UNIVERSITY OF CAMBRIDGE | Electricity Policy Research Group

New Models of Public Ownership in Energy?

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E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

Outline

- New challenges
- Theories of public ownership in energy
- Case studies:
  - Wind Power in Denmark
  - Nuclear Power in Finland
  - LNG in Greece
  - Electricity and gas distribution in New Zealand
  - Electricity and gas transmission in Northern Ireland
  - Energy services business models in Great Britain
- Conclusions

New Challenges

- Climate Change and Related Policies
  - CO_2 reduction
  - Renewables targets
  - Demand reduction aspirations
- Energy security concerns
  - Gas supplies in EU
  - Peak Oil (and Gas)
- Consumer engagement with regulation
- Financial crisis and investment challenge

Theories of public ownership

- Laffont and Tirole (1993) suggest public ownership has:
- Costs:
  - Absence of capital market monitoring
  - Soft budget constraint
  - Expropriation of investments
  - Lack of precise objectives
  - Lobbying
- Benefits:
  - Social welfare
  - Solves principal-agent problem within firm
- They suggest that:
  - Private firms have both regulators and shareholders who constitute conflicting principals
  - Managers in private firms appropriate investments and public sector managers suffer from imposition of social goals
- Ambiguous results for performance

Theories of public ownership

- Hart et al. (1997) look at public-private partnerships.
- Only narrow range of circumstances where public ownership would be favoured where:
  - Non-contractible quality loss serious
  - Competition is weak
  - Consumer choice is ineffective
  - Reputation effect of firms seeking contracts low

Theories of Regulation

Gilbert and Newbery (1994) highlight when regulators may want to appropriate private firm investments:

$$(1\text{-}P)(c\text{-}b) > r$$

Condition for full investment
P is prob of low *D: D* = 1- σ, *c* is cost of alternative, *b* is MC,
r is cost of capital+depreciation,
θ is weight on profits, *i* is discount rate

Expropriate if gains exceed PDV of future costs:

$$(1-\theta)r > \frac{\Delta C}{i} = \frac{(c-b)(1-\sigma P)-r}{i},$$

i.e. If i higher, r higher, θ lower, c-b small, P higher

Principles of risk allocation

- World Bank Risk Allocation and Sharing Tool Kit

- Risks most efficiently handled by private sector:
  - Economic and financing risks
  - Construction risk
  - Operational risk
  - Commercial risk

- Risks most efficiently handled by public sector:
  - Political and legal risks

Theory applied to energy

- Laffont and Tirole (1993): *how do new challenges change case for public ownership? (+ for public ownership)*
- Costs:
  - Absence of capital market monitoring (+)
  - Soft budget constraint (+)
  - Expropriation of investments (+)
  - Lack of precise objectives (+)
  - Lobbying (+)
- Benefits:
  - Social welfare (?)
  - Solves principal-agent problem within firm (?)
- They suggest that:
  - Regulators and shareholders who constitute conflicting principals (+)
  - Managers in private firms appropriate investments (?)
  - Public sector managers suffer from imposition of social goals (+)

- ***Case for some public ownership looks stronger on incentive grounds (relative to low base of course!)…***

Theory applied to energy

- Hart et al. (1997): *do new challenges make a stronger case for actual public ownership of service provided to government? (+ for public ownership)*
- Only narrow range of circumstances where public ownership would be favoured where:
  - Non-contractible quality loss serious (?)
  - Competition is weak (+)
  - Consumer choice is ineffective (+)
  - Reputation effect of firms seeking contracts low (?)

- ***Smarter procurement from private sector necessary to maintain case for private ownership for publicly financed goods (e.g. renewables and CO_2 reduction).***

Theory applied to energy

- Gilbert and Newbery (1994): *do new challenges increase risk of appropriation by regulator?* (+ for public ownership):
  - Social weight on profits declining (+)
  - Cost advantage of private sector falling (+)
  - Demand growth falling (+)
  - Rising public sector discount rate (+)

- ***This suggests appropriation by regulators more likely.***

Theory applied to energy

- *Are new challenges associated with changing nature of risk, thus favouring increasing public ownership?* (+ for public ownership):
  - Economic and financing risks (+, if in financial crisis)
  - Construction risk (+, if first of kind)
  - Operational risk
  - Commercial risk (+, if markets being dismantled)
  - Political and legal risks (+)
- ***Context and nature of risks favour increasing public sector involvement in financing.***

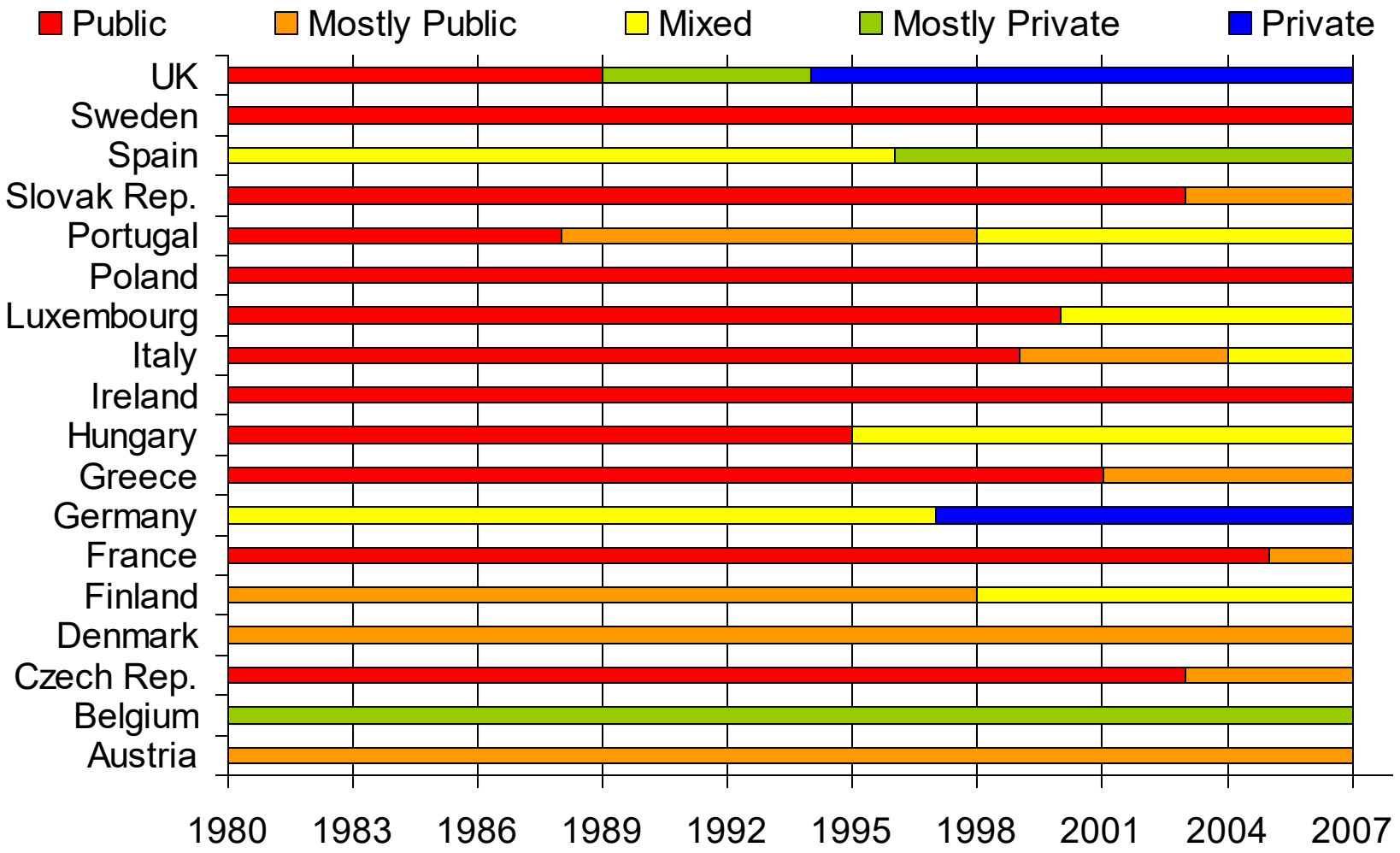
Particular applications

- *Public ownership is more likely in:*

- Wind Power (e.g. social objectives)
- Nuclear Power (e.g. first of a kind risk, appropriation risk)
- LNG (e.g. appropriation risk, social objectives)
- Electricity and gas distribution (e.g. lack of regulation)
- Electricity and gas transmission (e.g. appropriation risk)
- Energy services business models (e.g. social objectives)

- ***Small country context makes good regulation more difficult and competition less effective.***

Privatisation in EU over time



Source: OECD international regulation database, 2009

Wind ownership models

Community-led	Developer-led	Investment funds
Denmark General partnerships (cooperatives) *Sweden* Real estate commune consumer cooperative (traditional/local)	*Germany* Limited partnerships *UK* Baywind cooperative Sweden Consumer cooperative (national) *Denmark* Middelgrunden	*UK* The Wind Fund plc *Netherlands* "Green" Funds
Specific projects		No specific project
Community of Locality	→	Community of Interest

Source: Bolinger (2001)

Middelgrunden, Denmark

- 20 offshore wind turbines (2MW each) built in 2000
- 3.5 km outside Copenhagen
- Total investment cost: €44.9 million (26.1 million for turbines)
- Ownership:
    - 50% Middelgrunden cooperative (private partnership)
    - 50% Dong Energy (Danish state as principal shareholder – 74%)

Ownership and financing of Middelgrunden

50% private partnership

- 8,650 members initially with 40,500 shares (approx. $450 per share)
- General partnership – directly owned by electricity consumers
- Possible IRR of 8.25% over 20 years
- Worst-case scenario of 4.44% if project is unable to sell output when the feed-in tariff ends

50% publicly listed company

- Dong Energy with Danish state as principal shareholder (74%)
- Founded in 2006 when 6 Danish energy companies merged
- Company as a whole is 57% equity and 43% debt financed

Source: Bolinger (2001); Sorensen et al. (2002)

Nuclear power: Finland

- Olikiluoto nuclear power plant
- 2 active reactors: 1st connected to the grid 1978 and 2nd 1980
- 3rd reactor under construction – was due to be connected in 2009 but approx. 3 ½ years behind (initial estimate of €3 billion; 50% cost overruns)

Ownership and financing

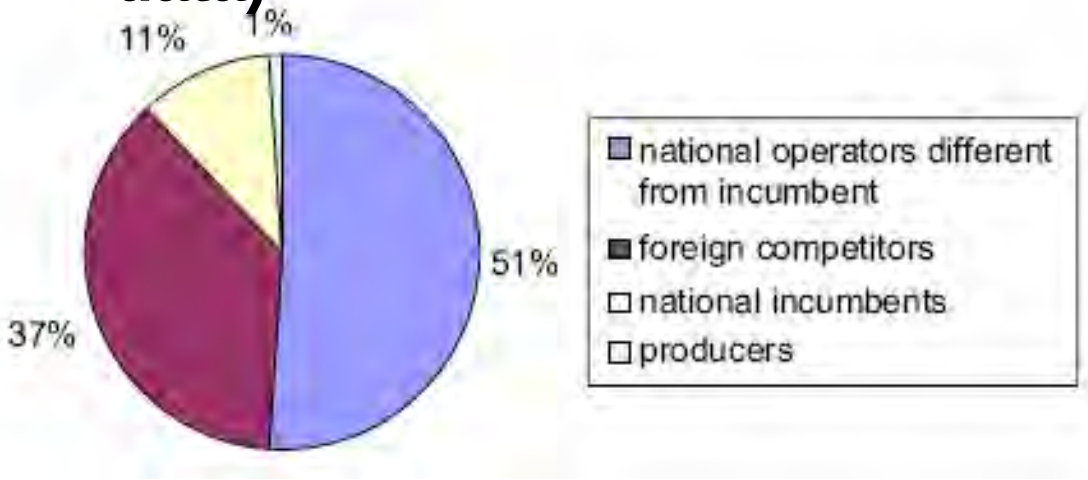
- Operator: TVO Organisation
- **Public-private partnership**: 43% owned by utilities – Fortum (51% state-owned) and Pohjolan Voima (part municipal ownership); 57% by large industrial consumers
- **Mankala principle**: shareholders receive electricity in line with ownership stake for lifecycle of plant
- 30% of construction costs for reactor 3 from shareholders and the rest from non-recourse debt financing
- Low risk financial structure

LNG terminals: Europe

Greece

- Owned/operated by DEPA (Public gas corporation)
- Shareholders: Greek state (65%); Hellenic Petroleum SA (35%)
- Operating since 2000
- Expanded to 4.5 bcm per year 2007

Ownership of planned European LNG terminals (2006 data)



Source: Dorigoni and Portatadino 2008

New Zealand: Electricity distribution networks

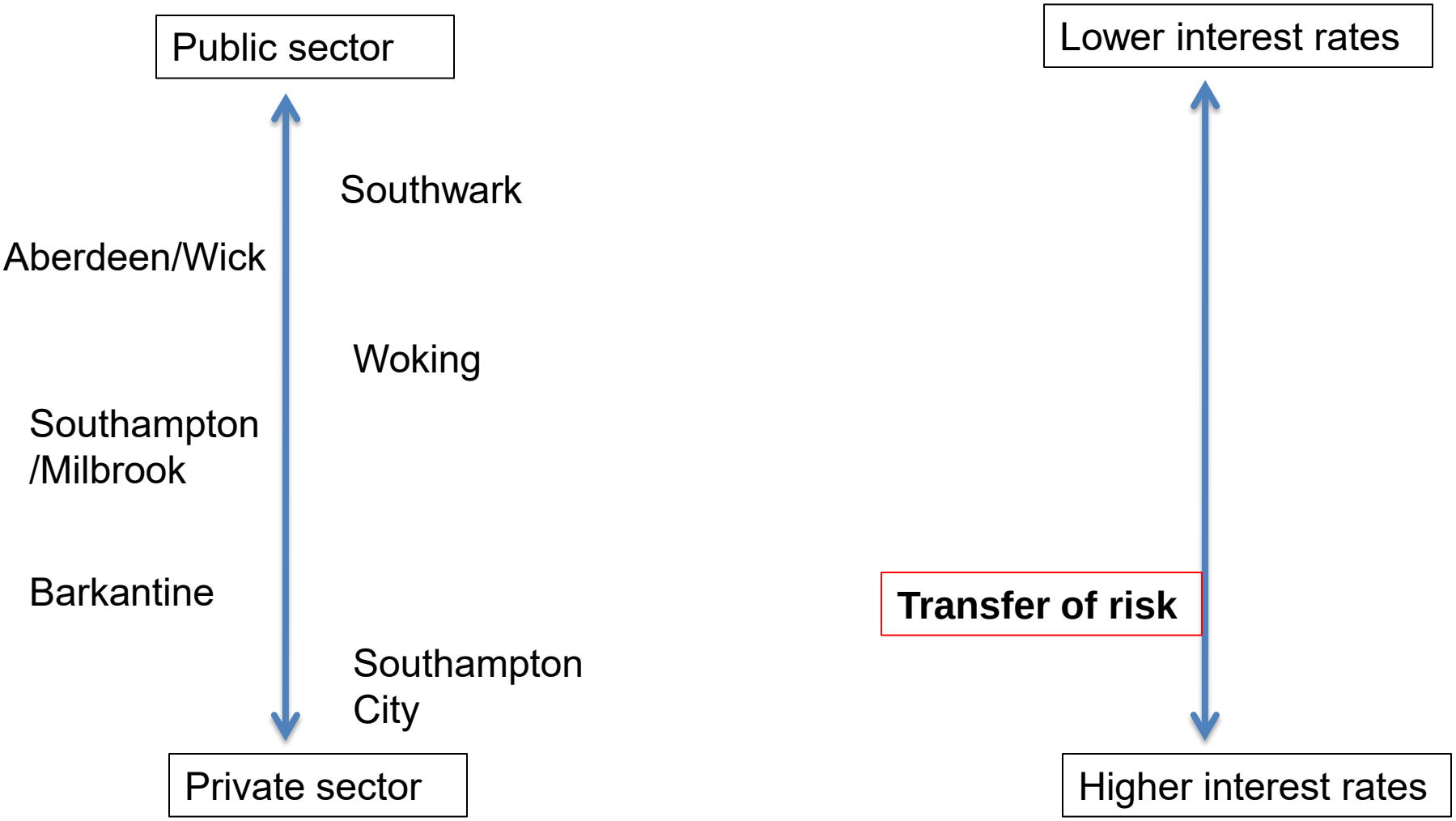
Ownership Type	No. of companies	Examples
Consumer Trust	18 (plus 1 with minority ownership)	Counties Power, Mainpower New Zealand, The Lines Company, Vector
Local Authority	4	Aurora Energy, Orion New Zealand
Community Trust	2	Eastland Network, WEL Networks
Public	1 (plus 1 with minority ownership)	Powerco, Horizon Energy Distribution (77% consumer trust; 23% public)
Cooperative	1	Electricity Ashburton
Other	2	Nelson Electricity (equal ownership by two consumer trusts); OtagoNet Joint Venture (b/w 2 consumer trusts and local authority)
Total	28	

Source: Adapted from Evans and Meade 2005

Moyle Electricity Interconnector: Northern Ireland to Scotland

- Owned by Mutual Energy Northern Ireland with a capital value of £135m
- Also own Scotland to NI gas pipeline (£107m); and Belfast gas transmission pipeline (£109m)
- Operational since 2002; refinanced in 2003
  - Mutual ownership model – company limited by guarantee
  - 100% debt-financed
- Board elected by company members (at least 30, representing stakeholder groups)
- Reduced cost of capital; provides best deal for consumers

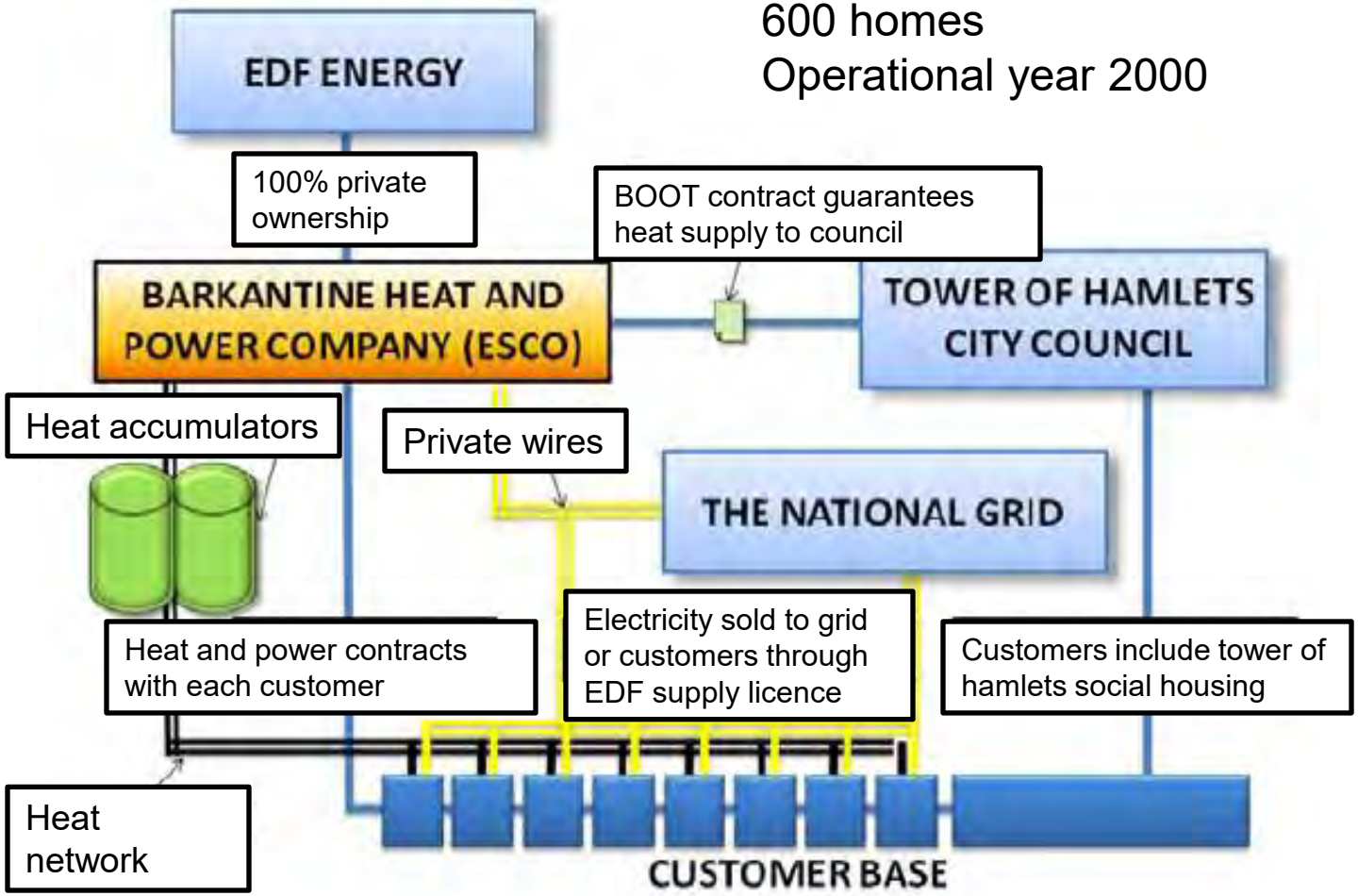
Public/private ESCO spectrum in GB



Source: London Energy Partnership (2007)

Barkantine ESCO

£6 million capital invested
600 homes
Operational year 2000



Source: Kelly and Pollitt (2009)

Conclusions

- Good reasons to think that theoretical case for mixed public-private ownership improving.
- However in some cases private sector involvement still much less than might be optimal.
- „Public" ownership can take a significant number of forms:
  - Mutual ownership
  - Consumer trusts
  - State ownership
  - Municipal ownership
- Key questions:
- What prevents different ownership forms from emerging?
- How can we maintain benefits of both private and public involvement?
- To what extent is improving case for public sector driven by ill-defined policy objectives and incomplete markets?

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