Understanding the Role of Incumbants and Challengers in Energy Transition Processes –

Insights from a Socio-technical & Multi-Level Perspective

HEEN Workshop: "End of Energy Giants, Rise of New Actors?" *1st July 2016*

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DLR

ENERGY-TRANS 2011-2016: A Socio-technical Perspective on Energy Research

Objective und epistemological interest:

- Investigation of the German energy system
- Investigation of the various ***interfaces between technological and social factors*** which influence the transformation process towards new energy infrastructures considerably
- Research which analyses the German energy system in its European and international context

Intended research results:

- Development of strategies to shape the transformation process in an ***efficient and socially compatible*** way
- Generation of “Knowledge for Action”

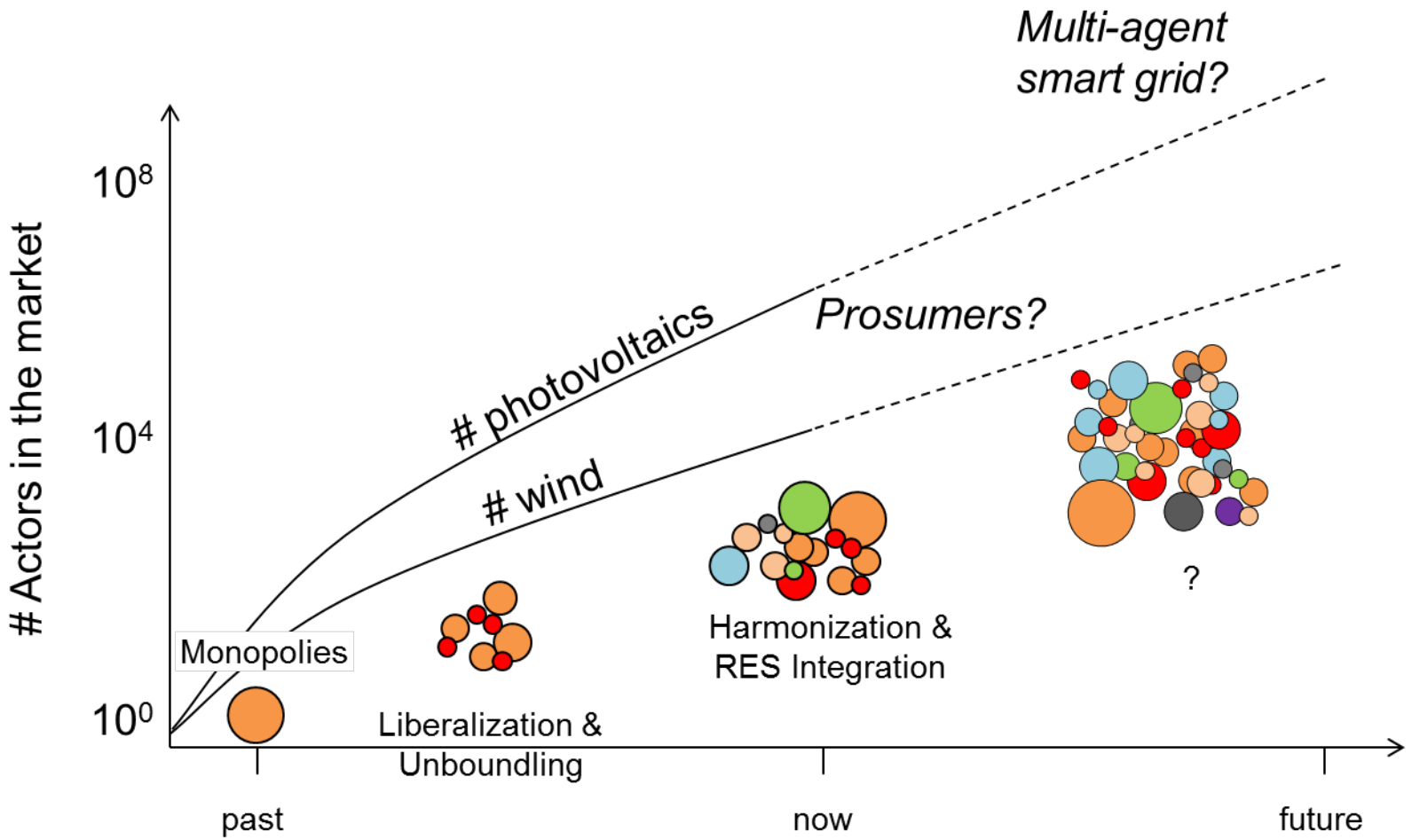
www.energy-trans.de

Challenges Associated with the Transformation

- Volatility → grid stability and security of supply has to be ensured in a system with a highly variable feed-in (Wind and PV)
- Innovation strategies (social + technological) including adequate framework conditions and incentive schemes
- New value-added chains and business models are required
- Strong increase in the number of actors involved (e.g., PV-Battery Systems, demand side management, e-mobility). New forms of innovation and risk governance needed
- Traditional user and consumer behavior will be challenged (e.g. new energy prosumers)
- Complex systemic interrelations between technical developments, diffusion of technical and social innovations, economic performance, social acceptance, and legal & ethical acceptability
- Major problems of acceptance and conflicts related to new infrastructures slow down the transformation process

→ Interdisciplinary perspectives, interdisciplinary culture, transdisciplinary projects

Challenges for Modelling Energy Markets



→ We have to deal with much more, heterogeneous actors that differ partially strongly in motivation, goals and expectations

Sustainable Development requires strategic knowledge of different kinds[1)]

Role of Actors

1) <u>System Knowledge:</u>
   - systemic interrelations,
   - causal links,
   - functionalities

→ classical task of positive or descriptive science approaches

2) <u>Orientating Knowledge:</u>
   - Goals of Transformation,
   - Assessment Criteria,
   - Picture of the Future, Scenarios

→ Classical task of normative science (Ethics) and future studies (Prospection)

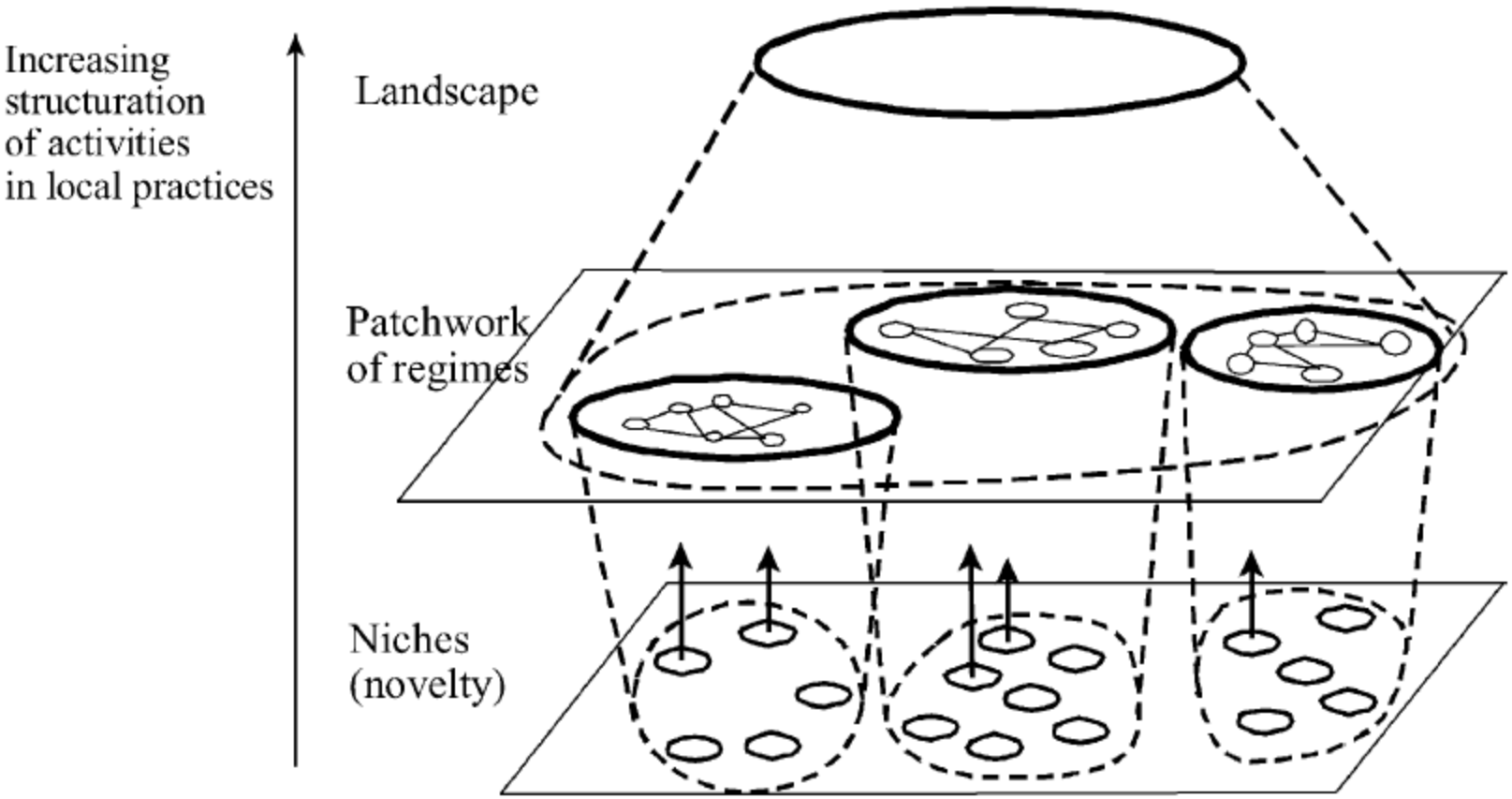
3) <u>Knowledge for Action:</u>
   - Measures
   - Consequences
   - Incentives
   - Not-intended side-effects

→ Classical task of decision and behavioral science like psychology, economics, …

→ Strategic Knowledge for Sustainability combines all three kinds of knowledge

1) Grundwald (2015)

The Multi-Level Perspective of Technological Change[1)]



1) Adopted from Geels (2002)

Theoretical Framework[1)]

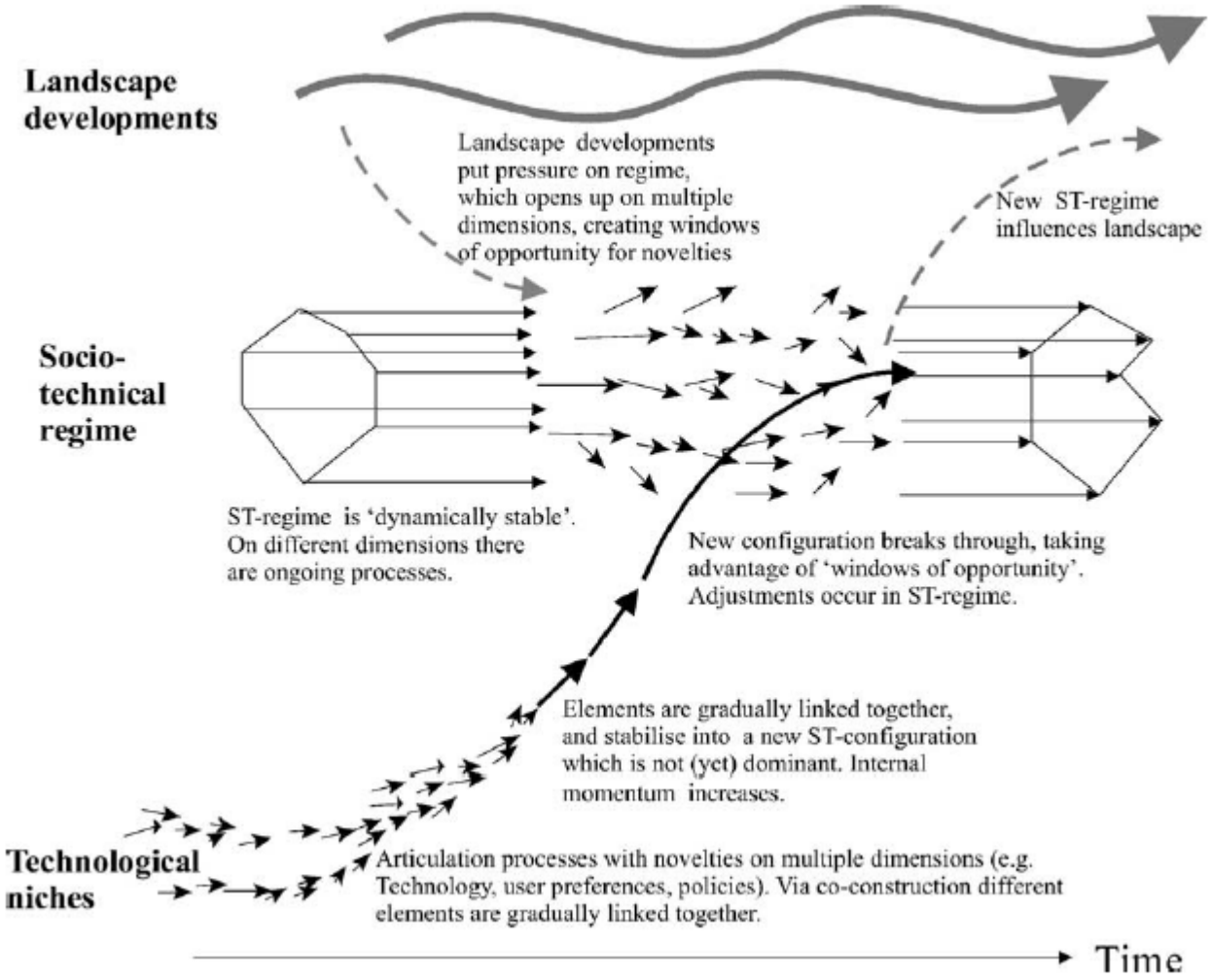
- Multi-Level Perspective
  - Framework to analyze socio-technical transitions
  - Three analytical levels referring to socio-technical configurations

1. Niche-innovations
   - New configurations that deviate substantially from existing socio-technical regimes (radical innovations)
   - Uncertainty, unstable rules and small support networks
2. Socio-technical regimes
   - Stabilized rules and practices that guide activities of incumbent actors
   - Incremental innovations along established trajectories
3. Socio-technical landscape
   - Slow-changing societal trends (demographics, macro-economic developments, ideologies…)

→ Transitions through interactions between processes at three levels

1) Taken from Geels et al. (2016)

A Dynamic Multi-Level Perspective on System Innovations[1)]



1) Adopted from Geels (2004)

Typology of ideal type transition pathways[1)]

1. Technological substitution pathway
   - Market competition and power struggles between old and new firms
   - New firms and technologies replace incumbent firms and technologies
2. Transformation pathway
   - Moderate landscape pressure: Regime reacts
   - New regime grows out of old regime through cumulative adjustments
3. Reconfiguration pathway
   - Niche innovations adopted in the regime to solve local problems
   - Then adjustments in the basic architecture of the regime
4. De-alignment and Re-alignment
   - Sudden landscape change leads to erosion of regime
   - Competition between multiple niche-innovations

1) Adopted from Geels & Schot (2007)

Political Goals of different Transition Pathways[1)]

Germany:

- In 2015: > 30% of electricity from RES in the power system
- Nuclear phase-out until 2022
- CCS and fracking do not play any role in transition plans (so far)
- RES-E goals of 35% by 2020, 40-45 % in 2025, 55-60 % in 2035 and 80% by 2050

→ mainly technological substitution pathway so far, but also some elements of de- & re-alignment pathway as well as reconfiguration pathway

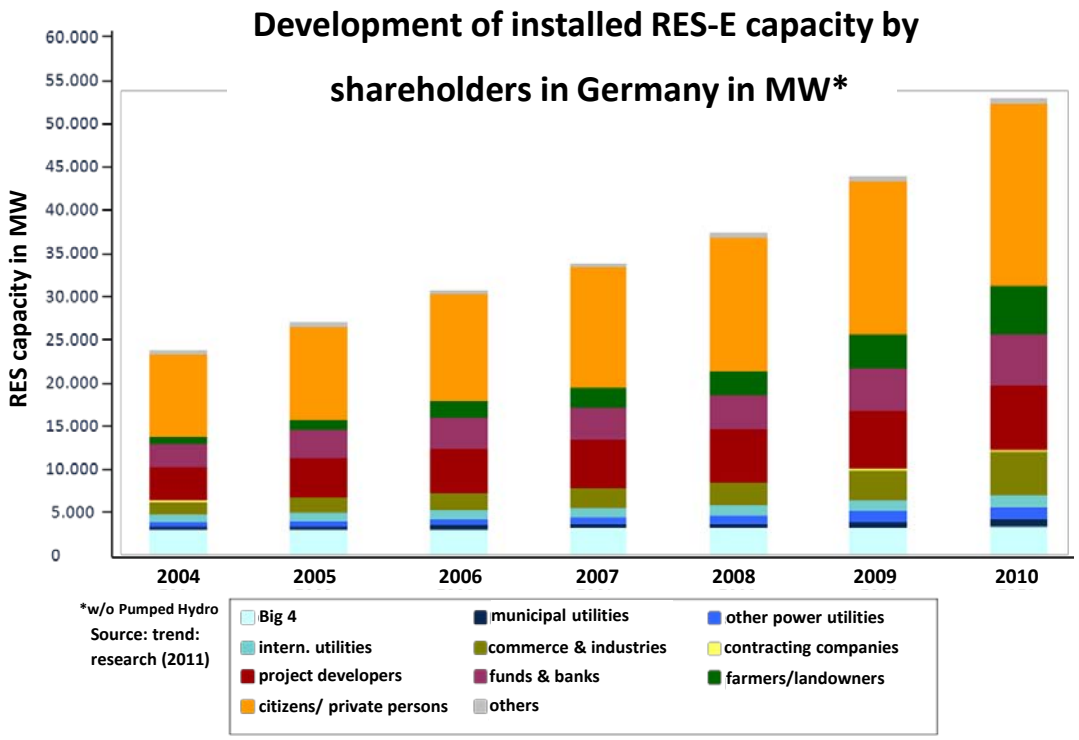
UK:

- In 2015: > 15% of electricity from RES
- Plans to construct new nuclear reactors (e.g. Hinkley Point C)
- CCS play important role in transition plans
- Plans to become a leader of the shale gas revolution (in Europe)
- 80% GHG emission reduction by 2050, 34 % reduction by 2020
- RES-E goals of 20% by 2020, but no specific post-2020 RES-E targets

→ Mix of two pathways: Technological substitution pathway & Transformation pathway

1) Taken from Geels et al. (2016)

RES-E Actors Constellation in Germany



Approx. 80 % of RES-capacity is owned by priv. Pers., farmers, PDs. & SME

These actor-types ARE USUALLY NOT ABLE to apply adequate risk diversification measures for DM:

- **No power market background/experience**
- **Single technology investments**
- **no portfolio of mixed resourcess**

→ **leads to high risk premiums for costs of capital for VRE**

→ **will increase support costs**

→ **although RoE expectations are relatively low for these actor-types**

Promising avenues for further research:

→ Which market risks (price & volume) should (really) be transferred to actors

→ Designing adequate policy instruments to cope with high uncertainties

Pros and Cons of the framework[1)]

Pros:

- Offers interdisciplinary and integrating approach: draws on works of science and technology studies, institutionalism, evolutionary economics
- Historical dynamics of transitions but also lock-ins can be analyzed
- Can be used as basis for developing socio-technical scenarios[2)] & Agent-based models[3)]

Cons:

- System boundary unclear
- Focus on co-evolutionary processes → ***actors strategies and conflicts at branching points underestimated!*** [4),5)]

1) Taken from Wassermann (2015)
2) Schweizer & Kriegler (2012), Weimer-Jehle et. al (2014)
3) Wooldridge, (2002), Arthur (2005), Reeg et. al (2013)
4) DiMaggio (1991), Scott (1995), Fligstein & McAdam (2011)
5) Wassermann, Reeg, Nienhaus (2015), Wassermann, Gawel, Reeg (in preparation)

Power Struggles & Branching Points since 1998 (I)

- 1998-2009: Parallel expansion of regime and niches
  - market liberalization & introduction of EEG in 2000 combined with agreed phase-out of nuclear
  - By coalition of Social Democrats & Green Party, but against votes of Christ Democrats & Liberals
- 2009: Change of governing coalition to Christ Democrats & Liberals
  - Energy concept 2010 passes parliament with votes of all parties (except Socialists) including delay of nuclear phase up to 2030
  - After Fukushima Crisis 2011: acceleration of nuclear phase-out until 2022

  → ongoing law suite of nuclear power plant share-holders because of sudden shut-down decision
- Germany 2009-2013[1)]: The battle of the systems over transition pathways begins...
  - 'Social widening' RES-E niches, more new entrants, Onshore Wind continued to expand
  - Government tried to stimulate offshore wind (to provide entry point for big utilities), but deployment remained slow,
  - PV Boom in Germany: installation of > 30 GW of mid-day peaking solar capacities, initially fast growth, stagnation and remained flat since 2013
  - Problems for German PV industry
  - Government aims to contain/suppress RES-E growth by:
    - 2009 and 2012 EEG adjustments
    - Market integration policies, e.g. 'direct marketing'
    - System integration efforts (storage, demand management…)

1) Taken from Geels et al. (2016)

Power Struggles & Branching Points since 1998 (II)

- Since 2009: New (global) energy economic framework conditions evolve
  - Energy demand reduction after financial & economic crisis
  - Shale gas & oil revolution in U.S
  - Fossil fuel & CO2 price reduction

  → Tremendous drop in wholesale power prices cause serious profitability problems of conventional (peak-load) power plants
- 2012-2015[1)]: Struggle over new power market design
  - New coalition formation: market liberals & RES scene against introduction of capacity markets
  - Conventional incumbents industry in liberalized markets in favor of CMs.

  → Result of Green & White Book process: no introduction of new CM, “only” strategic reserve
- 2015 & beyond: Post Paris Agreements Phase?:
  - Continuous divest-movement or global shale gas & oil establishment? ...

1) Wassermann, Gawel, Reeg (in preparation)

The Struggle over the RES-E Market Integration Regime

- "Central" Integration
  - via wholesale power markets
  - competitive setting of remuneration level (tenders and fixed premiums)
  - Increase of market risks (price & volume)
  - lot of energy economic know-how needed

  → Fits better to central structure of most incumbent actors
- "Decentral" Integration
  - e.g. via Load Serving Entities
  - e.g. local direct marketing via PV-Rooftop-Renting business models
  - administrative setting of remuneration level (FiT, variable premiums)
  - acceptable market risks also for small & remote market actors

  → Fits better to decentral structure of many challenger actors

→ With the EEG 2016 amendment the risk of pushing progressive & innovative concepts of challengers out of the system seems quiet high!

Some lately Press Releases & Some Conclusions

Kampfpreise schaffen neue Fakten

Der Börsenhandel mit Strom aus EEG-Anlagen macht Direktvermarktern gerade wenig Freude. Große Energieversorger gehen mit Kampfpreisen in den Markt und kaufen sich Portfolien zusammen. Weil die Betreiber um jeden Cent feilschen, läuft die Vermarktung auf ein Oligopol hinaus.

Sonne, Wind & Wärme (II-12/2015), S. 28

ERNEUERBARE ENERGIEN
DAS MAGAZIN

05.02.2016
Virtuelle Kraftwerke
"Ein Instrument zur Beibehaltung von Großkunden"

erneuerbare energien online vom 05.02.2016

Eine, die die Karten mischt

Erst kam der Wechsel vom Kanzleramt an die Spitze des BDEW, jetzt kommt ein RWE-Vorstandsposten – Hildegard Müllers Karriere verläuft steil. Die Energiewende ist für sie dabei ein Faktor von großer Bedeutung. Wird es ihr gelingen, den Kohlekonzern auf einen grünen Kurs zu bringen?

erneuerbare energien (2016-02) S. 74f

VW-STRATEGIE NACH DEM DIESELGATE

Volkswagen muss umbauen – auch in der Belegschaft

von: Stefan Menzel
Datum: 14.06.2016 08:34 Uhr

VW-Chef Matthias Müller präsentiert dem Aufsichtsrat die Strategie mit Elektrifizierung und Mobilitätskonzepten. Zudem wird ein Jobabbau unvermeidlich. Offizielle Zahlen gibt es nicht, doch es geht um sehr viele Stellen.

Handelsblatt online vom 14.06.2016

Stellenmarkt Terminkalender network-Datenbank Mediadaten Abonnement
Startseite Politik Unternehmen Menschen Energieeffizienz Strom Gas
Startseite > Politik > Deutschland RSS-Feed abonnieren
22 Juli 2015 | 10:52

Weniger Neugründungen von Genossenschaften

Durch die neue Gesetzgebung im EEG hat sich die Dynamik bei Energiegenossenschafts-Neustarts merklich verlangsamt.

ZfK Online vom 22.06.2015

»Da wird kein Geld mehr verdient«

DIREKTVERMARKTUNG Die Dienstleistungsentgelte sind auf ein Minimum geschmolzen. Manche Branchenexperten meinen, dass gerade in der jüngsten »Jagdsaison« im Herbst strategische Preise gezahlt wurden: Preise, die unter der Wirtschaftlichkeit liegen. Damit sollten Marktanteile gewonnen werden

ZfK (2016-03), S. 18

- → Refinement of transition pathways needed
- → New entrants can be broader than new firms (as in neo-Schumpeterian approach)
- → Incumbent actors not completely locked-in, they can diversify into niche-innovations
- → actors struggle over interpretive dominance on policy development as ongoing process

Struggle of Actors to be continued…

…Thank you very much for your attention!

…Questions?

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