

Does ownership unbundling of the distribution networks distort the development of distributed generation?

-WORK IN PROGRESS-

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Background

“Lines companies seem well placed to identify generation opportunities that could substitute for investment in distribution or transmission networks”.

Murray & Stevenson [2004, p. 49]

Background:

- **“Ownership unbundling” of electricity distribution network operators (DNOs) in the Netherlands**
 - **Current law proposal likely to pass parliament**
- **The effects of the development on distributed generation (DG) somewhat short of attention in the debate**

Key conclusion:

- **DNO ownership unbundling likely to impede DG**

Overview

- **Definition**
- **Policy overview of selected countries**
- **Network impact of DG**
 - **On costs and benefits**
 - **Connection charging: deep versus shallow**
- **The effects of unbundling on DG investment**
 - **DG and CAPEX**
 - **Shallow charging and external effects**
 - **Governance, coordination and information**
 - **Remedies and exemptions**
- **Concluding remarks**

Definition of Distributed Generation

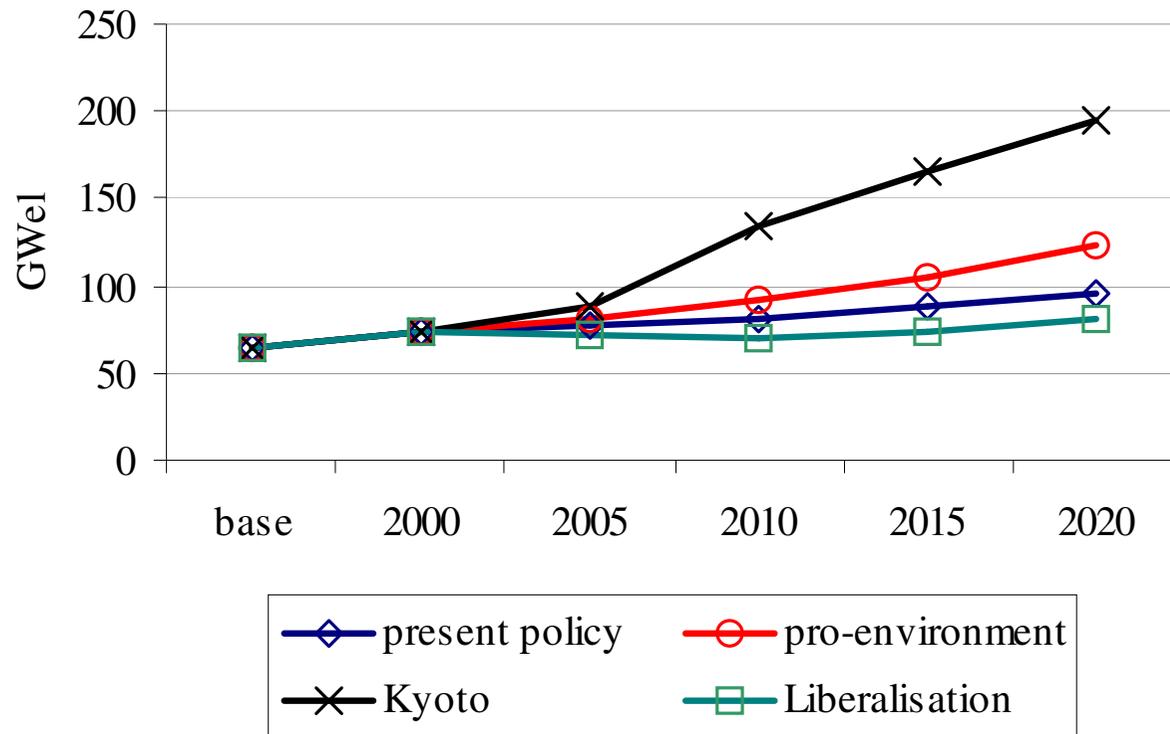
- **Ofgem:**
“**Distributed generation (...)** is electricity generation, which is connected to the distribution network rather than high voltage transmission network. It is typically smaller generation such as renewable generation, including small hydro, wind and solar power and smaller Combined Heat and Power.”
- **For the Netherlands (DTe):**
 - **DG connected strictly lower than 110 kV,**
 - **Typically smaller than 100 MW**

Definition: *deep* versus *shallow*

- DG usually has an impact on the D & T network *beyond* the first network connection point
- *Deep* connection charging:
 - the costs (and/or benefits) of this impact (e.g. network upgrades) are passed through to the new connection
- *Shallow* connection charging:
 - the new connection only pays the connection up to the first network connection point

Note thus that shallow neither includes network upgrades nor avoided network costs (investment and losses)

CHP in EU-15



Especially under Kyoto, CHP can grow

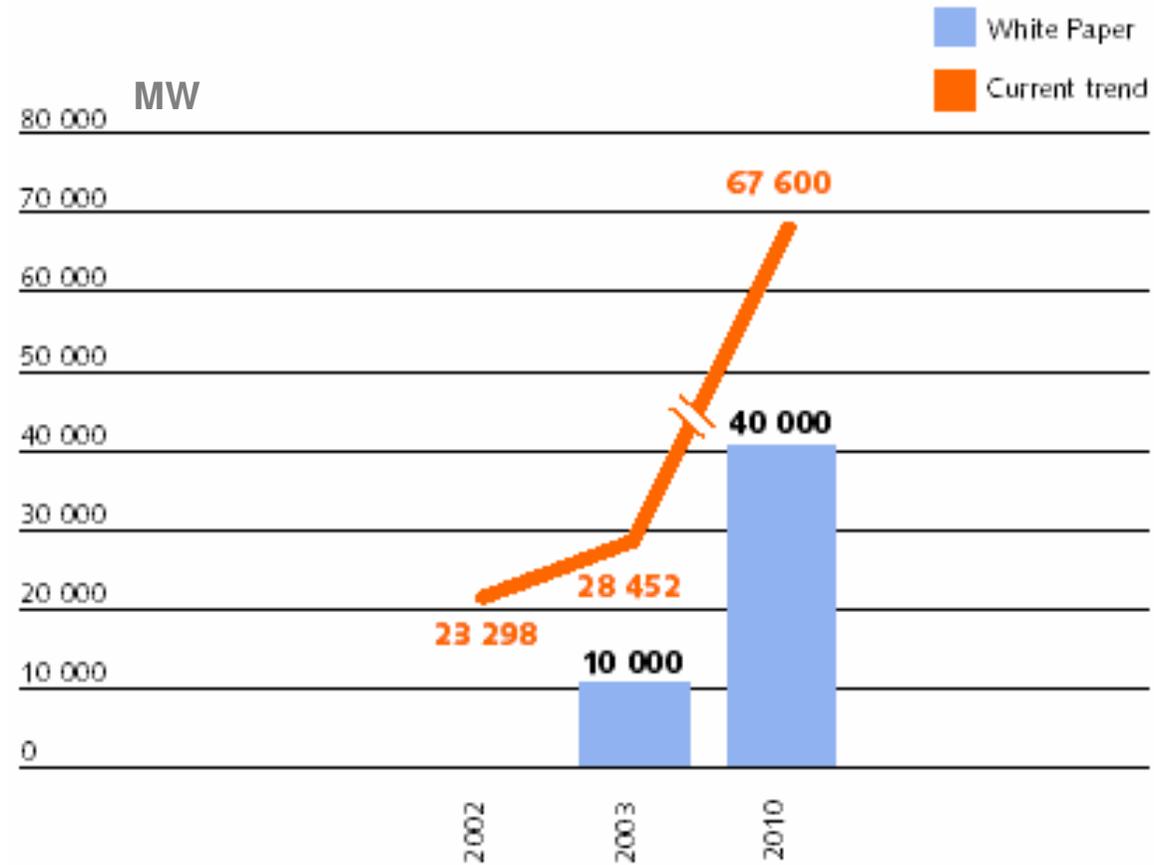
Note: not all CHP is DG!

Source: COGEN, 2001, tables 4-1 to 4-4.

Wind capacity in EU

Wind is doing well

Note: offshore wind is not DG!

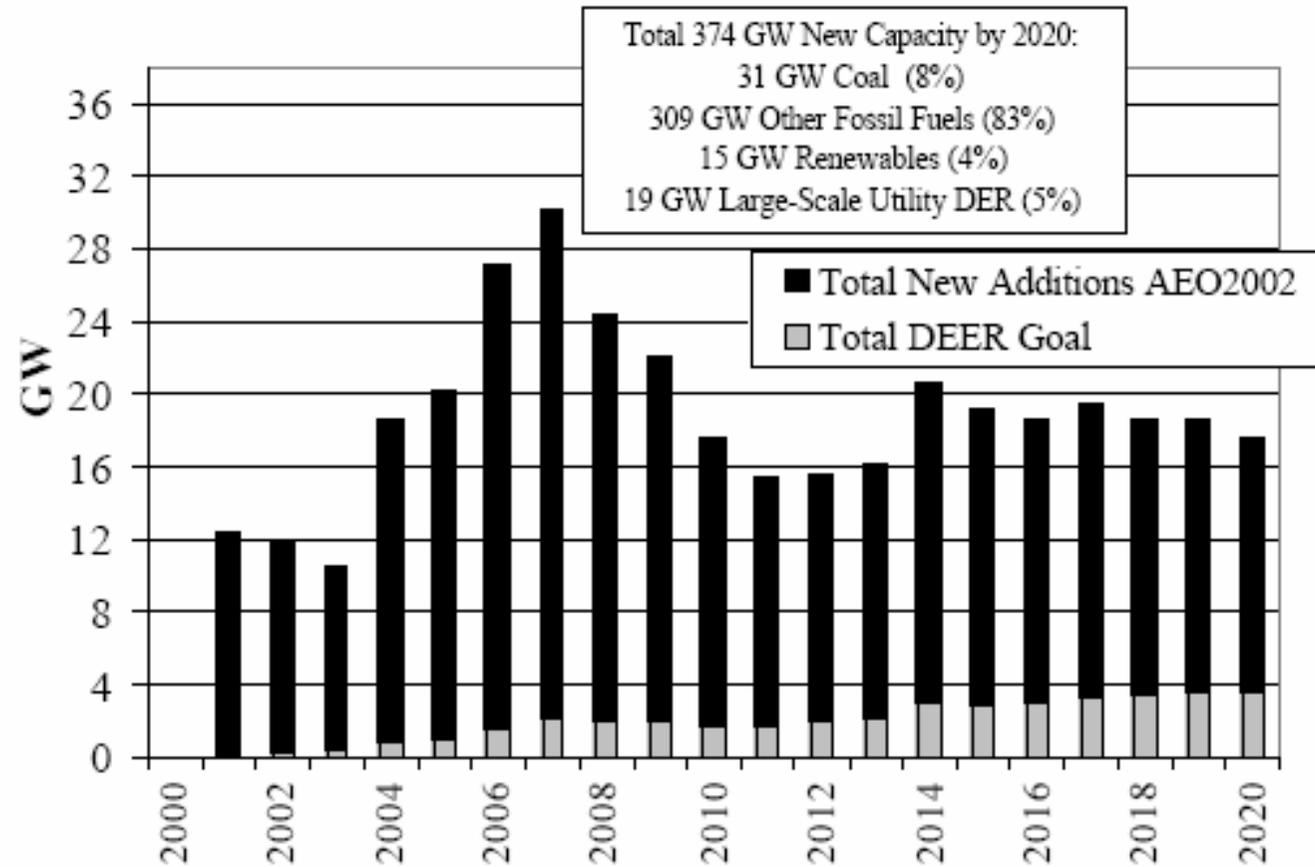


Source: EU DG TREN (EurObserv 'ER 2004)

New DG in the USA

Some 40 GW new DG projected to 2020

Note: DER = distributed energy resources = DG



Source: Gumerman et.al. (Feb. 2003), p. 2

EU policy

- **There is no explicit policy on DG**
- **Indirectly:**
 - **Promotion of RES, CHP, CO₂-ETS**
 - **Art. 7 of RES directive paves the way for favourable connection conditions**
 - **Network operators obligation to connect and bear the cost**
- **Regulation of networks**
- **Unbundling:**
 - **Legal unbundling but not ownership unbundling**
 - **For TSO this is policy aim but not feasible**
 - **DNO ownership unbundling not high on agenda**

Policy in selected countries - UK

- **Distribution Price Control 2005-2010**
 - **Makes a move from deep to shallow connection charging**
 - **Deep is entry barrier for new small DG**
 - **Novel sliding-scale rate-of-return element to allow for capital overspend**
 - **Allows ‘cost pass through’ of network upgrades**
- **DNO Unbundling:**
 - **Previously: Management separation plus strict ringfencing**
 - **Leading to ‘voluntary’ ownership split?**
 - **Trend towards less restrictive ringfencing**

Policy in selected countries – New Zealand

- **Until recently, no regulation of networks**
 - **Network connection conditions not favourable for DG**
- **Meanwhile effectively price caps**
- **Government promotes DG: relatively shallow charging**

- **DNO ownership unbundling!**
 - **Trend towards allowing stronger integration between D-network and generation**
 - **RES unrestricted**
 - **And non-RES-DG up to certain size**

Policy in selected countries - Netherlands

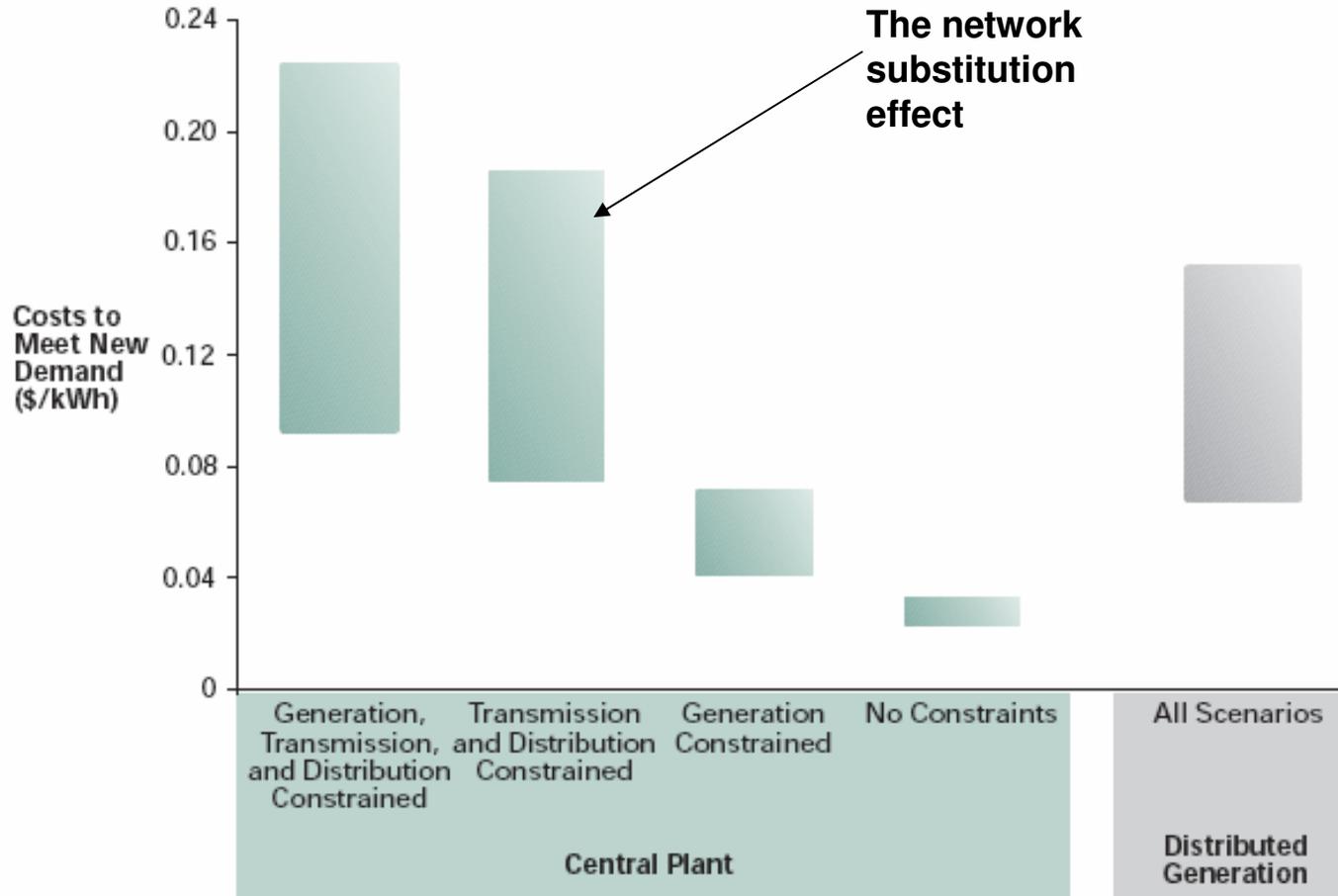
- **DG: lot of CHP**
 - **Shallow connection charging**
 - **RUN: arrangement for avoided transmission losses**
- **Regulation: UK-style price-cap**
 - **Cost-pass-through of significant new investment with ex-ante approval**
- **DNO ownership unbundling pursued**
 - **“Formal split” of D-network from commercial activities**
 - **First and (until now) only in Europe**
 - **Background is privatization debate**

Network impact of DG

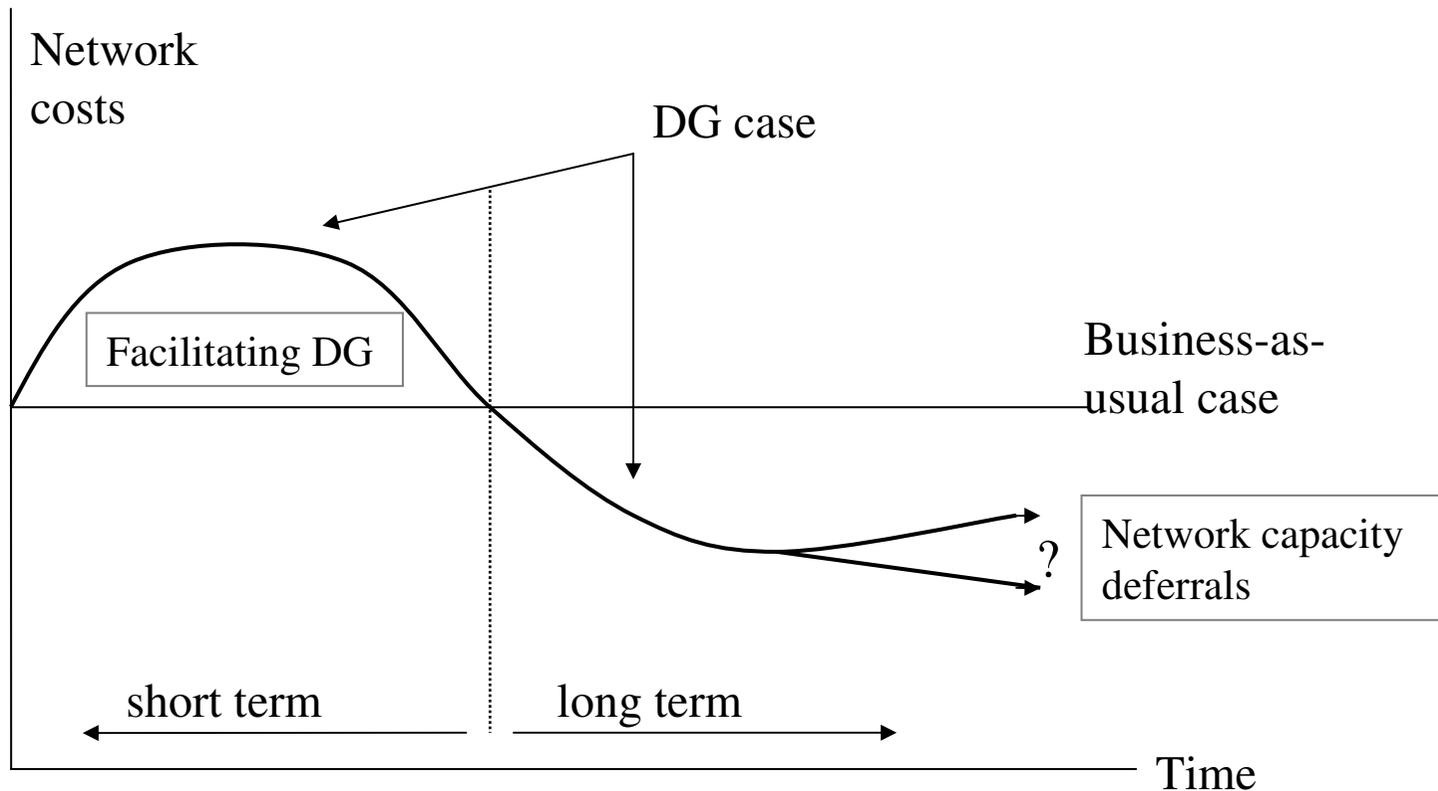
- **Many effects and context sensitive**
 - **Compare for example A.D.Little (1999), Iannucci et.al. (2003), Gumerman et.al. (2003), Ackermann (2004)**
 - **Distinctions:**
 - **Distribution versus transmission**
 - **‘dispatch’ (e.g. energy losses) versus investment**
 - **Utility versus consumer**
 - **Short run versus long run**
- **Working hypothesis (for the ‘longer’ run):**
 - **The predominant effect is ‘distribution capacity deferral’**
 - **DG can substitute distribution lines**
(cf. esp. Iannucci et.al., 2003)

DG and T/D investment

Figure 3.1: Range of Utility Costs to Meet New Demand—Vertically Integrated Utility



The impact of DG: hypothesis



Deep versus shallow connection charges

- **Working hypothesis:**
 - **Deep may be more efficient but is not feasible**
- **Arguments:**
 - **Legally often not allowed**
 - **Deep requires case-by-case calculation and negotiation**
 - **Recall that DG is usually small scale**
 - **Costly, uncertain and disadvantage for small firms**
 - **Asymmetric information between DNO and DG**
 - **Violation of level playing field**
 - **Free-riding and investment lock-in**

Effects: DG and CAPEX

- **Recall cost effect: short-run increasing and long-run decreasing**
- **Cost-pass-through depends critically on regulation**
- **Assume 'typical' price-cap regulation:**
 - **No cost-pass-through during control period (say 5 years)**
 - **Yet, recall the UK sliding scale for capital overspend**
 - **Capital-based adjustment at review**
- **Hence, assume**
 - **short-term: poor cost-pass-through,**
 - **long-term: strong cost-pass-through**

Effects: DG and CAPEX (cont'd)

- **Summing up the previous slide:**
 - **Short run: no cost-pass-through of cost increases means that DNO will delay new connection**
 - **Long run: capex-based adjustment at reviews means inevitable return of ROR type regulation**
 - **incentive for overcapitalization**
 - **poor incentive to defer new investment**
 - **poor incentive to connect investment-deferring DG**
- **Put differently:**
 - **Unbundled DNO will want to retain the network**
 - **Integrated DNO may shift attention to money-making DG**

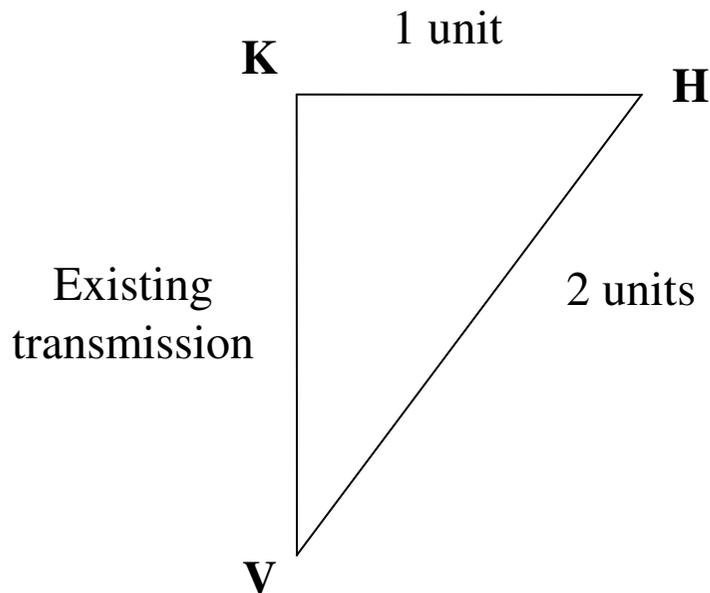
Shallow charging and external effects

- **Recall that deep charging is not feasible**
- **Shallow charging is unlikely to internalise external effects**
 - **Note that not everything is in fact an external effect**
 - **Socializing and pass-through can achieve much**
- **Asymmetrical network impacts are not internalized by shallow charging**
 - **Asymmetry: type, size, location, time and order**

Conclusion:

- **Shallow charging will not internalize all external effects and thus ownership unbundling will distort efficient investment of DG**

Governance, coordination and information



- **Coordination of Generation and Distribution investment**
(Baldick & Kahn (1993, JRE))
- **Suppose new DG at node H,**
 - **Build line H-K and upgrade of K-V if also new G at node K,**
 - **Build line H-V if no new G at node K.**
 - **Optimal network investment depends on G-investment**
- **Hence, information about investment is crucial**

Source of figure: Baldick & Kahn (1993, JRE)

Governance, coordination & information

- **‘Moral hazard in teams’:**
 - **If system reliability decreases (system breakdown), is the DNO or the DG responsible?**
 - **Imperfect accountability, parties will expose moral hazard**
 - **Unlikely that incentive contracts can substitute Vert. Int.**
- **Lack of information:**

“Lines companies seem well placed to identify generation opportunities that could substitute for investment in distribution or transmission networks”.

Murray & Stevenson [2004, p. 49]

Can market-governance or -institution restore this?

Some remarks on remedies

- **New and/or modified regulation:**
 - **E.g. obligation to connect, but DNO can delay connection**
 - **Unlikely to address all reasons**
 - **Threat of regulatory chain**
- **Allowing ‘exemptions’ (compare New Zealand):**
 - **NZ example suggests that new (regulatory) constraints limit the possibilities for new DG by DNOs**
 - **Technology bias**

Concluding Remarks

- DNO ownership unbundling will at least *distort* and may *impede* efficient investment in DG
 - Key arguments:
 - DG ‘eats away’ the network
 - Deep pricing not feasible and shallow pricing creates external effects
 - Coordination and information asymmetries between Generation and Distribution investment
- Remarks:
 - This is only one argument in a larger debate
 - The quantitative effect is unclear but arguably not very big

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