



Regulation of electricity distribution networks in the Netherlands and Norway

A comparison of two regulatory models

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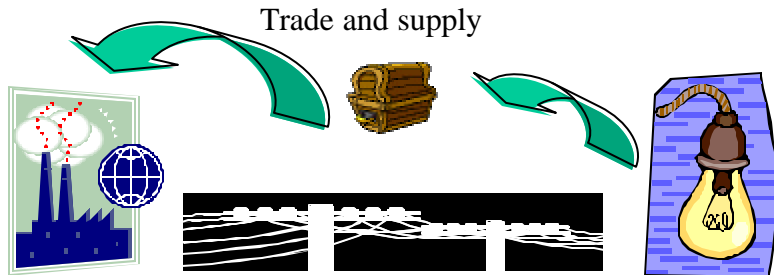


Outline

- Introduction
- Regulation in the Netherlands
- Regulation in Norway
- Comparison



The electricity market



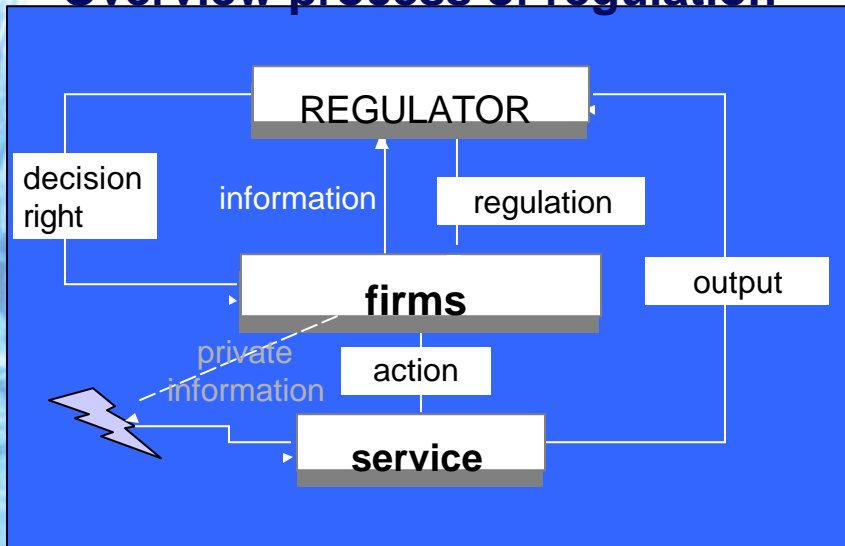
Production and trade are potentially competitive

HV-transport and distribution are (local) natural monopolies

Consumer



Overview process of regulation





Development in regulation

- Cost-of-service regulation
Averch and Johnson (1962)
- Price cap
Littlechild (1983)
- Yardstick competition
Shleifer (1985) and Bogetoft (1994 and 1997)



Yardstick competition

- Average performance (Shleifer, 1985)

$$P_i = \frac{1}{N-1} \sum_{j \neq i} C_j$$

- Best practice (Lyon, 1991, Bogetoft, 1994,...)

$$P_i = \min_{j \neq i} C_j$$

“C” is cost, in practice includes return on capital



Incorporating quality [1]

- Problem: how to incorporate quality in these high powered incentive schemes, so as to achieve a balance between prices consumers have to pay and quality provided (here quality=reliability of supply)



Incorporating quality [2]

- Mikkers and Shestalova (2003): suggest a regulation scheme of the form:

$$R_i = p(-i) \min(Y_i, Q_i) - j(-i)(Y_i - Q_i)_+$$

R: revenue

p: price

φ : customer interruption cost

Y: demand for electricity

Q: capacity of network

$\min(Y_i, Q_i)$: company i's output (actually delivered energy)

$(Y_i - Q_i)_+$: notdelivered output



Incorporating quality [3]

The scheme allows the regulator:

- to enforce a desired level of investment corresponding to the socially optimal level of reliability of supply
- to allocate the welfare gains to the customers
- and therefore, to resolve the trade-off between price and quality



The Dutch case



Regulation in the Netherlands

- Incentive Based Regulation
- 1st period (2001 - 2003): X's fully benchmarking driven
 - Standardizing total controllable costs
 - Identifying historical inefficiencies
- 2nd period (> 2003) : yardstick competition
 - Generic x-factors
 - Yardstick
 - Quality aspects included (from 2005)



Second Regulation Period: Generic x-factor based on TFP growth model

- The X-factor is calculated on the basis of the weighted average productivity growth (the growth of outputs minus the growth of inputs).

$$1 - (1 - X)^3 = \frac{\sum_i p_{i,2000} y_{i,2003} \frac{C_{i,2000} / y_{i,2000}^* - C_{i,2003} / y_{i,2003}^*}{C_{i,2000} / y_{i,2000}^*}}{\sum_i (p_{i,2000} y_{i,2003})}$$



Historical Inefficiencies

- Problem: generic x-factors based on average productivity growth
- Example

Firms	Cost period 0	Tariffs period 0	Cost period 1	x-factor	Tariffs period 1	Profit
1	100	100	100	5	95	-5
2	110	110	100	5	105	5



Determining x-factors in the first regulatory period

$$EC_{2000} = \min \left\{ \frac{TC}{y^*} \right\}$$

$$EC_{2006} = EC_{2000} * (1 - FS_1)^3 * (1 - FS_2)$$

$$FS_1 = 2\%$$

$$FS_2 = 1,5\%$$

$$AR_{2006} = EC_{2006}$$

$$AR_{2006} = AR_{2000} * (1 - x_1)^3 * (1 - x_2)^3$$

$$x_1 = 3,8\%$$



Yardstick competition: quality side

- Revenue is adjusted by the amount reflecting customer interruption cost
- Two terms: for number and for duration of interruptions (measured by SAIFI and SAIDI)
- E.g. for SAIDI:
 $f^D n (? SAIDI_{i,0} - SAIDI_{i,v})$
f : interruption cost
n : customer number
?: generic index reflecting average in the sector



The Norwegian case



Introduction - historical review

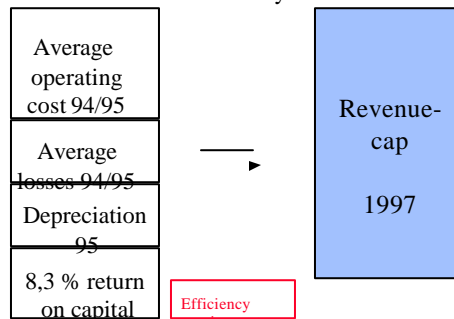
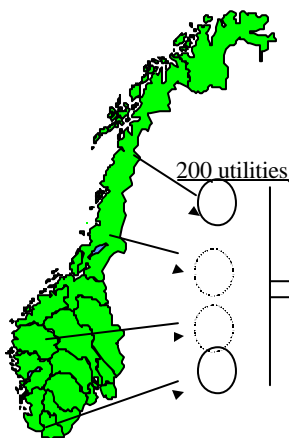
- Before 1990: Central regulation - Political determined prices on energy
- After 1990
 - New energy act in force of 1. January 1991
 - Unbundling of supply and transmission
 - Opened for competition in supply
 - 1991-1996: Cost-plus regulation
 - Cost covered and fixed rate of return on capital
 - 1997: Incentive regulation
 - Income-cap
 - combined with minimum and maximum return on capital
 - 2001: Incentives on reliability are incorporated
 - 2002: Revision of income caps

Incentive regulation - Review

Income-cap

(transmission & distribution)

For each utility





Revenue is annually adjusted for:

- Inflation (CPI)
- Price of energy
- Change in the number of customers (load)
- A general (1,5 %) and individual (0-4,5 %) efficiency requirement



Quality dependent income-cap

- To ensure that the quality does not fall to a sub-optimal economic level
 - Income depends on maintaining reliability
 - Reliability is measured in terms of ENS (energy non-supplied)
 - Value of ENS reflects customer interruption cost
 - 6 groups: industrial, intensive-energy industrial, services, government, agricultural, households
 - 2 rates: Notified and non-notified outage (kWh)
 - Maintain quality - income unchanged
 - Declining quality - income reduction
 - Increasing quality - income increasing



Comparison between the Netherlands and Norway

The Netherlands	Norway
Yardstick competition (ex post)	Price cap regulation (ex ante)
One dimensional benchmark	Multi dimensional benchmark
Quality will be incorporated from Januari 1, 2005	Quality incorporated from 2001
Quality measured in the number and duration of outages	Quality measured as ENS (energy nonsupplied to consumers)
The disutility of consumers is estimated from a survey (SEO)	The disutility of consumers is estimated from a survey