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New Outlook for Energy Efficiency

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COP 25 Madrid – Spain (Dec 05th, 2019)

Side Event: Energy Efficiency, Renewable Energy and Investment Projects

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ENERGY

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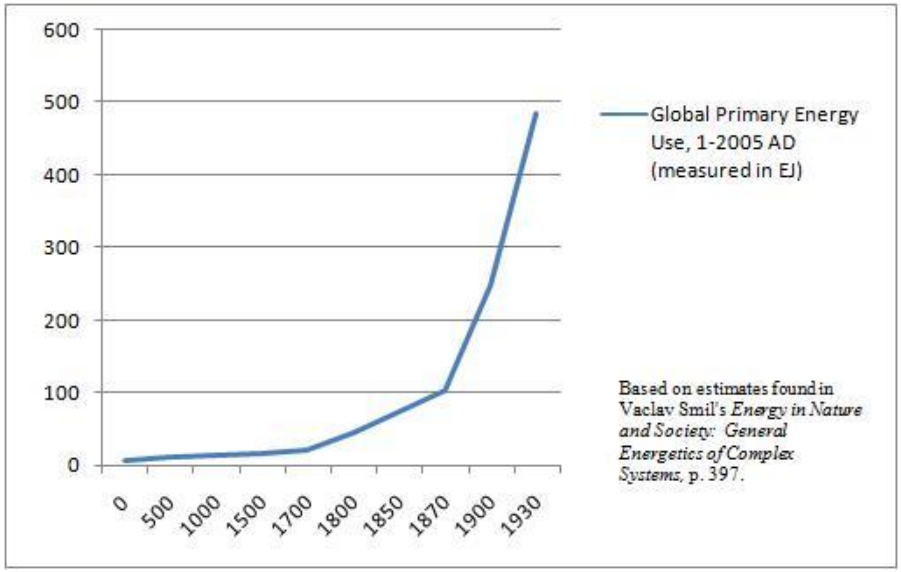
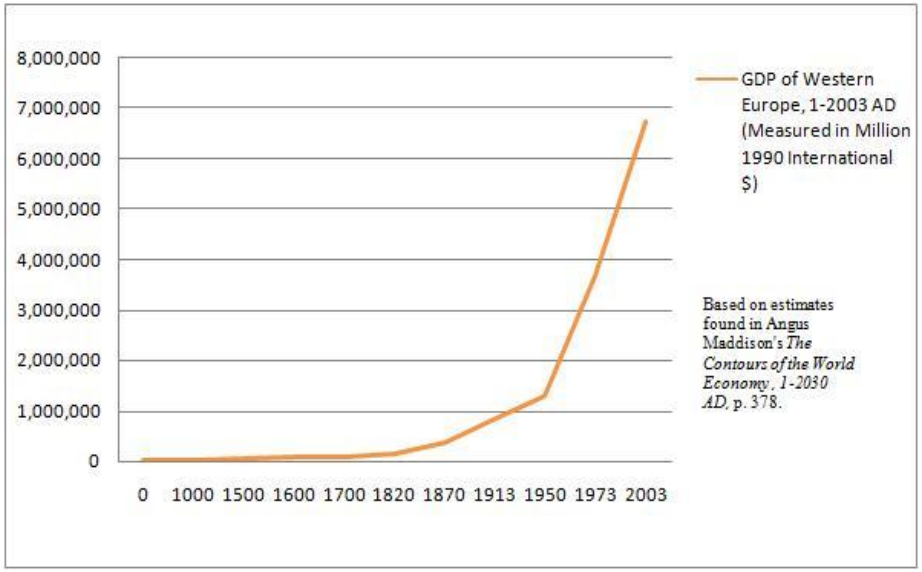
Primary Energy Consumption



GDP Europa



THREE WAYS OF EXCEEDING ENERGY CAPACITY

1. Combine your energy expenditure with that of other humans
2. Appropriating fruits of the energy expenditure of other human beings
3. Control a non-human energy source

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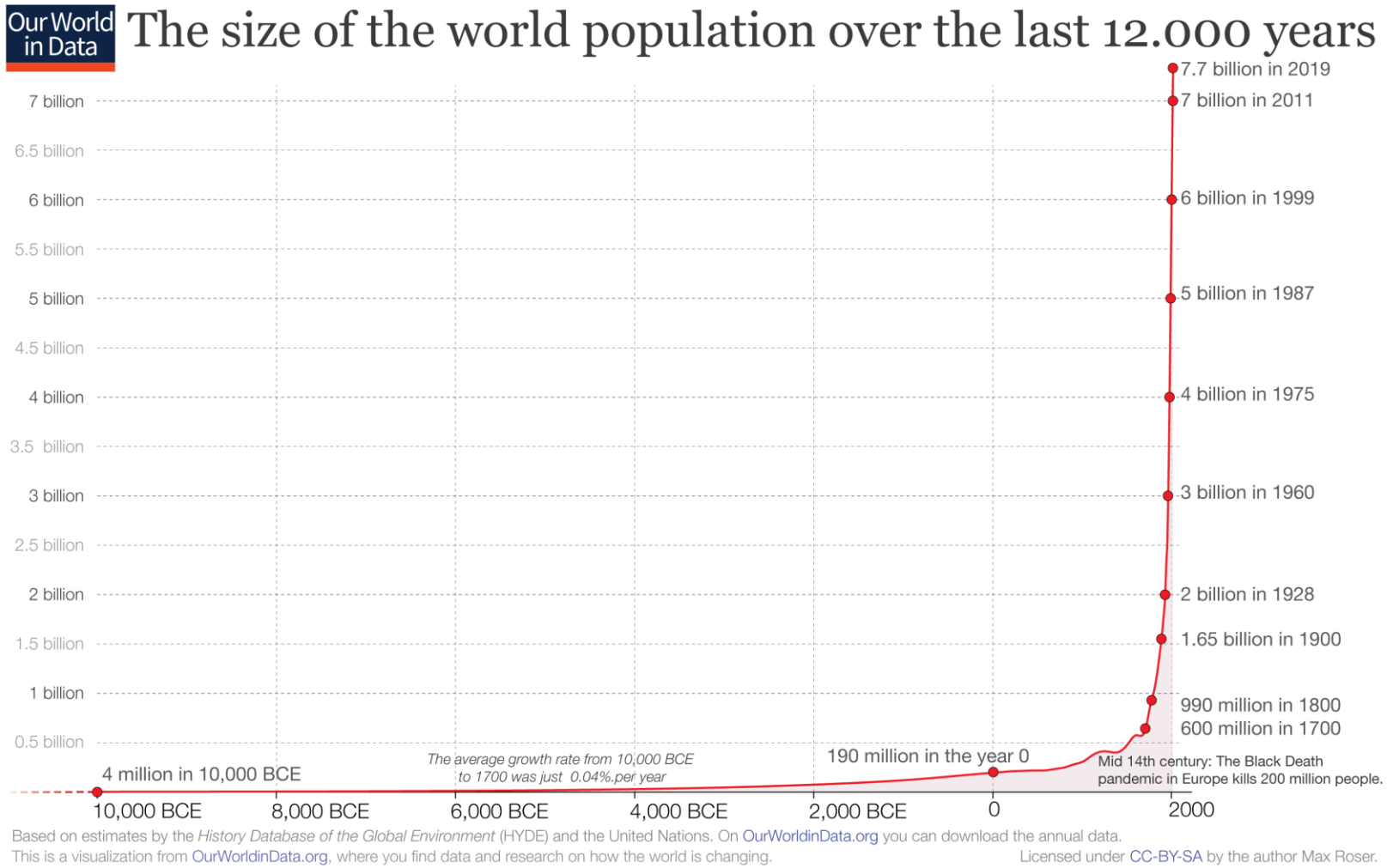

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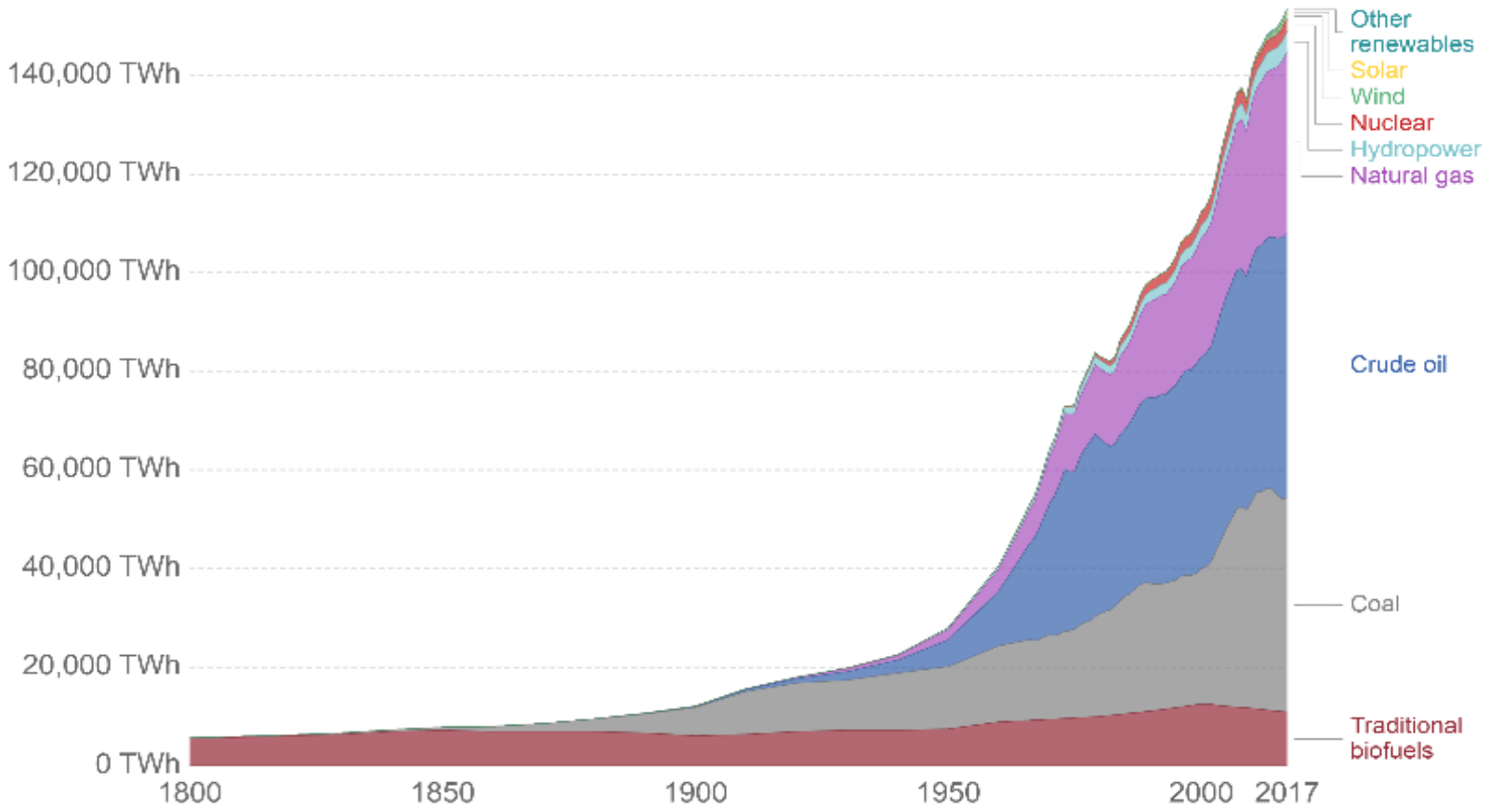
Global primary energy consumption

Global primary energy consumption, measured in terawatt-hours (TWh) per year. Here 'other renewables' are renewable technologies not including solar, wind, hydropower and traditional biofuels.



Source: Our World Big Data

CLIMATE CHANGE

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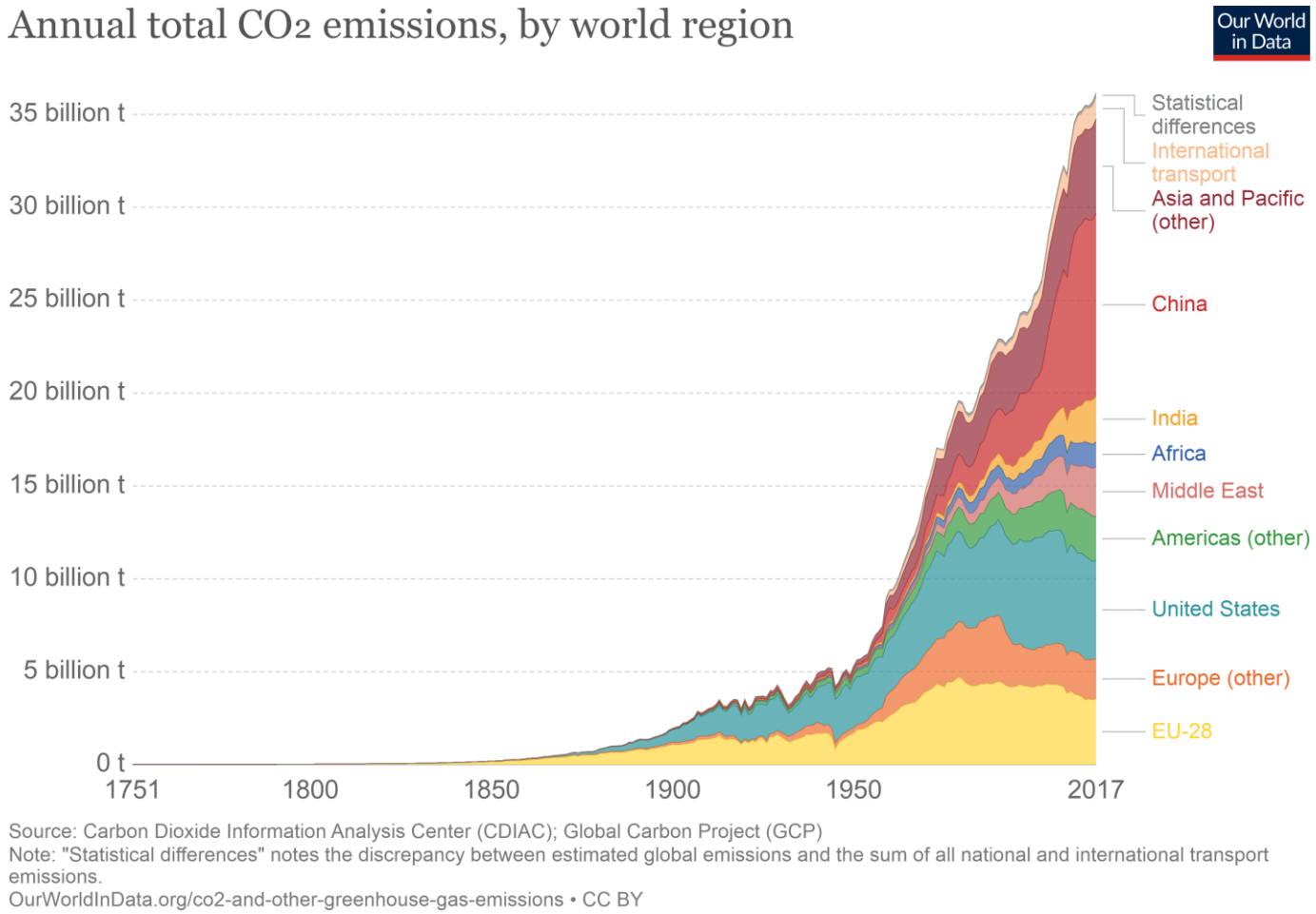

Source: Our World Big Data

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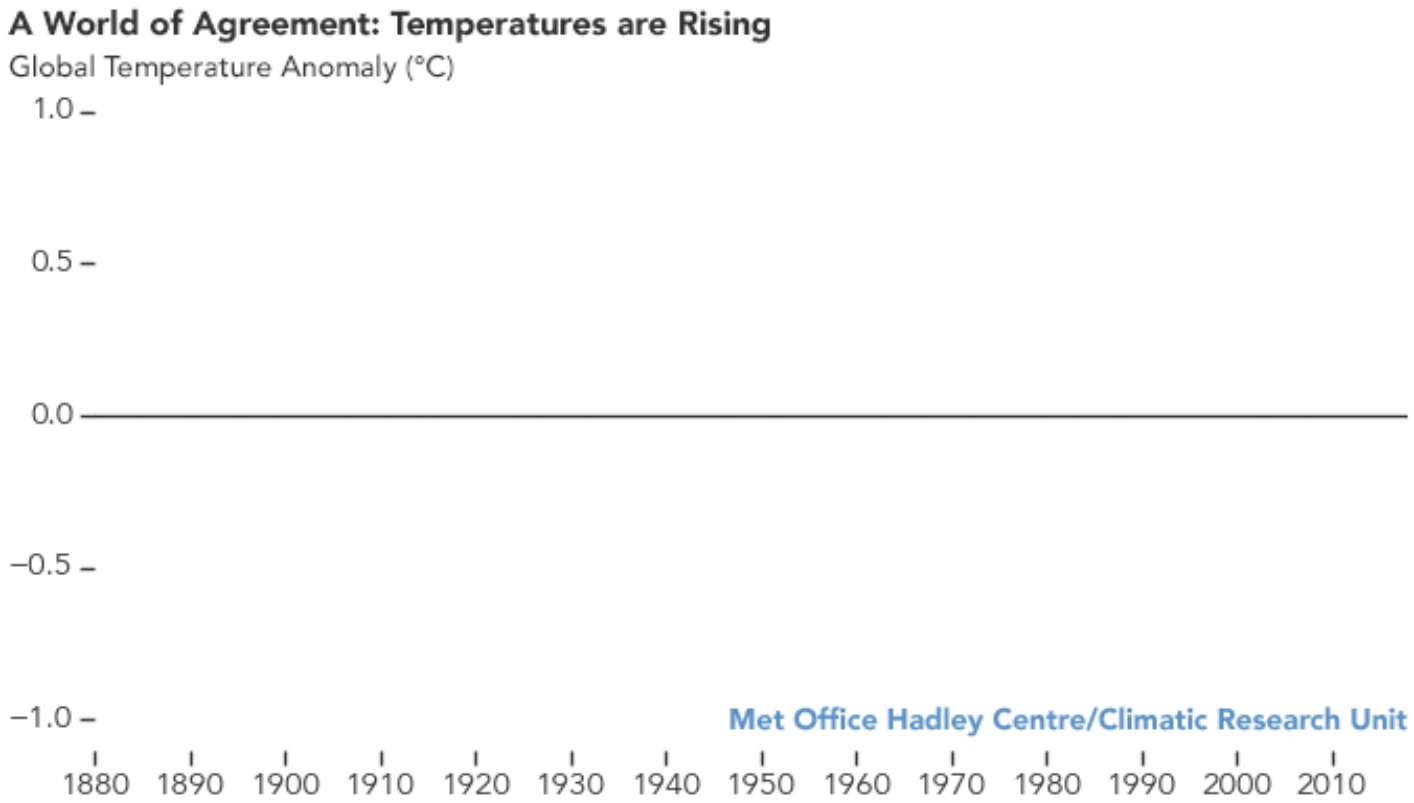

Source: NASA

DISRUPTIVE

INNOVATION

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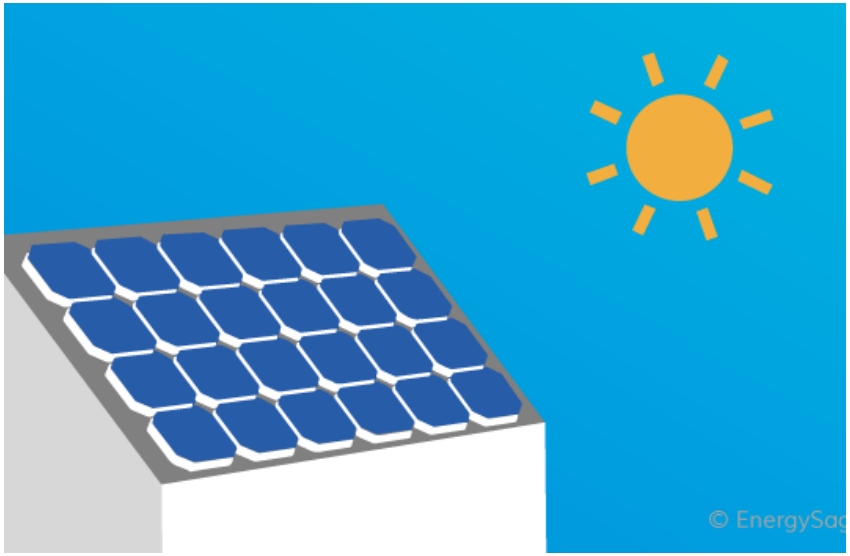

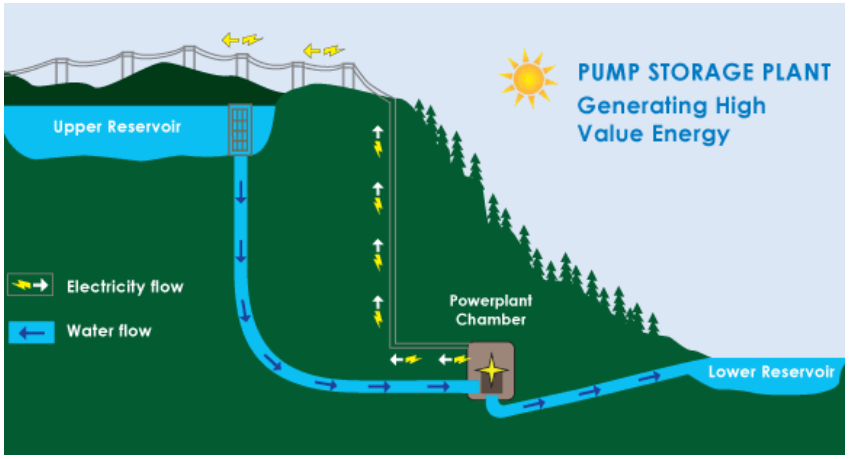

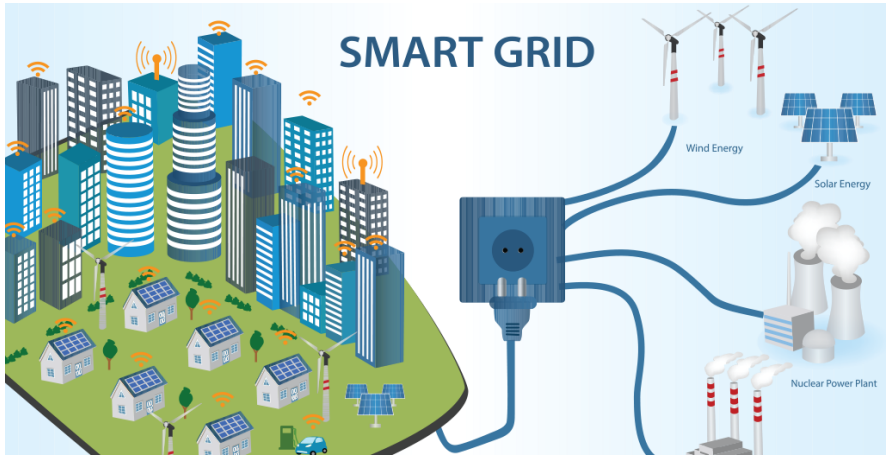

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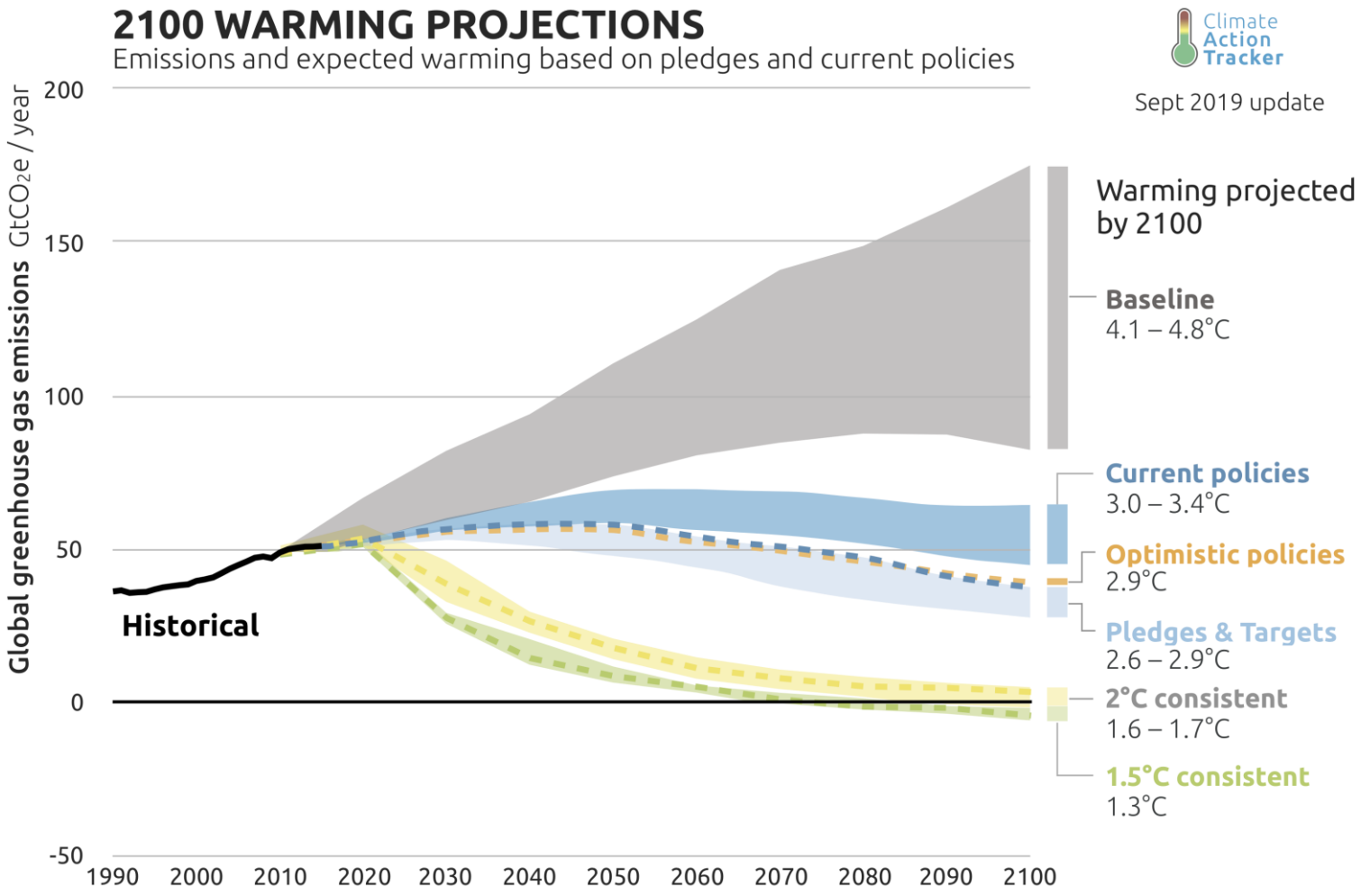

Source: ClimateActionTracker

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Transforming The Energy System, by IRENA (2019)

In response to the threat of climate change, countries around the world have pledged to invest in low-carbon energy. National plans and investment patterns, however, show a stark mismatch with the pathway to meet the commitments set out in the Paris Agreement, which would keep the rise in global temperatures well below 2 degrees (°C) and ideally hold the line at 1.5°C.

At least USD 95 trillion worth of energy investments are planned worldwide until mid-century. These must rise to USD 110 trillion to climate-proof the energy mix, IRENA analysis shows. At the same time, planned fossil-fuel investments must be substantially redirected, with annual investments in renewables more than doubled for the coming decade.

Renewables and efficiency together offer the most realistic way to cut energy-related carbon-dioxide emissions in the timeframe identified by the Intergovernmental Panel on Climate Change. Combined with rapid electrification, they can achieve over nine-tenths of the reductions needed.

Transforming the energy system is not only about installing renewables. It is about investing in more flexible infrastructure. It is about rethinking current plans to avoid stranding assets in outdated systems. Aligning energy investments with broader socio-economic policies can ensure just and timely changes that leave no one behind.

IRENA
International Renewable Energy Agency

FOREWORD
from the IRENA Director-General

Source: IRENA

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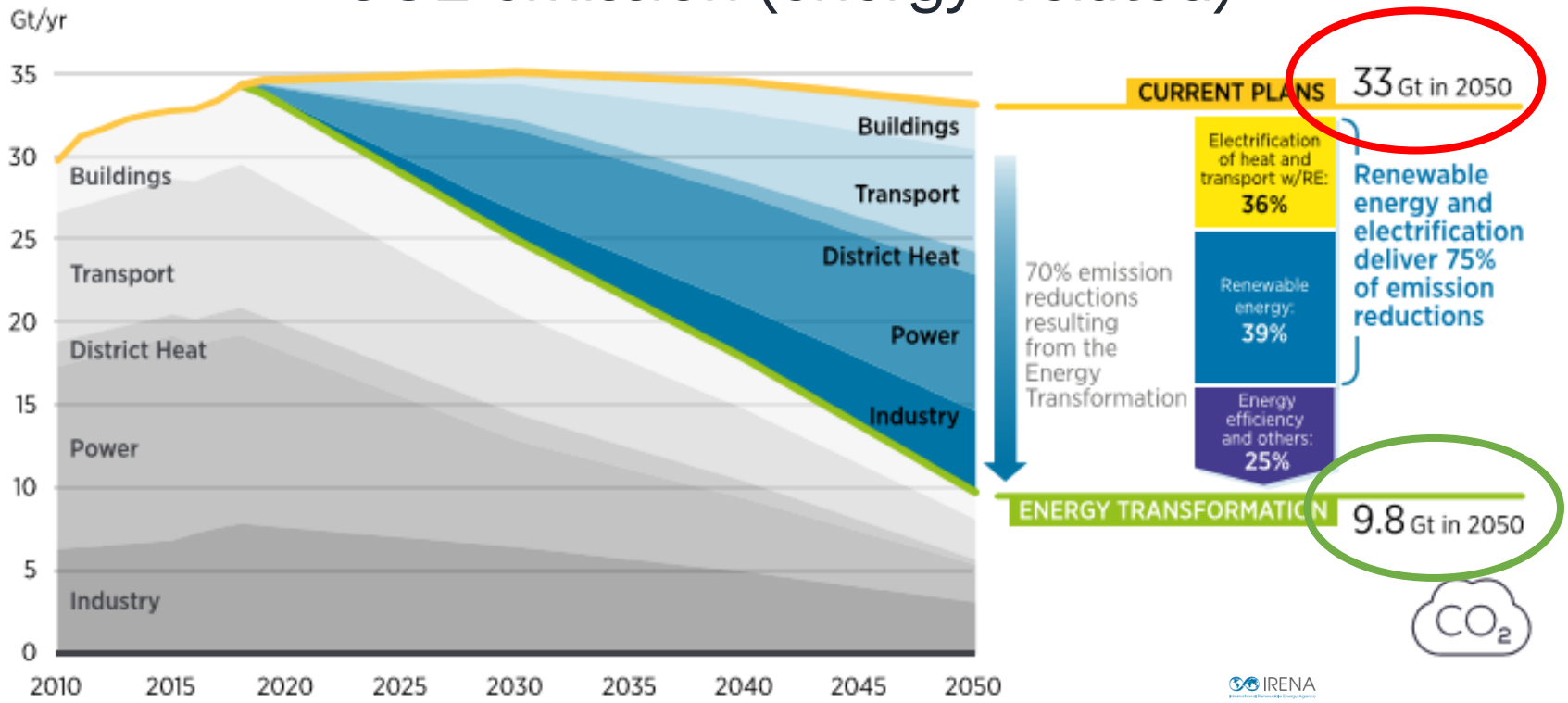
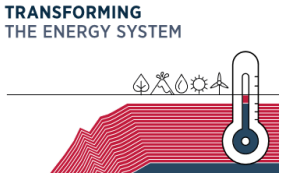
CO2 emission (energy-related)



Based on IRENA, 2019b.

Transforming The Energy System, by IRENA (2019)



Source: IRENA

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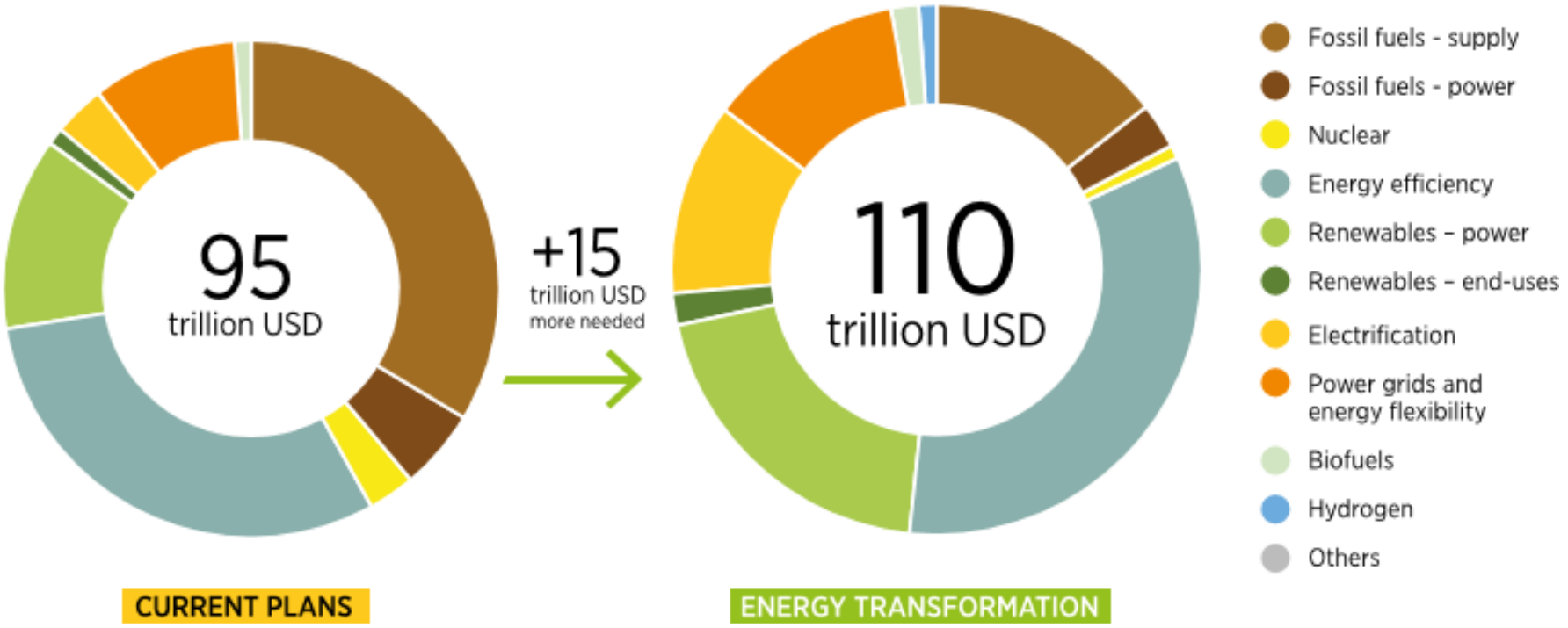
Cumulative Investments



Source: IRENA analysis.

Source: IRENA

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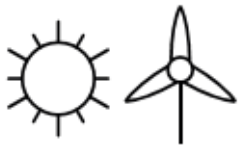
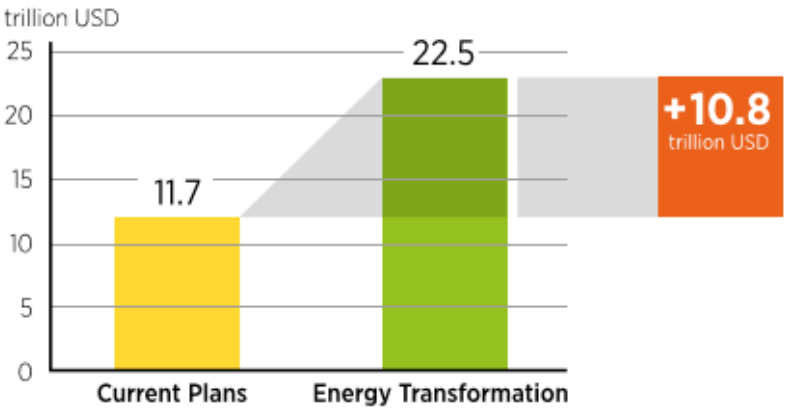
Renweables and Power Grid

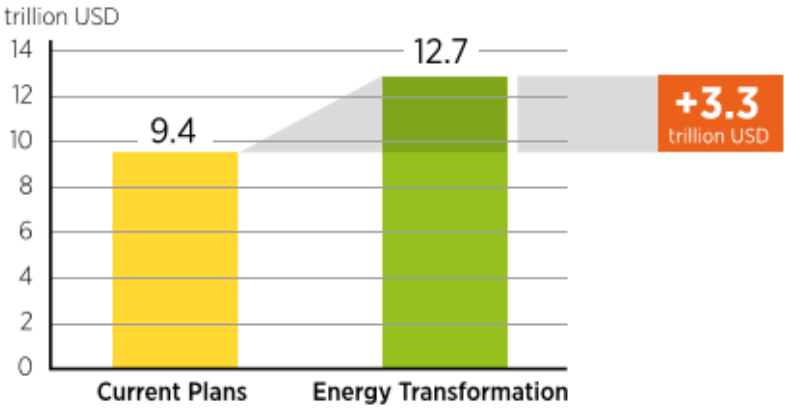
Renewables-based power generation capacity (excl. electrification)





- Chiefly, construction of generation capacity fuelled by wind and solar PV

Power grids and flexibility



- 80% for extension and reinforcement of transmission and distribution networks
- Balance for smart meters, energy storage (pumped hydro, battery storage), and retrofitted or new generation capacity to ensure adequate reserve capacity

Source: IRENA

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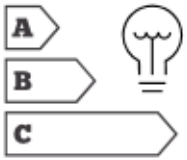
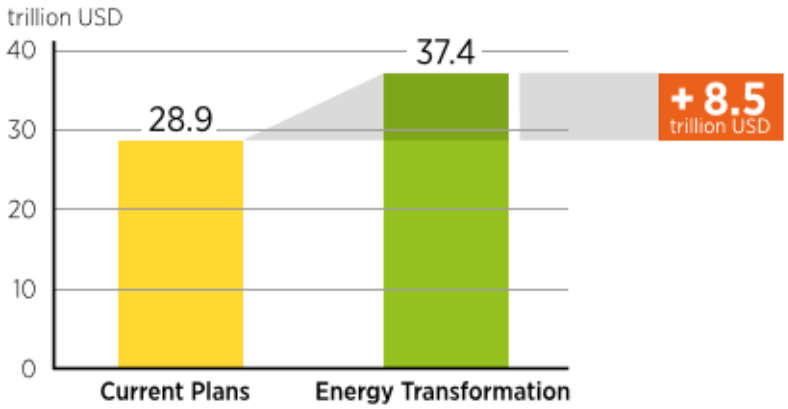
Energy Efficiency and End-Use

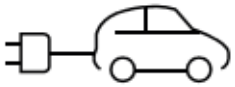
Energy efficiency in end-use sectors (excluding electrification)

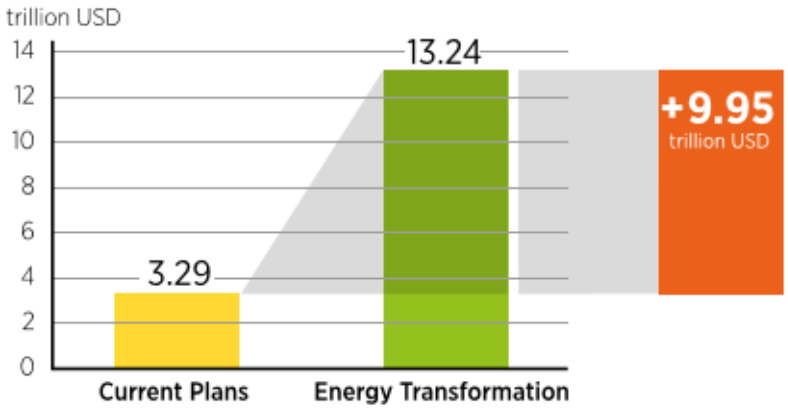




- 50% for building renovations and construction of new efficient buildings
- Balance for improvements in transport and industry

Electrification of end-use sectors



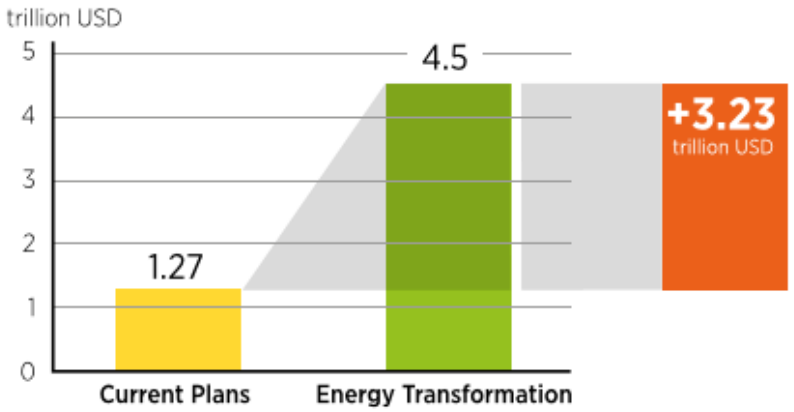


- 80% for charging infrastructure for electric vehicles and electrification of railways
- Balance for heat pumps in buildings (12%) and industry (8%)
- Fraction of 1% for 1 TW of electrolyser capacity to produce 19 exajoules of hydrogen.

Source: IRENA

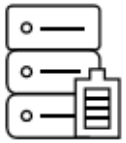
Direct Application of Renewables

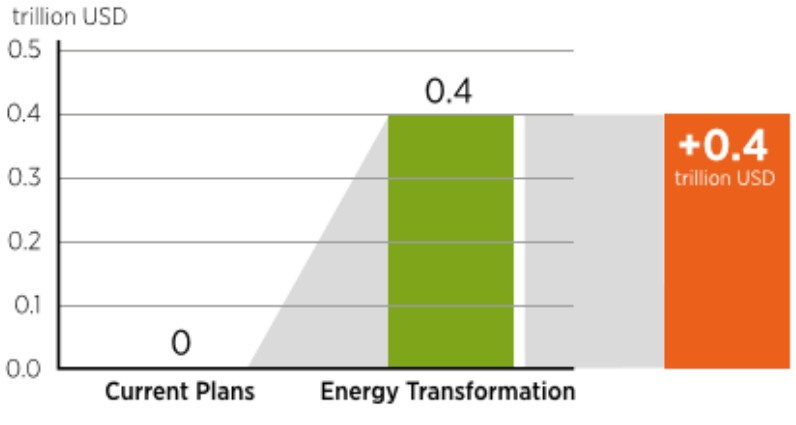
Direct applications of renewables



- 42% for biofuel production to decarbonise the transport sector, especially aviation and shipping
- 40% for solar thermal deployments in industry (primarily) and buildings
- 11% for modern biomass; balance for geothermal deployment

Other





- Includes carbon capture and storage in industry and efficiency improvements in materials

Source: IRENA

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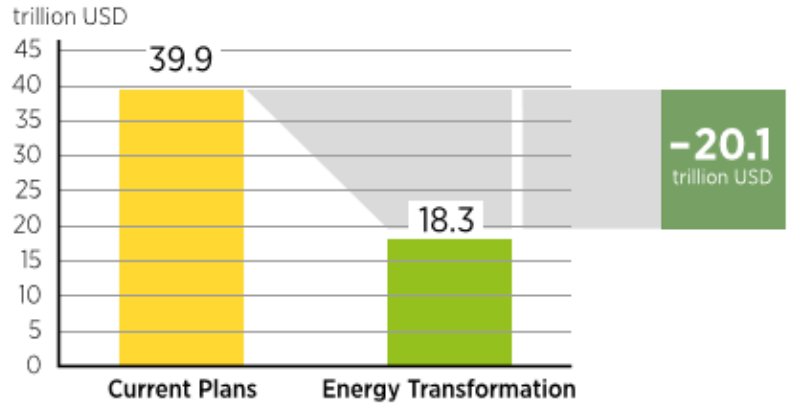
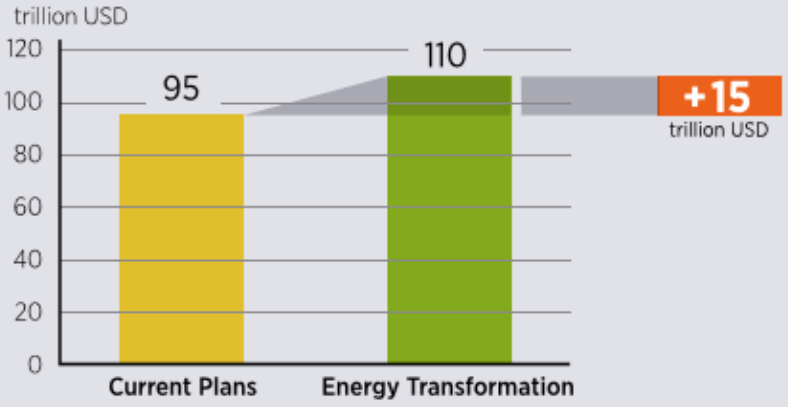
Non-Renewables

Non-renewables



- More than 90% of change due to lower spending on fossil fuels (upstream supply, generation capacity)
- Balance reflects avoided investments in nuclear power generation capacity

Total difference



Overall incremental investment needs are USD 15 trillion.

Source: IRENA

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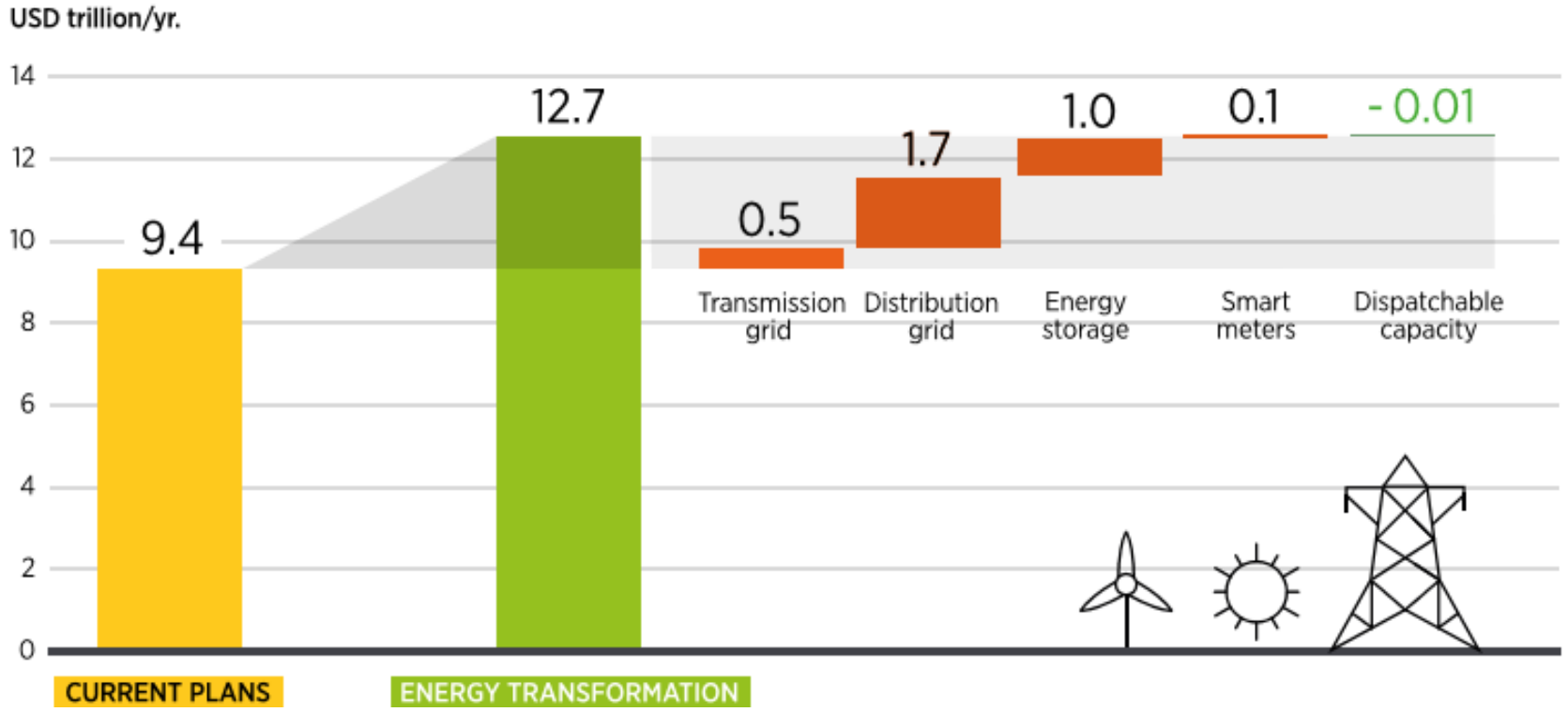
Transmission and Distribution Networks



Source: IRENA

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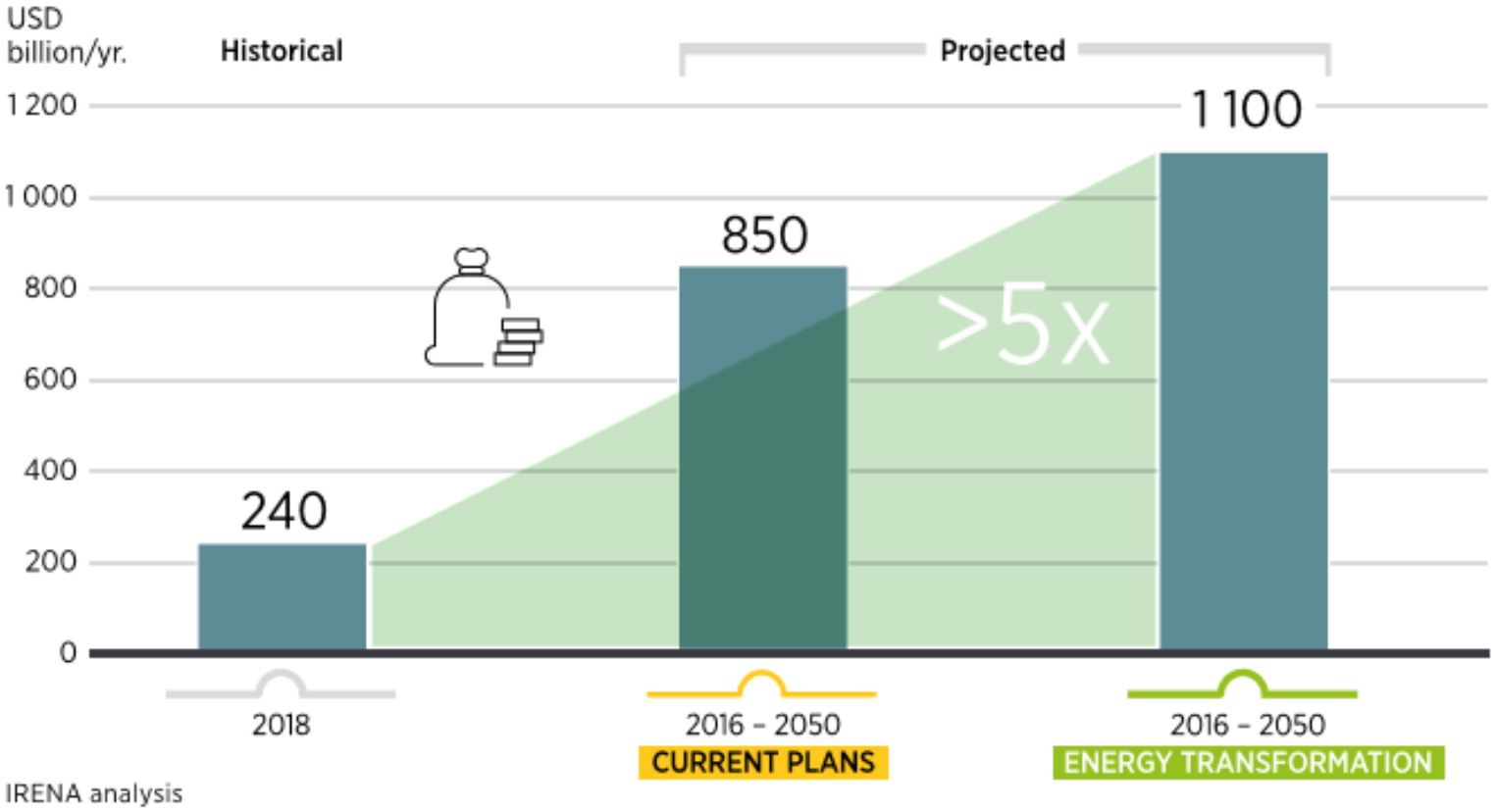
Energy Efficency

Figure 2.5: Average annual investments in energy efficiency measures through 2050



Source: IRENA

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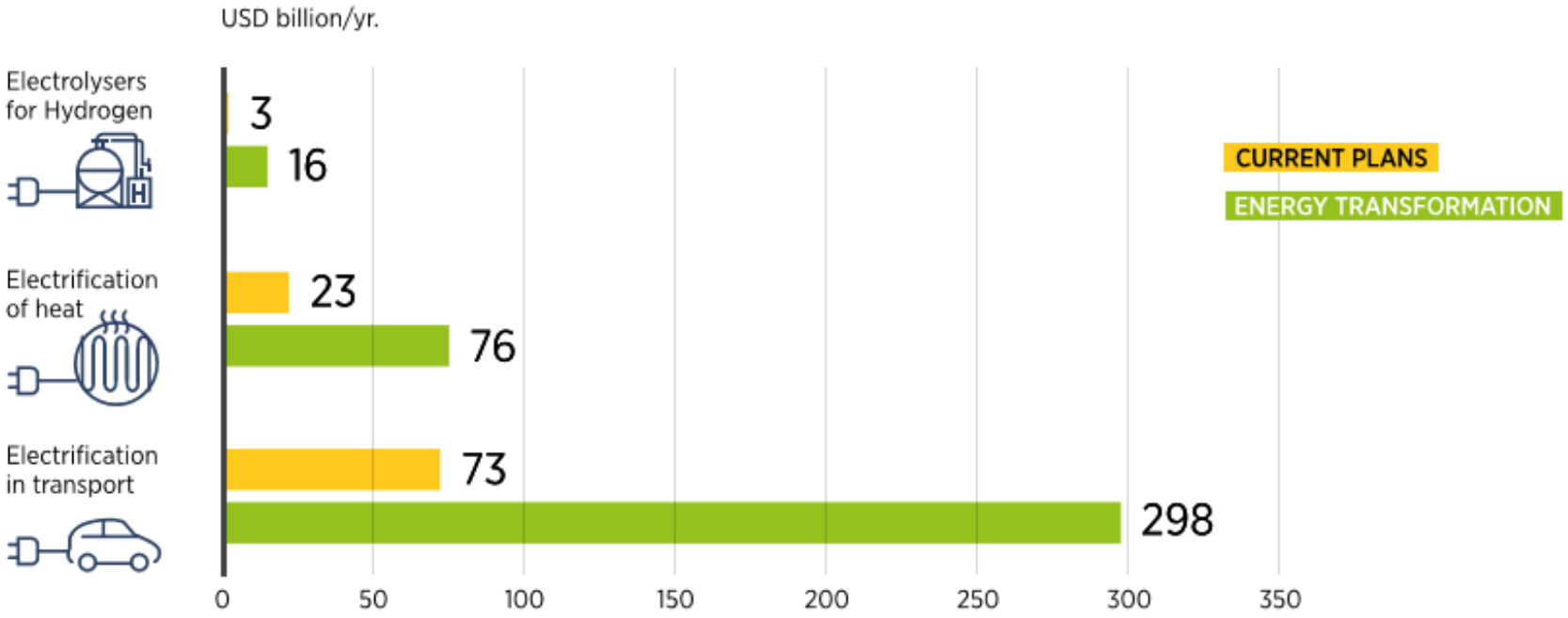
Energy Electrify

Figure 2.6: Average annual investments to electrify heat and transport through 2050



Source: IRENA analysis

Source: IRENA

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TIME FOR ACTION

Immediate Actions Needed

ACCELERATE RENEWABLE CAPACITY ADDITIONS TO GENERATE ADEQUATE POWER WITH LOW-CARBON TECHNOLOGIES

1) Identify and map renewable energy resources and develop a portfolio of financeable projects for the medium to long term.
2) Construct no new coal power plants and plan and implement an end-of-life phase-out of coal capacities.

SUPPORT DISTRIBUTED ENERGY RESOURCE (DER) DEPLOYMENT

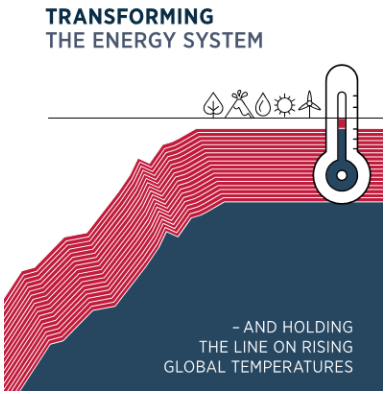
1) Incentivise energy consumers to become prosumers.
2) Support regulatory and pricing policies, including rights to generate and sell electricity, tariff regulation and grid-arrival policies.
3) Enable energy aggregators to foster use of DERs.

Source: IRENA

Immediate Actions Needed

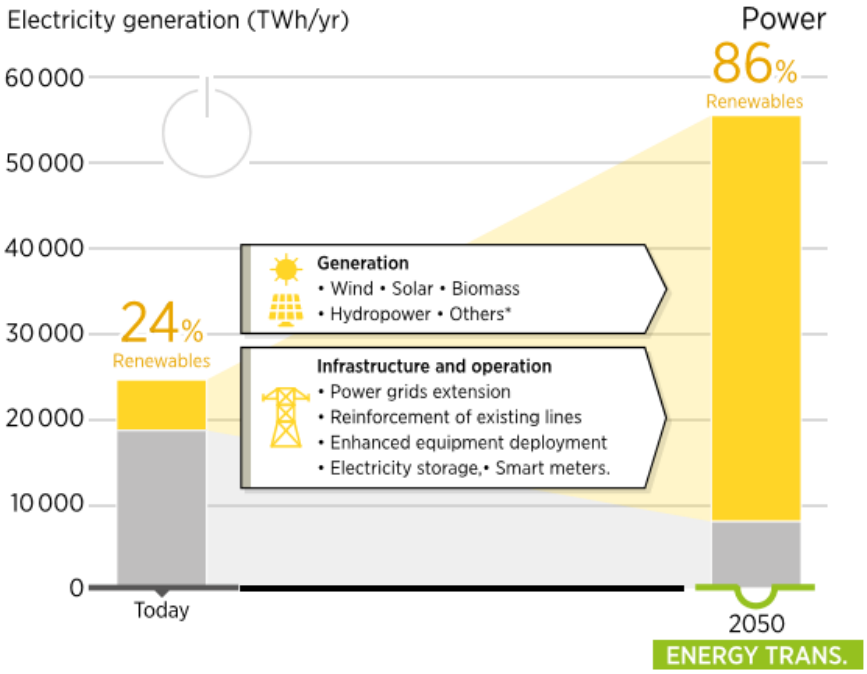
UPDATE GRID PLANNING TO ACCOMMODATE RISING SHARES OF VARIABLE RENEWABLE (SOLAR AND WIND) ENERGY

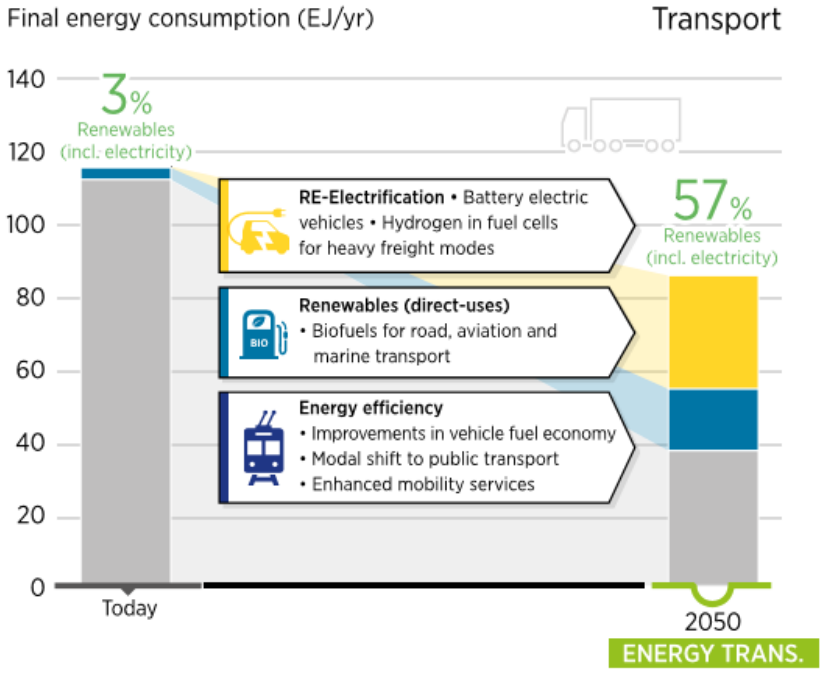
1) Develop a flexible power system (with flexible supply, storage, demand response, power-to-X, electric vehicles, digital and ICT technologies, etc).
2) Update grid codes.
3) Deploy micro-grids to improve resilience and expand energy access with renewable sources.
4) Deploy super-grids to interconnect regions.
5) Deploy cost-reflective tariff structures by properly readjusting the balance between volumetric charges (USD/kWh), fixed charges (e.g., USD/metre-month) and, where applicable, demand charges (USD/kW).



Source: IRENA

Immediate Actions Needed





Source: IRENA

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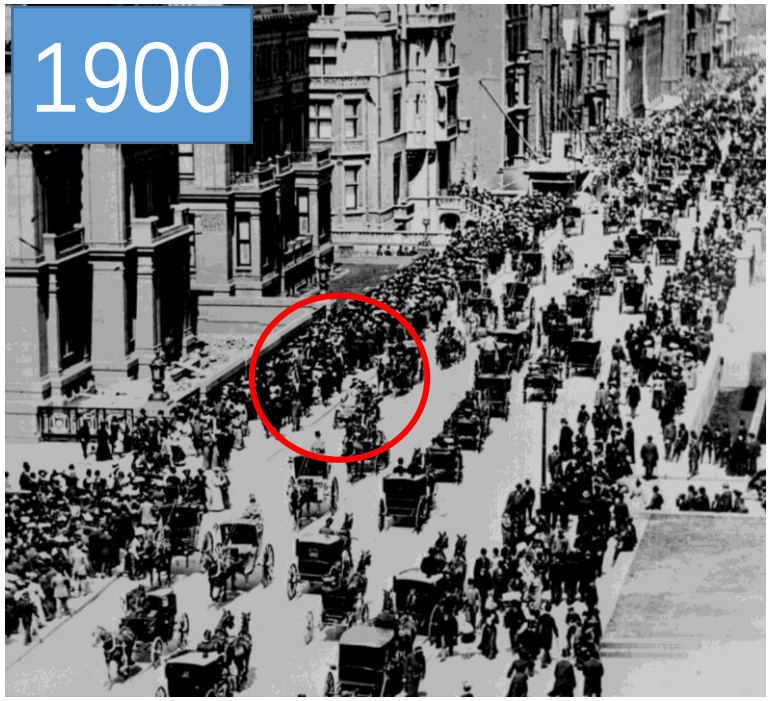
Disruptive Innovation - Pareto 01
5th Avenue New York, 1900 Vs. 1913



Source: US National Archives

Source: George Grantham Bain Collection

99% - 13 yrs

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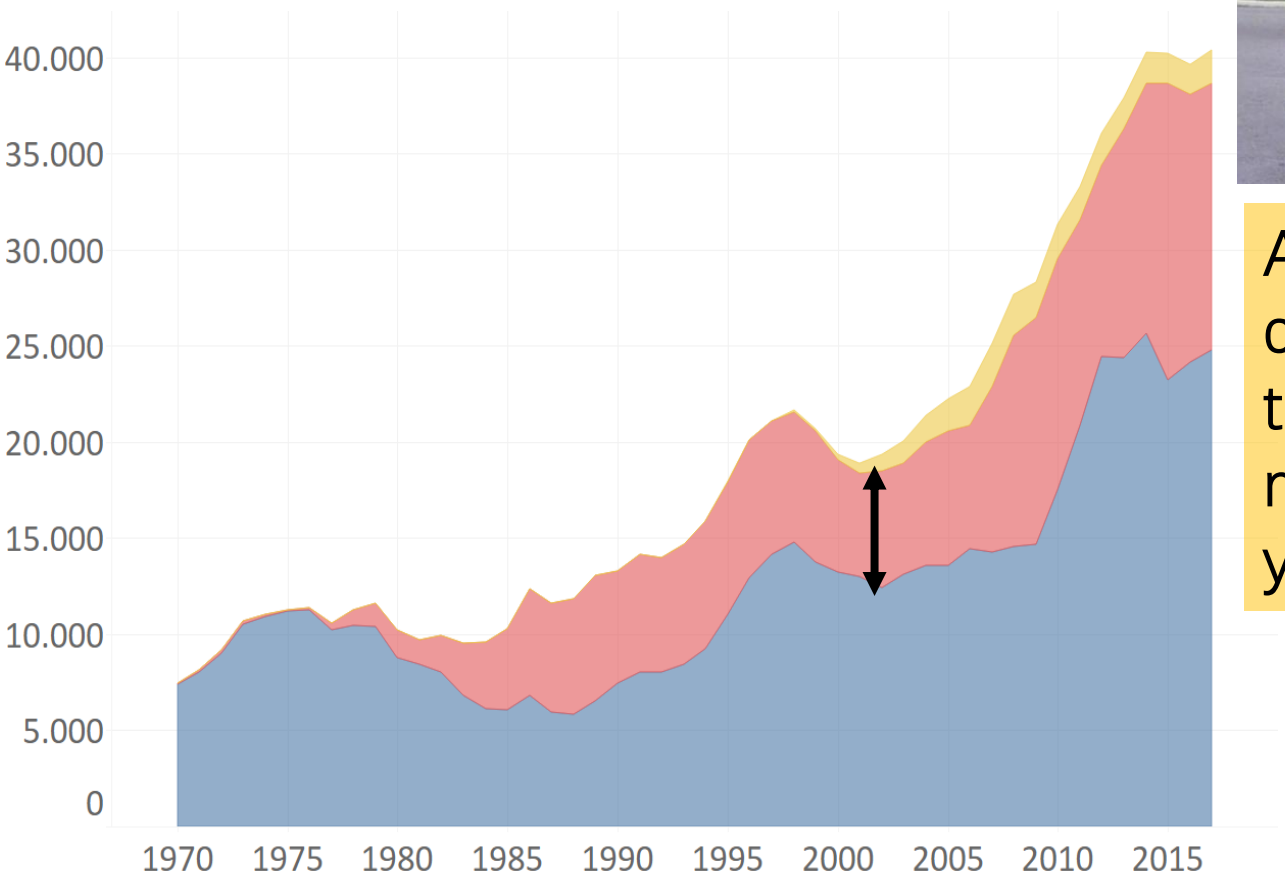
Disruptive Innovation
Pareto 02 – Fuel alcohol



Source: Balanço Energético Nacional (BEN), EPE 2017

Alcohol has captured 43% of the light vehicle market in 12 years.

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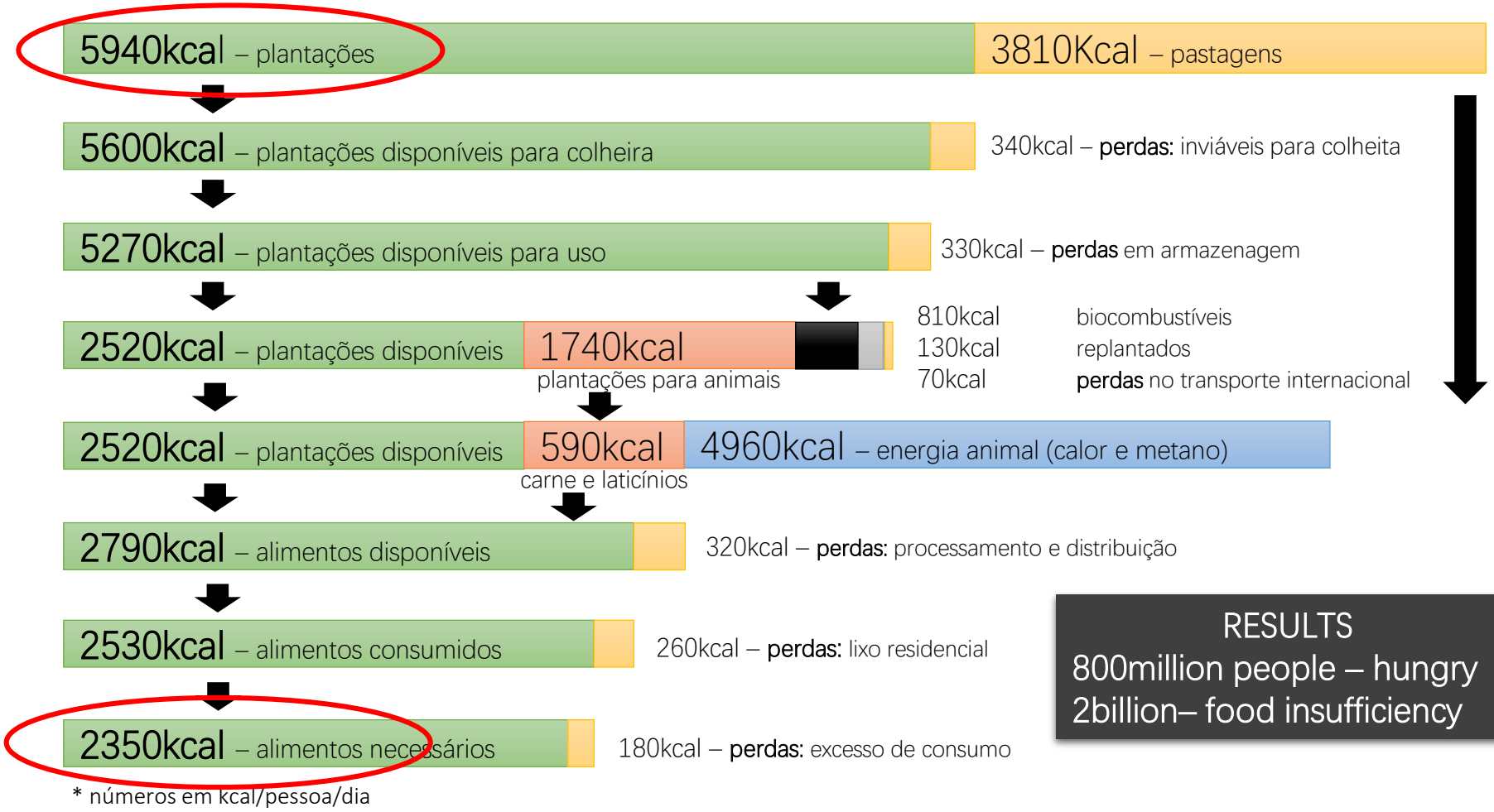
Disruptive Innovation – PROVOCATION 01
OVERVIEW FOOD SECURITY



* números em kcal/pessoa/dia

RESULTS
800million people – hungry
2billion– food insufficiency

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Source: There is no Plan B, Mike Berners-Lee

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Disruptive Innovation - Provocation 02 – URBAN MOBILITY

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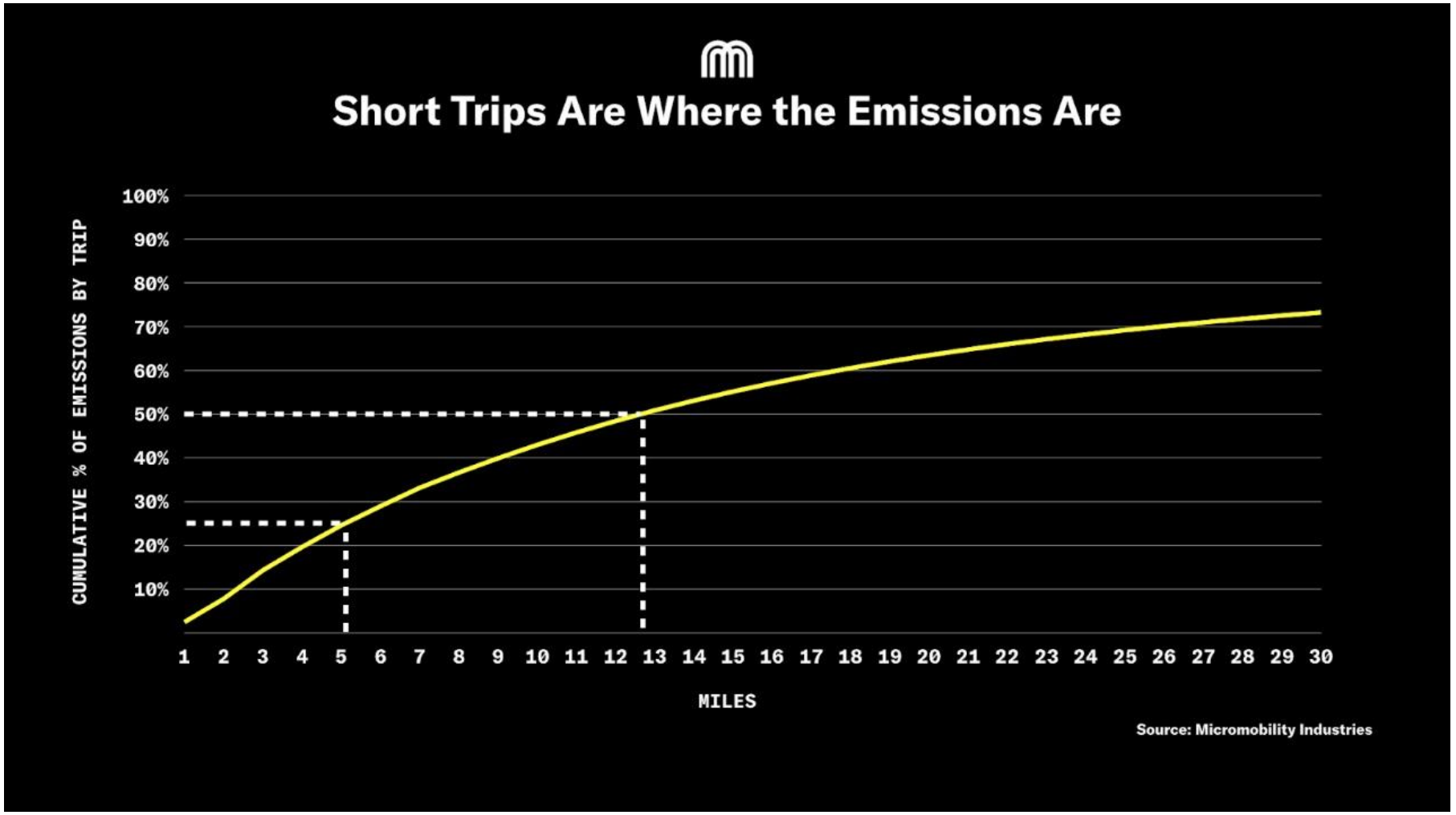
Disruptive Innovation - Provocation 02 – URBAN MOBILITY



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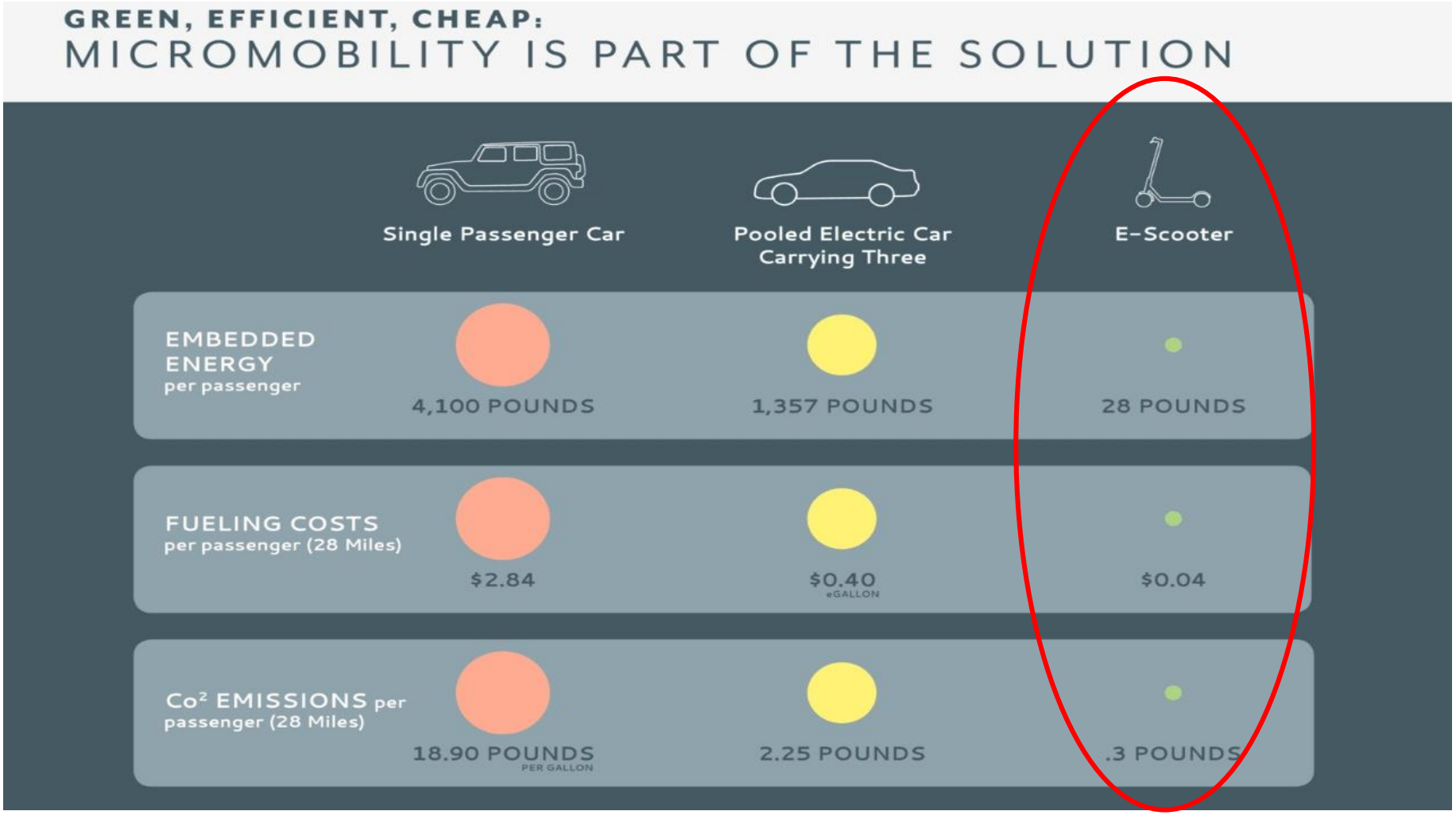
Disruptive Innovation - Provocation 02 – URBAN MOBILITY



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THANK YOU!

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