Governing for Demand Management Innovations in Germany

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IGov New Thinking For Energy

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Presentation in Sum

- This work part of the IGov project:
  - Based on IGov working paper: http://projects.exeter.ac.uk/igov/working-paper-governing-for-demand-management-innovations-in-germany/
- Demand management defined
- Overview of demand/flexibility in Germany
- Overview of German transition governance
- Demand policies, issues and potential solutions:
  - Energy Efficiency
  - Distributed energy
  - Demand side response/flexibility
- What can we take from this?

Demand Management Defined

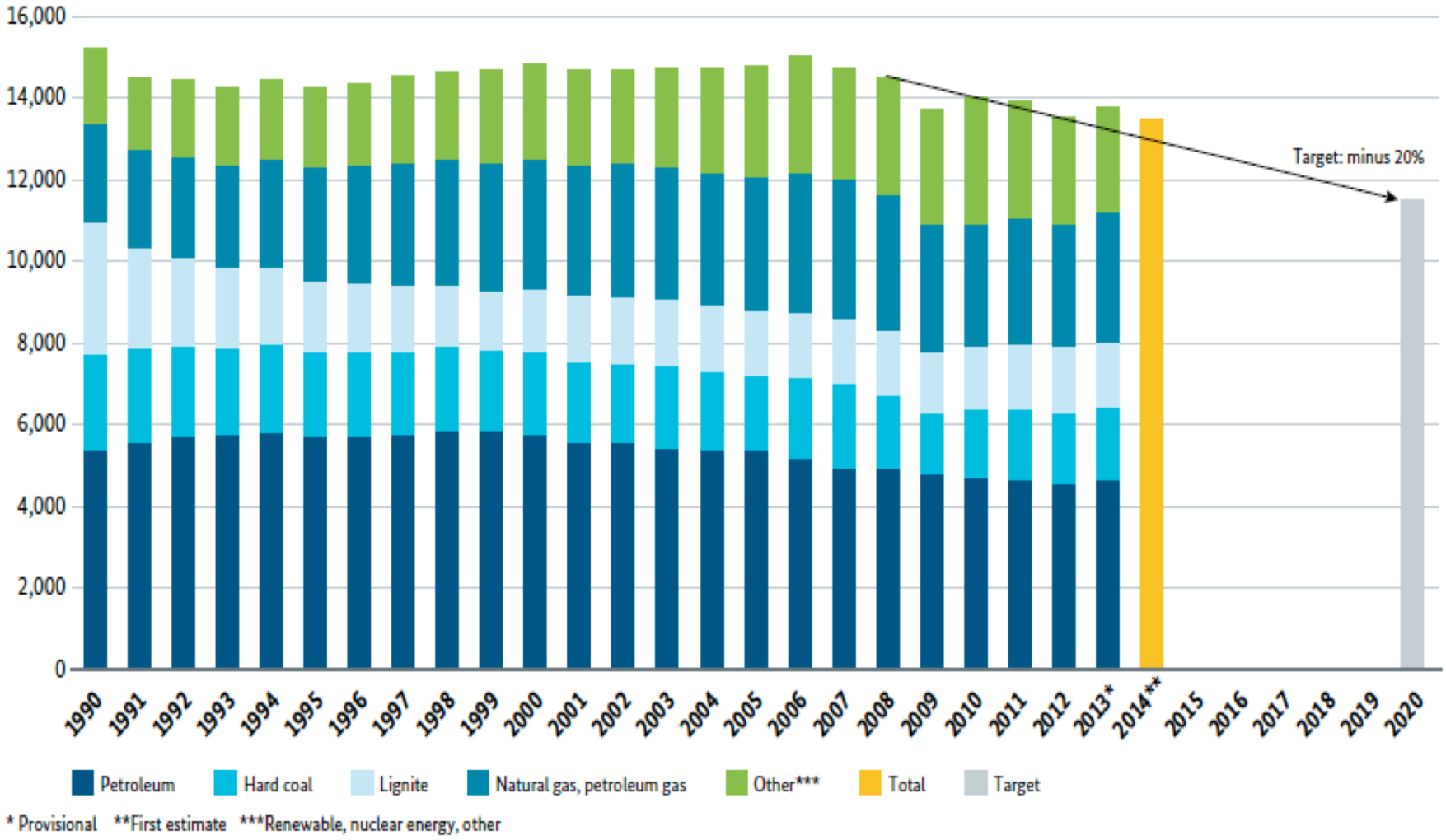
- D3: Distributed Energy; Demand Side Response (DSR); Energy Efficiency: DECC 2014; Ofgem 2015
- Characteristics of a demand oriented system:
  - A distributed energy system, preferably with high rates of citizen and/or community participation
  - Flexibility of demand (and supply)
  - New business models that enable demand response, efficiency and flexibility (energy services)
  - Smart, energy efficient and interconnected networks
  - Open availability of *relevant market data*
  - Storage

German Demand Overview

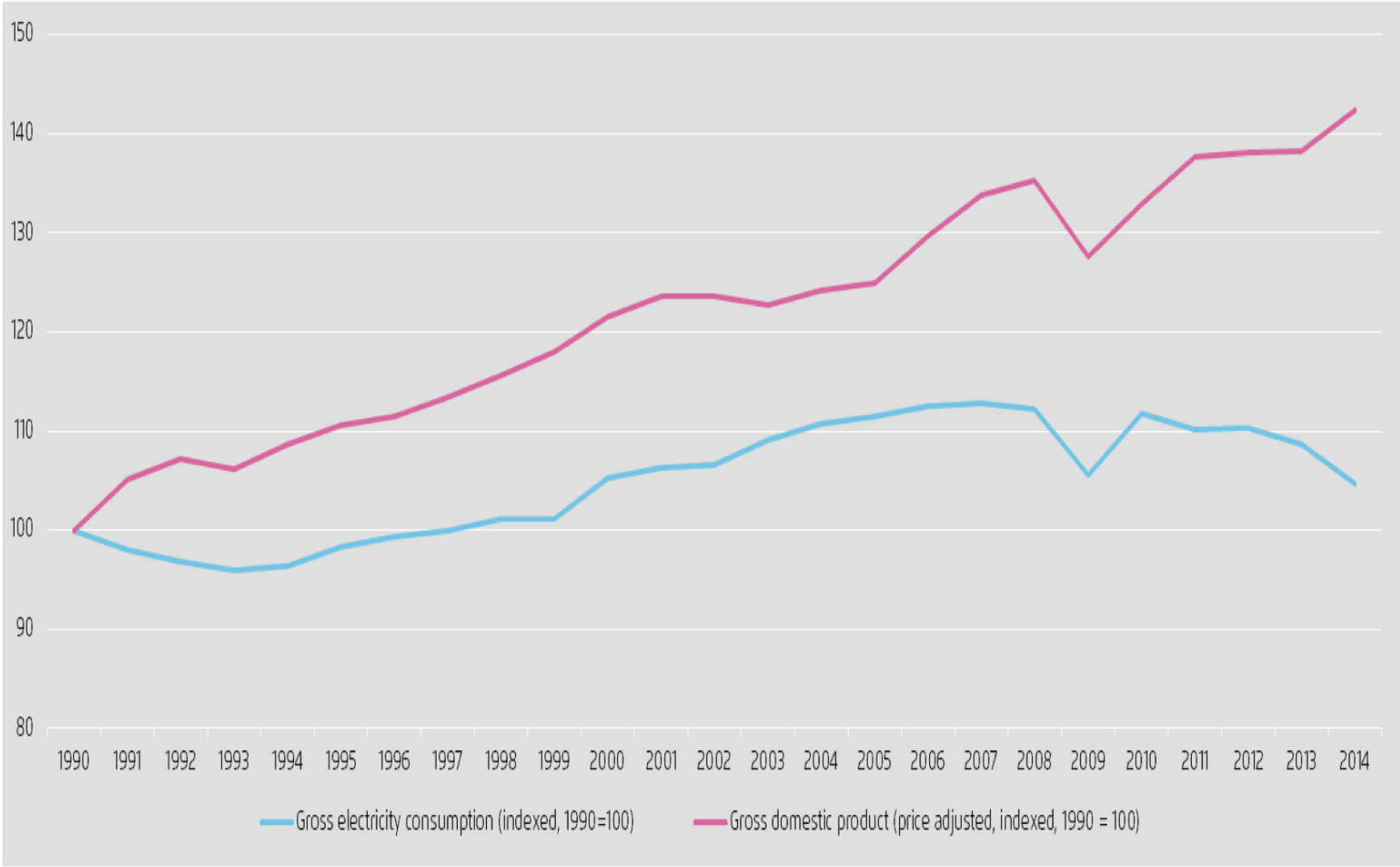
- Germany ranks highly (no. 1 American Council for an Energy Efficient Economy's 2014 benchmark)
- Primary energy consumption fell 9% from 2008 to 2014 (adjusted 7%)
- Electricity demand has fallen versus 2008, whilst economy has grown (delinking)
- Electricity is 25%, heat 47% of energy consumed
- DSR: in 2013 about 3% of demand was flexible (whilst estimates are that over 50% could be flexible)
- Distributed:
  - 46% renewables owned by citizens; 41% investor groups, 12.5% Big 4
  - 1.5m + households with rooftop solar

Development of primary energy consumption by energy source

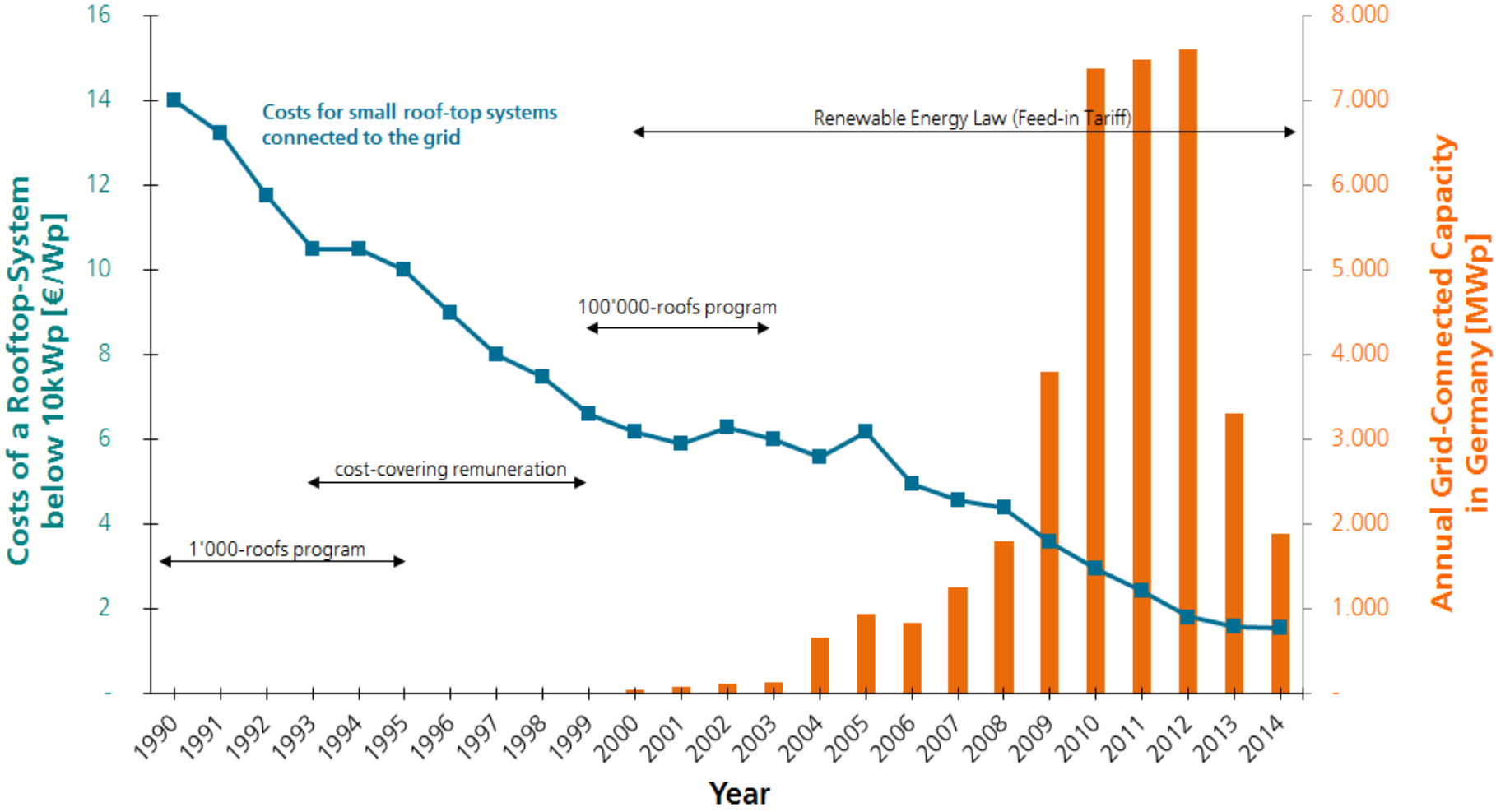
Adjusted (for temperature) figures in petajoules (PJ)



Indexed economic growth and electricity usage (1990 = 100)



Evolution of cost of rooftop PV systems: Germany



German Transition Governance: Overview

- Political System:
  - Social market economy, goal oriented governance
  - Popular support for environment/anti-nuclear
  - Proportional representation: Greens (Red-Green Coalition 1998 to 2005)
  - Federal system: distributed power (16 Länder)
- Current government SDP/CDU/CSU: more focus on economic costs, energy to Economic Ministry (BMWi)
- Distributed energy system: municipals dominated
- 2000: Erneuerbare-Energien Gesetz (EEG)
- Energiewende 2011:
  - Nuclear phase-out: implications for RES
- Electricity Market Reform *White Paper* (EOM 2.0)

Momentum for Improved Demand Strategy

- Supply oriented transition so far…
  - Nuclear phase out, coal now
  - Growth in RES, requirement for demand flexibility
- *But – no capacity market for flexible supply*
- *Estimates miss* 2020 Energiewende demand targets

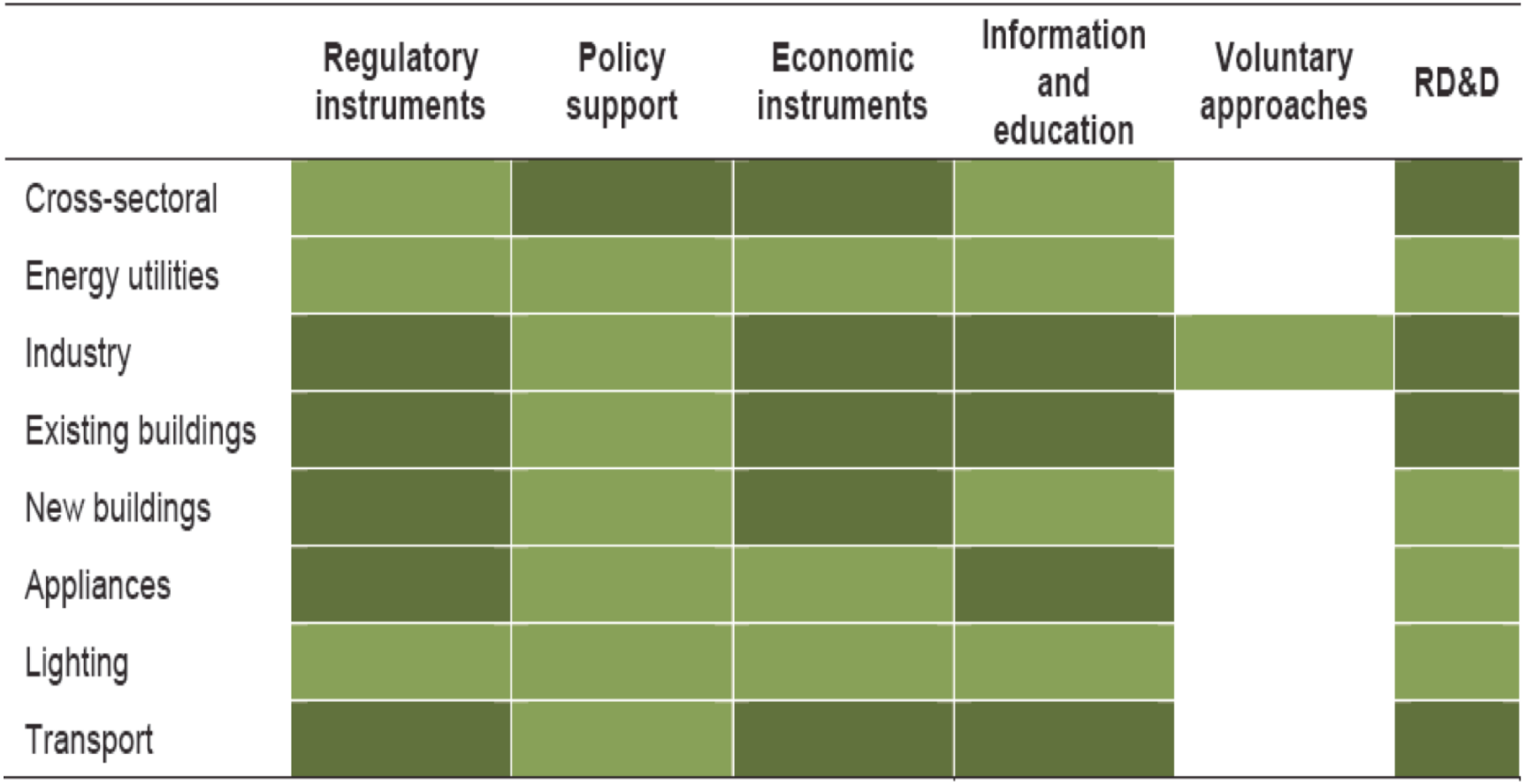
Table 1: Key German Energiewende Targets

		2020	2025	2030	2035	2040	2050
Greenhouse gas emissions	Reduction of GHG emissions compared to 1990 levels	-40%		-55%		-70%	-80 to -95%
Nuclear	Phased shut down of all nuclear power plants by 2022	11 by 2015	Rest 2022				
Renewable Energies	Share in final energy consumption	18%		30%		45%	Min 60%
	Share in gross electricity consumption		40 to 45%		55 to 60%		Min 80%
Energy efficiency	Reduction of primary energy consumption compared to 2008	-20%					-50%
	Reduction of gross electricity consumption compared to 2008	-10%					-25%

Energy Efficiency Policies

- National Action Plan Energy Efficiency (NAPE): 30 mt CO2
- Households/buildings:
  - Renovate remaining stock by 2050 (2% per annum)
  - Strict standards for new builds (zero carbon)
  - *Loans (.5 to 1%) and grants via KfW* ***€2bn available*** *p.a.: 4.1m homes and 2,900 non-residential retrofitted over 10 years*
- Commercial/Industry:
  - Subsidies for upgrading technology & equipment
  - Mandatory energy efficiency audits every 4 years
  - Energy Efficiency Networks Initiative (500)
- ESCo's: established market – 500-550 in operation
- *Industrial policy: promoting 'green' technologies, establishing efficiency supply chains, skills/training, employment*

German Energy Efficiency Policies
(Type and Sector)



DARK GREEN = Several relevant policies are in place. **GREEN** = At least one relevant policy is in place. WHITE = No relevant policies have been identified in EE PAMS.

Issues and Emerging Solutions

- Main fear is *missing 2020 target of -20%* primary energy consumption versus 2008 (est.s no include NAPE)
- NAPE delays: not all policies implemented
- 1Q16: *Green Book for Energy Efficiency*: comprehensive strategy for long-term demand reduction
- EOM 2.0 White Paper:
  - Considering greater coordination between incentives for efficiency and flexibility and in energy market design
  - Power to Heat: assumption that heat pumps powered by ambient heat and renewables run at 340% efficiency
  - Power to Mobility: assumption that electric transport to run at 80% efficiency compared to 25-40% combustion engine
  - NRM 11: recharging points, BMWi €2bn incentive scheme for greater electric mobility

Distributed Energy (Civic Participation)

- 2000 EEG – design for distributed system:
  - Create a reliable mass market, lower transmission losses, more efficient use power/heat and civic participation, *distribute benefits and embed the transition*
  - *FiT: low risk (lowest cost of capital for RES in Europe); and priority access for RES*
  - *Subsidies for storage: focus on small-scale (PV)*
- Finance: KfW, Landesbanken, Bürgschaftsbanken
- BUT:
  - EEG charges: €23bn distributed through bills (taxes, grid)
  - 10% of consumers have exemptions (regressive distrib.)
  - Average family faced 70% rise power prices 1998-2015: EEG 20% of tariff (whilst wholesale prices fall)
  - Less as % disposable income (low in Europe) and welfare

Governance Changes and Implications

- EEG 2014:
  - Annual corridors (min and max) for each RES
  - Direct marketing (CfDs) for plants over 100kW (2014-17)
  - 2017: auctions for RES generation (over 150kW (PV))
  - Reduction in exemptions for industry/self-consumption
- New large-scale projects: Offshore wind (compromise with Big 4); North-South transmission
- Implications for distributed energy?:
  - Medium plants face more market risk, assume greater system responsibility, and must pre-qualify at auctions
  - Effects on cost of capital (higher risk)
  - Big investments in large-scale generation/transmission focuses transition resources away from small scale projects

Local markets?

- Pockets of innovation: 6 E-Energy projects (IT)
- Re-municipalisation – water, power, gas + (Hamburg)
- Innovative suppliers:
  - Lichtblick: virtual power plants (Swarm Energy Concept)
  - Grundgrün: regional business model/guarantee of origin
- Obstacles:
  - Regulation behind advances – new framework needed
  - Lack of locational pricing and balancing
  - Large-scale storage would enable, but *not a focus*
  - *DSOs*:
    - Fragmented market (900), small companies: 90% less than 100,000
    - Lack of transparency re: costs and regulated revenue too high?
    - Not sufficiently incentivised to become ‘smart’ (digitalisation, forecasting) = the ‘intelligence gap’ - BNetzA addressing now

Demand Side Response

- Flexibility as the new paradigm of Energiewende?
  - Intermittent generation forces more focus on demand flexibility, and flexibility cheaper than new generation
  - Interconnection solves some issues around intermittency
  - But.. no clear regulatory framework for DSR (or aggregation)
- Ancillary Services Markets
  - Mainly large industrial plants and pumped storage active
  - Rules as barriers: bid size, product interval, pre-qualification; and grid fees apply to flexible load but not generation

Table 2: Auctioning Rules on Reserve Markets

Reserve	Frequency of action	Product duration	Minimum bid size	Pooling
Minute/Tertiary	Each working day	4 hours	5 MW	Yes
Secondary	Weekly	High (8am to 8pm) Low (8pm to 8am) Sat/Sun: all day	5 MW	Yes
Primary	Weekly	1 Week	1 MW	Yes

Source: BMWi 2015e: 65

DSR – Emerging Governance

- EOM 2.0 White Paper:
  - Propose improved price signals for flexibility: extend short-term trading so that trades close nearer to delivery time
  - Secondary balancing and minute reserve should be tendered every day, and new short-term b/s market?
  - Proposal that Minute Reserve product block should be reduced from 4 hours to hourly blocks
  - Examine possibility for a situation based balancing capacity bidding process (relate to wind/solar generation)
  - Change incentives for industrial consumers to use more (i.e. over 7,000 hours load factor and over 10GWh p.a. = exemptions from fees/surcharges/tax)
  - Registered meter customers should be charged per hour according to wholesale price, improve visibility/flexibility

Aggregation of Flexible Load

- Aggregators just ‘at the door’ in Germany
- *Minute, Secondary*, Primary markets: pooling of loads
- Entelios AG, Lichtblick, Next Kraftwerke, Grundgrün, ESCOs: utilising latest IT and communications systems
- Issues:
  - Role of aggregator not recognised in law/no framework
  - Requirement to act as balancing group manager and to sign multiple bi-lateral contracts (suppliers, generators, DSOs +)
  - Absence of real time data
- Solutions:
  - EOM 2.0: suggests clarifying rules for aggregation of load, and simplifying access rules to balancing markets
  - Replace multiple bi-lateral contracts with standardised contract
  - Provide services without being a balancing group manager?

Take Away Points

- *Detailed targets* provide long-term vision beyond emissions, direction for policymakers, and drive policy changes: governance for transition as iterative process
- *Transition as opportunity*: green industry, supply chain skill
- *Citizens and transition*: distributed benefits enable deeper embedding of changes - but also protect vulnerable
- *Risk matters for inclusive change*: FiT enabled low risk RES markets and low cost of capital; accessible finance
- Technological and business model innovations *ahead of regulations*
- Emerging recognition of need to *link efficiency and flexibility solutions*, incentives and market designs

Introduction to IGov

- Innovation and Governance for a Sustainable, Secure and Affordable Economy – 4 years, 5 person team
- Complex inter-actions: governance and innovations
- Governance: objectives, policies, rules and incentives, as well as the political and institutional context
- Governance matters for innovation:
  - Pace and type: who loses, benefits and compensation
  - Governance can act to enable and to constrain innovation
  - Governance as providing direction and leadership
- International comparisons:
  - US (California, Texas, New York)
  - Denmark
  - *Germany*