

Energy transitions in Europe: Policy or market driven?

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Energy transitions in Europe

“Energy transition”

Move to a new (more sustainable?) energy system

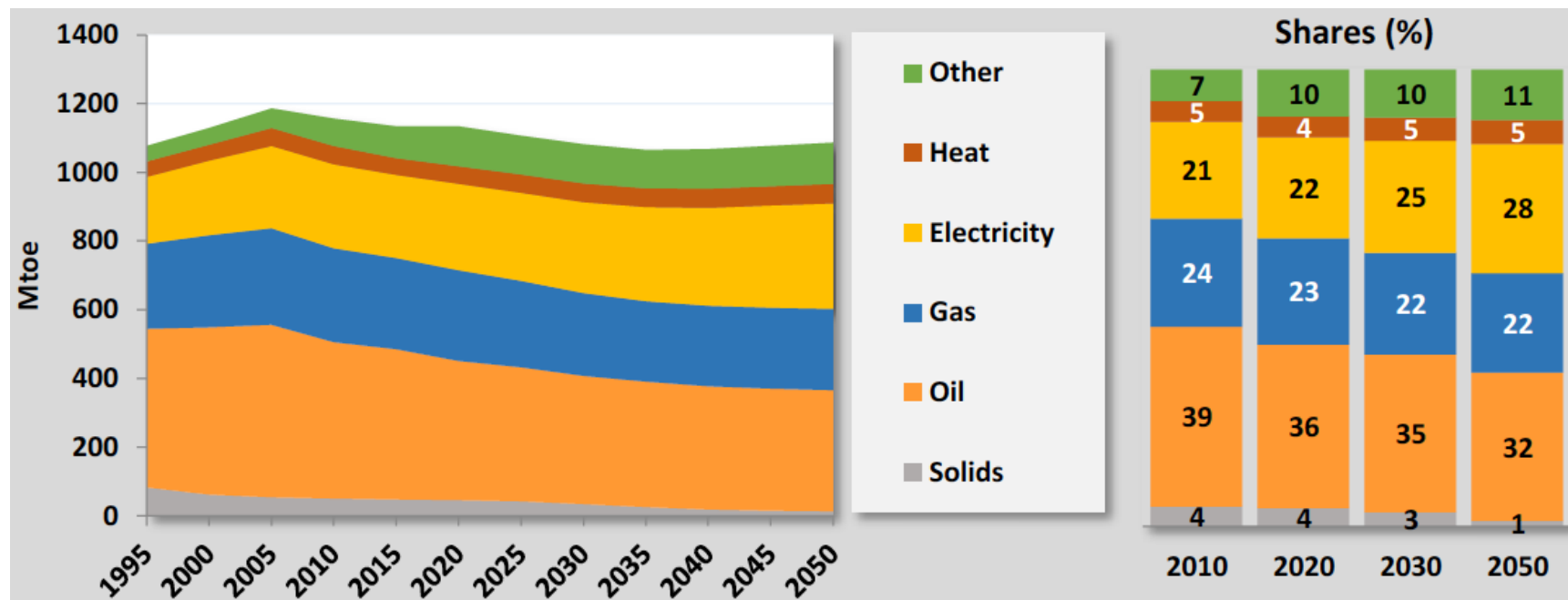
Different approaches, but some typical components:

- Decarbonization
- More “new renewables” (solar, wind, biomass, geothermal)
- Increased share of electricity (mobility, heating)
- “Smart” use of energy (matching use to generation)
- Reduced energy consumption

In some countries additionally:

- Phase-out of nuclear power
- Decentralization of generation
- Market deregulation

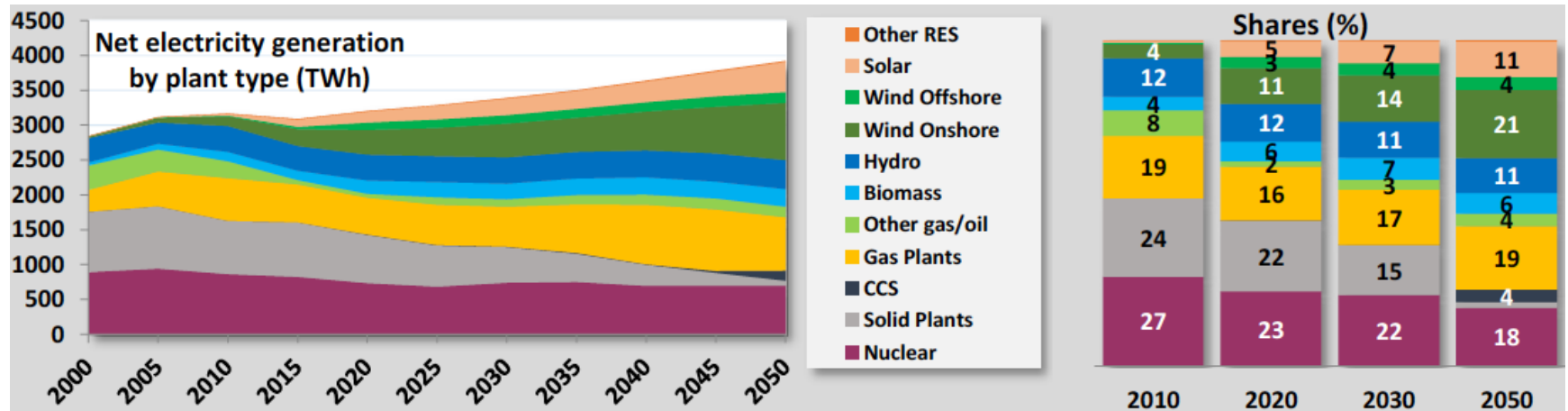
Energy transitions in Europe



Final energy consumption by fuel

EU Reference Scenario 2016; DG Energy, DG Climate Action, DG Mobility & Transport

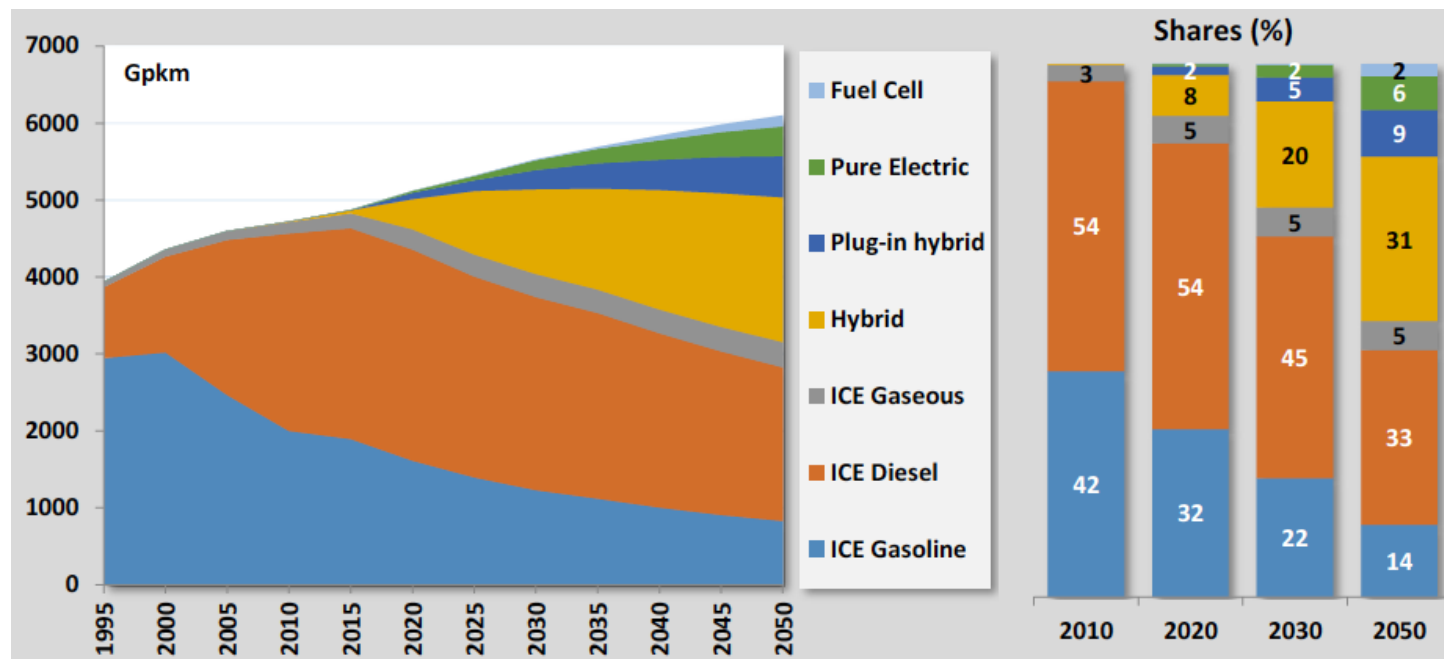
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Electricity generation by plant type

EU Reference Scenario 2016; DG Energy, DG Climate Action, DG Mobility & Transport

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Passenger cars and vans by type and fuel

EU Reference Scenario 2016; DG Energy, DG Climate Action, DG Mobility & Transport

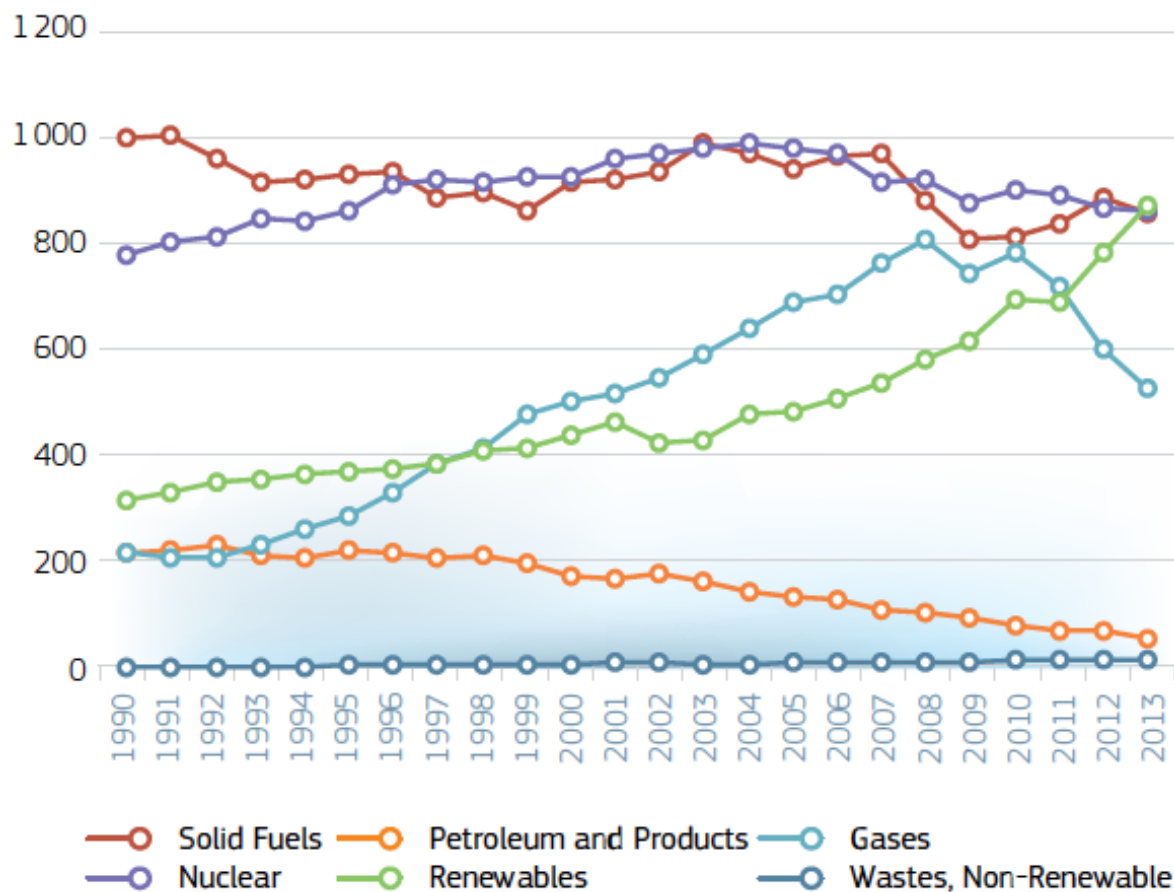
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Substantial changes ahead, but why?



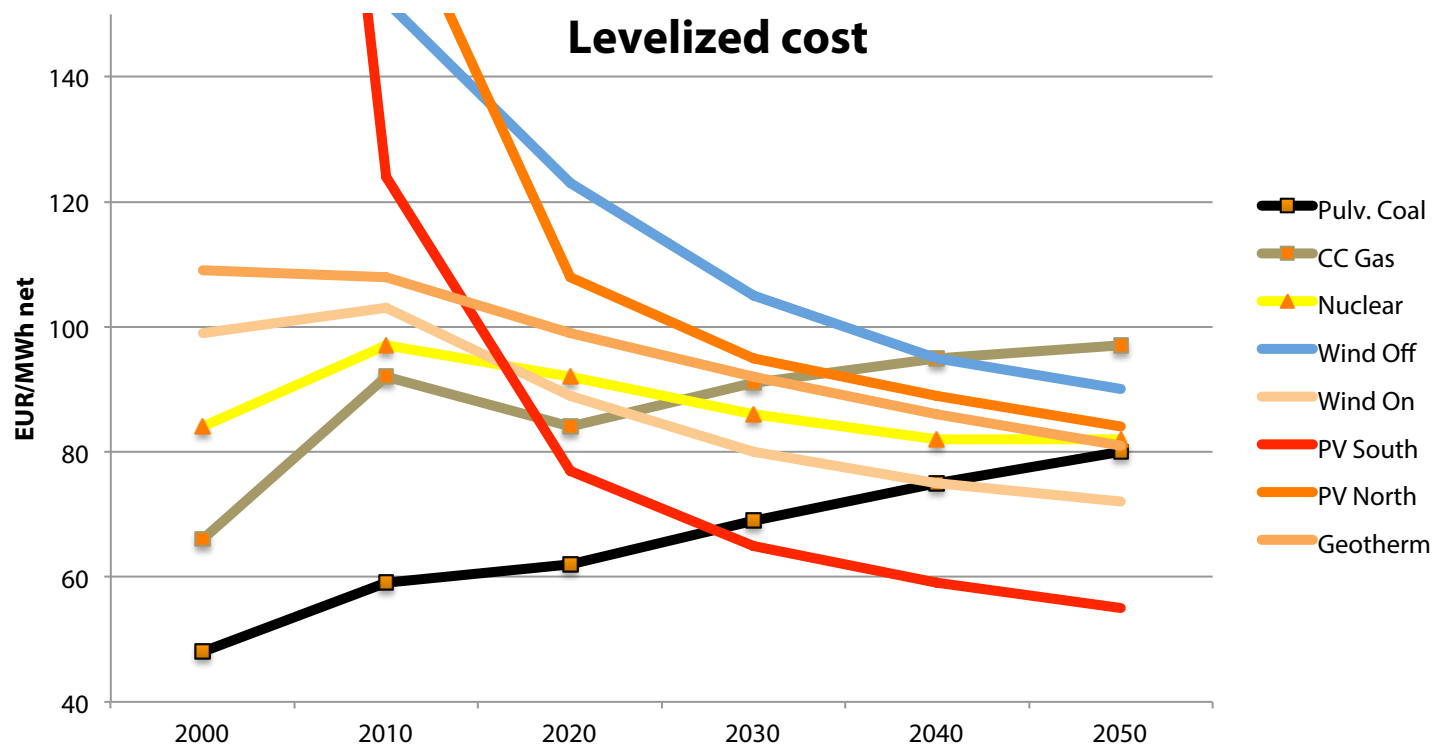
1. Change in technological possibilities, preferences, prices (“market driven”)?
2. Change in taxes, subsidies, regulations, authorization and monitoring procedures (“policy driven”)?

Example: Renewables



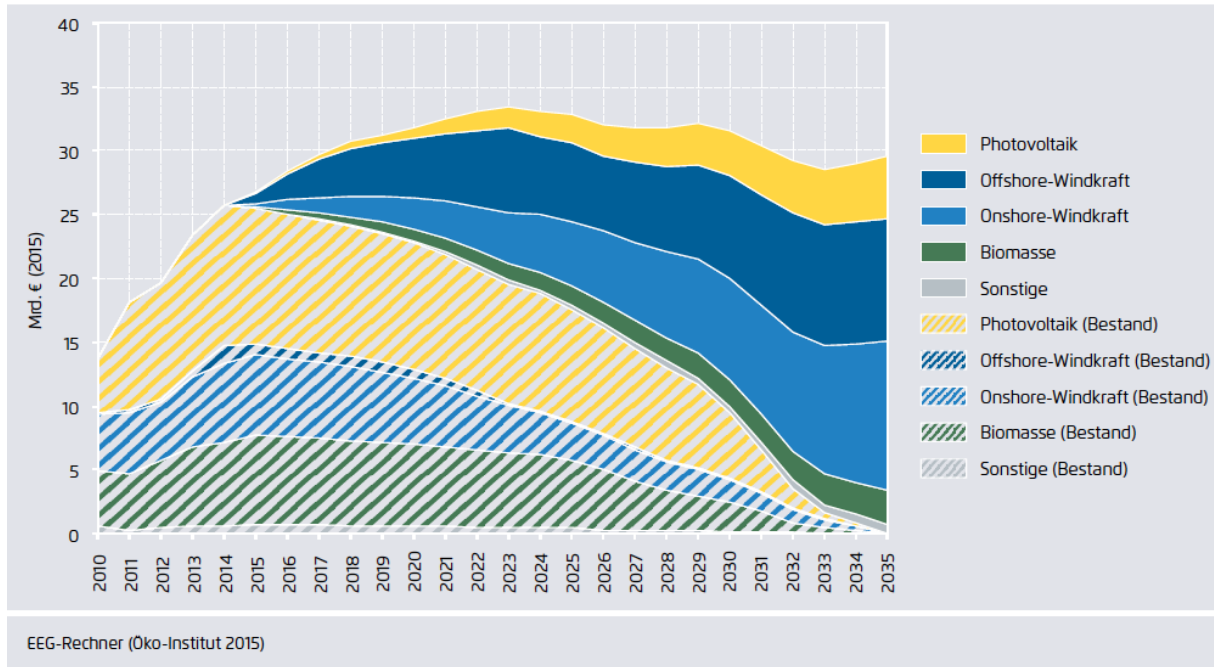
Eurostat, 2015

Example Renewables



EU Reference Scenario 2016; DG Energy, DG Climate Action, DG Mobility & Transport

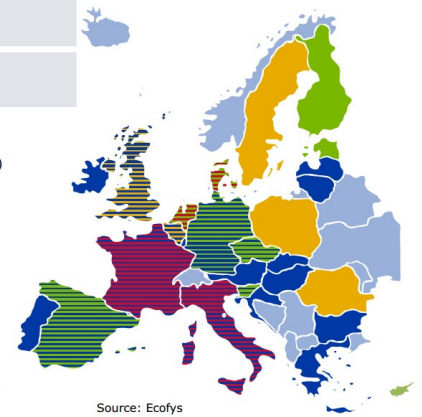
Example Renewables



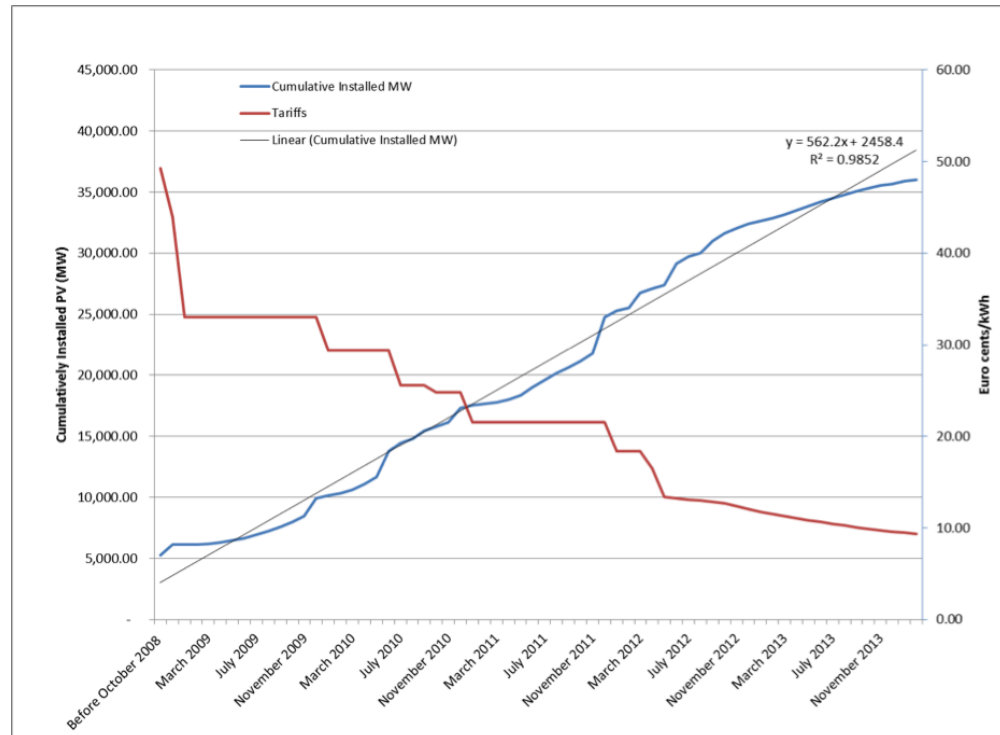
- **Expansion of RES induced by policy**

- Feed-in tariff (FIT)
- Feed-in premium (FIP)
- Quota
- Tenders

Note: This map does not include secondary support instruments like tax incentives, investment grants, etc.



Example Renewables



- Expansion of RES induced by policy
- **Market dynamics amplify effects**

■ Quota
■ Tenders

Note: This map does not include secondary support instruments like tax incentives, investment grants, etc.

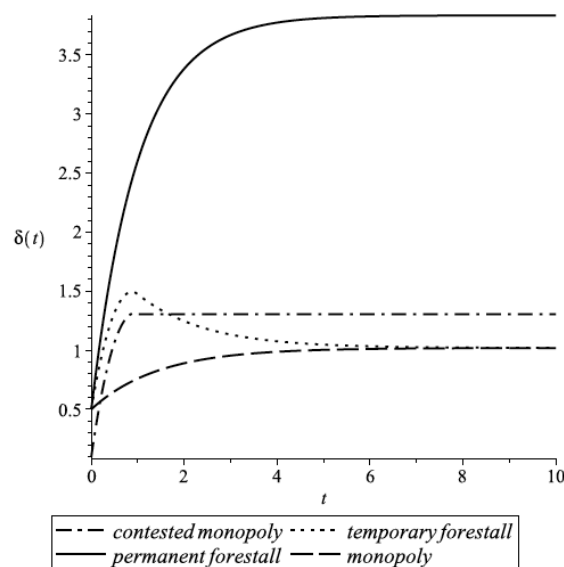


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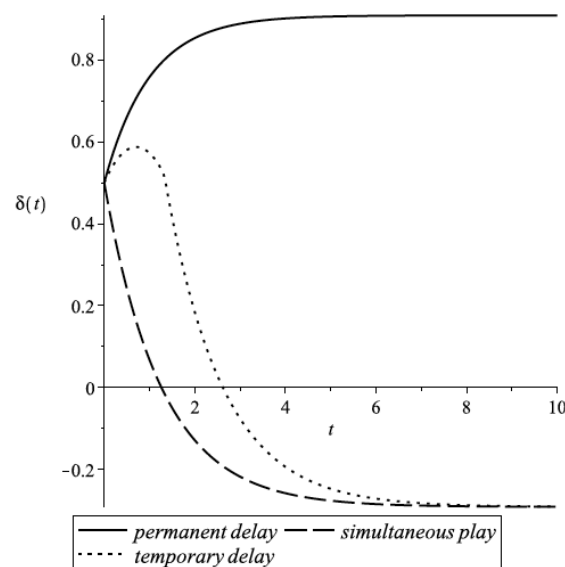
Example highlight connection

- Policy sets conditions for initial development & start of diffusion of new technologies
- Markets induce further refinements, cost decreases, and most investments
- Due to lock-in effects (infrastructure, market power), policy is essential in starting process (Unruh 2000, 2002; Krysiak, 2011; Bondarev & Krysiak, 2016)

Example: Lock-in through market power



(a) Contested monopoly for $t^P = 1$



(b) Delay for $\delta_d = 0.8$

Market power and technology development

Bondarev & Krysiak (2016)

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**Energy transition unlikely to happen without policy
– so why rely on markets at all?**

Example

Push-in policy: Mandate share of RES

- Each firm uses cheapest technology that meets requirements
- If firms are similar, only one technology will survive
- Policy costly, as all firms have to meet target, regardless of their situation (e.g., location)

Market-based policy: Tradable quotas for RES

- Firms have to bear additional risks; portfolio of technologies can help to manage them (Krysiak, 2009)
- Firm decisions coupled via market; several technologies can survive (Requate & Unold, 2003; Krysiak, 2011)
- Policy cheaper, as firms in good locations have higher RES share and firms in inferior locations lower share

Conclusions

Energy transitions need policy measures in an initial phase

- Lock-in effects
- New technologies need support to get a chance

Policies can benefit from using market mechanisms

- Broader technological progress
- Reduce costs by differentiated outcomes



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