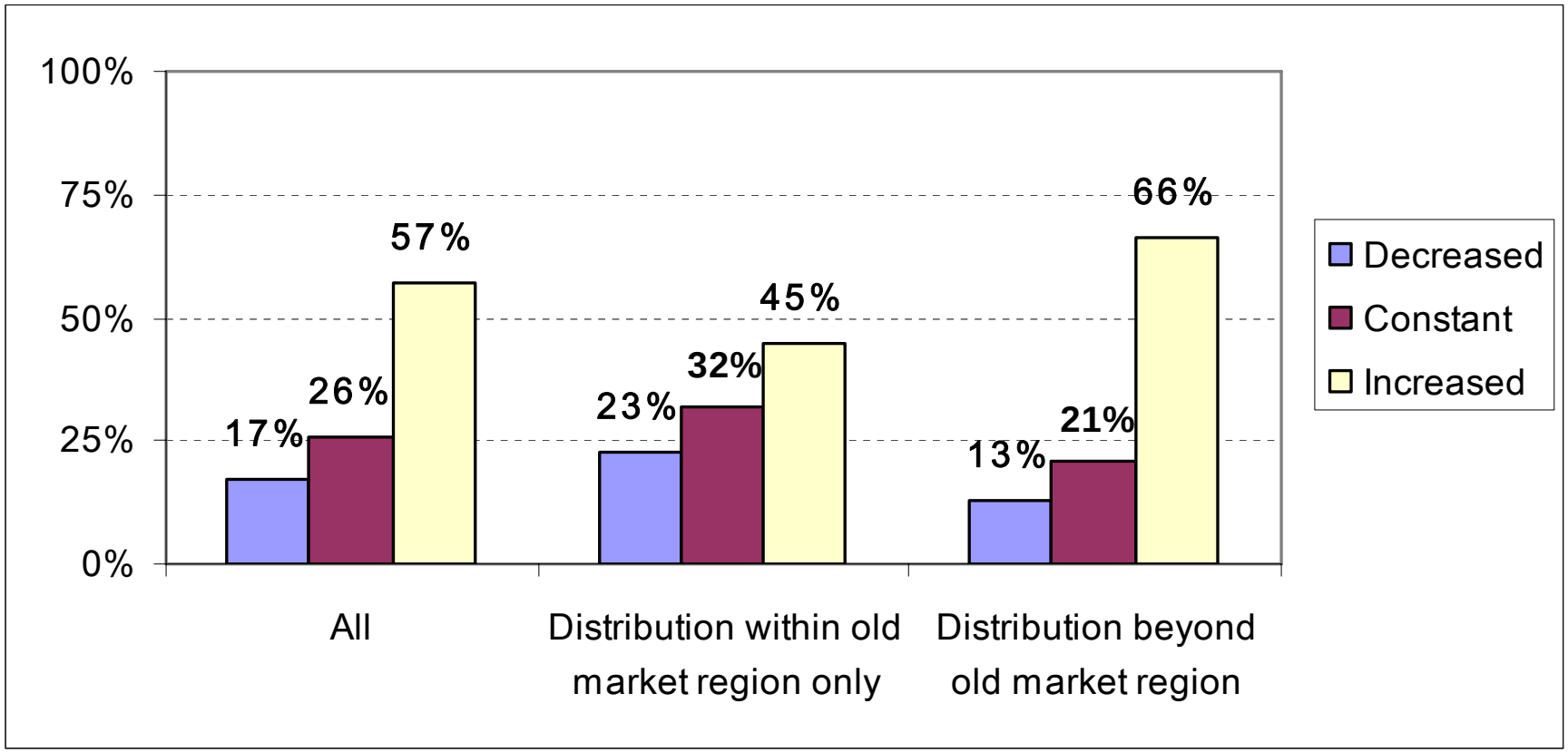


Figure 4: Engagement in Specific Innovation Domains by Size of Utility (%)

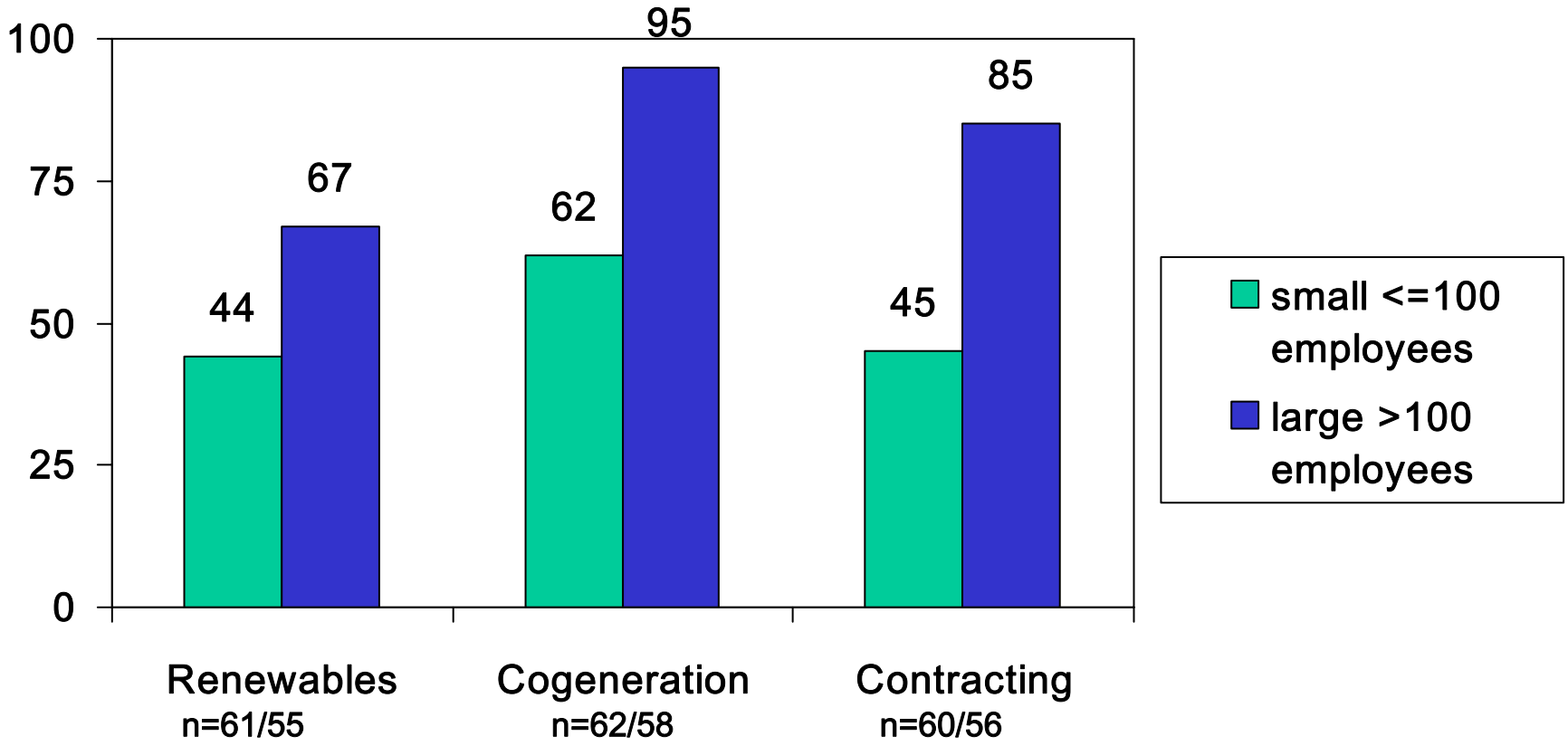


Figure 5: Effects of Knowledge, Values and Openness for Liberalization on Innovative Generation (%)

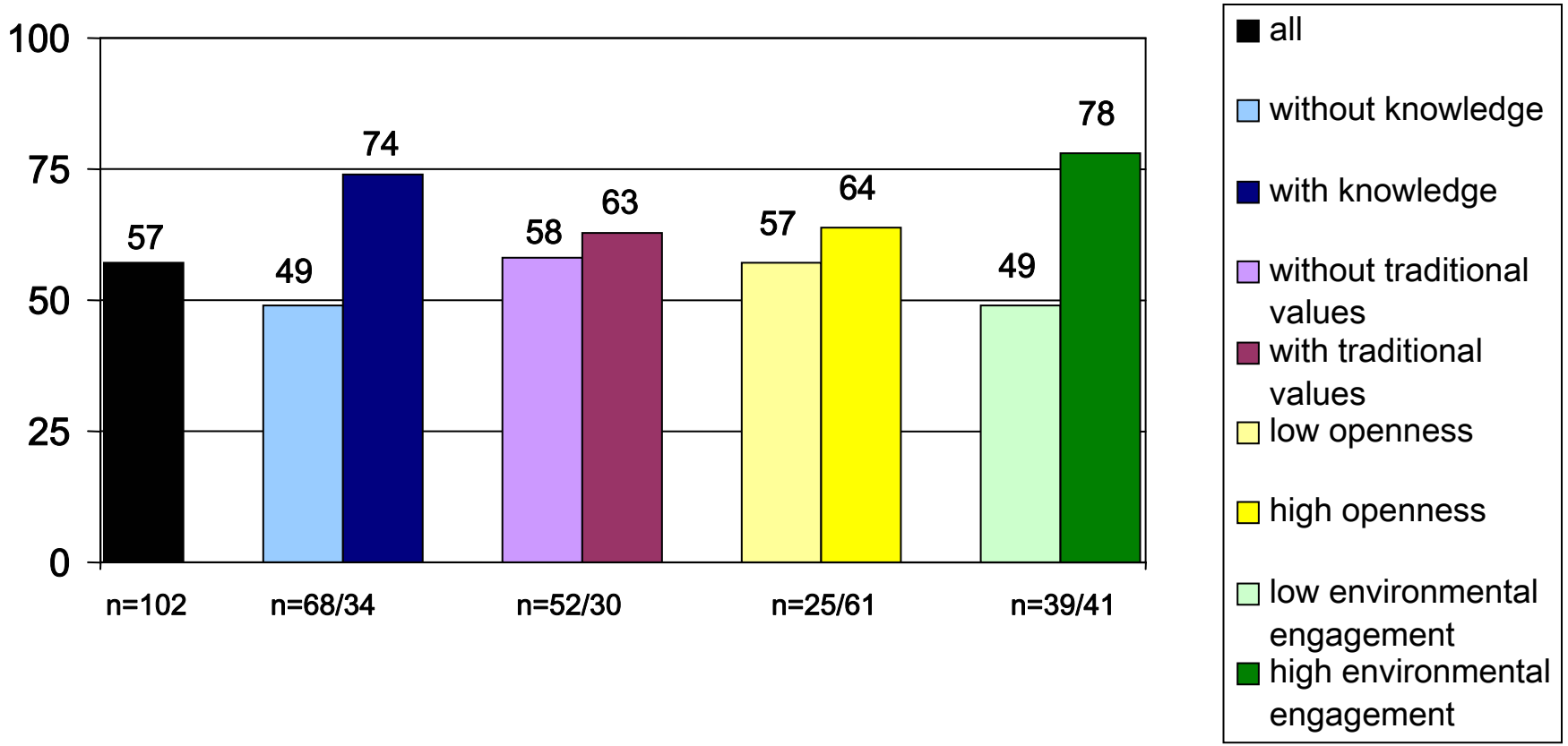


Figure 6: (Dis-)Synergies for Multy Utility Portfolios Decisions to Invest in Renewables, Cogeneration and Contracting

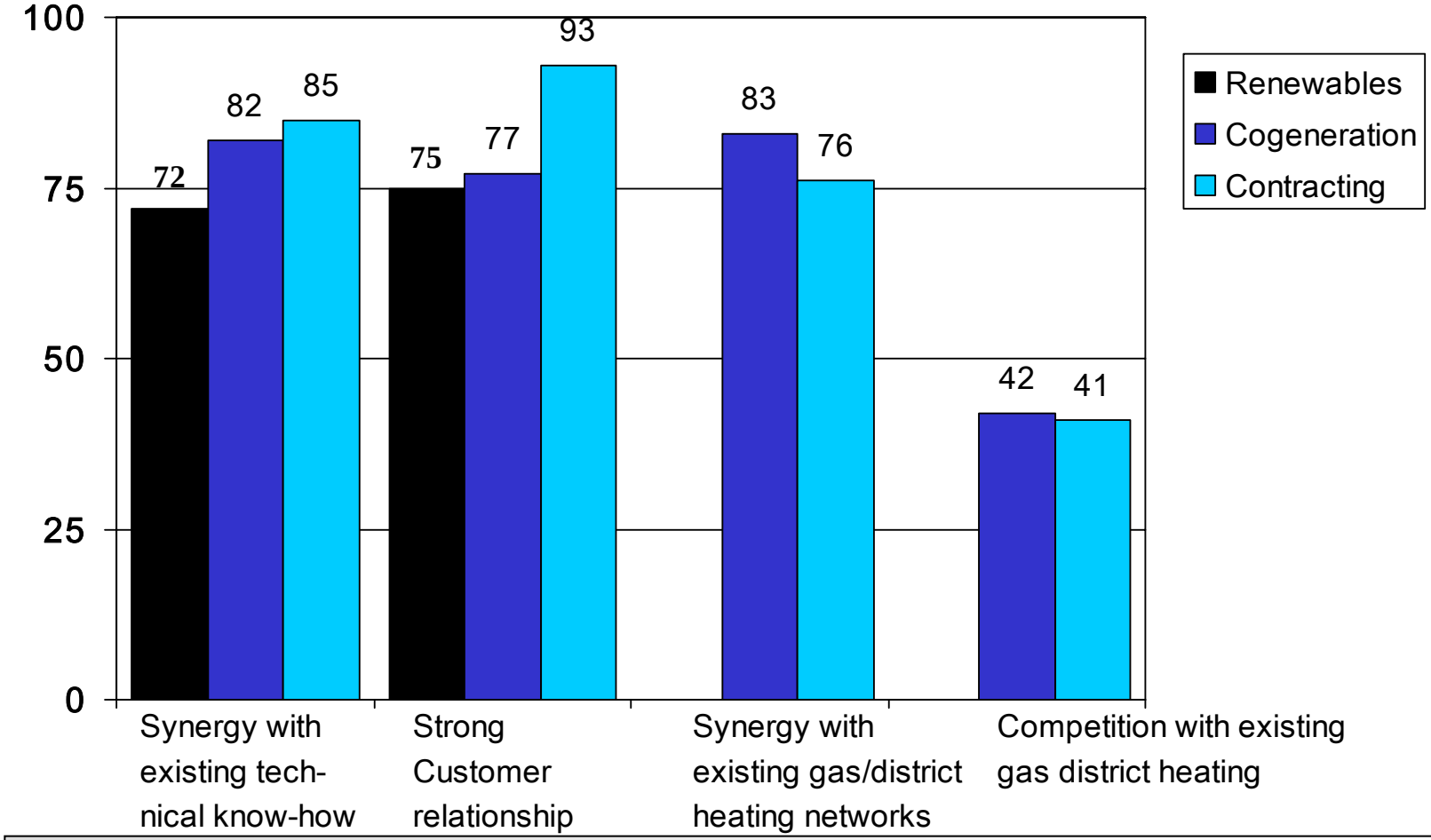


Figure 7: Impact of Regulatory Acts (RES, CHP, EU ETS) on Decision to Invest in RES and CHP (%)

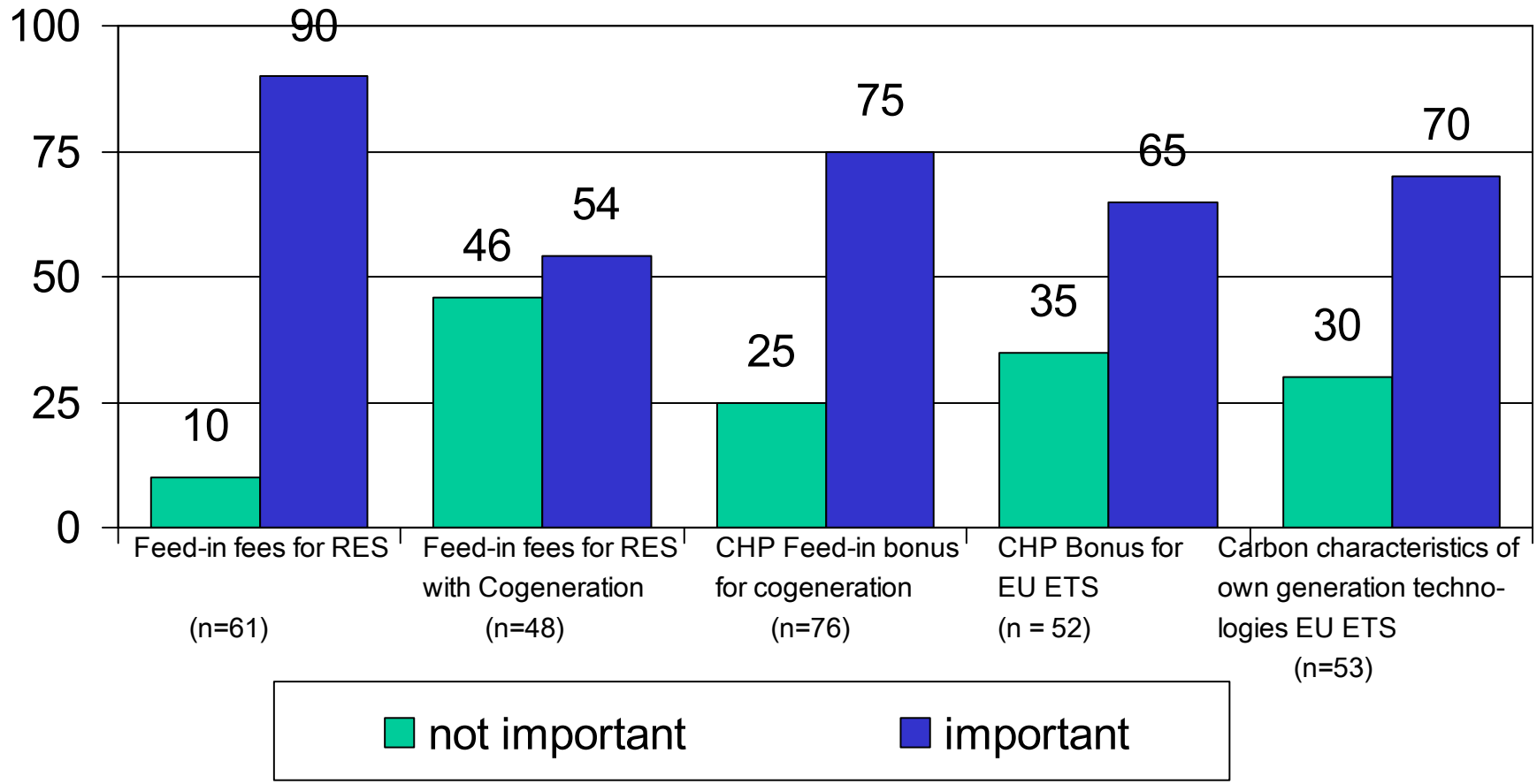
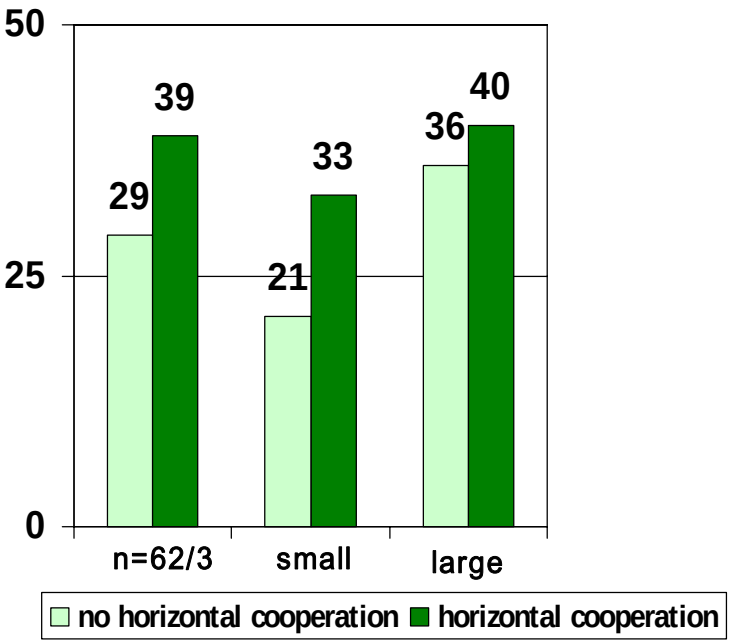


Figure 8: Effects of Size, Horizontal Cooperation and Private Shareholding on Engagement in Conventional Generation (%)



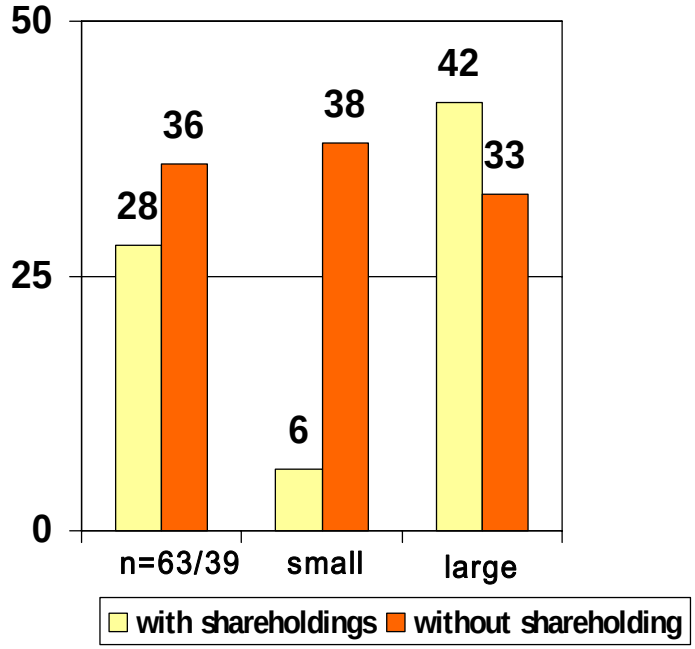


Figure 9: Effects of Size and Horizontal Cooperation in Generation and Shareholdings on Engagement in Innovative Generation