

Regulation and Investment in Energy Networks

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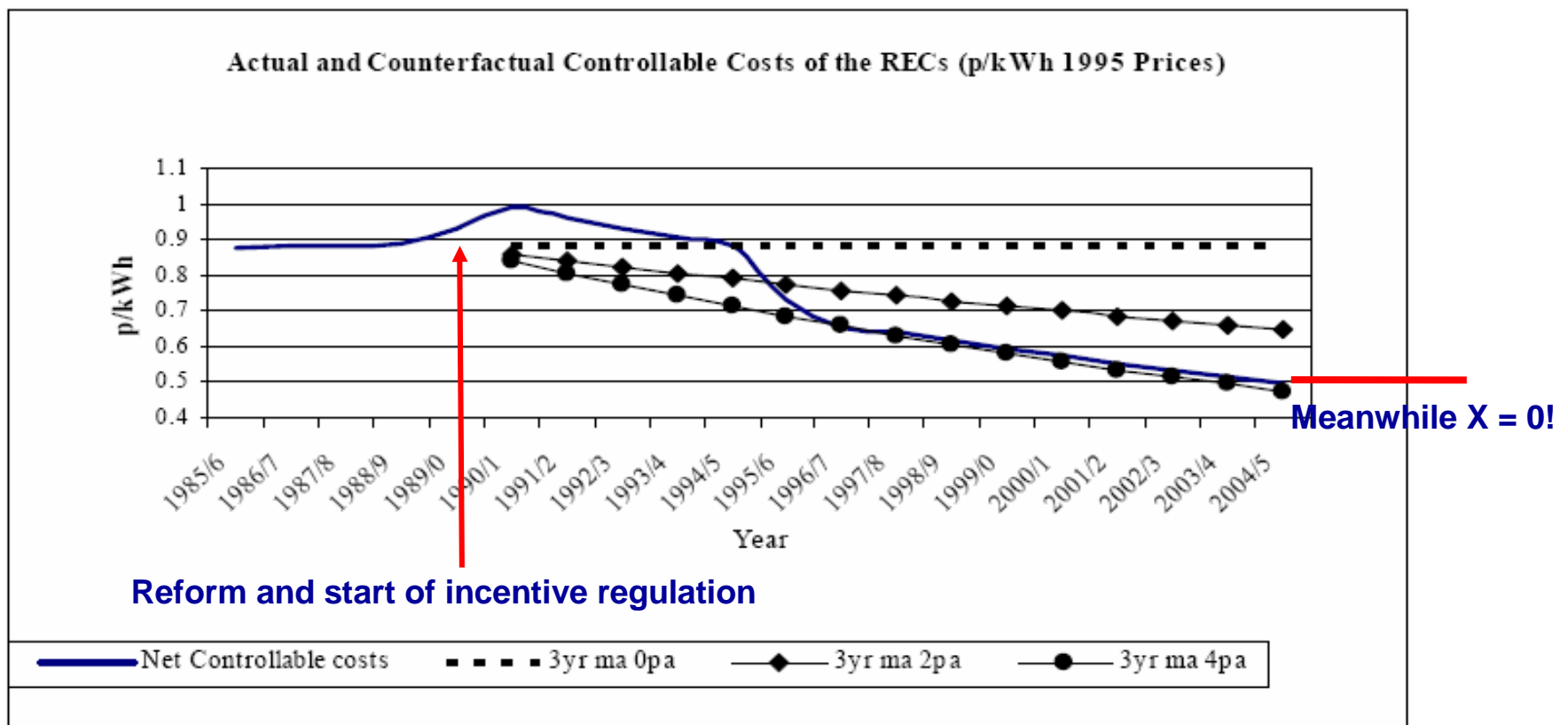
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7-May-10



Efficiency gains in the UK

► Development of controllable cost of distribution networks in UK



Source: Domah and Pollitt (2001), p. 21

Investment in the UK

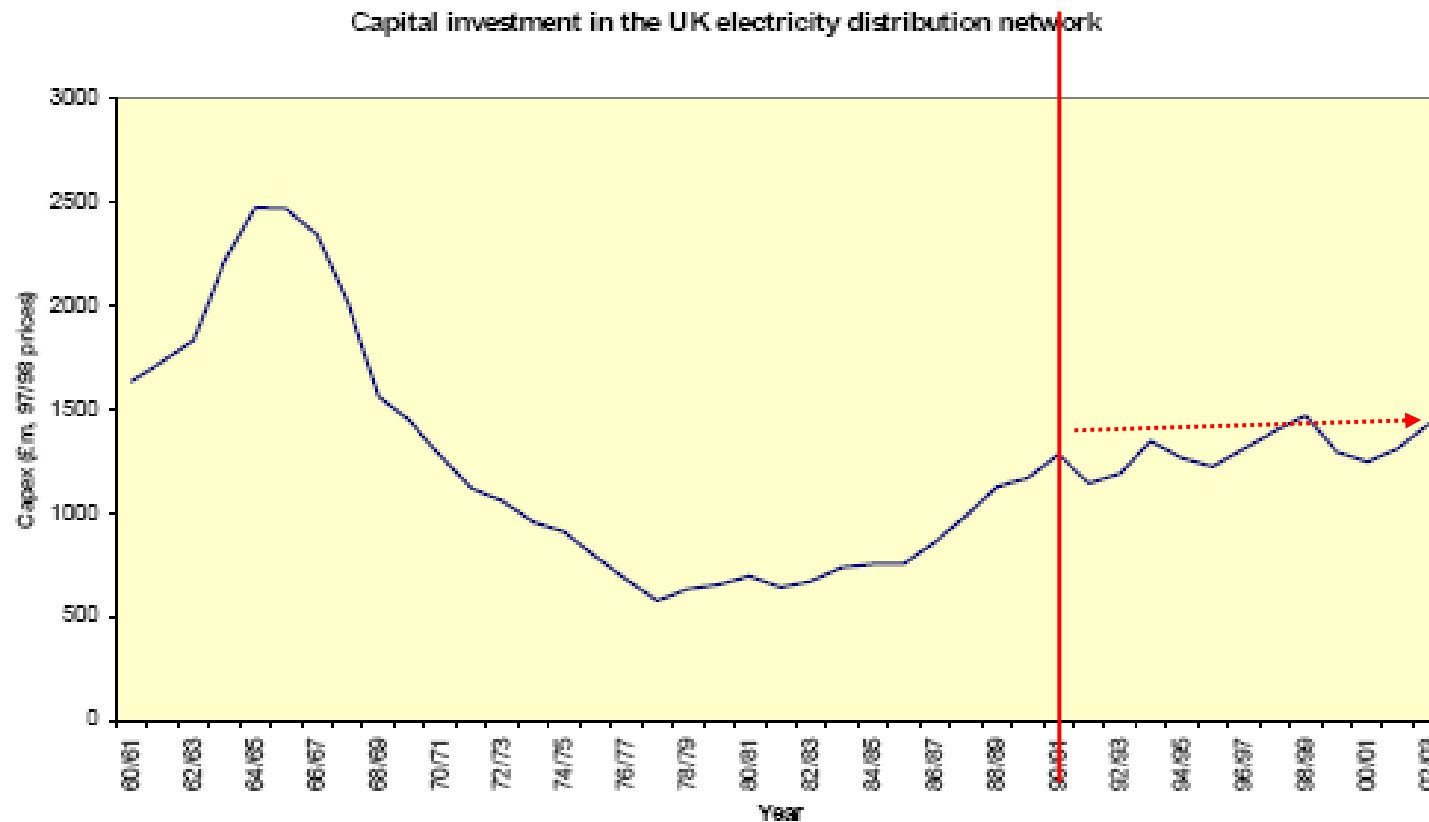
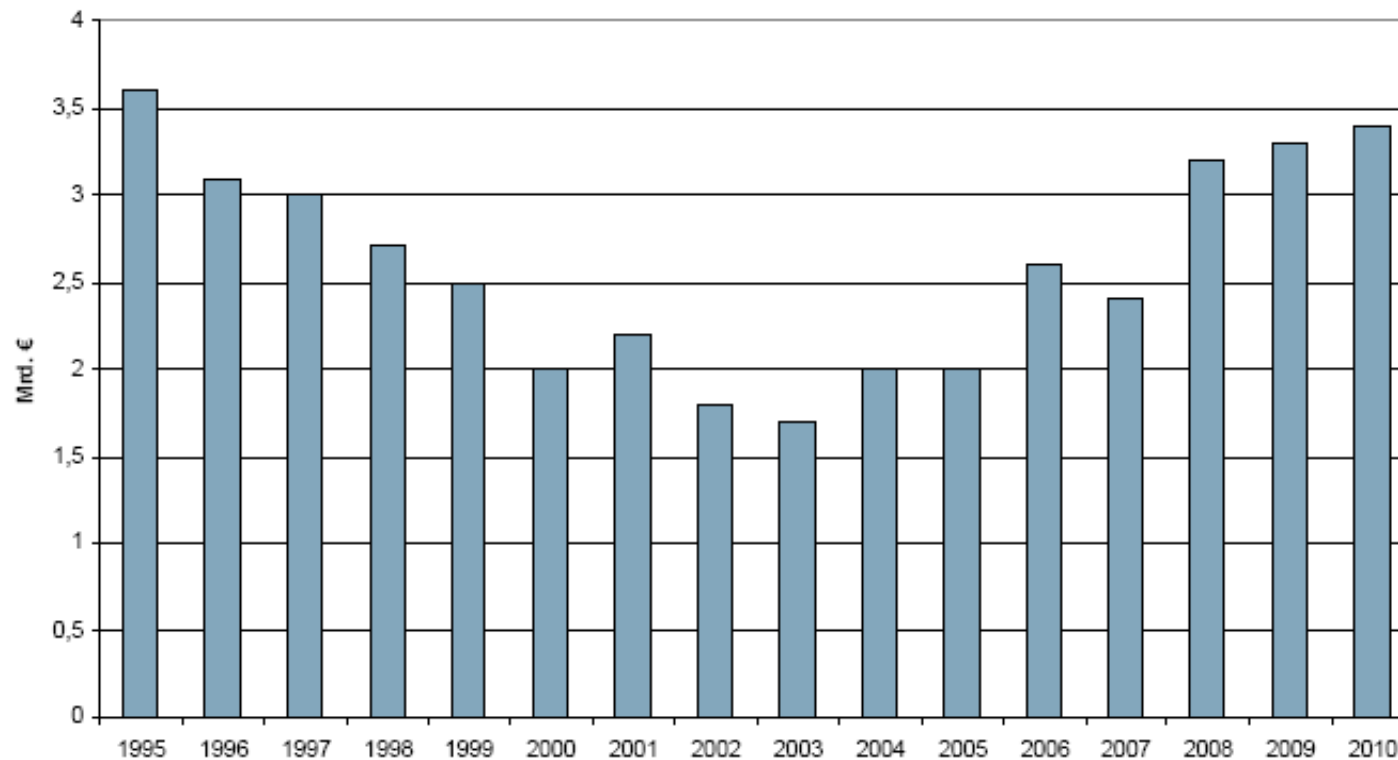


Figure 12: Capital investment in the UK electricity distribution network

Source: Ofgem (2006)

Electricity Network Investment in Germany

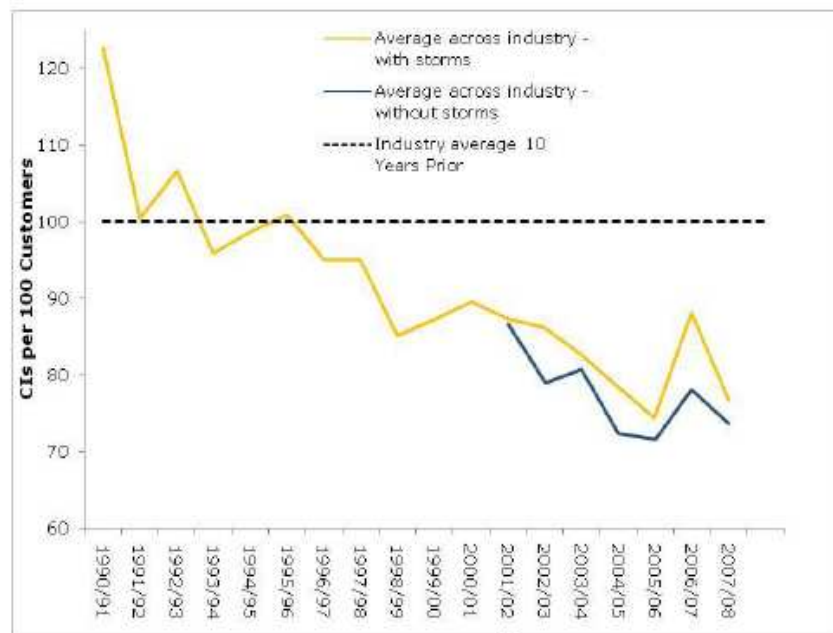


Source: BDEW, 2009

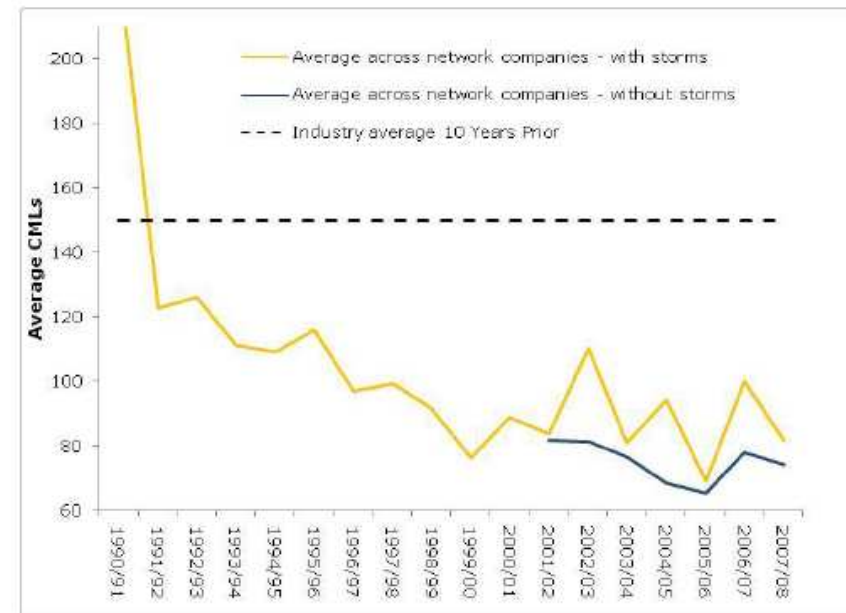
Note: Data 2008 – 2010 are planned investments, not actual values!

Network quality in UK

- Quality improved quite considerably
 - Does this contradict expectations?



Source: Ofgem and Offer, various sources²⁷.



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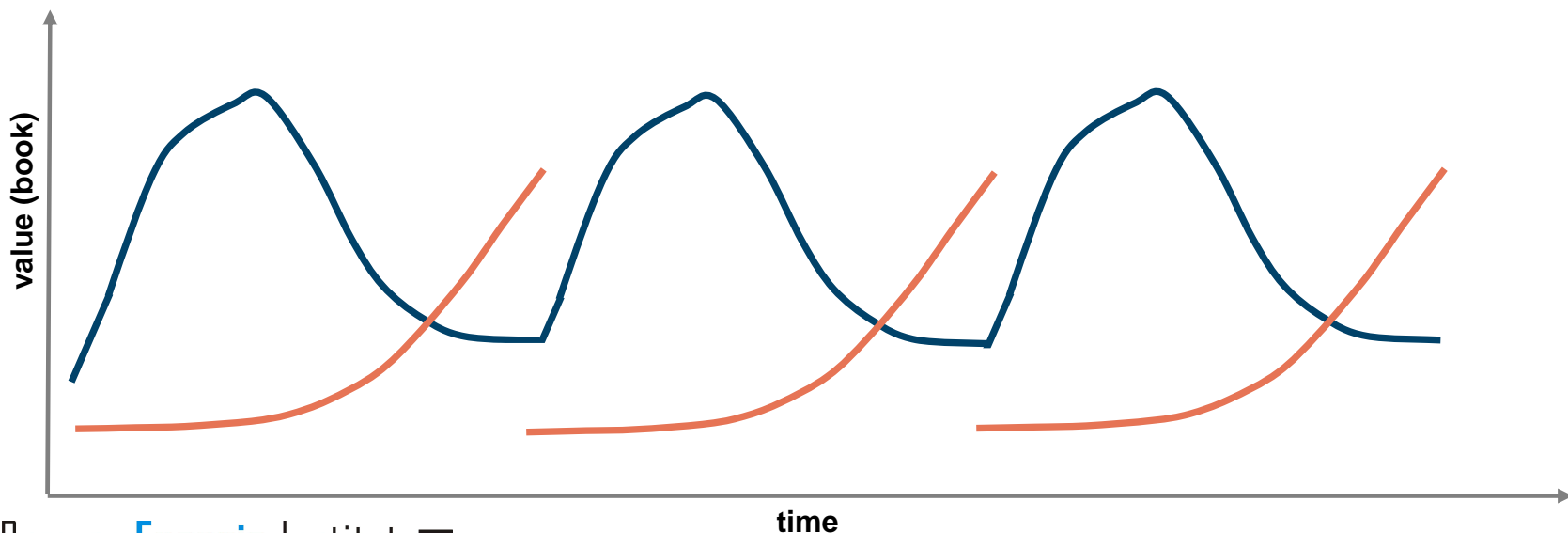
Berichtsjahr	Anzahl NB	Letztverbraucher (Mio)	SAIDI (Minuten)
2008	813/ 834	48,4	16,89
2007	825	48,5	19,25
2006	781	48,5	21,53

- **Quality is already high and it improves**
 - **However, „incentive regulation“ still without Q-component started in 2009**

- **We need to distinguish three types:**
 - **1) „Normal“ Investment**
 - **Expansion versus Replacement**
 - **2) Innovation**
 - **Product- versus process-innovation**
 - ▶ **Basically, difference between demand-shift and cost-shift**
 - **3) Quality**
 - **OPEX versus CAPEX**
 - **SAIDI (duration) versus SAIFI (frequency)**
 - ▶ **Note: if modelled, quality is a demand-shift problem**

Do costs go up or down?

- What happens to the „regulated cost“ after investment?
 - Following notation of Guthrie (2006, p. 947): $\Delta C < > rI$
 - ▶ Is reduction in production costs smaller or larger than investment cost?
 - ▶ Put differently, should regulated prices go up or down?



Price-based regulation is good for short-term efficiency, but what about incentives for long-term investment?

- 1. Price-cap regulation increases risk**
- 2. Price cap repairs gold-plating effect**
- 3. Price-cap regulation impedes quality**
- 4. Price-cap regulation: more vulnerable to regulatory time-inconsistency problem**
- 5. Price-cap regulation may decelerate investment**

Brunekreeft G. & Borrmann, J., 2010, „The Effect of Monopoly Regulation on the Timing of Investment“, Bremen Energy Working Papers, No. 1 Feb. 2010, Jacobs University Bremen

A model of regulation and timing

- **Three key assumptions**
 - **Sufficiently large projects**
 - Sufficiently high investment outlay
 - Scale economies in construction: lumpy
 - **Sufficiently strong dynamics**
 - Variable cost increase in time: “wear and tear”
 - ▶ *Replacement* investment
 - Demand growth
 - ▶ *Expansion* investment
 - **Investments would costs regulated prices to go up**

The comparison

- In all cases we assume a monopoly (no *race for investment*)
- The maximization problem is the optimal investment *timing*
- We compare four types:
 - Social welfare maximizer (SW)
 - Unregulated monopolist (Π)
 - Price-based regulated monopolist (YR) - Yardstick
 - Cost-based regulated monopolist (CB)
- Cost-based versus Yardstick:
 - ▶ Cost-based: (own) investment triggers (own) price change
 - ▶ Yardstick: (own) investment does not affect own regulated prices

Conclusions on *timing* issue

- Difference replacement- and expansion-investment matters
- Effect of investment on regulated costs (up or down) matters
- ▶ Yardsticks work nicely for replacement investment
 - A lower yardstick accelerates the replacement investment
 - But note the cost-recovery constraint
- ▶ Cost-based regulation accelerates timing as compared to yardsticks
 - “Adders” and “top ups”
- ▶ For new capacity (“green field”), regulation will decelerate as compared to unregulated and therefore as compared to social welfare maximization

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Price-based regulation and Quality



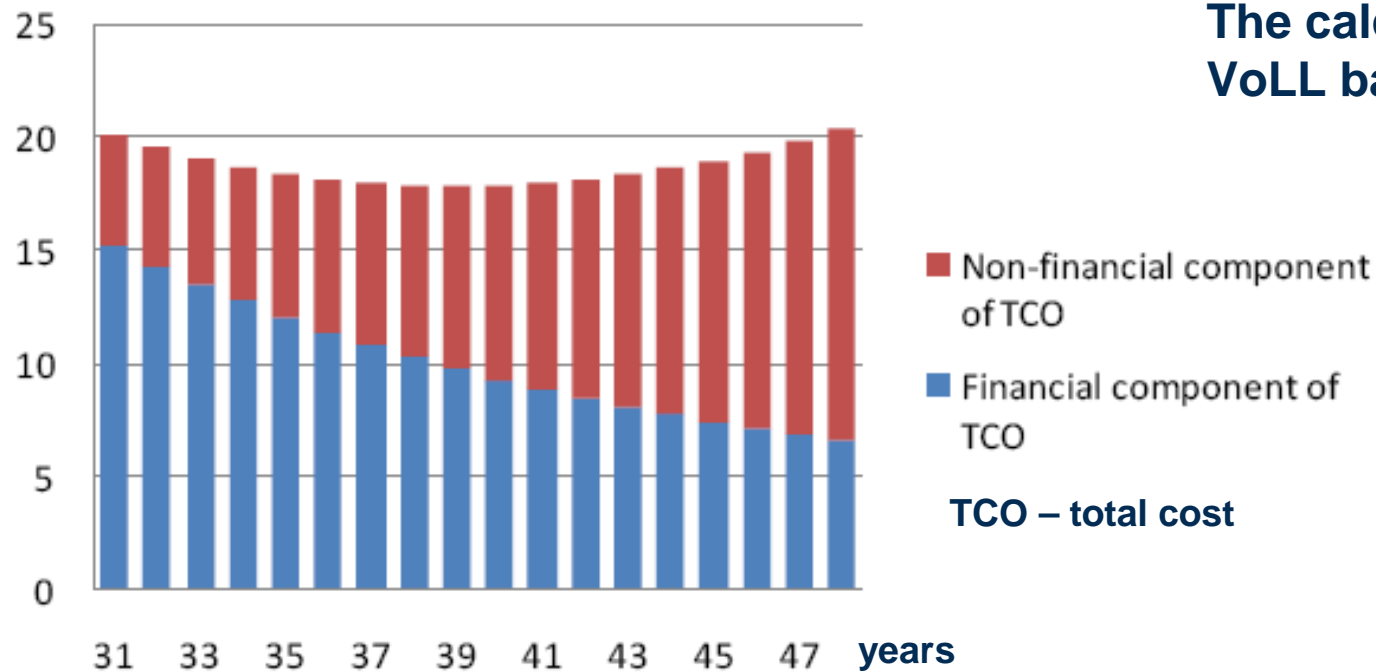
- **Theory: Spence (1975)**
 - **Given certain assumptions, the unregulated monopolist provides optimal level of quality**
 - **Key assumption: Change in quality does not alter the slope of the demand function**
- **Price-based regulation: quality likely to be too low**
 - **With price-based regulation:**
 - **Remaining profits after avoiding cost**
 - **Avoid maintenance and new investment**
 - **Note the crucial difference between a price-cap and a revenue-cap!**

Does a problem exist at all?

- **Empirical evidence is thin**
 - **Ter-Martirosyan (2003) / Kwoka & Ter-Martirosyan (2008) find effects in the US:**
 - **Effect on SAIDI (duration), but not on SAIFI (frequency)**
 - **Q-component offsets effect on SAIDI**
- **“bath-tub” problem and myopic management (cf. Kwoka, 2009)**
 - **Argument: “Investment in quality works out only far in the future (>10 years), and as management usually sits only 5 years, they act myopically” ► under-investment**
 - **Comment: What about shareholders’ interests?**
- **What about public shareholders?**
 - **Cf. Dutch experience (PWC 2009)**

Is VoLL effektive?

Financial vs non financial costs



Source: Wijnia, May 26, 2009, presentation at NMA, The Hague

Key issues in current debate

- **Smart regulation for „smart grids“**
 - **Innovative Regulation for Intelligent Networks (IRIN):**
<http://www.bremer-energie-institut.de/irin/>
- **Regulation and incentive-mechanisms**
 - „Menu of sliding scales“
- **Network expansion of transmission lines**
 - Locational pricing
- **Vertical unbundling and coordination of investment**
 - **Coordination of decentralized decisions** ➔
- **Regulation and Investment incentives**
 - **More cost-based elements?**

Brunekreeft, G. & Friedrichsen, N., (2010), “Vertical unbundling and the coordination of investment: can “cheap talk” solve the problem?”, *mimeo*, 2010
Jacobs University Bremen

**Thank you for your
attention!**

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7-May-10

