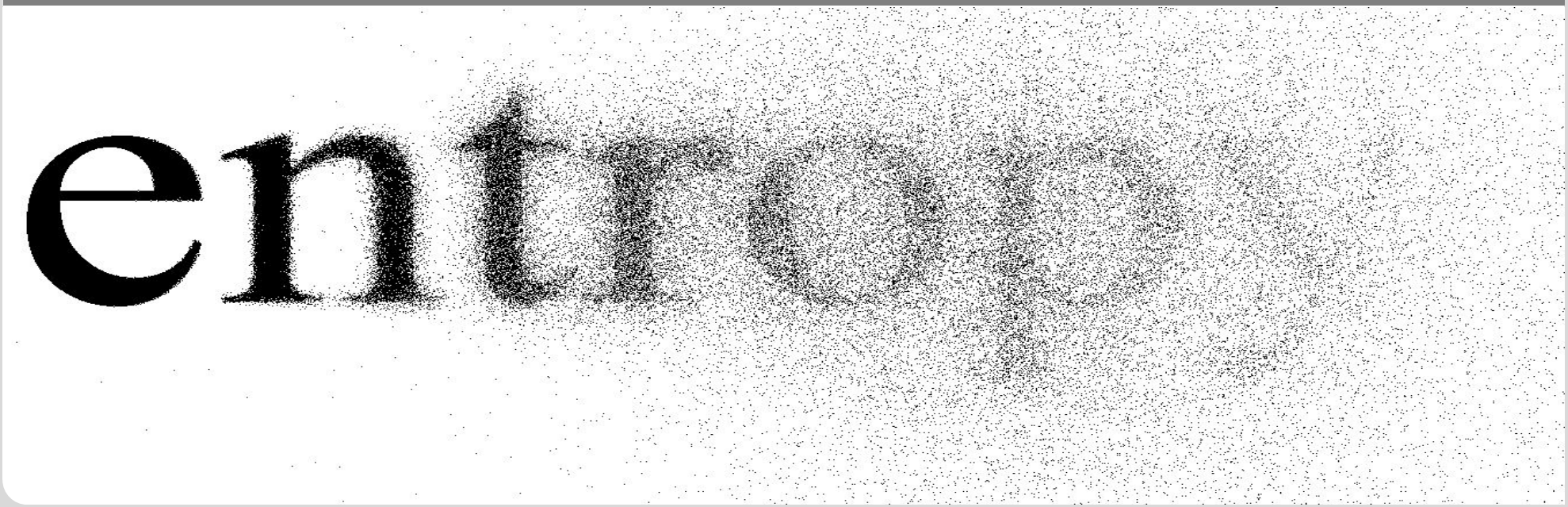
Karlsruher Institut für Technologie

Observing converging infrastructures

A Heuristic for Technology Assessment

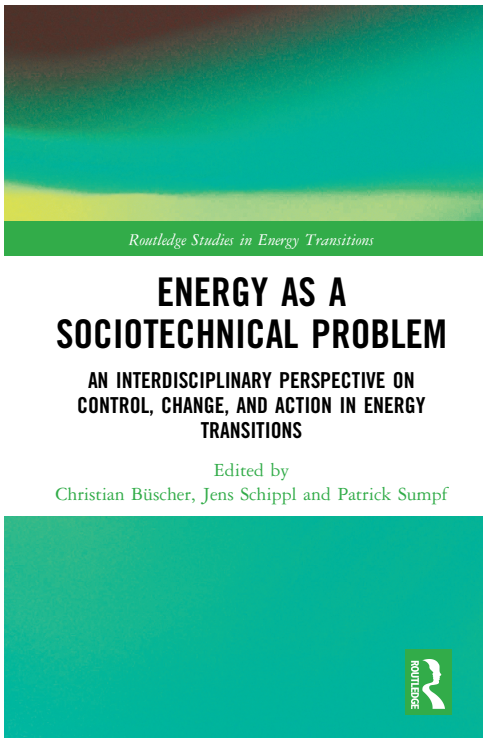
Christian Büscher | 4th European Technology Assessment Conference | Bratislava | 06/11/19

INSTITUTE FOR TECHNOLOGY ASSESSMENT AND SYSTEMS ANALYSIS



How to observe converging infrastructures?

''The overall system can be fruitfully described as posing a linked series of sociotechnical problems.''
(P. Edwards)



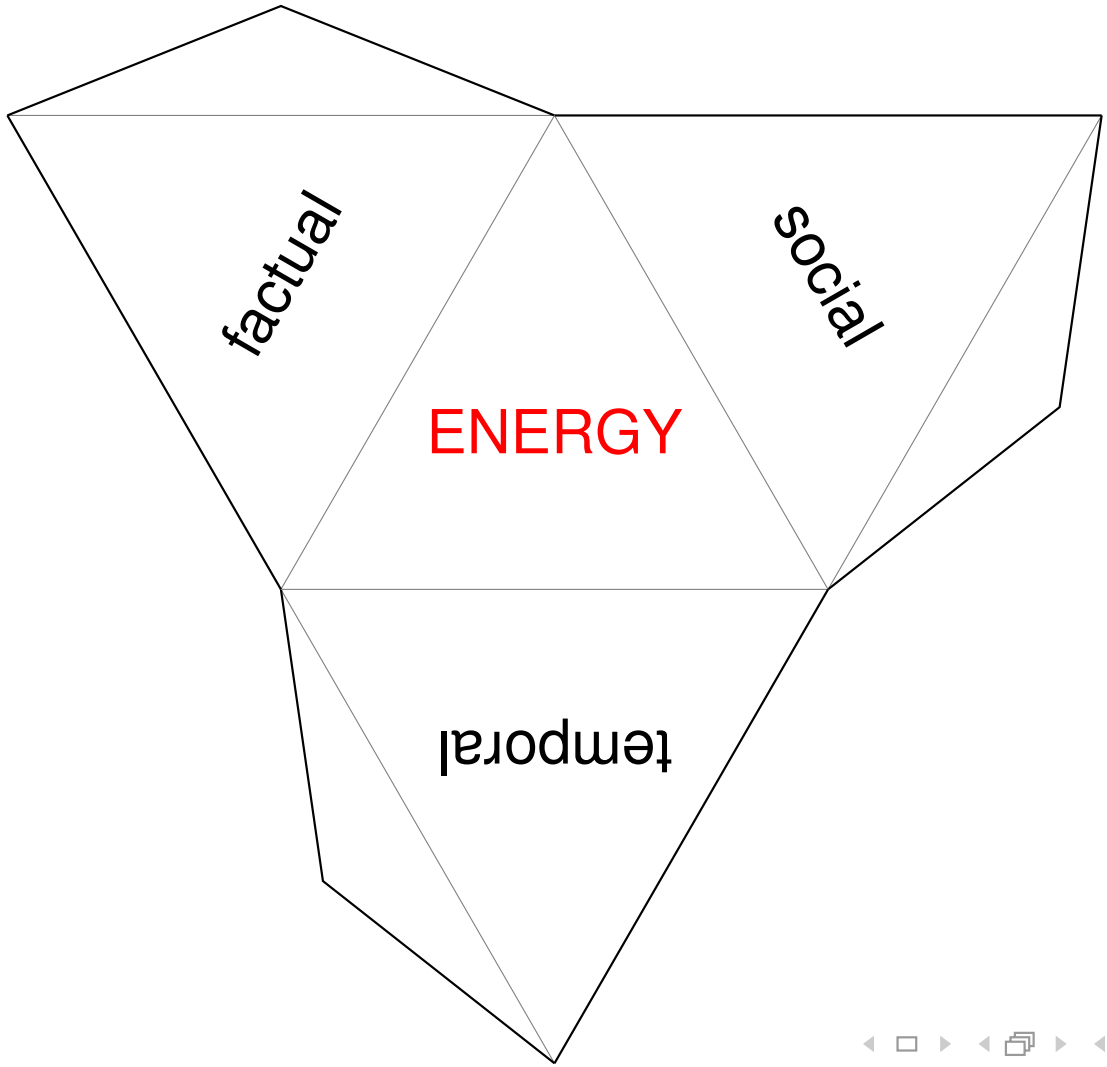
Büscher, C., Schippl, J., Sumpf, P.: Energy as a Sociotechnical Problem. An Interdisciplinary Perspective on Control, Change, and Action in Energy Transitions. (Routledge, 2018).

Sociotechnical Problems

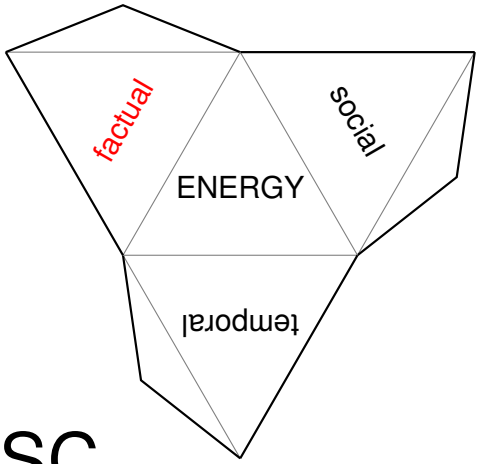
Transition

dimensions	stable *expectations*	*uncertainty*	
factual	control	complexity	→ **maintain control**
social	redundancy	variety	→ **instigate change**
temporal	actionability	non-transparency	→ **enable action**

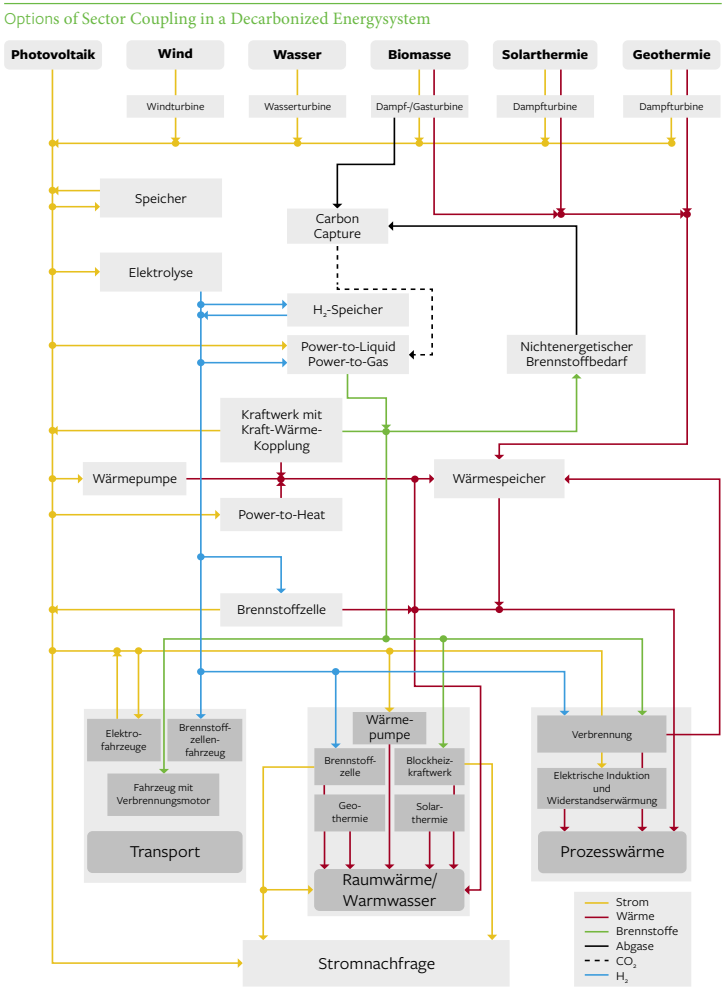
Dimensions of the energy complex



Complexity/Control



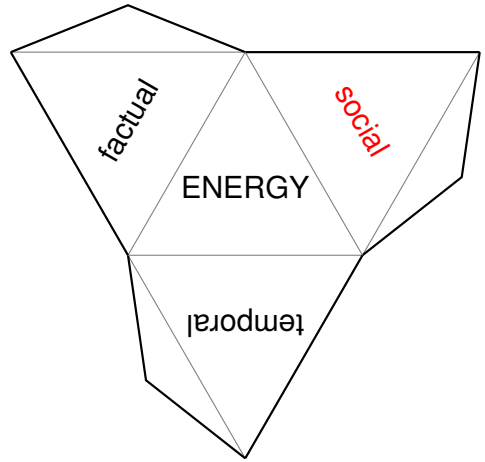
SRU. 2017. Umsteuern erforderlich: Klimaschutz im Verkehrssektor. German Advisory Council on the Environment (SRU), P. 44



Structural Changes SC

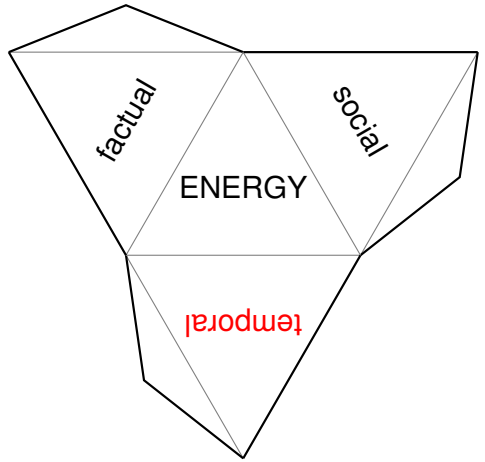
- Centralization/De-Centralization: control of systems, networks of systems, networks of networks
- Integration/Dis-Integration: vertical 'unbundling' – horizontal 're-bundling' (?)

Redundancy/Variety



VARIETY	REDUNDANCY: high	REDUNDANCY: low
high	A. learning organization; regime/ niche-constellation	B. experimental settings; emerging technology fields
low	C. dominant regimes path dependency lock-ins	D. low degree of organization

Actionability/Non-transparency



- **Orthogonal Relation:** Simultaneous operation of social and technical realities
- **Increasing non-transparency and non-knowledge:** Simple interface $\leftrightarrow$ complicated physical and social structures/institutions

$\Rightarrow$ Effects on short term (operating) and long term (investing, planning, governing) decision-making

$\Rightarrow$ Role of social mechanisms: responsibility/liability, trust in systems, etc.

Outlook

Ongoing activities:

- Exploring recent studies
- Operationalization of sociotechnical problems
- Assessment of consequences of SC developments

Planned Activities:

- TATuP Special Issue in 2020

Studies

- ST1: Ausfelder, F., et al. 2017. "'Sektorkopplung' - Untersuchungen und Überlegungen zur Entwicklung eines integrierten Energiesystems." Schriftenreihe Energiesysteme der Zukunft. München.
- ST2: BMUB. 2016. "Klimaschutzplan 2050 – Klimaschutzpolitische Grundsätze und Ziele der Bundesregierung." Berlin: Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (BMUB).
- ST3: Henning, Hans-Martin, and Andreas Palzer. 2015. "Was kostet die Energiewende? – Wege zur Transformation des deutschen Energiesystems bis 2050." Freiburg: Fraunhofer-Institut für Solare Energiesysteme ISE.
- ST4: Wietschel, M., et al. 2018. "Sektorkopplung – Definition, Chancen und Herausforderungen." Working Paper Sustainability and Innovation. Fraunhofer ISI.
- ST5: Bauknecht, D., et al. 2018. "Visionen Und Pfadentscheidungen Der Energiewende: Ein Bericht Im Rahmen Des Kopernikus-Projekts ENavi." Potsdam: Geschäftsstelle des Kopernikus-Projekts Energiewende-Navigationssystem — ENavi.
- ST6: Winter, Martin. 2018. "Effiziente Kopplung der Sektoren Energie und Verkehr." Berlin: Technische Universität Berlin.
- ST7: Hoffrichter, Albert, and Thorsten Beckers. 2018. "Cross-Border Coordination as a Prerequisite for Efficient Sector Coupling in Interconnected Power Systems. Institutional Economic Considerations on Allocating Decision-Making Competencies in the European Union." Berlin: Technische Universität Berlin.
- ST8: Canzler, Weert, and Andreas Knie. 2013. Schlaue Netze: wie die Energie- und Verkehrswende gelingt. München: Oekom.
- ST9: Robinius, M., et al. 2017. "Linking the Power and Transport Sectors: Modelling a Sector Coupling Scenario for Germany." Energies 10 (7): 956.