ENA

Institute for Alternative Policies

FOURTH INDUSTRIAL REVOLUTION

Challenges & Opportunities for Europe

Workshop Session 3: The 4IR & Climate Mitigation-Adaptation

Towards a Consumer Centric Approach

FORCE

Fourth Industrial Revolution: Challenges & Opportunities for Europe

THURSDAY 8 JULY 2021

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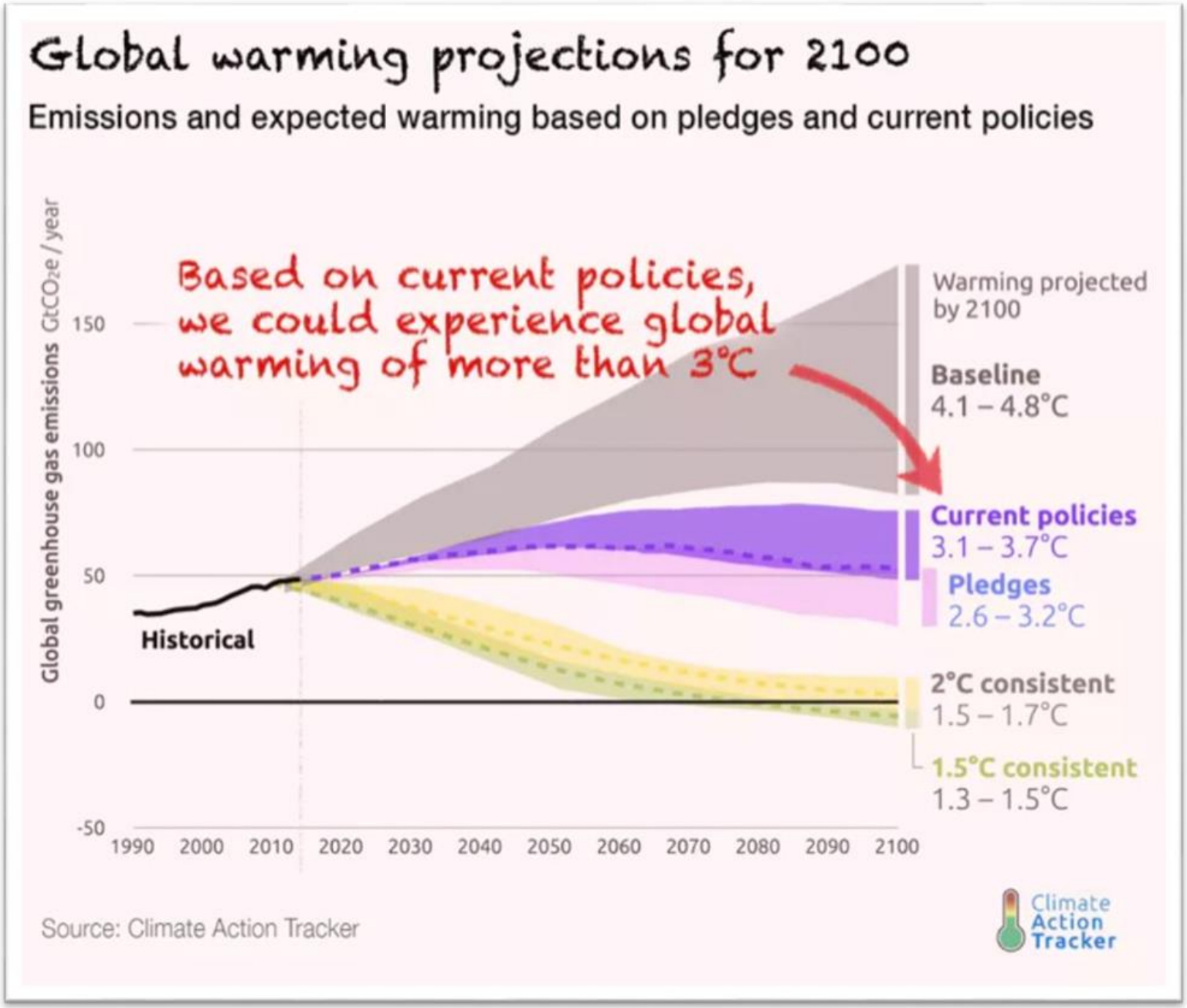
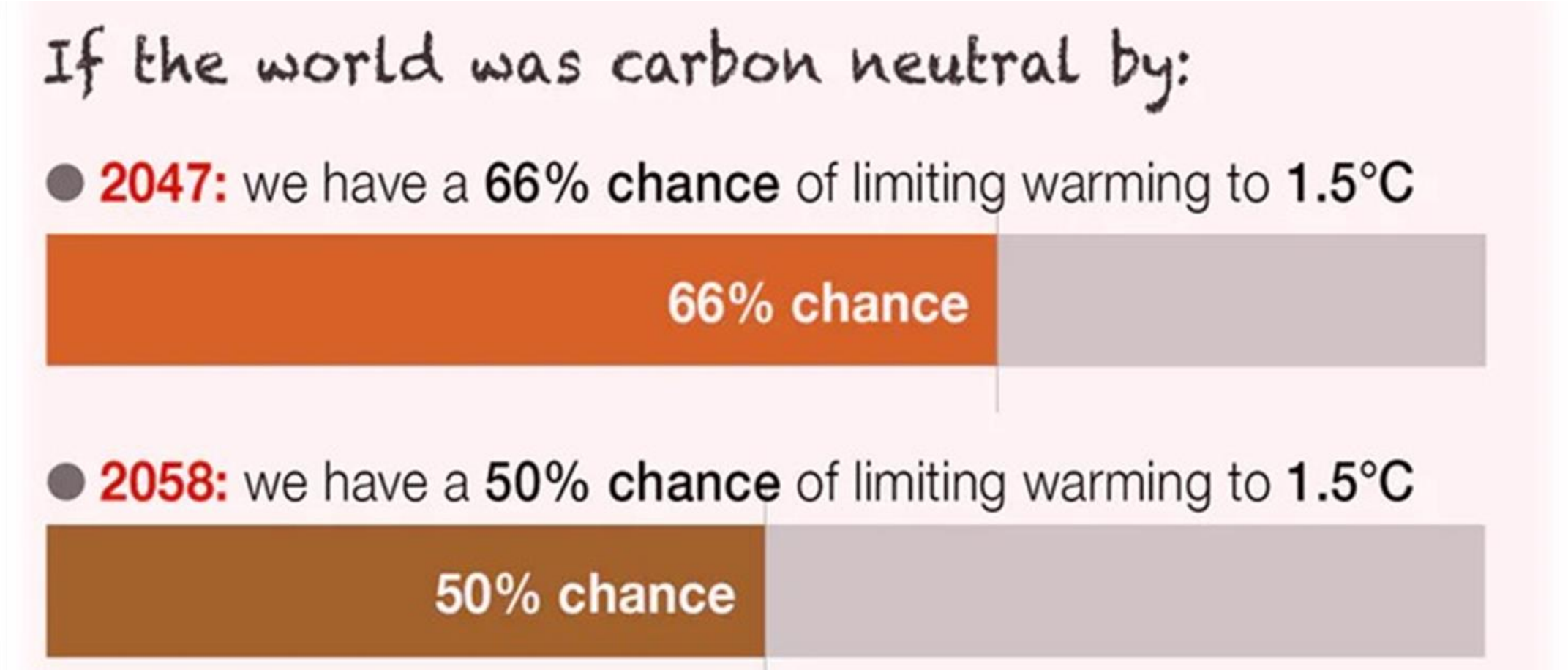


The Problem

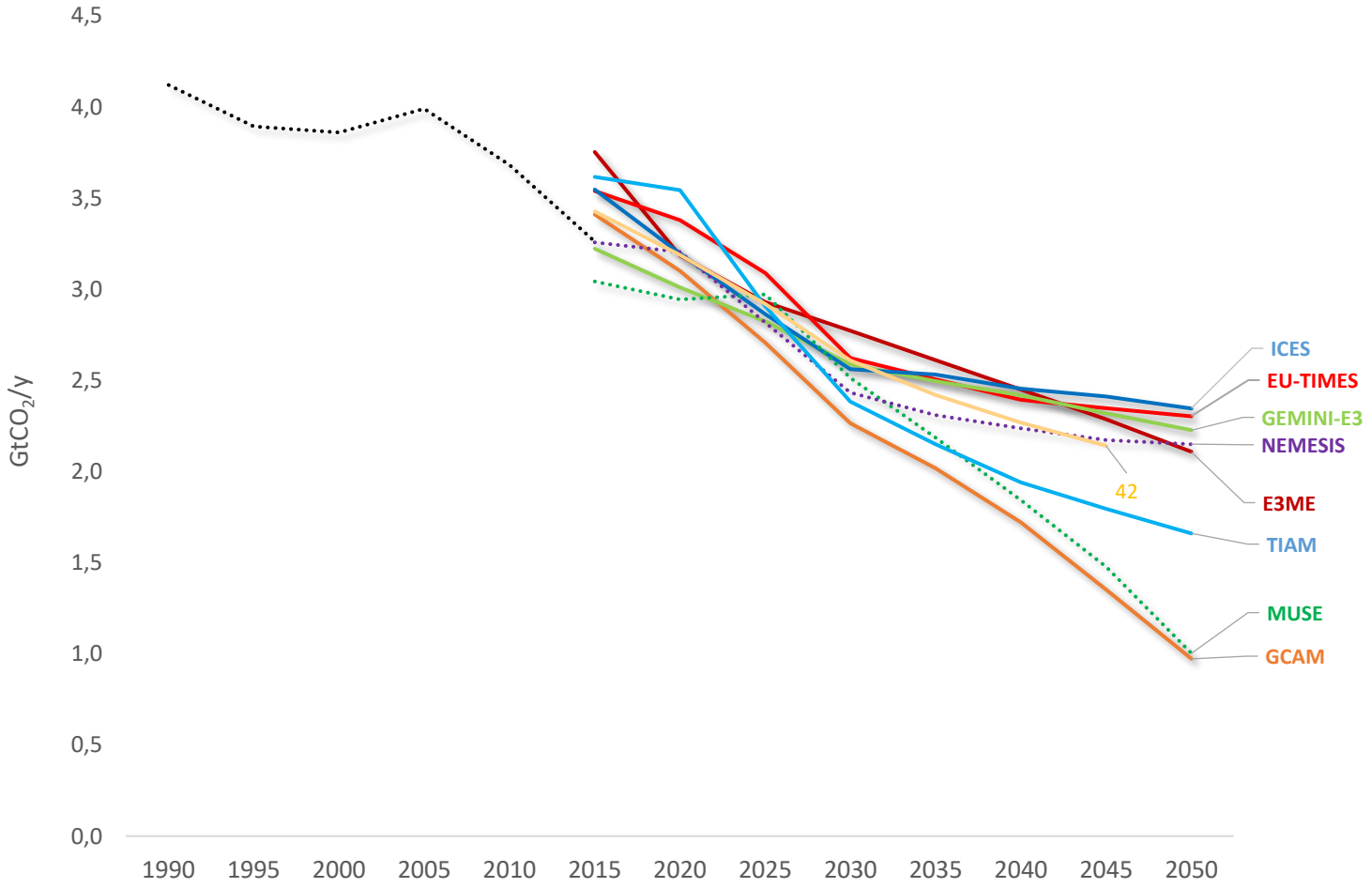
- CO_2 emissions – Doubled in comparison with pre-industrial levels

The Problem



Source: UN's 1.5 C special climate report

The Problem and where Europe Stands



- **GHGs 2030**
  - ✓ Previous Target (-40% from 1990)
  - x New Target (-55% from 1990): **-39% έως -51%**
- **CO_2 2050**
  - x With negative emission technologies: **1.0 – 1.65 $GtCO_2$**
  - x Without negative emission technologies : **2.1 – 2.35 $GtCO_2$**
- Globally, 2050 – **2.2°C με 2.9°C**.

PARIS REINFORCE

The Challenge

Installation of renewable energy sources

New role for the consumers

Decarbonization

Digitization

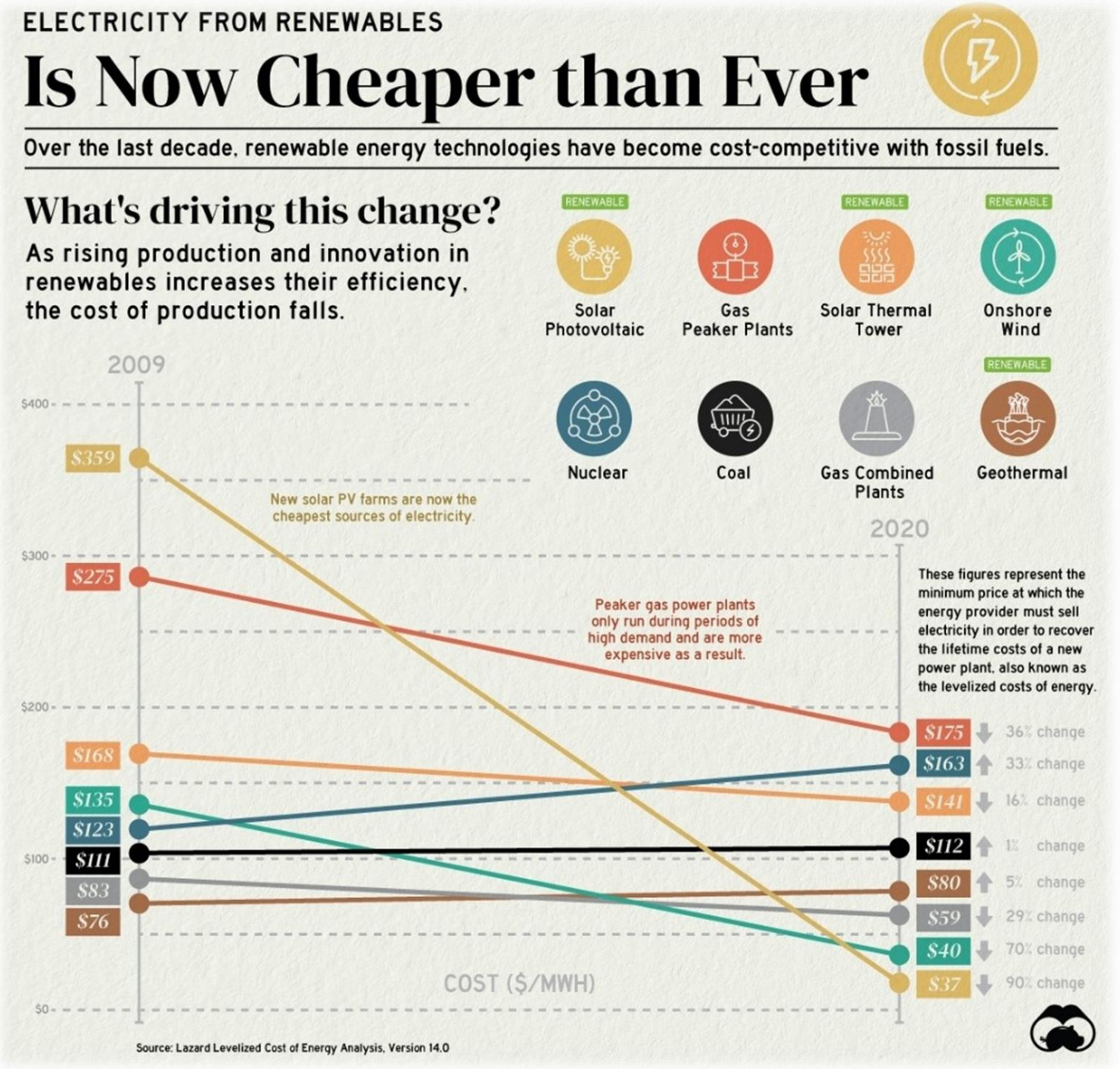
Decentralization

Democratization

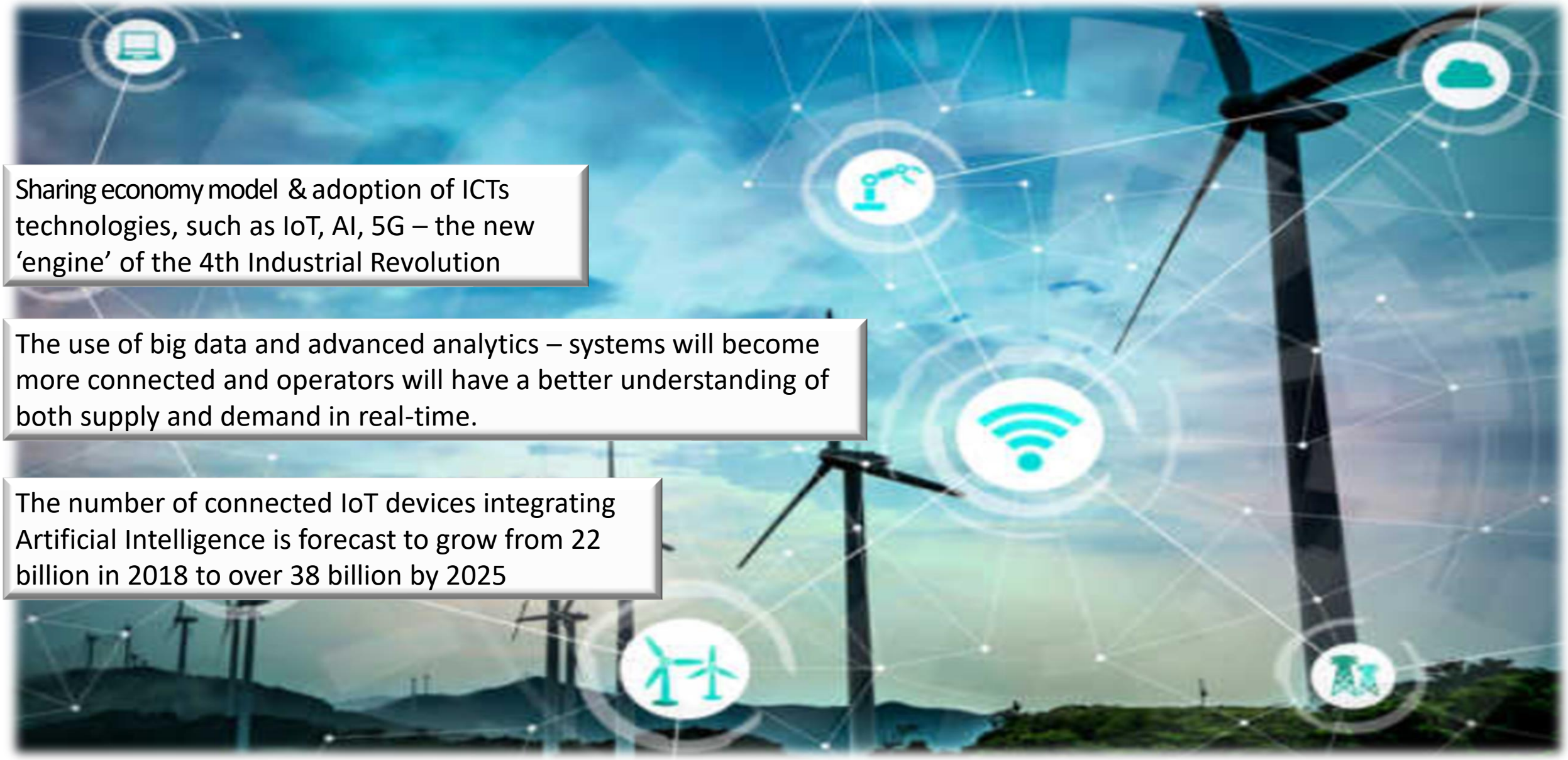
Decarbonization (1/2) of the energy system

Source: The European Power Sector in 2019, European Power Sector Up-to-Date Analysis on the Electricity Transition (March 2020), Agora Energiewende &Sandbag

Decarbonization (2/2) of the energy system



Digitization (1/3)



Sharing economy model & adoption of ICTs technologies, such as IoT, AI, 5G – the new ‘engine’ of the 4th Industrial Revolution

The use of big data and advanced analytics – systems will become more connected and operators will have a better understanding of both supply and demand in real-time.

The number of connected IoT devices integrating Artificial Intelligence is forecast to grow from 22 billion in 2018 to over 38 billion by 2025

Digitization (2/3)

Digitization (3/3)

The evolving energy landscape demands confidence

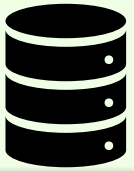
Volume

Data at Scale

Terabytes of records

Tables

Figures



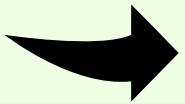
Velocity

Data in motion

Real/near-real

Streams

Processes



Variety

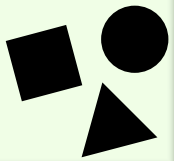
Data in many forms

Structured

Unstructured

Multi-factor

Dynamic



Veracity

Data in many forms

Authenticity

Origin reputation

Accountability

Availability

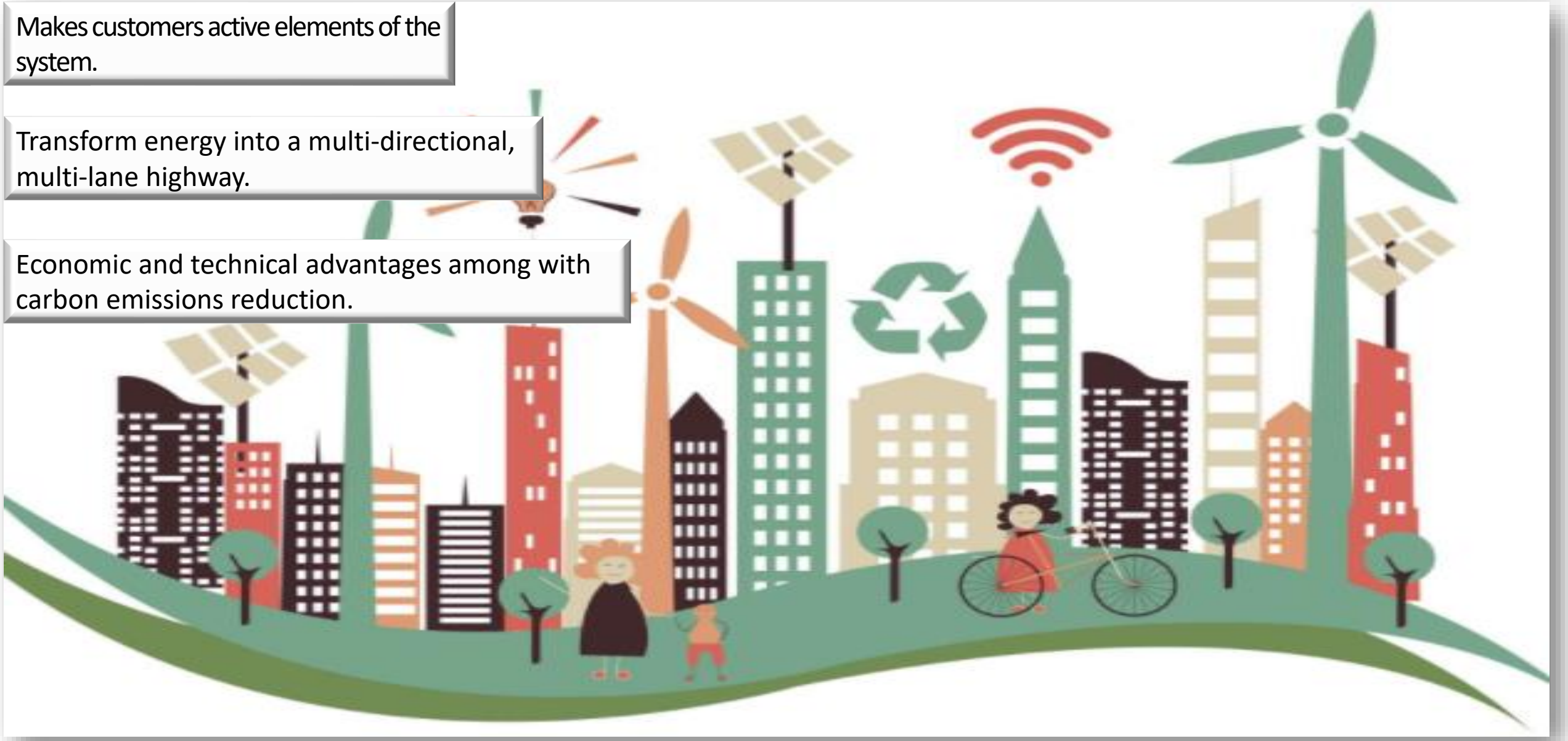
Trustworthiness

Decentralization (1/5)

Makes customers active elements of the system.

Transform energy into a multi-directional, multi-lane highway.

Economic and technical advantages among with carbon emissions reduction.



Decentralization (2/5)

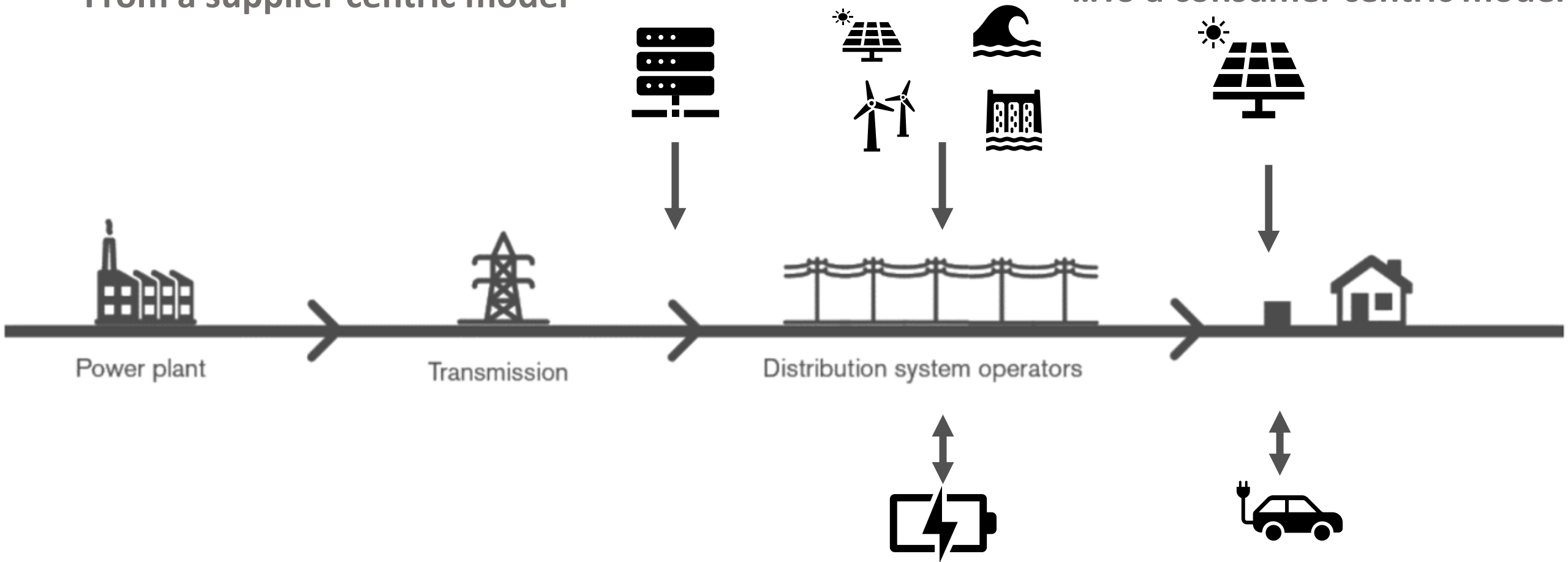
Growing Responsibilities of Operators

Before

From a supplier centric model

Current challenges

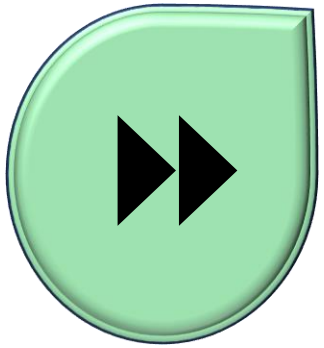
…To a consumer centric model



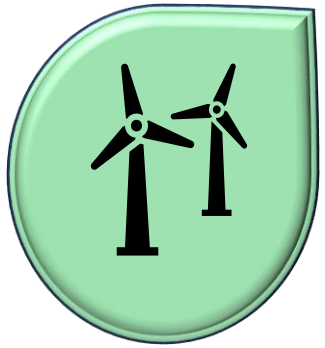
Decentralization (3/5)

How to achieve decentralised energy market?

Transition architecture for low-carbon energy system

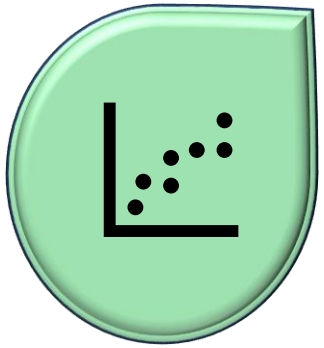


Energy mix with **integration of RES** and alternative fuels



Increased **flexibility** and **reliability** of performance

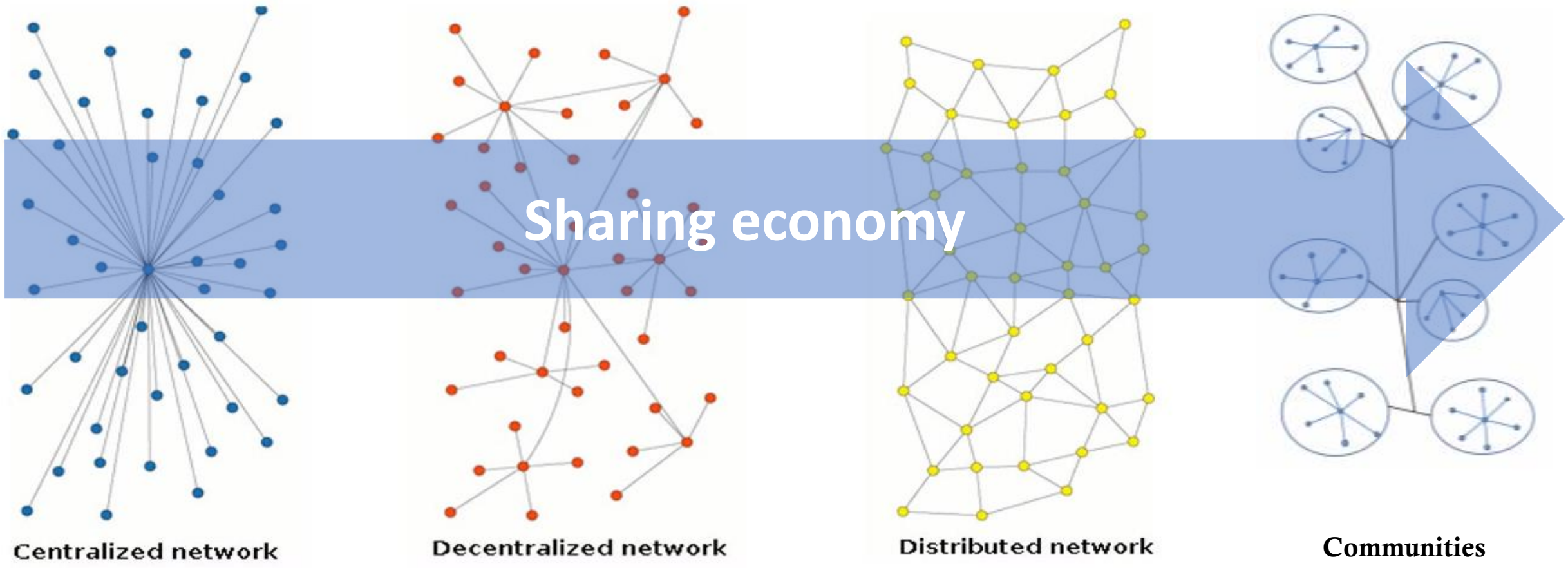
Extensive use of **data analytics** to empower users

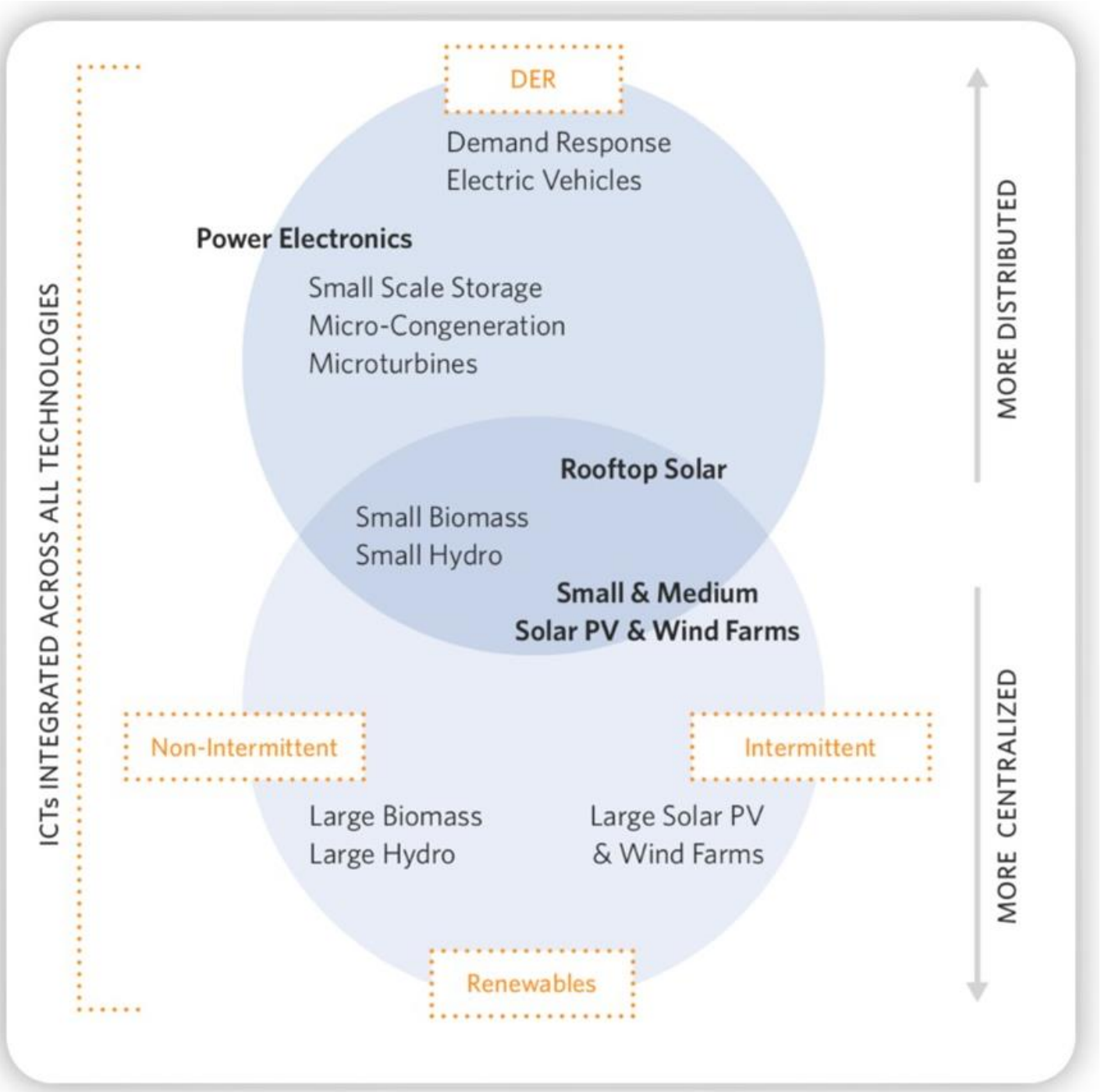


Virtual Power Plant

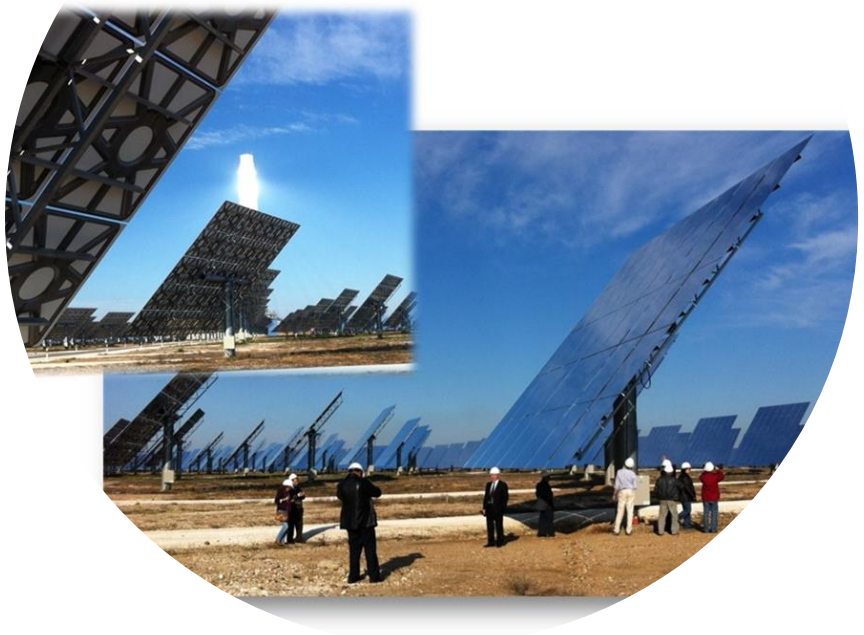
Decentralization (4/5)

Organisation of consumer-centric electricity markets





Decentralization (5/5)

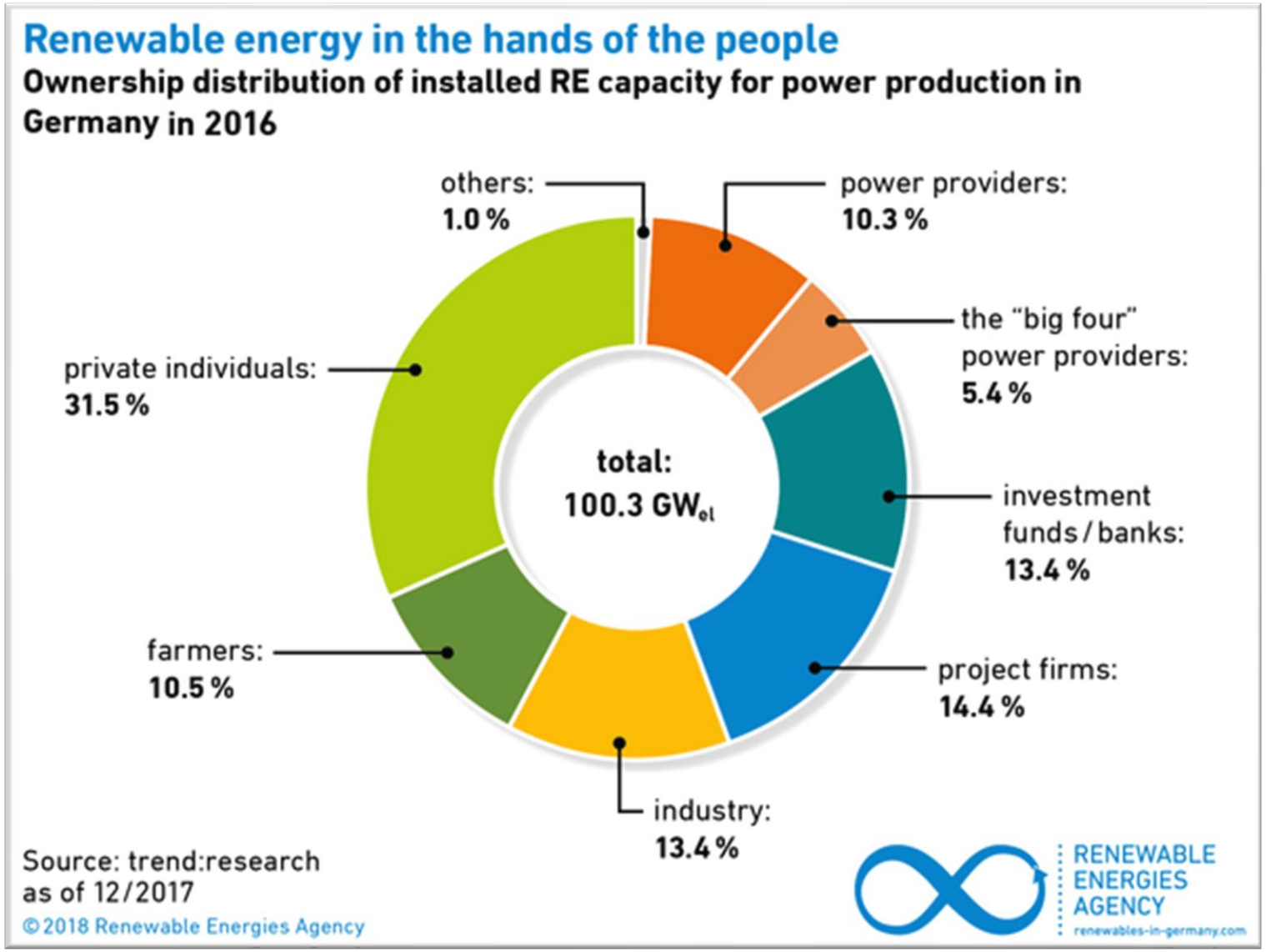


Centralized renewables

Decentralized Renewables

Distributed Renewables

Brooklyn Microgrid could be a game changer



Democratization (1/5)

Democratization (2/5)

From CONsumers to PROsumers

Democratization (3/5)
Prosumers Overview

Households

-Grid connected with on-site PV, storage systems and flexible load
-Grid connected with offsite DER
-Off grid households

Commercial Buildings

-Onsite DER and flexible load

-Corporate sourcing of RES

Industry

-Onsite DER and flexible load

-Corporate sourcing of RES

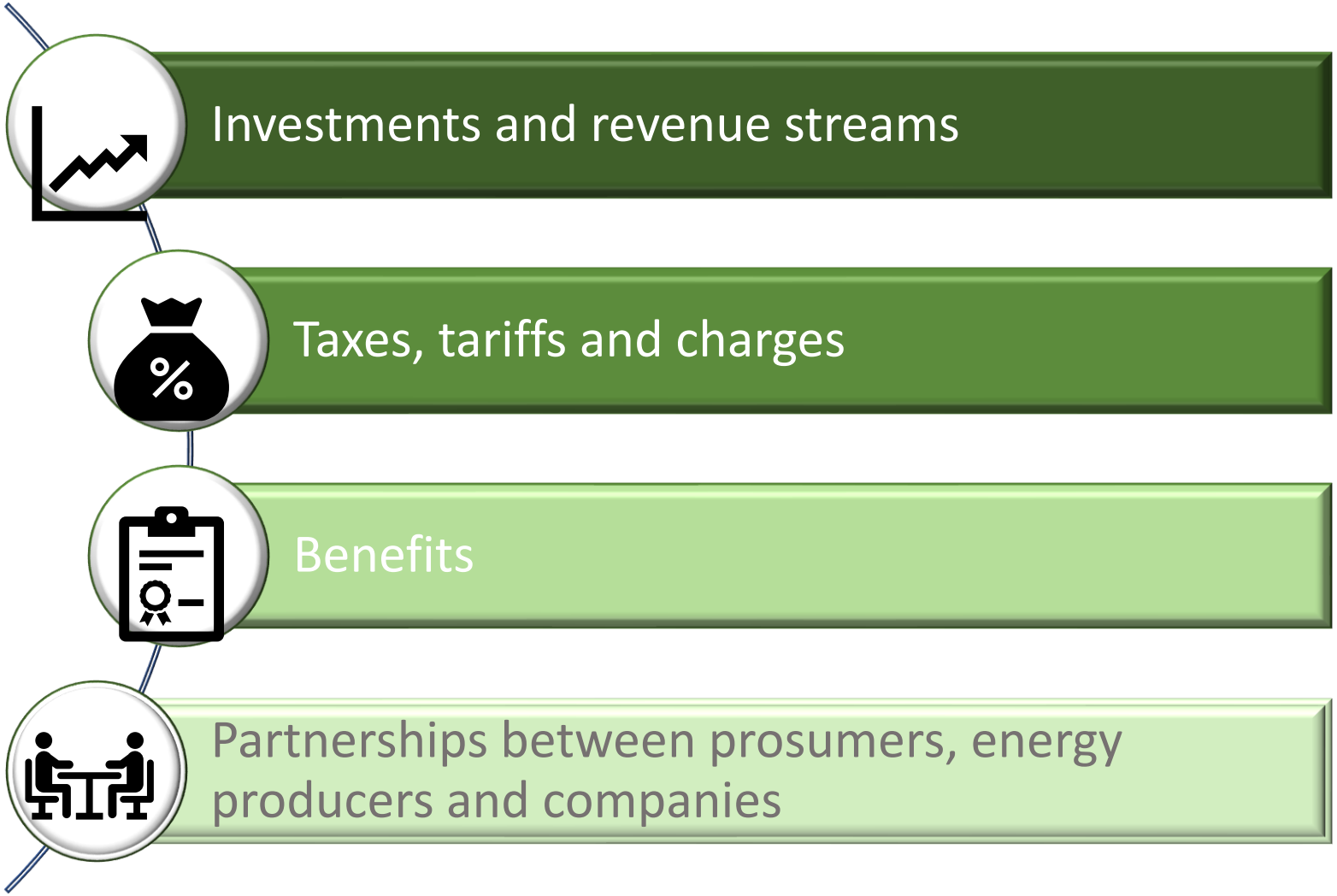
Communities

-Energy Communities

-Virtual Energy Communities

Democratization (4/5)

Prosumers' drivers



Democratization (5/5)

Intelligent Energy Management

…to make customers active elements of the system

Carbon Reduction

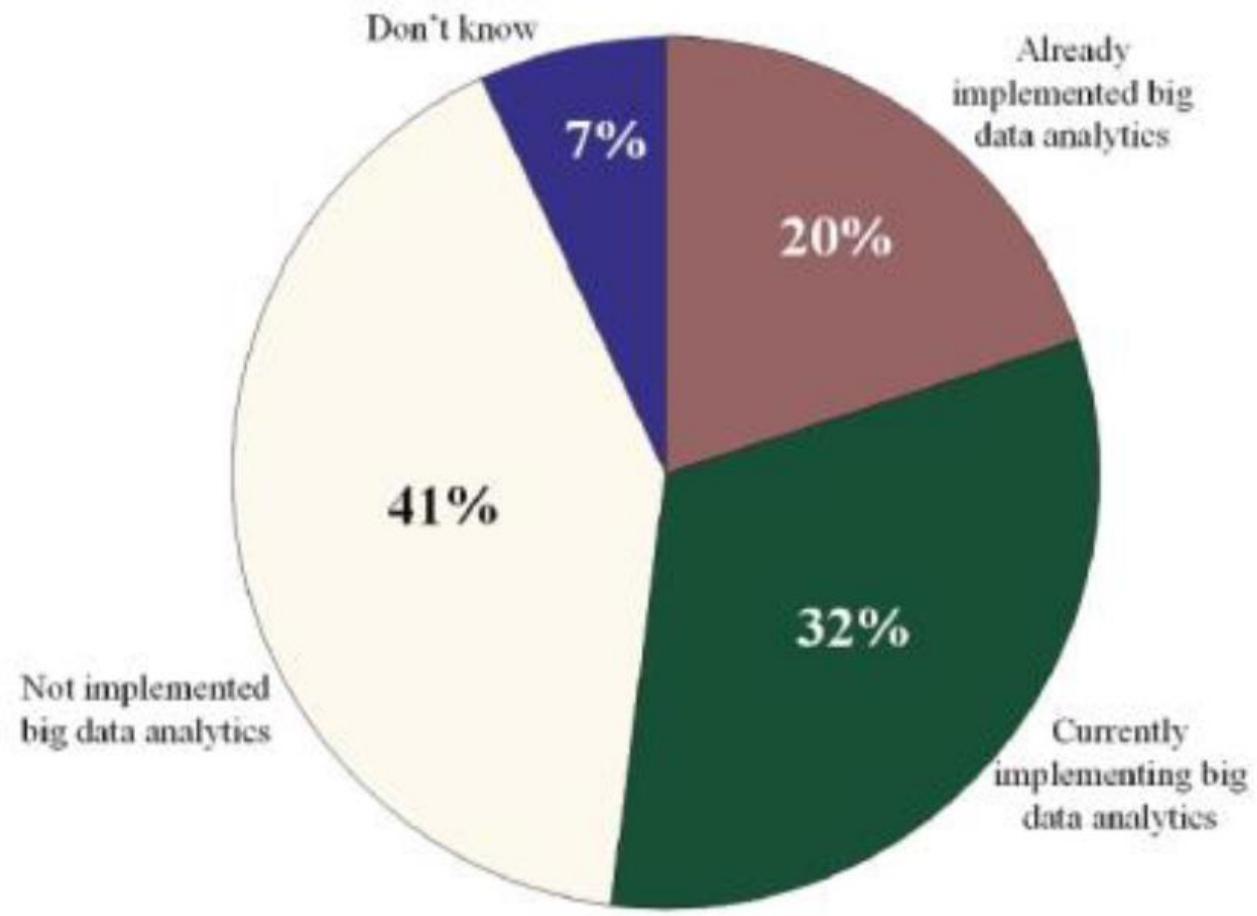
Data integration

Data forecasting

Action plans development

Decision making

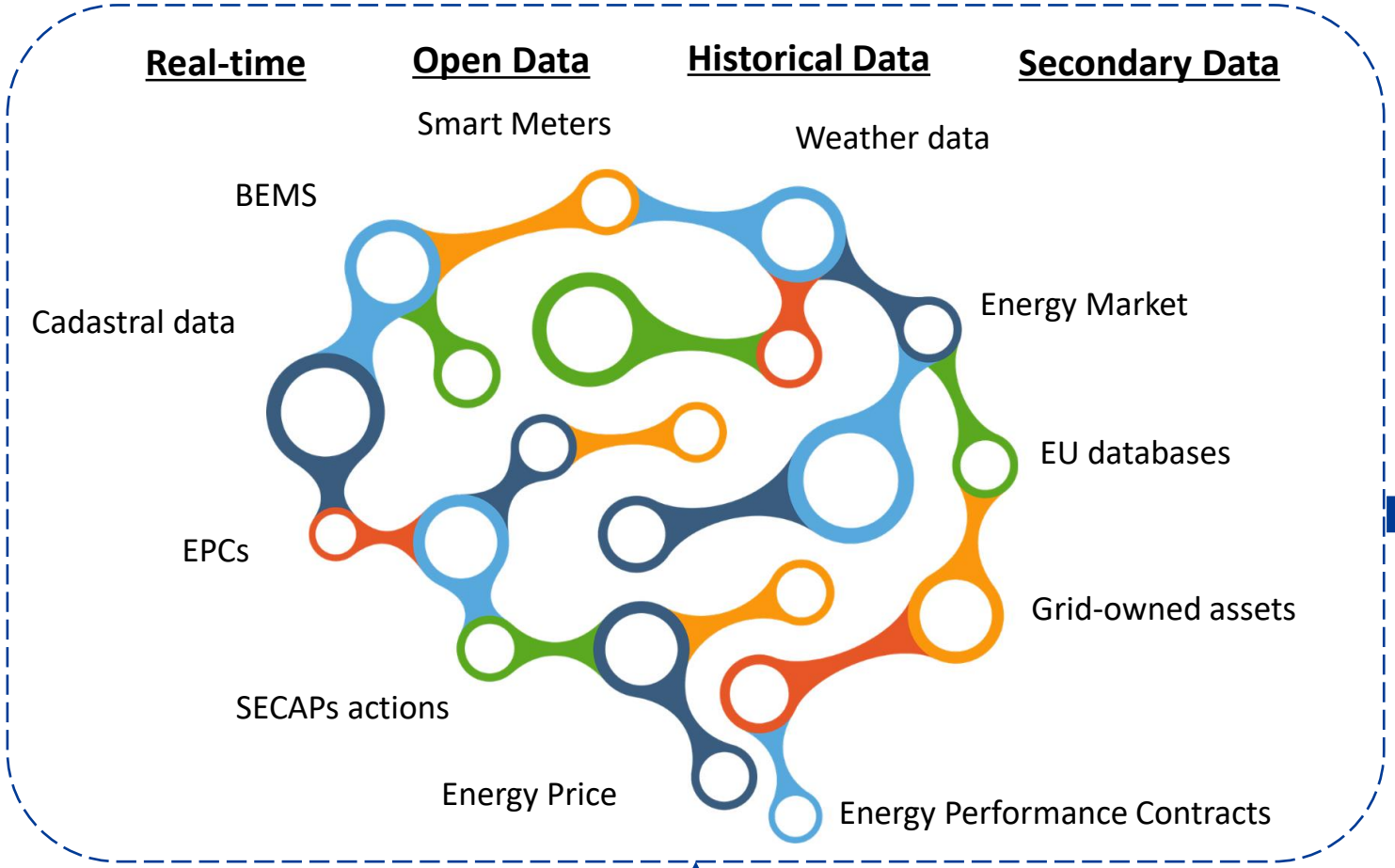
Source: "Enabling Local Authorities to Produce Short-Term Energy Plans: A Multidisciplinary Decision Support Approach", Management of Environmental Quality Journal, Vol. 27 Iss 2, pp. 146 - 166, 2016.



Current status of big data implementation in electric utilities

N. Mohamed, S. Lazarova-Molnar, I. Jawhar, and J. Al-Jaroodi, "Towards service-oriented middleware for fog and cloud integrated cyber physical systems,"in Proc. IEEE 37th International Conference on Distributed Computing Systems Workshops (ICDCSW), 2017, pp. 67–74.

Data is everywhere - How to support prosumers



Multi-scale & Multi-stakeholder approach

Beneficiaries

ENERGY VALUE CHAIN

Generators; Suppliers; TSOs; DSOs; Aggregators; Consumers, ESCOs, IFIs, Banks, Off-grid data/solution providers, etc.

The BD4NRG PROJECT….

Decentralized energy data-driven ecosystem, consisting of a federation of **distributed Data Hubs**

Standardised way to collect and analyse data

Open Modular Big Data Analytics Energy Toolbox

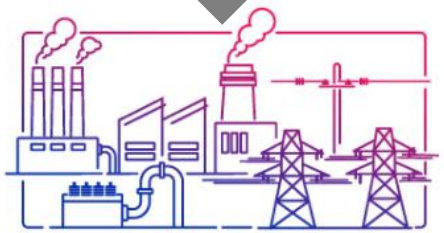
BD4NRG

Data Governance Middleware

Big Data Management & Modelling

Big Data Smart Grid Service Analytics

Data/AI Models/ Edge Resources Marketplace



Operation of Electricity Networks

Management of Distributed Energy Resources

Investments & Efficiency In Buildings

www.bd4nrg.eu

BD4NRG project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement No 872613

Towards consumer centric holistic approach…

- ✓ **Precise understanding of data nature** and **radically new digital technologies**
- ✓ **Combined data from different domains with open source toolboxes**
- ✓ **Smart grid-tailored near real time energy-specific open analytics modular frameworks**
- ✓ **Open source highly distributed interoperability reference architectures**
- ✓ **Safe, reliable, resilient and affordable solutions**

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Thank you for your attention!

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