THE ASSOCIATION FOR RENEWABLE ENERGY & CLEAN TECHNOLOGY

# Decentralised Energy Forum

Chair:
Harry Vickers,
Green Investment Group

12th February 2020

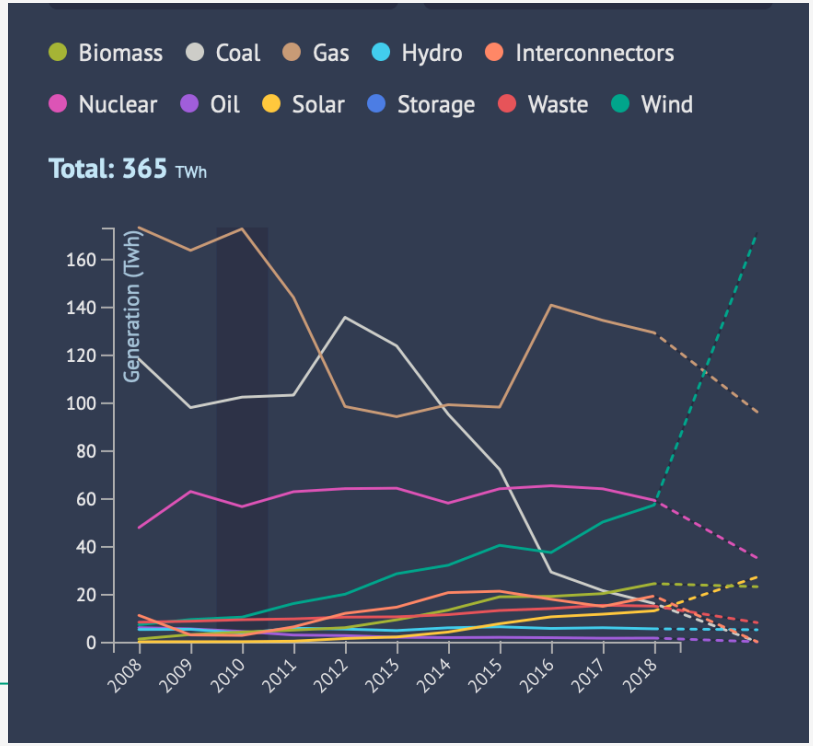
## "Speed" Workshop: Decentralised energy – joining the dots!

- A discussion on how the REA joins up the themes of decentralised energy and what cross-cutting issues the REA and members can jointly work on
- Seeking your advice on *key stakeholders* in the decentralised energy & built environment space that REA should be engaging with

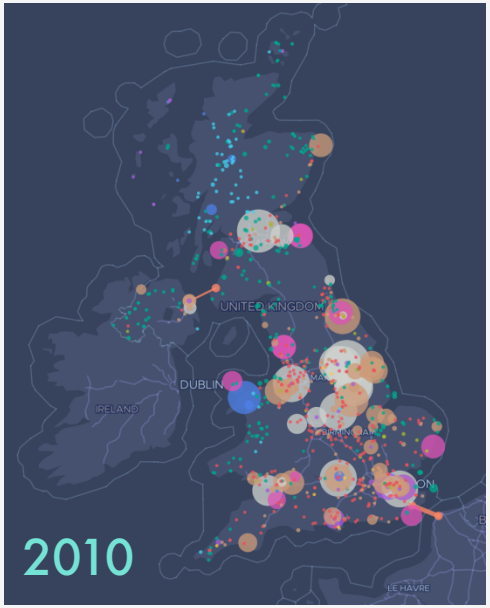
*Decarbonising the economy*

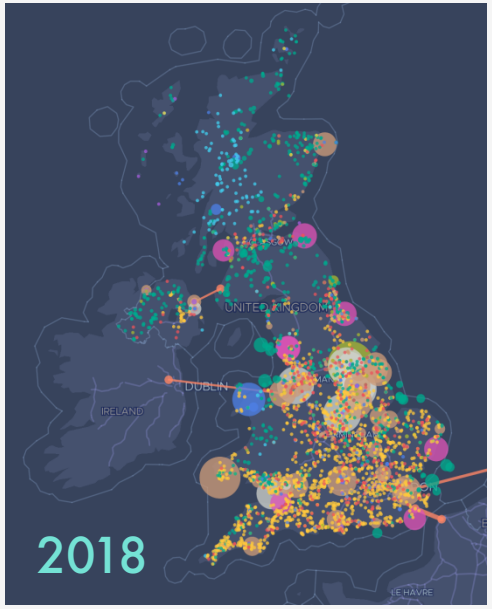
# Looking back: 2010 - 2018

## Generation in the UK




Figures courtesy of Carbon Brief



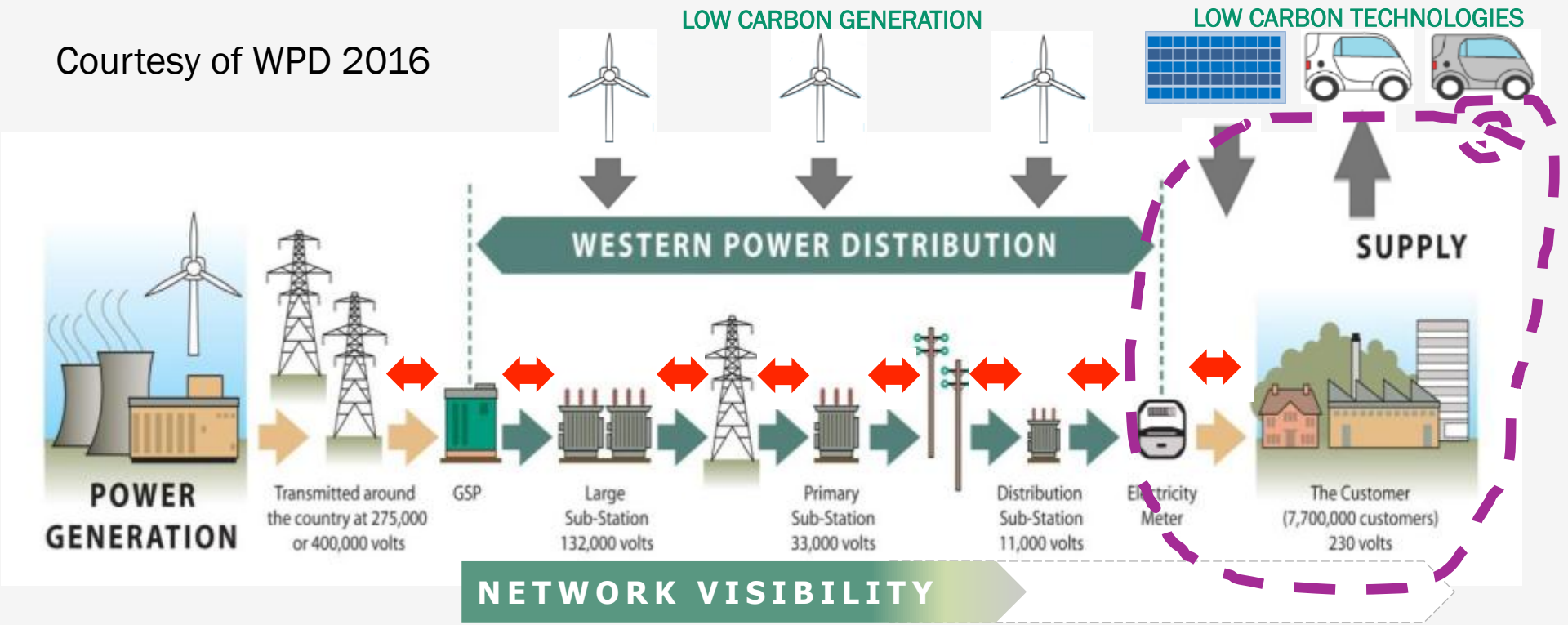

## Policies & Environment

- 2010 introduction FiT for small scale renewable generation
- Levy Control Framework:
  - Contract for Differences (CfD)
  - 2017 RO closed
  - 2019 FiT scheme closed
- Smart Flexibility Systems Plan

https://interactive.carbonbrief.org/how-uk-transformed-electricity-supply-decade/

# Power Systems
## – transition to a more DECENTRALISED ENERGY world

Courtesy of WPD 2016



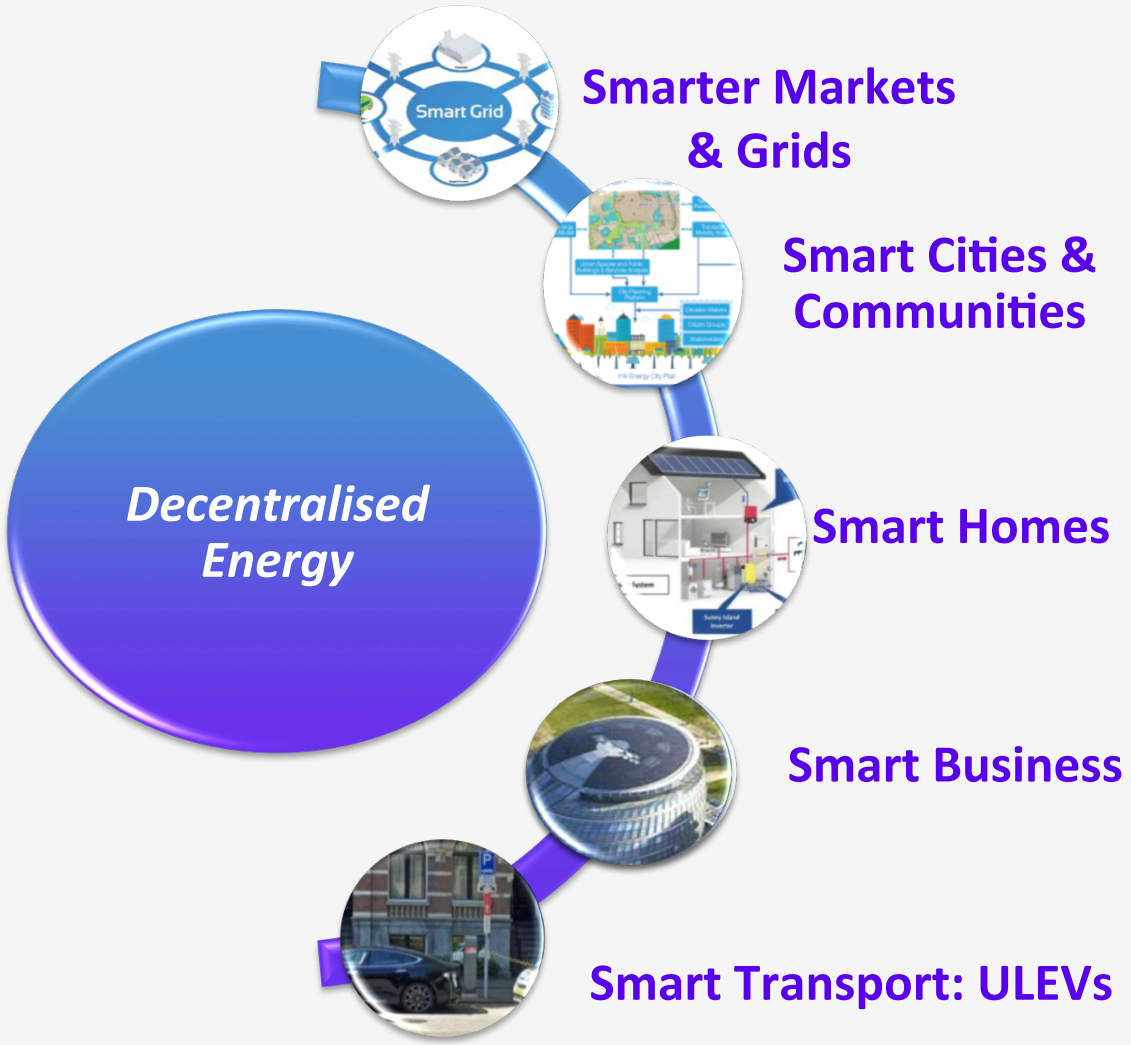

- Centralised generation
- One-way power flow
- Load centric/passive design
- Sufficient peak capacity
- Passive operation
- Limited visibility

- Distributed (Decentralised)Generation/ changing demand
- Two-way power flows
- Reduced headroom
- Active operation - Distribution System Operation
- Need for increased visibility
- Increased Intelligence / Active Management

Looking back:

In 2016, REA created a forum with the aim to draw upon the *unique* REA pan - technology insights and activities to support the deployment of Decentralised Energy

# With the Changing Landscape, *is this the NEW normal?*



# In 2020:

REA DECENTRAL


## Markets & Grids [1]

## Communities to Cities [2, 3, 5]

## Homes [2, 3, 4]

## Business [1, 2, 3, 4, 5]

## Transport [4]


## Smart consumers/ Prosumers [2, 3, 4, 6]

REA Forums & Subsidiaries:
1. Large Scale Markets & Grids; 2. Solar
3. Energy Storage 4. EV,
5. Wood Heat 6. REAL

"Decentralisation creates closer links between sources of energy supply and demand via local network and consumers take a more active part in managing their energy needs"

UK Power system capacity:

2019 : 108 GW
- 71% transmission system connected
- 25% distribution network connected
- 5% Microgeneration (<1 MW)

2050 : Future Energy Scenario
- Community Renewables/Consumer Evolution
- Up to 58% of generations capacity could be local by 2050
  - 36% distribution network connected
  - 22% Microgeneration (53GW)

Other scenarios could see <25% distribution network connected!

*Future Energy Scenarios, July 2019 National Grid ESO*

# REA work in 2019

REA DECENTRAL


Markets & Grids

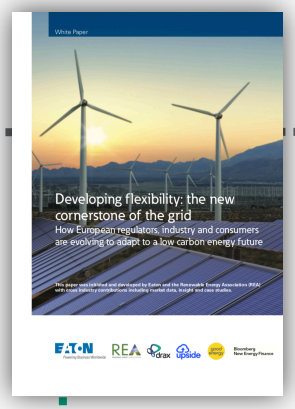
Communities to Cities

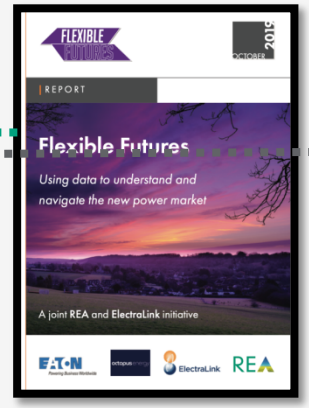
Homes

Business

Transport

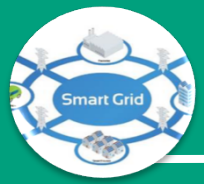

Smart consumers/ Prosumers




# Stakeholder Map

DECENTRAL




Markets & Grids

ENA, NG ESO, DNOs, Electralink, Universities, Consultancies

Communities to Cities

Community Energy England, REGEN, Local Community Energy Groups, Ashden, UK100, LEPS ???

Homes

UKGBC, RICS, RIBA, Construction Companies, NHBA, BEAMA, Energy Saving Trust, SEA, STA, ADE

Business

RE100, Aldersgate, Energy Saving Trust, ADE, SEA, ???

Transport

OLEV, Low CVP, SMMT, TfL, NFA, EVSE, BCPA ??


Smart consumers/ Prosumers

Citizens Advice, Which, REAL, MCS, Energy UK, ADE, NGOs

General: Government Bodies: BEIS, OFGEM, Energy Systems Catapult, Innovate UK, MHCLG, Treasury, DEFRA, CCC

# Questions:

DECENTRAL


Markets & Grids

Communities to Cities

Homes

Business

Transport


Smart consumers/ Prosumers

BEIS/OFGEM Smart Flexible Systems Plan – how far are we along to enable a decentralised energy future? Recent BEIS/OFGEM update, what do REA need to do influence the agenda? What will build confidence to continue to invest in this Sector? Is the ETRI of value? How can more REA members support?

With leading Cities taking a proactive positions to tackle Climate Emergency, how much of their efforts are focused on decentralised energy? What are the barriers to progress? Local authorities and communities progress - barriers? Which of our members are engaged supporting efforts here?

New Government messaging for future homes – what do you think are the most important levers? Existing homes priorities energy efficiency and LCT. Role of "Sector coupling" Power to heat, Progress to a Hydrogen Agenda?

Flexible Futures report revealed that businesses are the "Untapped Potential". What can REA do more to accelerate the take up? Do members work directly with RE100 & Aldersgate groups? Industrial heat solutions that can delivered in a decentralised way?

Sector coupling is viewed the most extensive here. EV take up and infrastructure development and systems are key. How do the REA ensure we cover a balanced view for decarbonising transport across cars, vans, trucks, trains… + boats & planes?

*Energy as a service* and the role of aggregators and new "connected systems" providers.
What is the journey to create "engaged smart consumer" and LCT Prosumers? What will create the tipping point? How do we ensure a "just transition" at the same time?

# The Future


Graphic: Courtesy National Grid ESO

# REA REPORT: *Developing flexibility: the new cornerstone of the grid*

*June 2019*


## Power system *flexibility* supports high renewables deployment

**Table 10: Summary of scenario outcomes in 2030**

| Scenario | System cost | Emissions | Fossil capacity as share of peak demand | Renewable share of generation | Zero-carbon share of generation |
|---|---|---|---|---|---|
| NEO (base case) | 32.8 GBPm/TWh | 16.8 MtCO2 | 49% | 74% | 88% |
| Relative change vs NEO | | | | | |
| Low-flex | 3% | 9% | 10% | -1% | -1% |
| High uptake of EVs | 2% | -19%* | 0% | 1% | 0% |
| High uptake of EVs and flexible charging | 0% | -30%* | -7% | 2% | 1% |
| High uptake of storage | -2% | -13% | -12% | 1% | 1% |
| High uptake of flexible demand | 1% | 1% | 1% | 0% | 0% |
| Interconnection to the Nordics | -2% | -25% | -11% | 3% | 3% |

**Table 11: Summary of scenario outcomes in 2040**

| Scenario | System cost | Emissions | Fossil capacity as share of peak demand | Renewable share of generation | Zero-carbon share of generation |
|---|---|---|---|---|---|
| NEO (base case) | 39.8 GBPm/TWh | 11.6 MtCO2 | 34% | 80% | 94% |
| Relative change vs NEO | | | | | |
| Low-flex | 13% | 36% | 45% | -1% | -2% |
| High uptake of EVs | 4% | -88%* | 3% | 1% | 0% |
| High uptake of EVs and flexible charging | 4% | -96%* | 0% | 1% | 0% |
| High uptake of storage | 0% | 1% | -1% | 0% | 0% |
| High uptake of flexible demand | -5% | 2% | -10% | 0% | 0% |
| Interconnection to the Nordics | -2% | -24% | -10% | 2% | 2% |

*Source: BloombergNEF. Note: Colour scales differ between columns, but in all cases green is desirable. *Emissions for EV scenarios include a negative contribution from emissions displaced in the oil sector.*

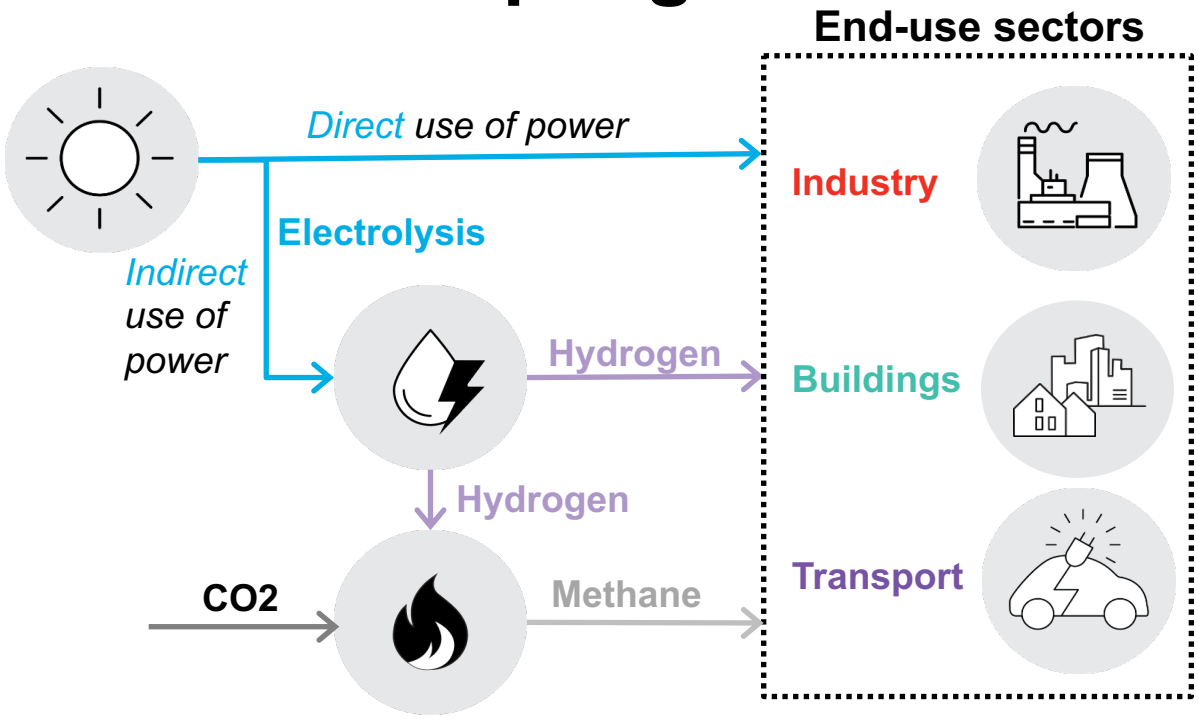
BNEF analysis indicates that.. *low* grid flexibility
=> higher carbon system in 2030 & 2040. NOT ACCEPTABLE!

http://electricalsector.eaton.com/en-gb_renewables-energy-transition-section-3?_ga=2.44034789

# Building on earlier BNEF reports..launched yesterday!

Context

## What is sector coupling?




*Source: Robinius, M.; Otto, A.; Heuser, P.; Welder, L.; Syranidis, K.; Ryberg, D.S.; Grube, T.; Markewitz, P.; Peters, R.; Stolten, D. Linking the Power and Transport Sectors—Part 1: The Principle of Sector Coupling. Energies 2017, 10, 956.*



EATON Powering Business Worldwide Statkraft BloombergNEF

Sector coupling pathway

# Our high-level approach to constructing the pathway

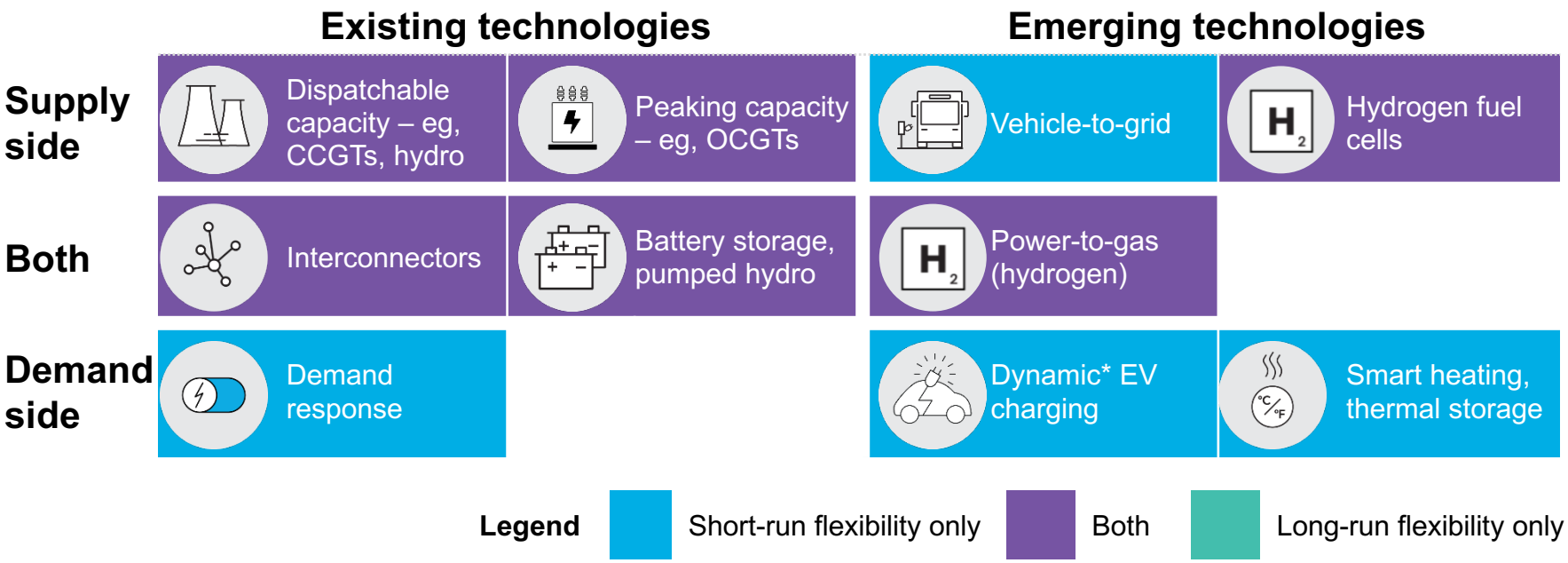
BloombergNEF **technology cost** outlook + Countries' **policy** ambition to overcome barriers to adoption or accelerate already-economically-favorable transitions + Informed by other considerations – eg, technical feasibility, consumer behavior, carbon leakage concerns, asset lifetimes and replacement rates =

## Our scope for sector coupling:

**Northern European archetype**: high wind-and-solar power market with little domestic flexible capacity and high demand for heating, which is mostly dependent on fossil fuels – eg, the U.K. and Germany

Impact on the power system

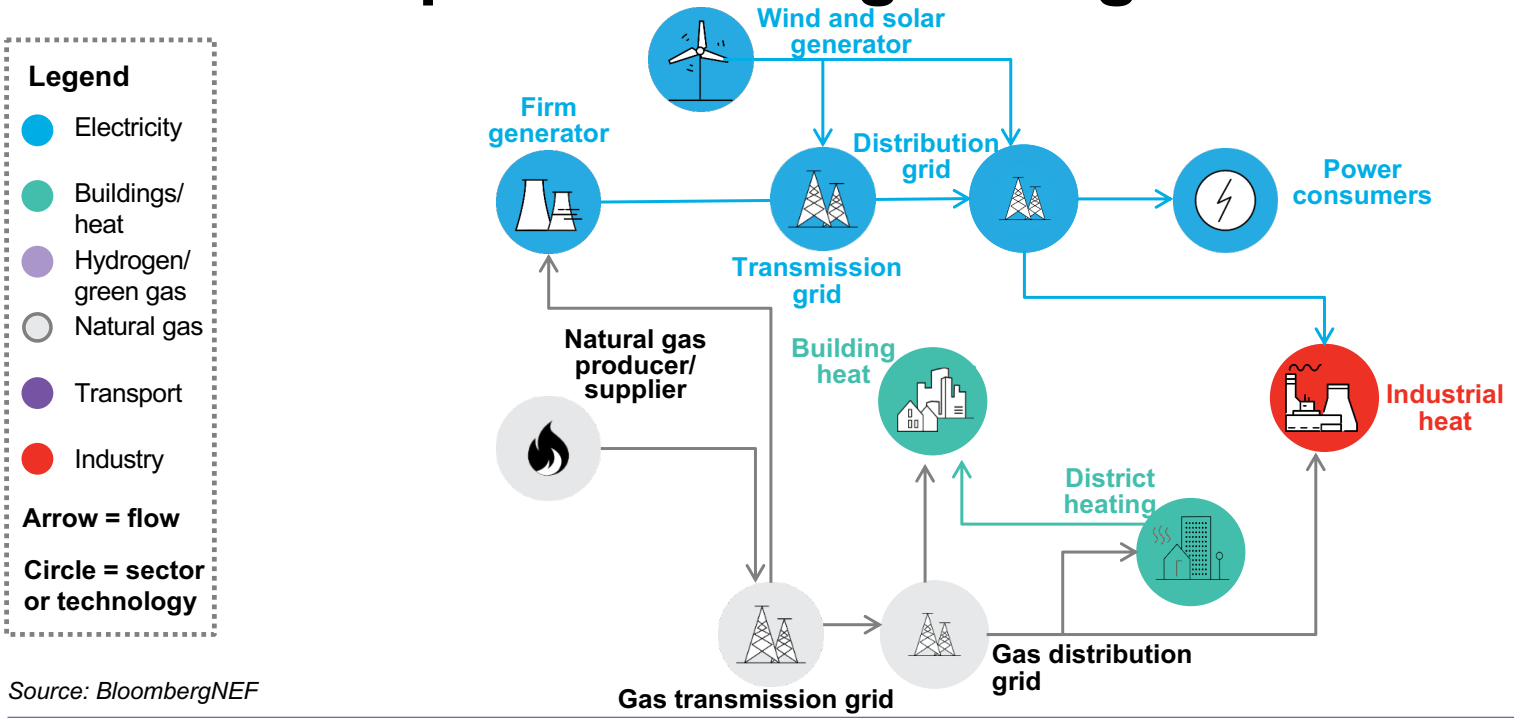
# Selected sources of power-system flexibility




*Source: BloombergNEF. Note: *Dynamic = responsive to market signals (eg, price).*

Impact on the power system

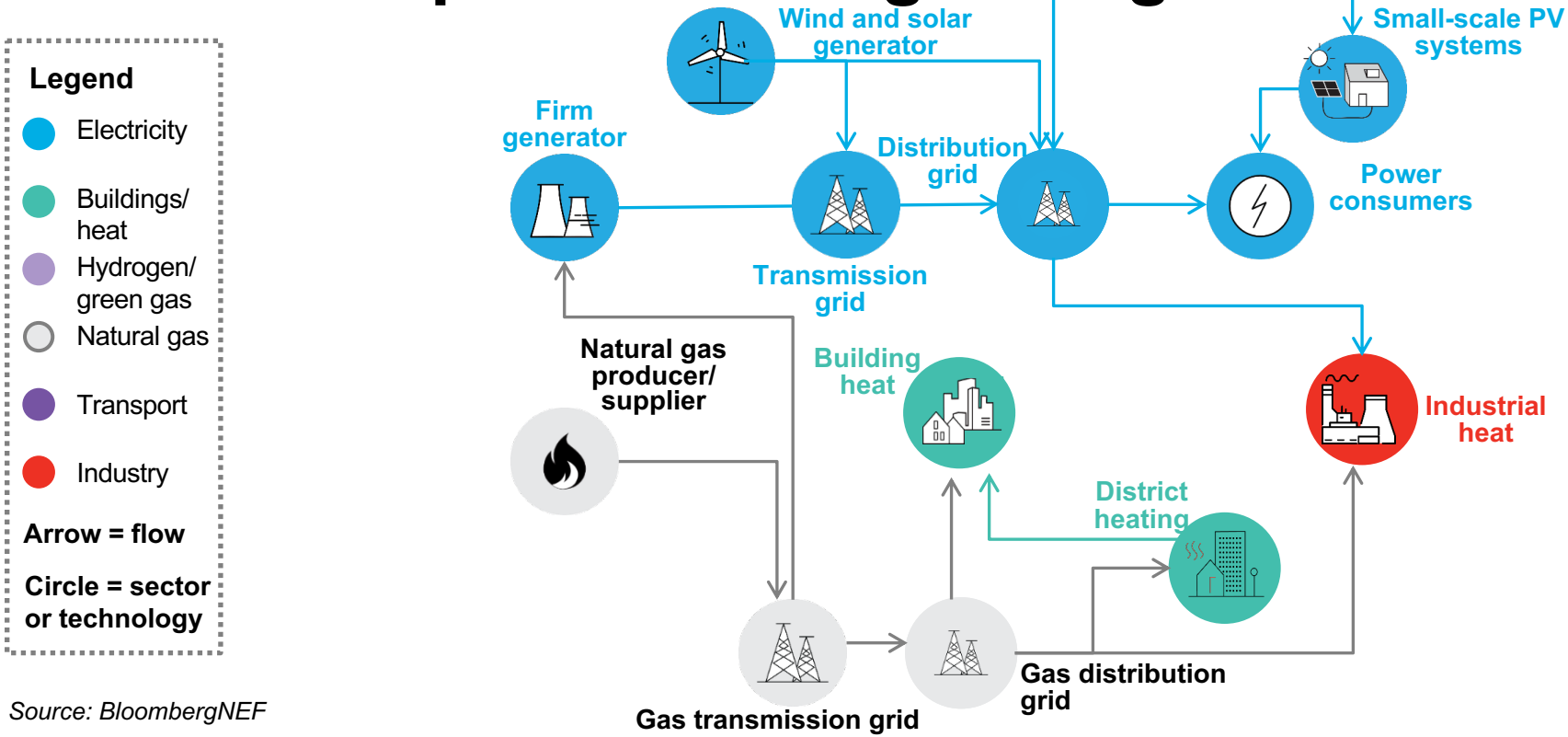
# A more complex and integrated grid




*Source: BloombergNEF*

Impact on the power system

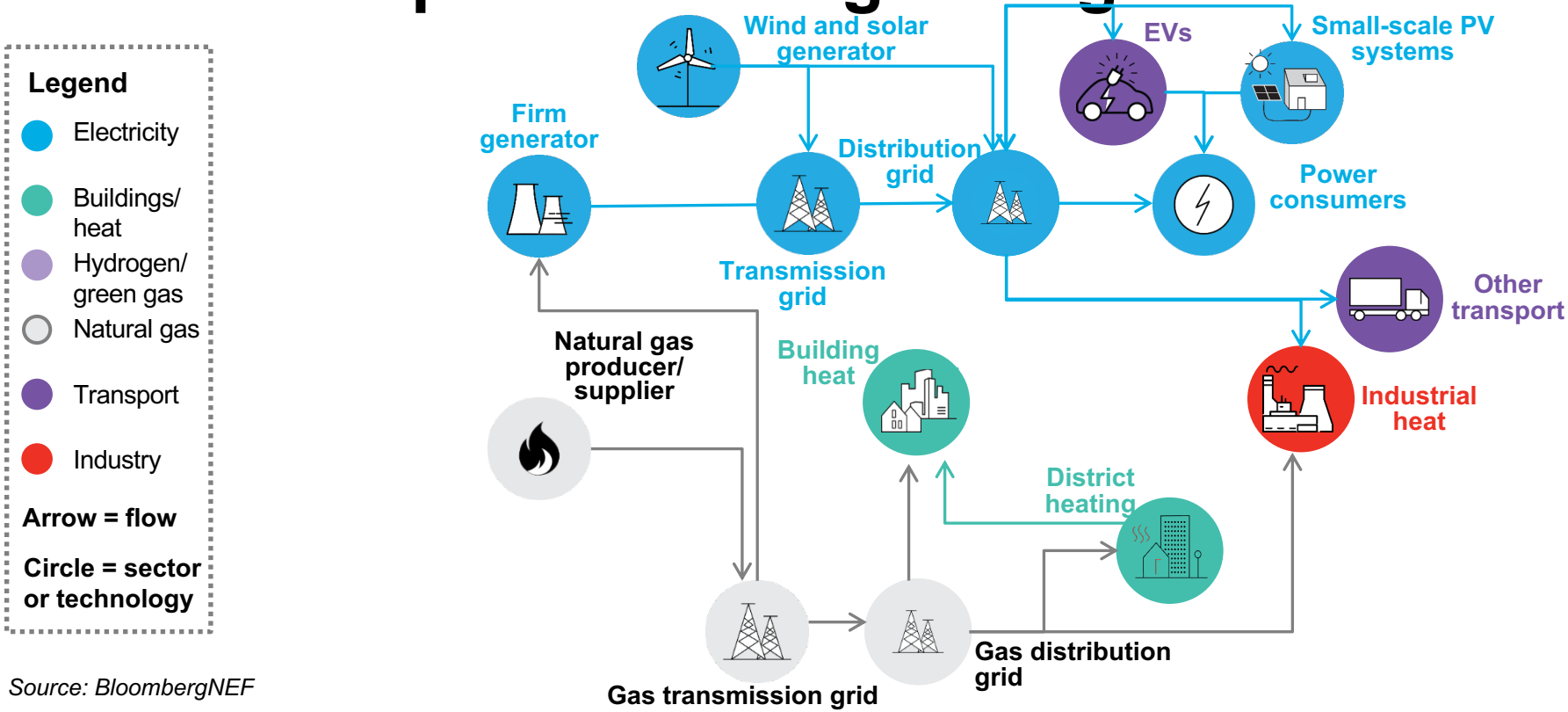
# A more complex and integrated grid




*Source: BloombergNEF*

Impact on the power system

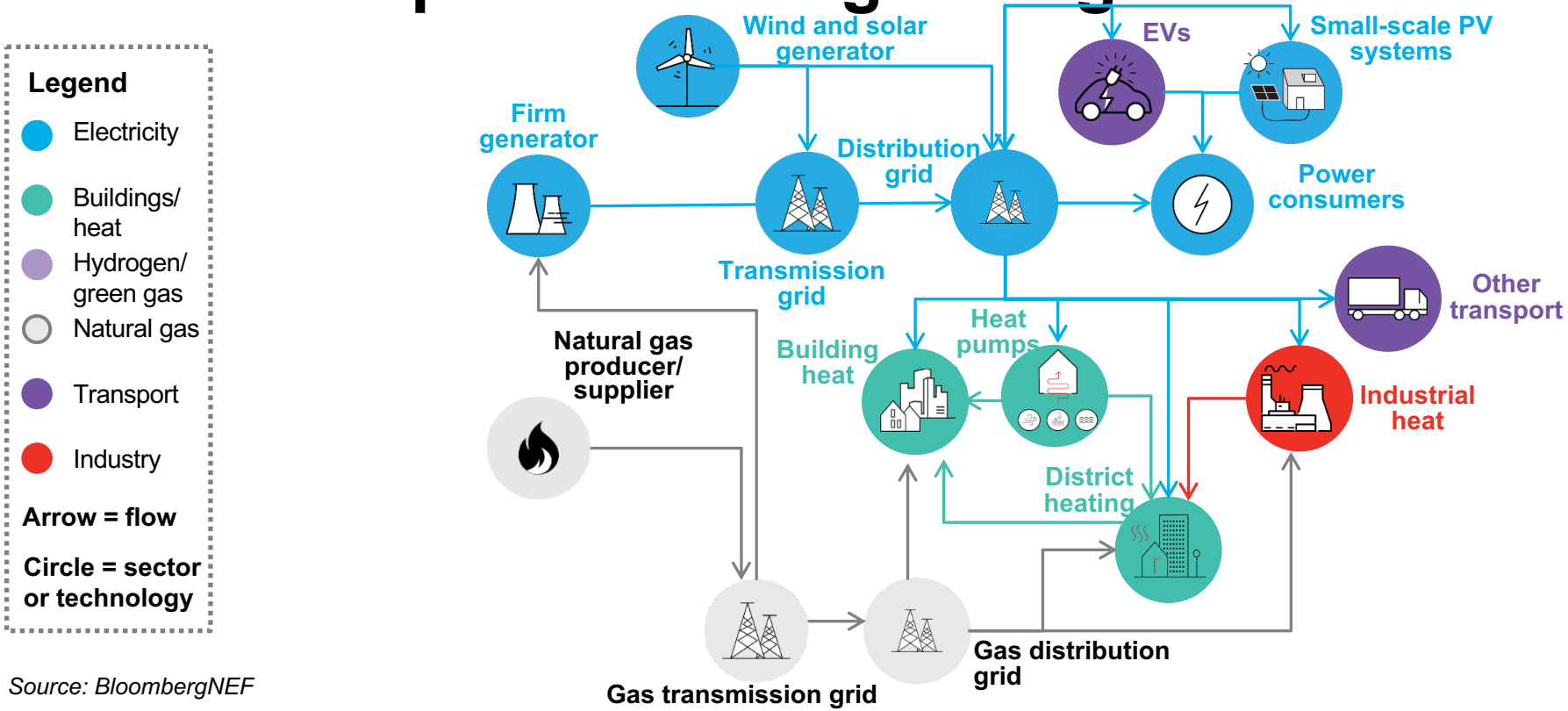
# A more complex and integrated grid




*Source: BloombergNEF*

Impact on the power system

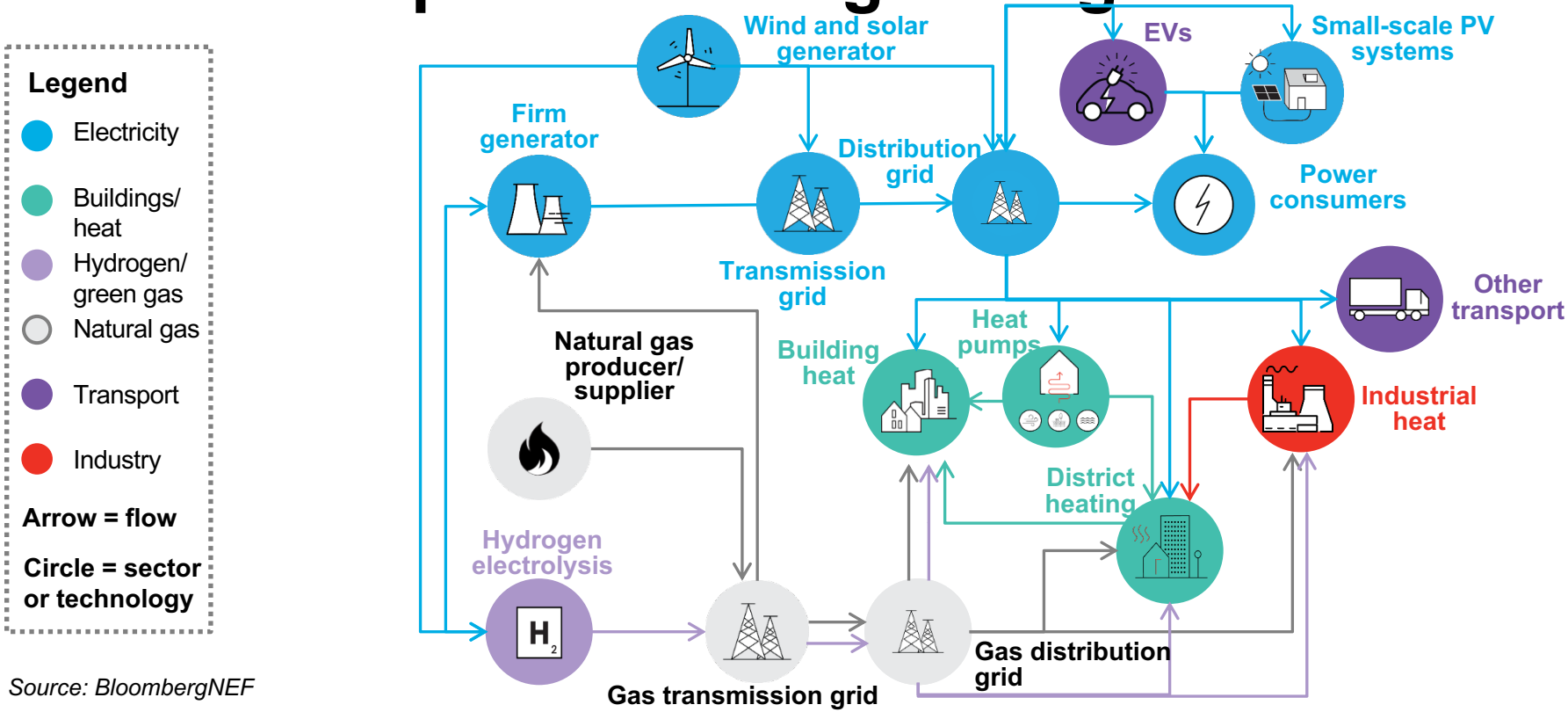
# A more complex and integrated grid




*Source: BloombergNEF*

Impact on the power system

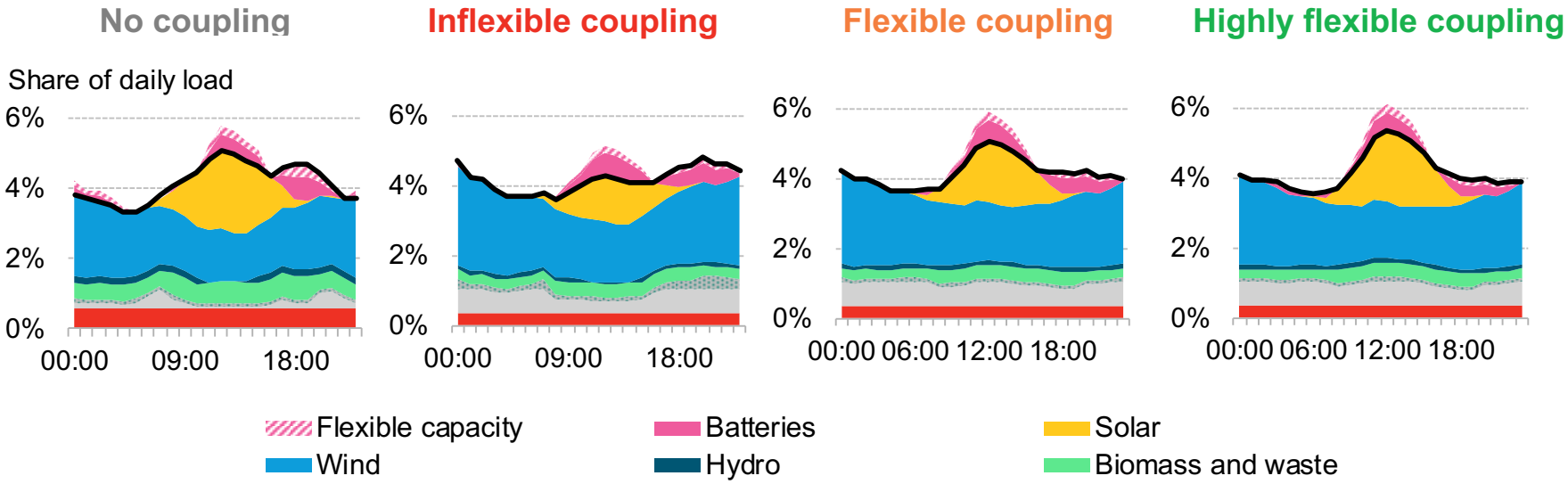
# A more complex and integrated grid




*Source: BloombergNEF*

# Impact on generation

## Generation profiles for U.K. across the scenarios: a low-wind winter day in 2050




*Source: BloombergNEF. Note: Demand line excludes battery charging and downward flexible capacity response*

# Additional Slides for reference

# REA REPORT: *Flexible Futures*

*Oct 2019*


## The need for power system *flexibility*

- Growth of renewable generation to meet Net Zero targets
- Growth in decentralised energy resources, also offering generation flexibility, storage and demand response
- Reduction in large "synchronous" generators and their flexibility services, for frequency, reserve, inertia, voltage, resilience
- Electric vehicles – expected rapid growth adding to demand

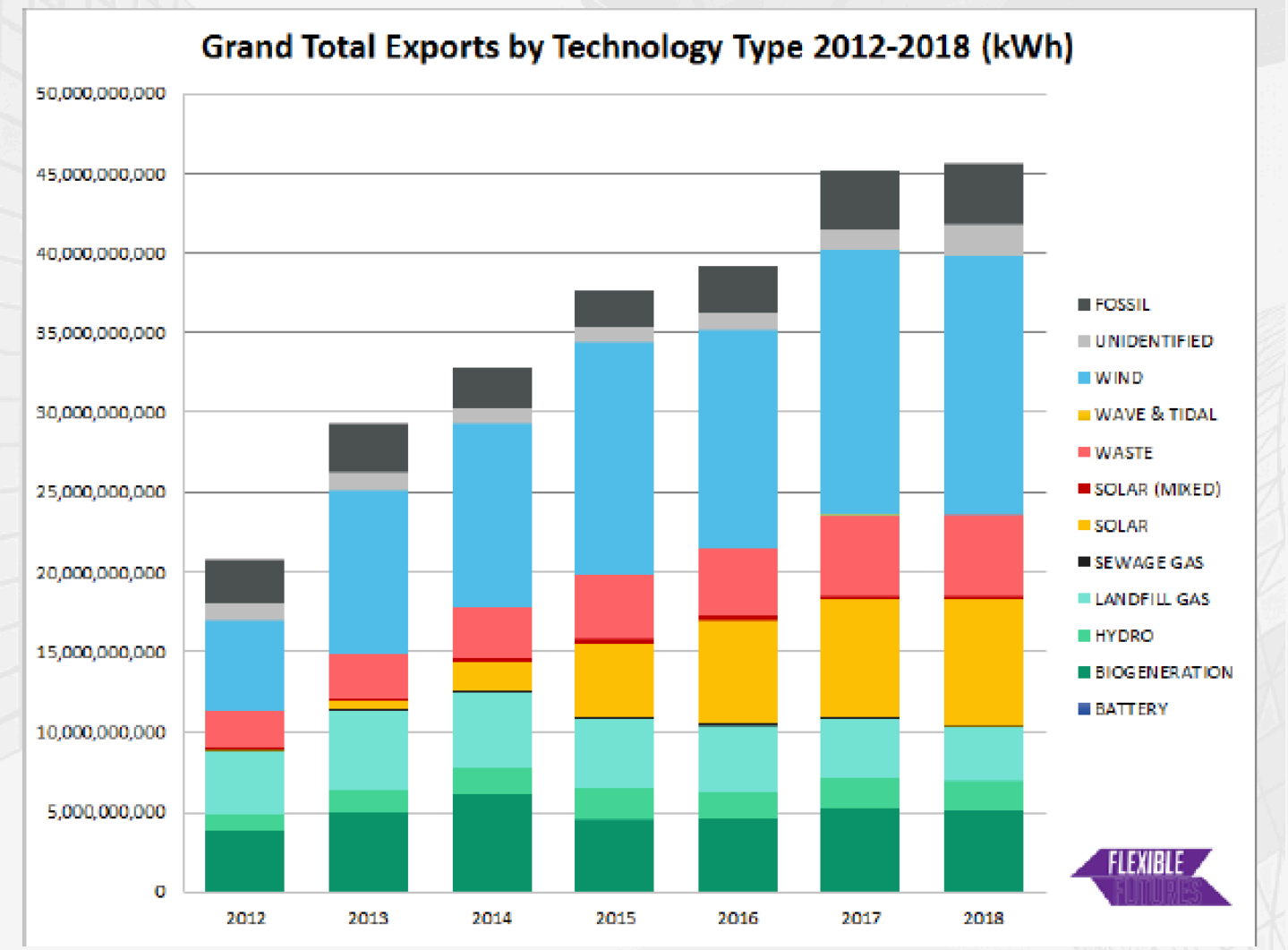
National Grid's latest **Future Energy Scenarios (FES)** forecasts between 14 and 28 GW of storage needed for 2050, from c 4GW today

**The National Infrastructure Commission** identify as much as £8 billion of savings per year by 2030 by utilising new flexibility services

***Decentralised & distributed*** **flexibility services** are expected to make a significant contribution to these savings

https://www.r-e-a.net/resources/flexible-futures-report/

# What's being exported to the Distributed Network? –III

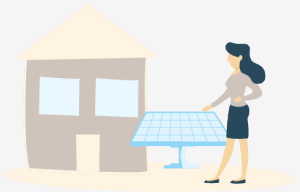


# The study identify FIVE Flexibility Customer Types

**Unengaged** – hasn't switched since 2012

**Somewhat engaged** – has switched at least once since 2012

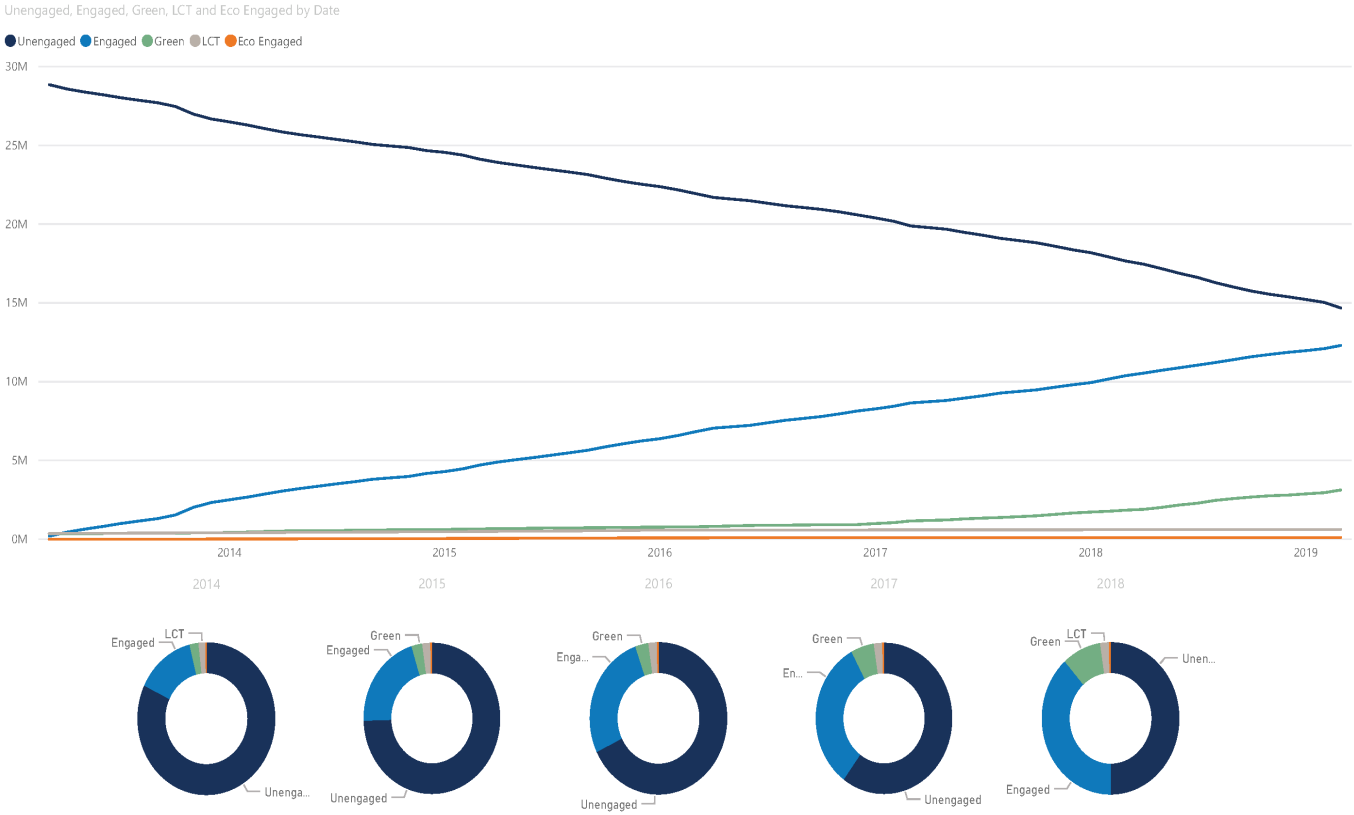
**Green** – has switched to a supplier that only offers 100% renewable **electricity** supply tariffs



**Green investor** – has installed a low-carbon technology since 2012 (Flexibility)

**'Eco-engaged'** – has both a 100% renewable power supplier and installed LCT (Flexibility)

# All customer trends from 2012

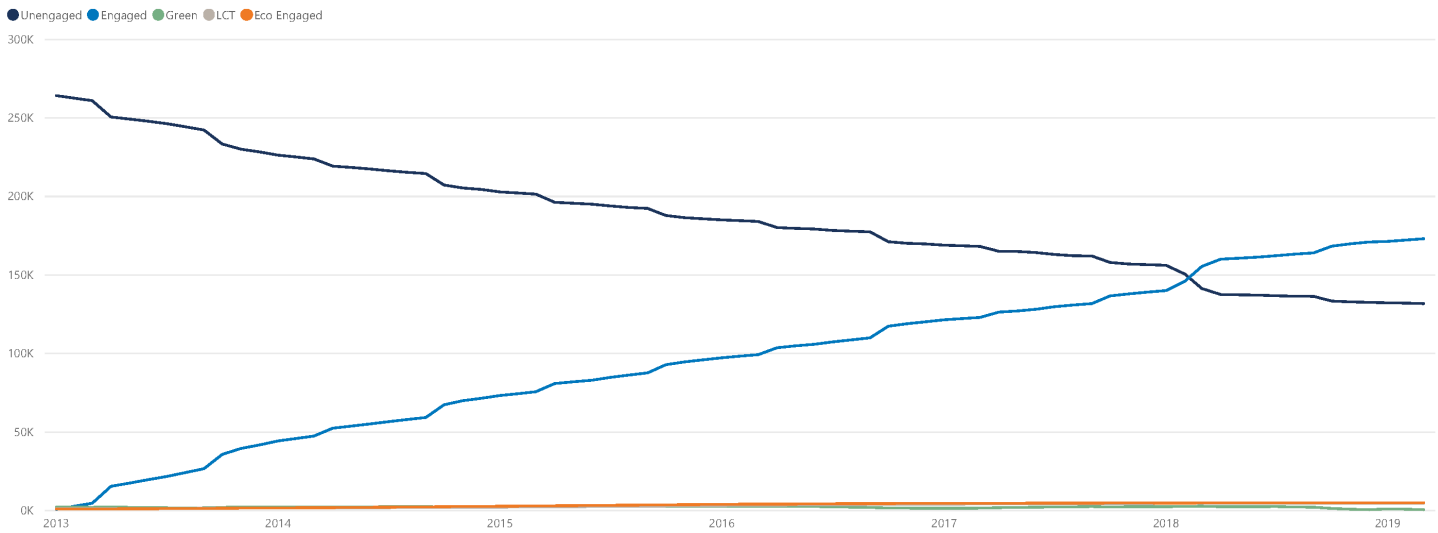


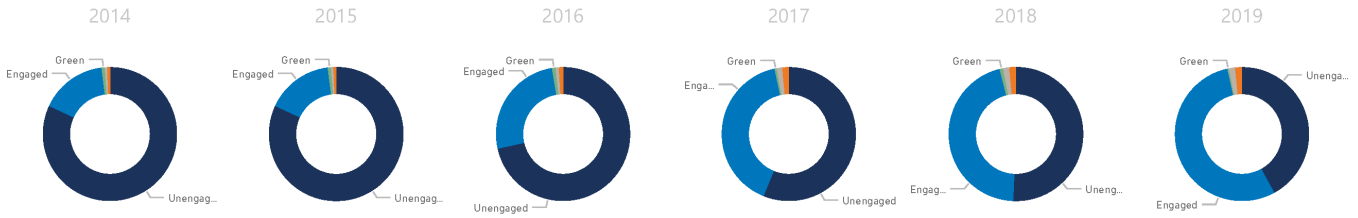

Almost 50% of customers have switched once since 2012

Almost 50% of customers are not engaged

Green tariff customers now total 3m

# Industrial & Commercial trends




Around 60% of customers have switched once since 2012

Around 40% of customers are not engaged

Adoption of LCT remains very low

Untapped Potential?

# Industrial & Commercial Green tariff and Low Carbon trends


LCT investors and ECO engaged are growing slowly post 2017

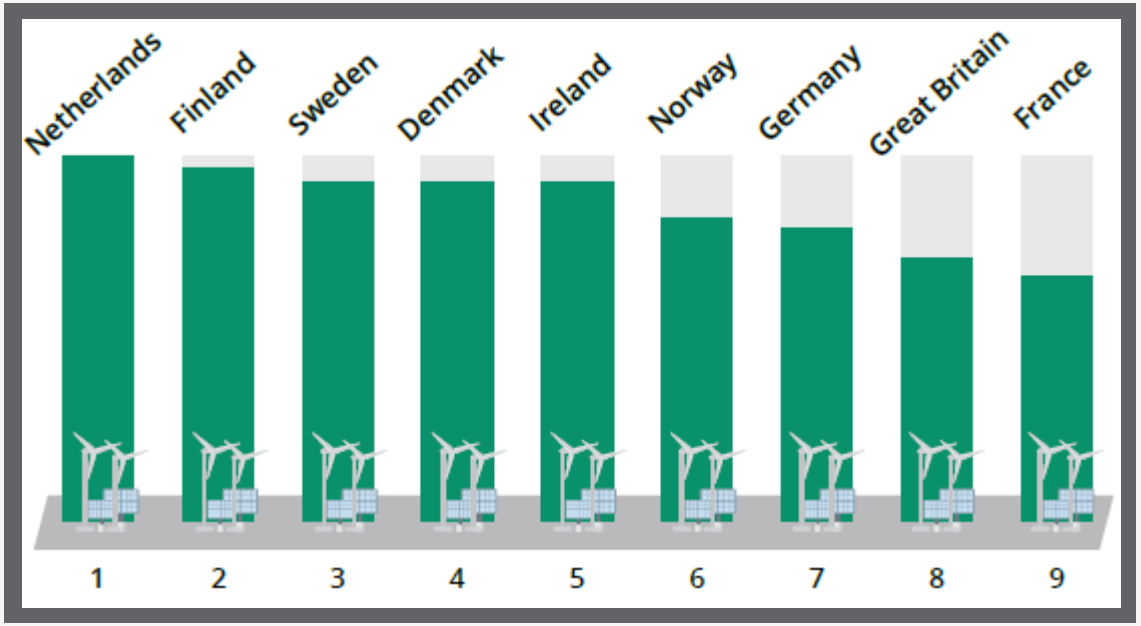
Our analysis shows that the majority of these customers originally had a green tariff

This appears to show a migration from green tariff to LCT investment.

This may also indicate the future potential to engage with flexibility services

# REA REPORT: Energy Transition *Readiness* Index

***Nov 2019***


## Transition factors

**Market access**
- Regulation enables fair access for all providers
- Trading - markets are open and effective
- Transaction costs are fair for flexibility

**Socio-political support**
- Flexibility needs are recognised
- Supportive political and public consensus
- Public policy and regulation aligned

**Technology potential**
- Grid accessibility
- EV Infrastructure deployment enabled
- Digitisation enabled
- Innovation enabled

https://www.r-e-a.net/wp-content/uploads/2019/11/Energy-Transition-Readiness-Index-2019.pdf