REINER LEMOINE INSTITUT

Why we need energy policy to drive innovation

Dr. Kathrin Goldammer, Reiner Lemoine Institute

September 19, 2016

The Reiner Lemoine Story

SOLON Don't leave the planet to the stupid

Q.CELLS

RLS REINER LEMOINE STIFTUNG

RLI REINER LEMOINE INSTITUT

Reiner Lemoine

1978 Engineering collective

1996 Founded Solon & Q-Cells

1999 Founded Solon & Q-Cells

2000 EEG

2006 RLS foundation

2010 Start of RLI

Strategic objective of Reiner Lemoine Institute (RLI): Applied Research for 100 % Renewable Energies

Scientific staff: Approx. 25 employees, with 3 research groups: energy system modelling, e-mobility, off-grid electrification

What drives innovation and global change?

Breakthroughs in engineering

- So-called „disruptive technologies“
- Advances that will transform lives and businesses
- Some are real physical technologies like electricity storage. Others are more concept-based, like the „full automation and digitalization of work“ or the „internet of things“ (everything serves as a personal computer)

→ change demand & supply

→ create/change market conditions

→ drive prices and start new dynamics

Policy and regulation

- Standards, like fuel efficiency for cars or carbon-efficiency for power plants
- Carbon emission cap-and-trade schemes
- Incentive schemes, like tax incentives (when buying something or investing) or feed-in tariffs like the German „EEG“
- Disincentives like taxes, e.g. energy taxes to reduce consumption

→ They also change demand & supply, create/change market conditions, drive prices and start new dynamics

→ But we can use them for steering!

Steering is important for environmental causes

DE GRUYTER DOI 10.1515/green-2013-0006 — Green 2013; 3(1): 35–41

Expert View from Science

Kathrin Goldammer and Ulrich Mans*

Why We Need High-tech Politics to Make Renewables a Success Story

Abstract: With the continued growth of renewable energy technologies, major changes are under way in a growing number of energy systems across the globe. Wind, solar, biomass, hydroelectric and geothermal solutions experience an impressive boom and have created a new business sector worth US$243 billion in 2011. This trend is not caused by recent breakthroughs in engineering; in fact most of the technology has been around for some time.

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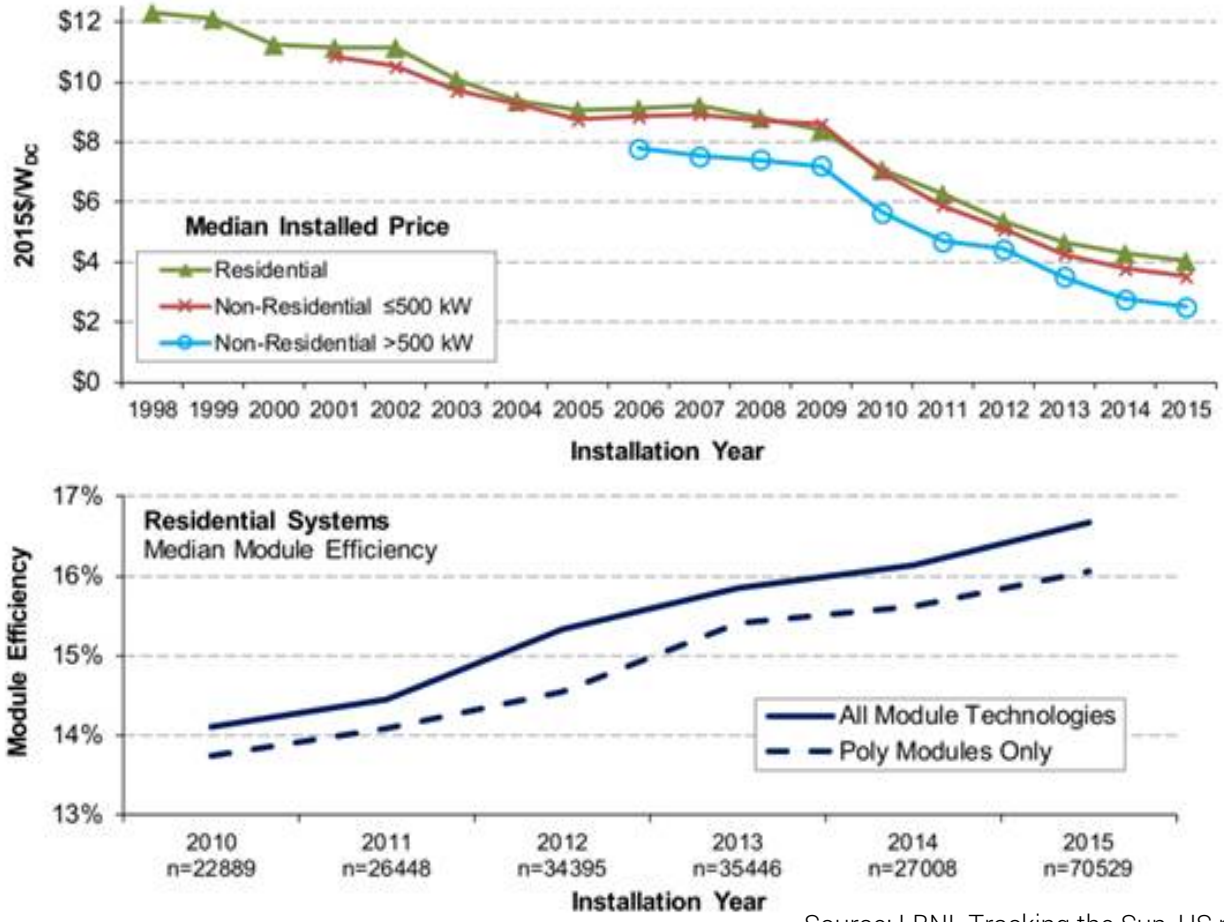
Solar PV as an example of an impressive development



Source: LBNL Tracking the Sun, US prices

This allows diversification …

Source: Bloomberg

Dubai Gets Record-Low Bid Of 2.99¢/kWh For 800 MW Solar PV Project

Source: Cleantechnica

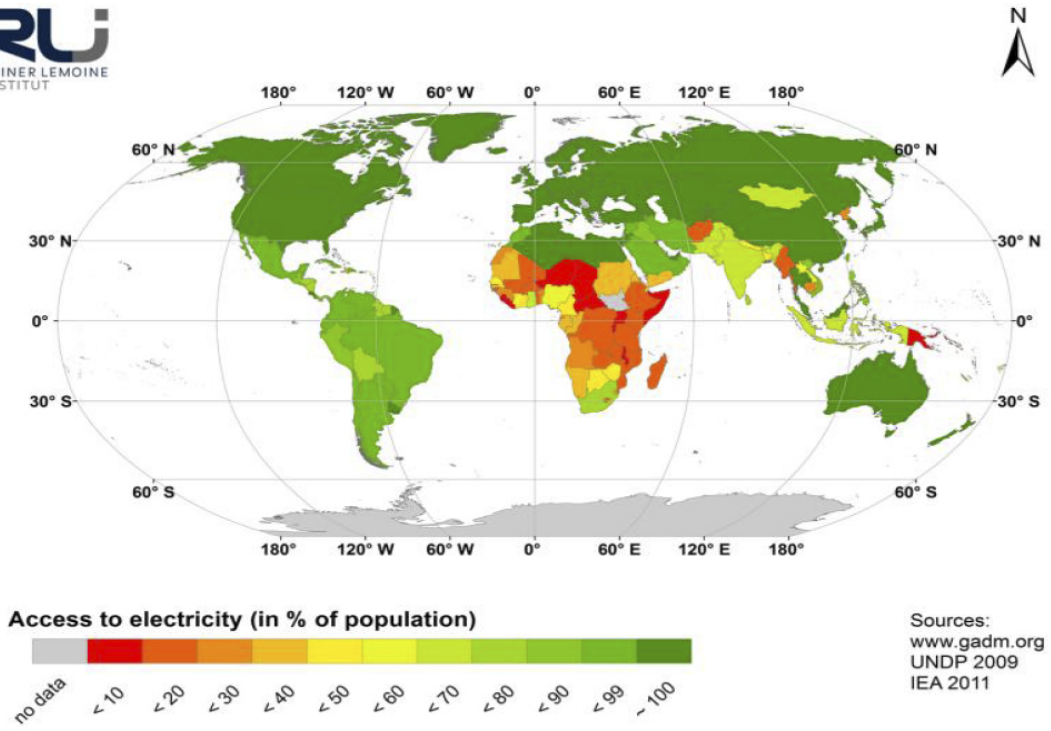
Phase 1 of the Mohammed bin Rashid Al Maktoum Solar Park. Source: First Solar.

Dubai Shatters all Records for Cost of Solar with Earth's Largest Solar Power Plant

Source: Apricum

… and electrification

Picture source: GIZ/ RLI Kenya project



This is the real breakthrough!

What does (top-down) research show?

Research likes to compare different political measures:

- Efficiency (i.e. cost efficiency) and effects of certain measures
- One-size-fits-all vs. combination of instruments etc.

Results show:

- The „perfect-fit“ regulatory frameworks and policies may differ
- But policy is a key element of change

Markets versus Regulation: The Efficiency and Distributional Impacts of U.S. Climate Policy Proposals

Sebastian Rausch and Valerie J. Karplus

MIT JOINT PROGRAM ON THE SCIENCE AND POLICY of GLOBAL CHANGE

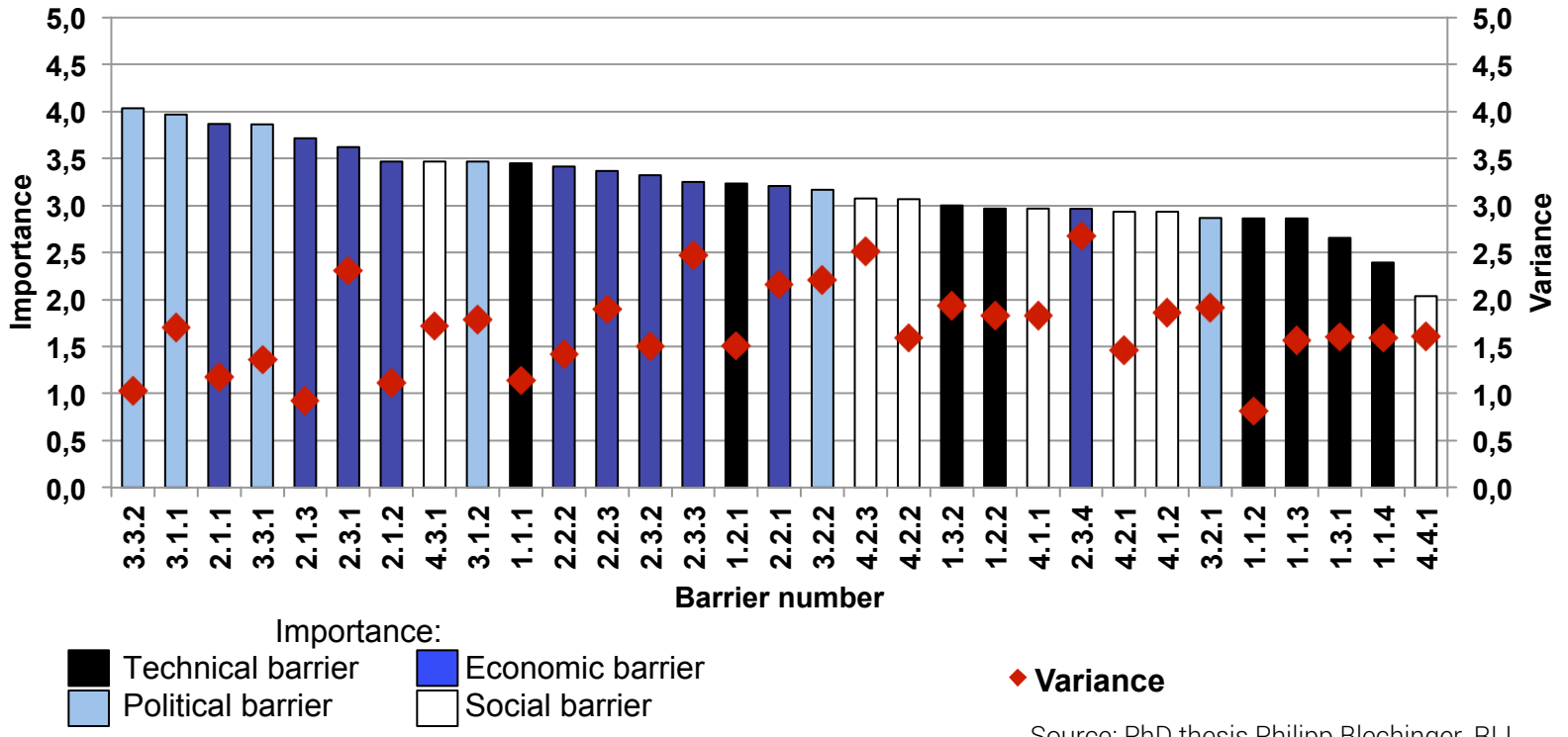
What about bottom-up research?

Category	Sub-category	# of barriers
Technical	Natural conditions	4
	Technological constraints	2
	Infrastructure	2
Economic	Costs / prices	3
	Financial aspects	3
	Market failure / distortions	4
Political	Policies	2
	Institutional capacities	2
	Regulatory framework	2
Social	Consumer behavior / awareness	2
	Interactions / networks	3
	Cultural habits	1
	Psychological / moral considerations	1

Source: PhD thesis Philipp Blechinger, RLI

- Study on renewable energy implementation on the Carribean Islands
- 30+ typical barriers were identified by literature analysis

Stakeholder ranking puts policy and economy first



Source: PhD thesis Philipp Blechinger, RLI

- Political and economic barriers have the highest importance.
- Variance was also analysed for this study.

Barriers are typically in regulation, policy and financing

Cluster I – Regulatory frameworks and policies

Regulatory

3.3.2 Lack of regulatory framework and legislation for private investors
3.3.1 Lack of legal framework for power contracts

Policy

3.1.1 Gap between policy targets and implementation

Pol. capacity

3.2.2 Lack of RE experts on governmental level
3.2.1 Lack of formal institutions

Cluster II – Costs and financing

Cost drivers

2.1.3 Diseconomy of scale
2.1.2 High transaction costs
3.1.2 Lack of incentives or subsidies for RE
1.1.1 Land use competition on islands

Costs

2.1.1 High initial investments

Financing

2.2.2 Lack of understanding of project cash flows from financing institutions
2.2.3 Lack of private capital
2.2.1 Lack of access to low cost capital or credit

Cluster III: utility monopolies, strong fossil fuel lobbies, fossil fuel subsidies etc.

Source: PhD thesis Philipp Blechinger, RLI

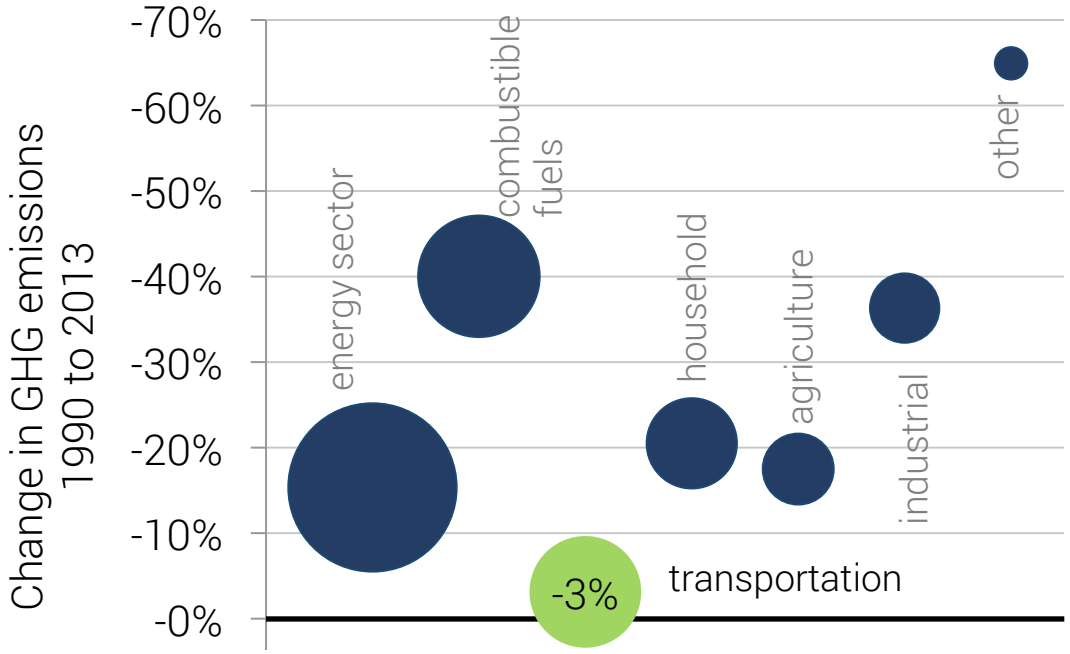
What about innovation in the transportation sector?

Decarbonisation of all energy sectors

Germany: Greenhouse gas (GHG) emissions are to be reduced by 40 % (compared to 1990 levels) across all sectors by 2020.

The transportation sector contributes 17 % of all GHG emissions, a substantial percentage.

GHG emissions in transportation have hardly declined since 1990.



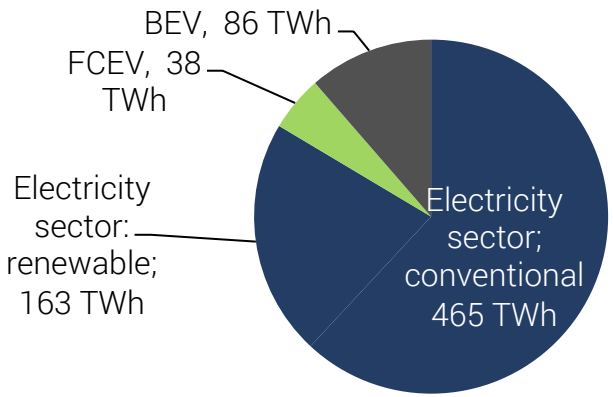
Data for Germany. Circle area: GHG emissions 2013

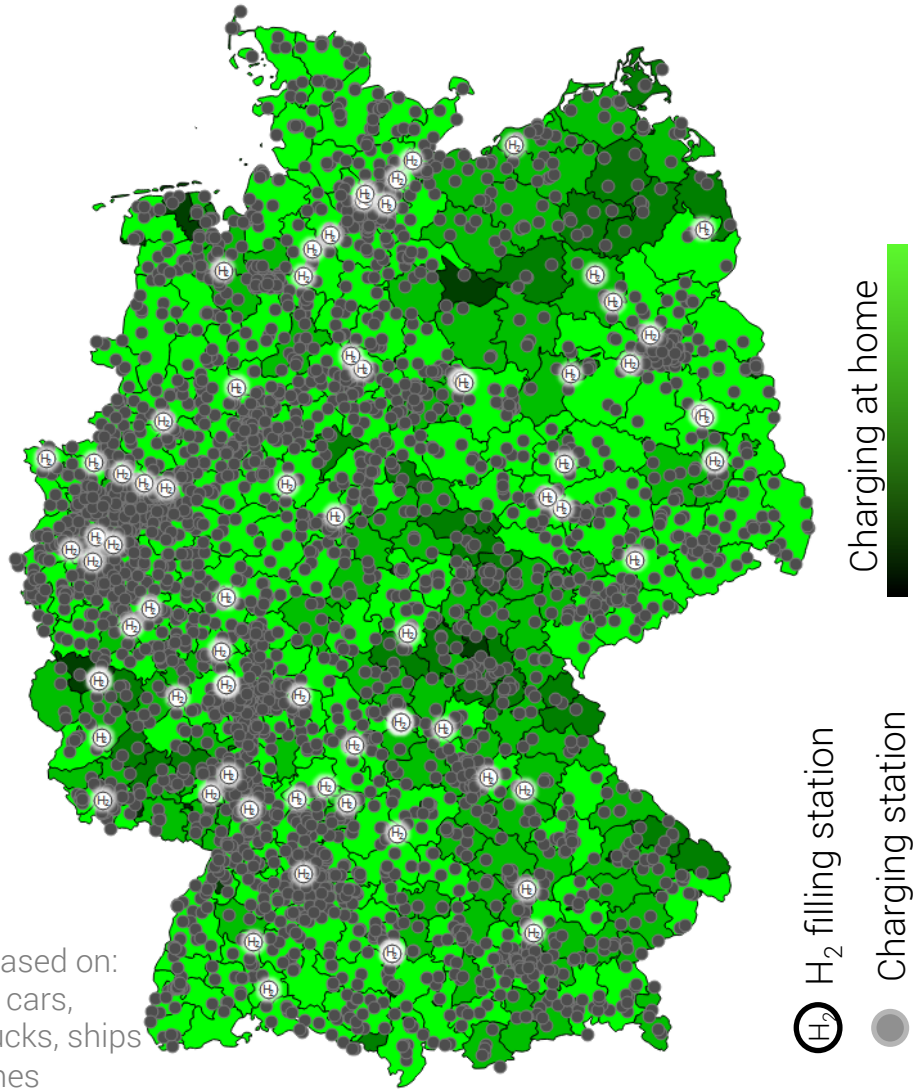
Sources: German Environment Agency (UBA), „National Trend Tables for Atmospheric Emissions Reporting“ (*Nationale Trendtabellen für die deutsche Berichterstattung atmosphärischer Emissionen*), 2015;
Bundesregierung, Energiekonzept für eine umweltschonende, zuverlässige und bezahlbare Energieversorgung, 2010

How will policy set the scene for future mobility?

BEV	FCEV
90 %	10 %

- Additional electrical energy demand
- EVs are efficient but will probably cause large peak loads



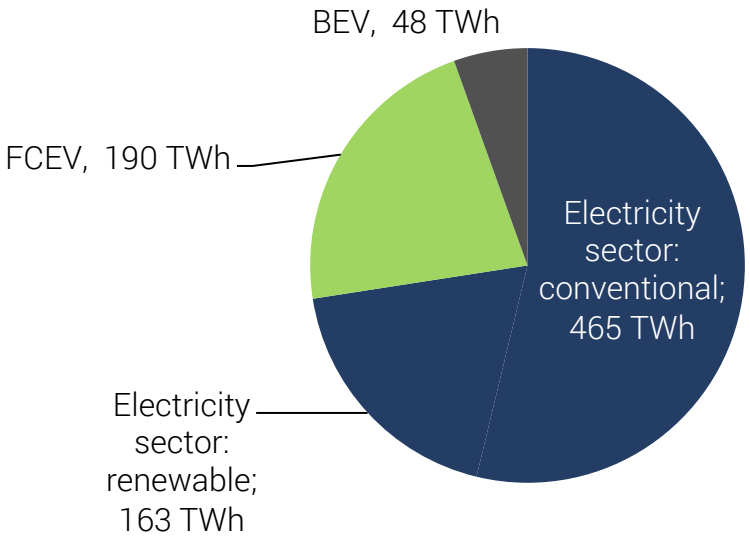


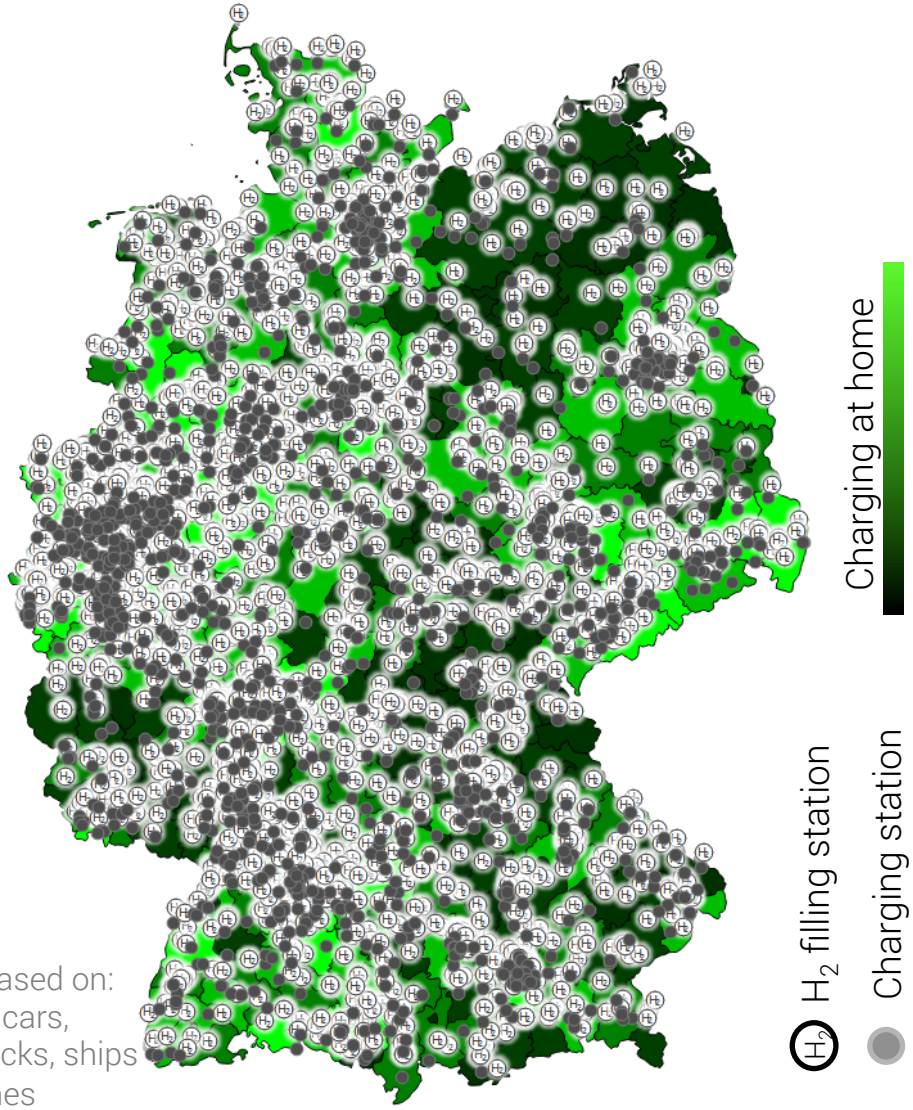
estimate based on: passenger cars, without trucks, ships and airplanes

Political strategies have a great influence

BEV	FCEV
50 %	50 %

- Fuel cell electric vehicles are less efficient, but…



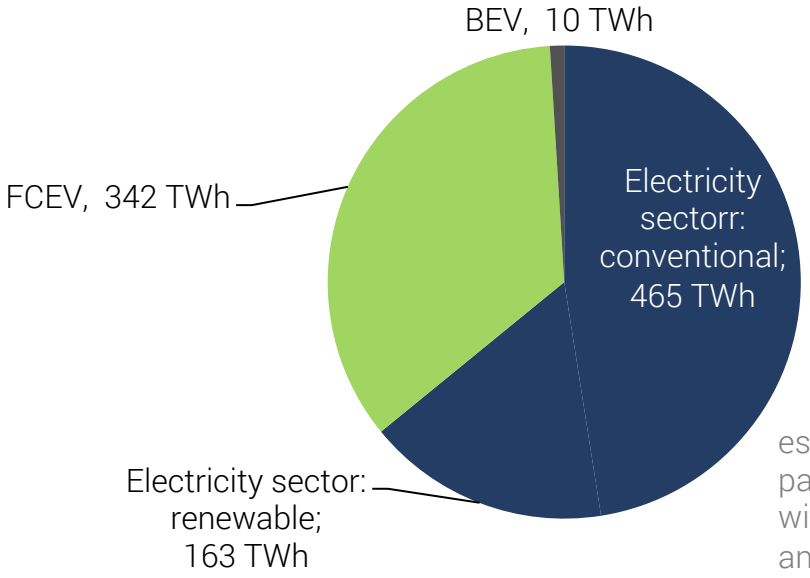


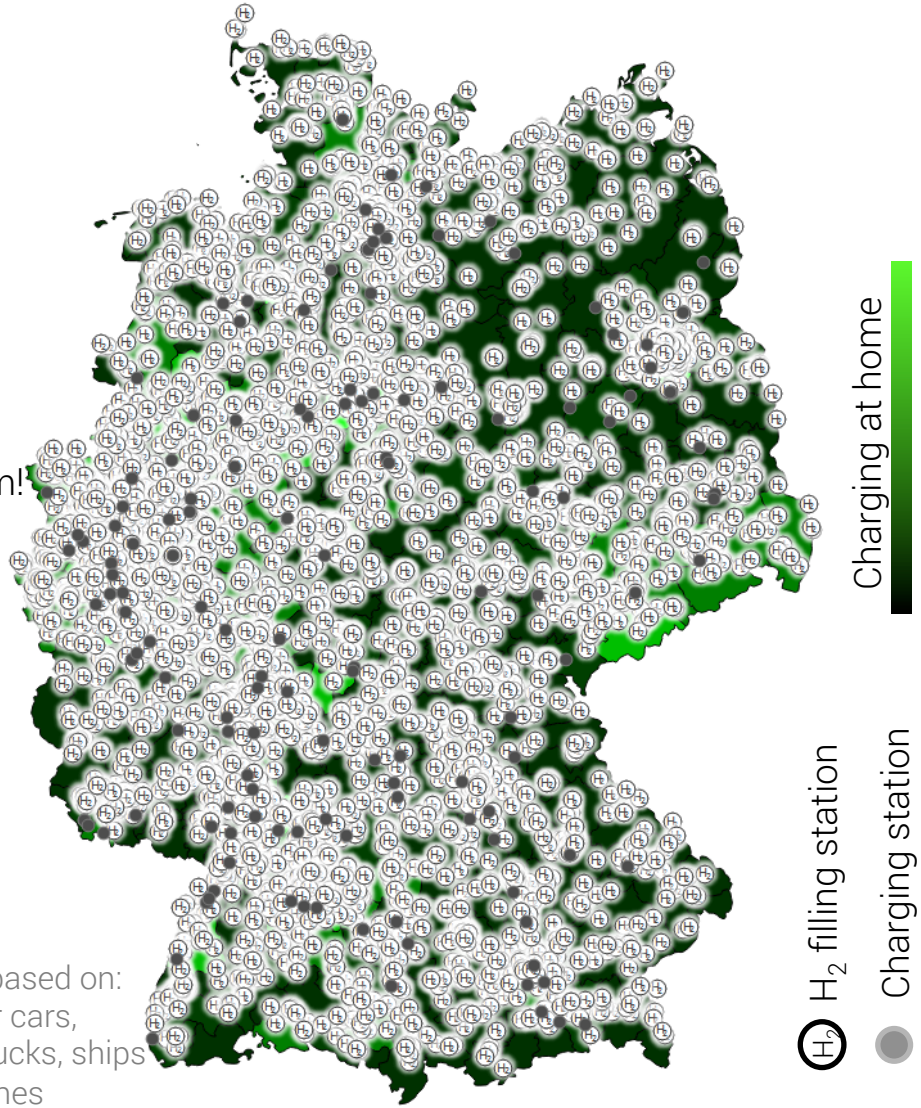
estimate based on: passenger cars, without trucks, ships and airplanes

Don‘t underestimate policy‘s influence!

BEV	FCEV
10 %	90 %

- Fuel cell electric vehicles are less efficient, but…
- They offer flexibility (storage) options
- Consider this when transforming the energy system!





estimate based on: passenger cars, without trucks, ships and airplanes

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What‘s the role of ICT?

1) Productivity and efficiency increase: More energy efficient and less carbon intensive economies (reduce carbon emission growth)

2) It accelerates breakthrough/disruptive technologies: e.g. ICT rewrites rules for electricity production and distribution through „smart“ grids

3) Governance of global change: More policy? Then more transparent government

4) Participation and civic engagement

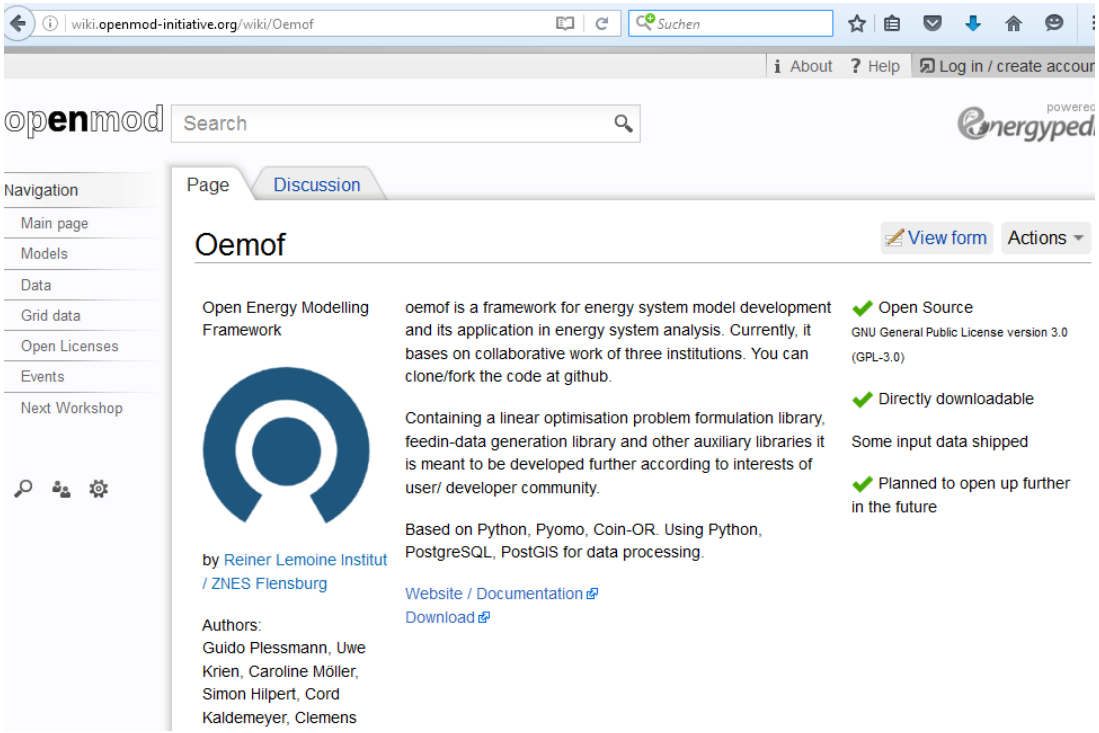
- Example 1: research project REEEM
- Example 2: open energy modelling framework

Get involved today at the energy modelling session!

RLI & open-source

- We get involved for open data and open source projects
- RLI is original member of the open modelling initiative
- We develop fact sheets to enable comparisons of (energy) frameworks, models and scenarios
- http://openmod-initiative.org/
- http://reiner-lemoine-institut.de/open_ego-open-electricity-grid-optimization/

What are the rules for transparent code writing?



Thank you
and get in touch with us.

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