



Electrify Everything...

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Better future, quicker

ScottishPower today...

100% 1st integrated energy company generating **100% green energy**

Part of the Iberdrola group, **leader in renewable energies**

£6 billion

Investing **£6 billion**
in the UK between
2018 and 2022

2000 MW

Over **2,000 MW**
of wind capacity

5600

5,600 employees,
supporting over
72,000 UK jobs

5M

5M electricity and gas retail
customers spread all over the UK

3.5M

Networks: **3.5M** points of supply
and **110,000 km** of power lines



Better future, quicker



Don't Forget Why....



Based on
IRENA analysis

Economic

- Consumption and investment
- Employment

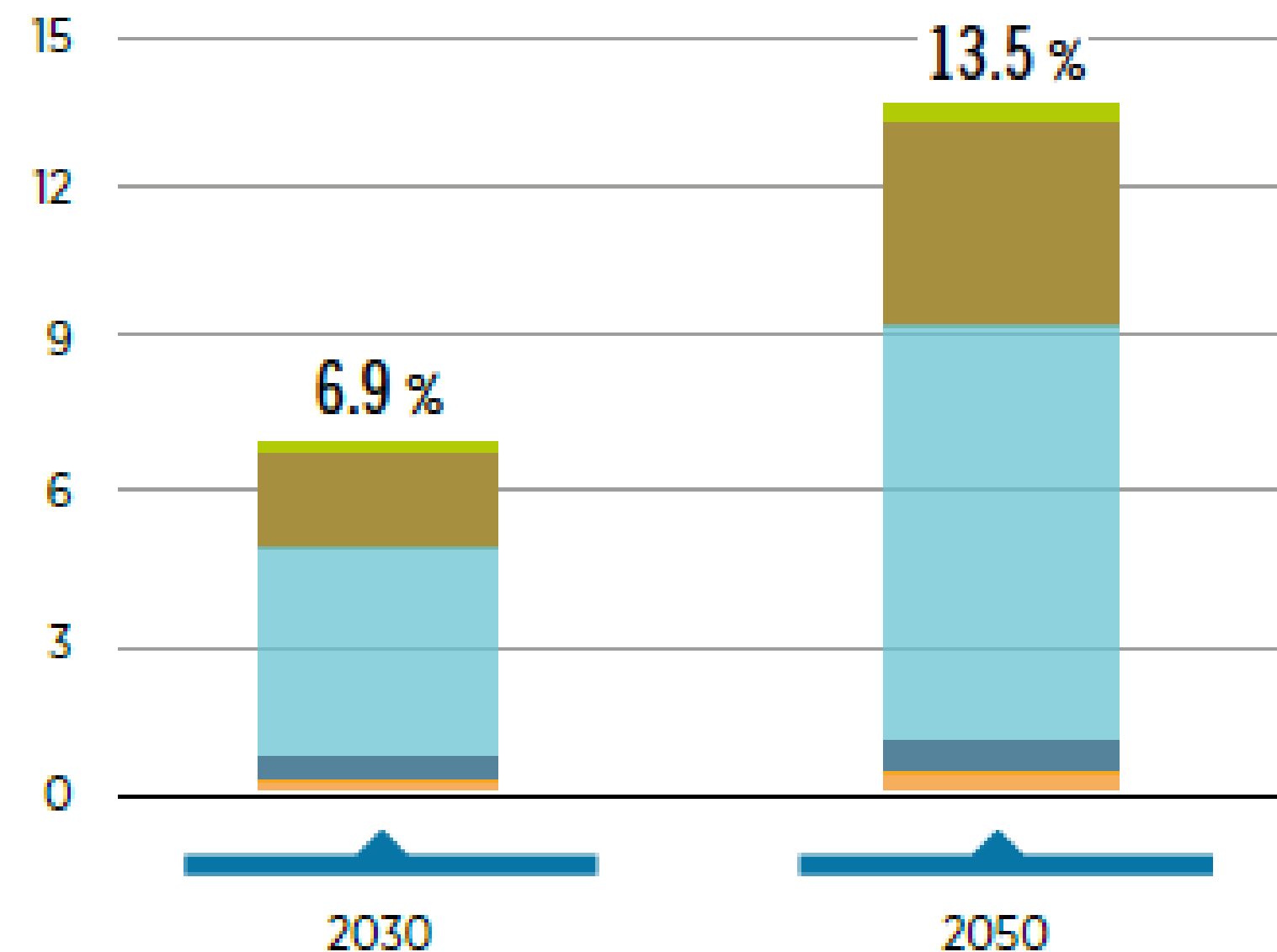
Social

- Education
- Health

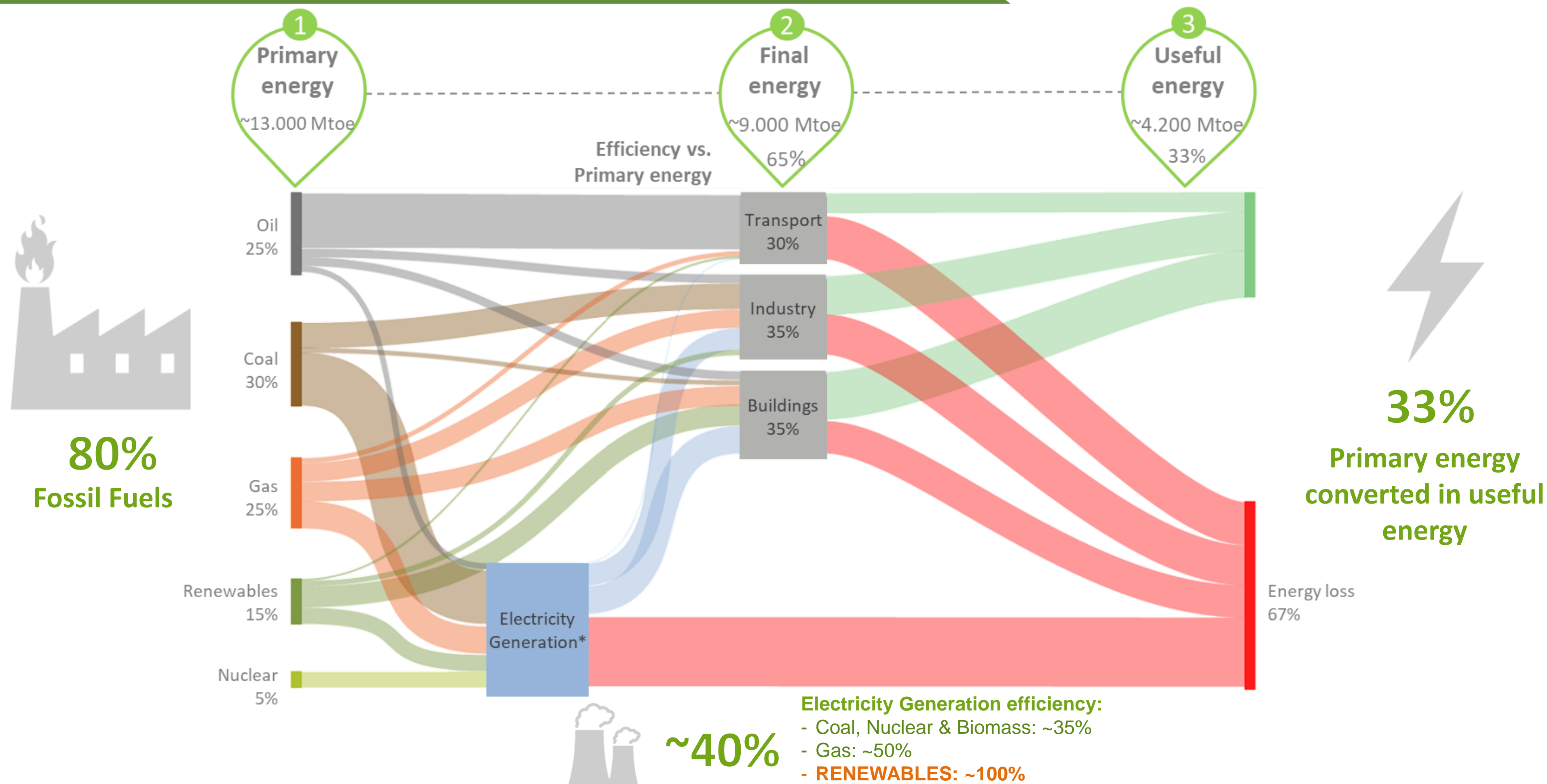
Environmental

- Greenhouse gas emission
- Material consumption

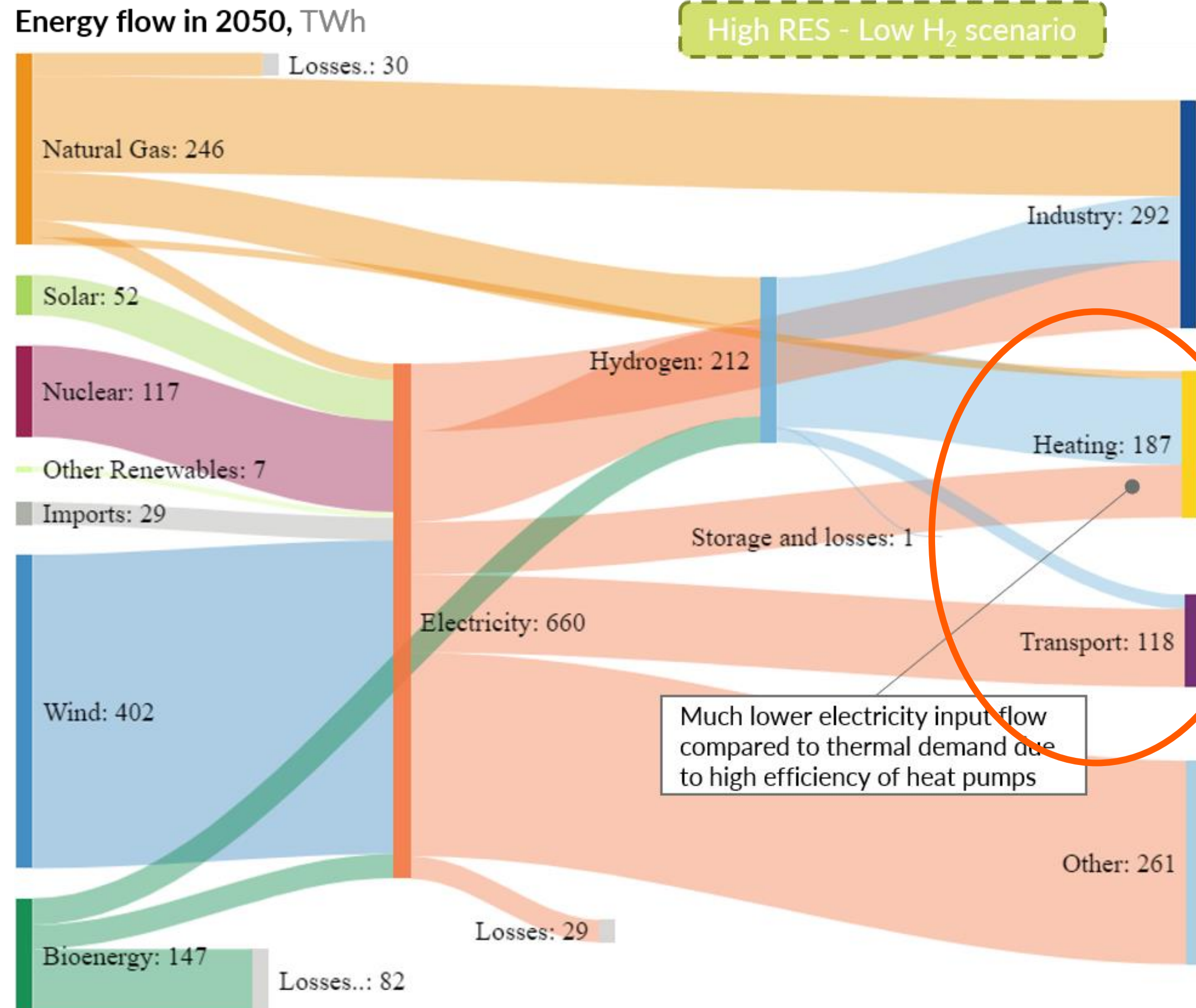
% difference in welfare from PES



Global Action for Climate Change



Electrification for Everything...

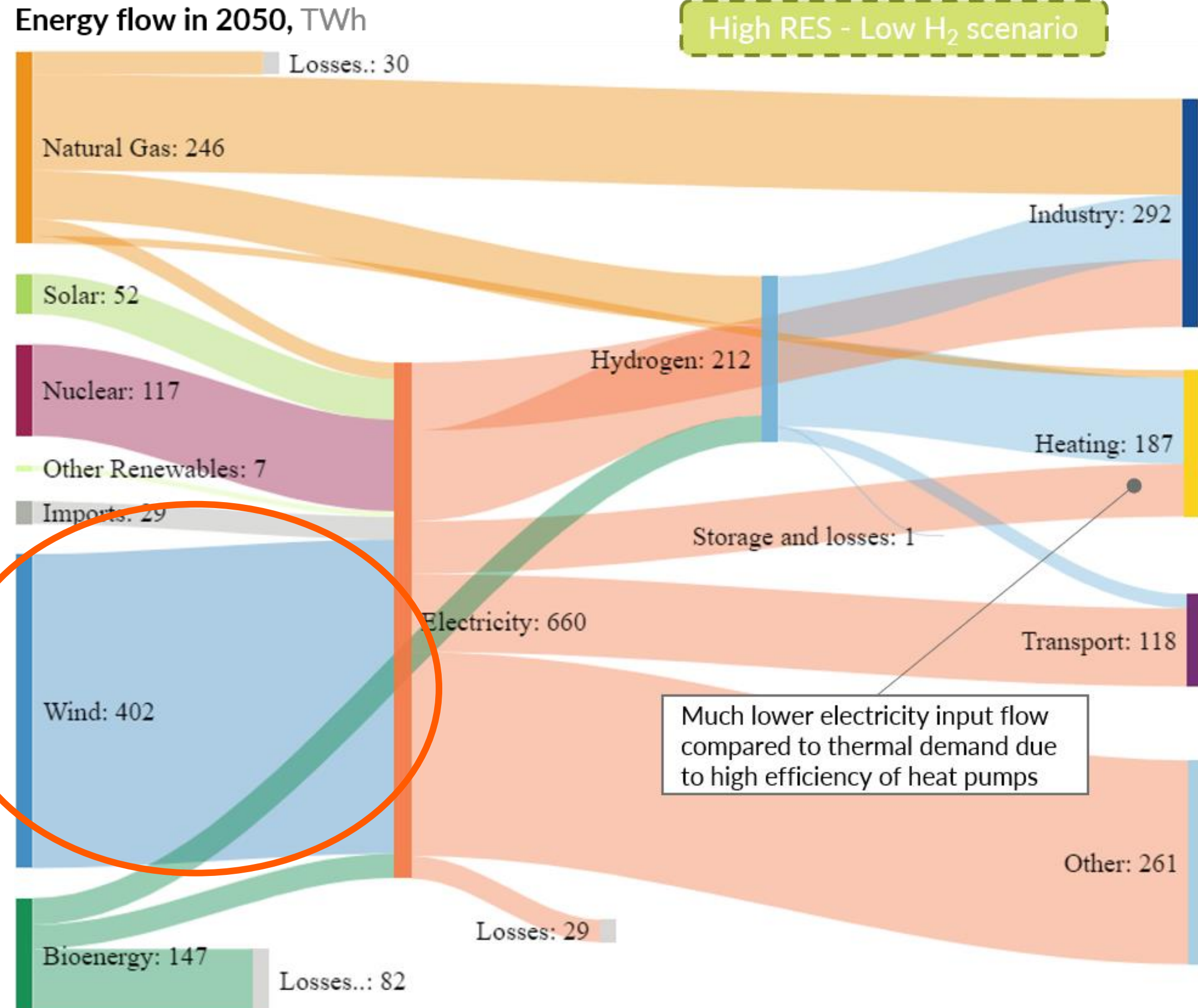


Electric heating
more efficient

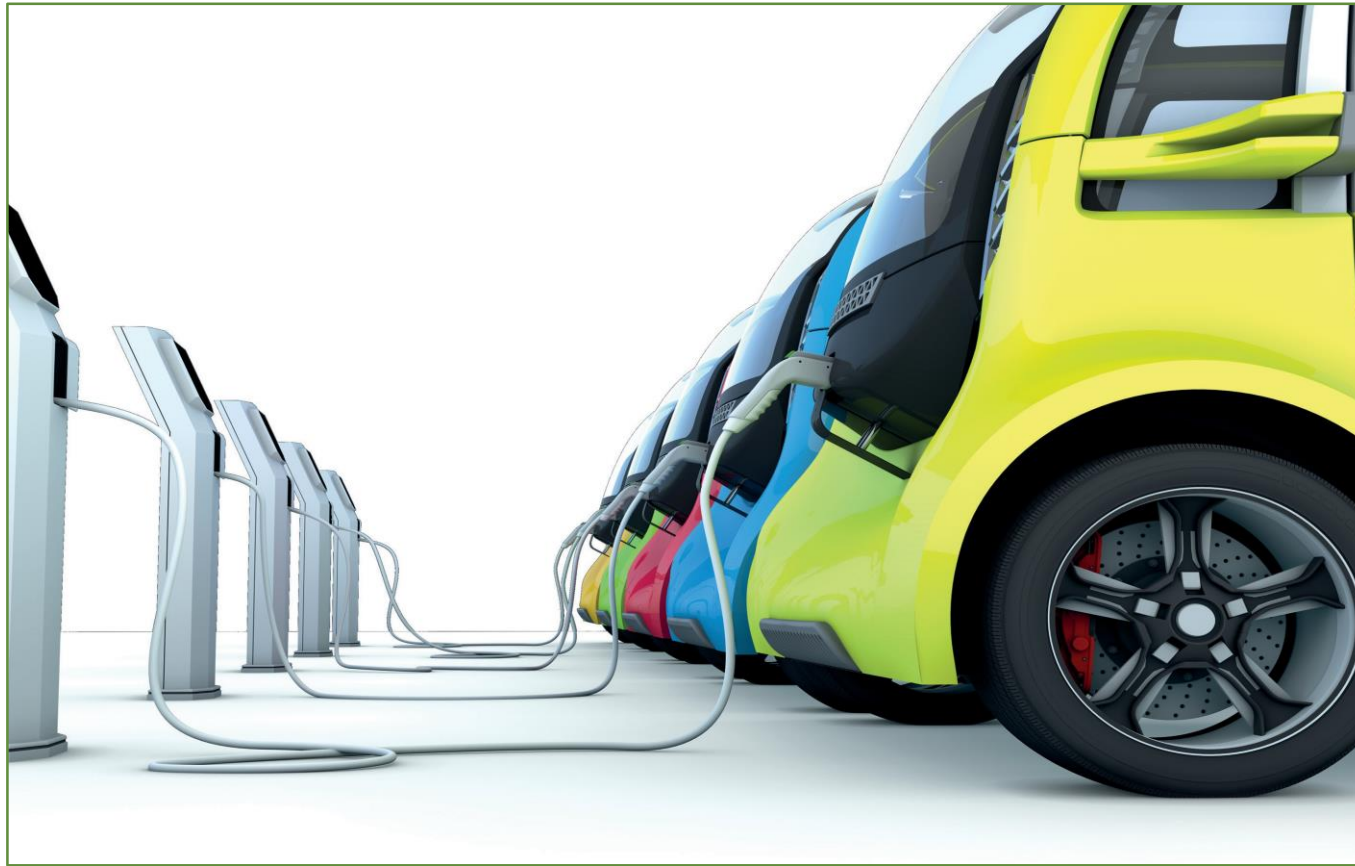
Electric transport
more efficient

Electrification for Everything...

Enormous growth
in renewables
capacity required



Not just electric cars...



Electric Buses - Considerations

During decision making process to electrify a bus fleet, the main technical factors to take into account are:

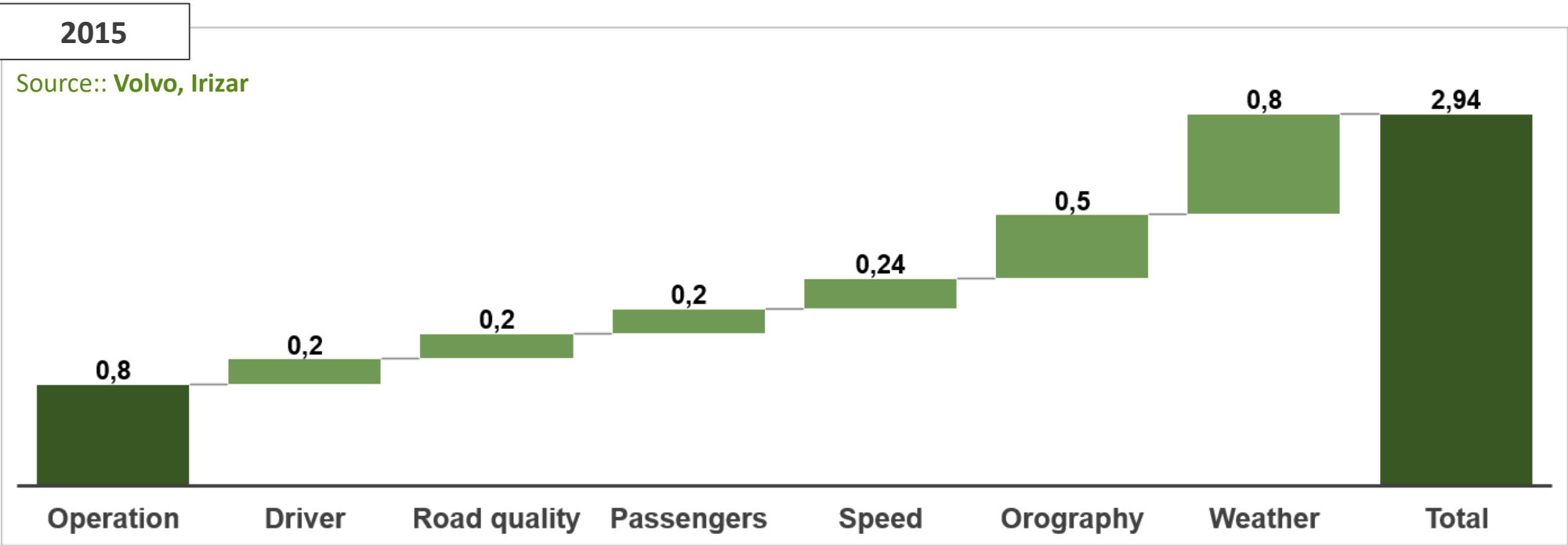
- Required autonomy
- Passenger capacity
- Orography of the city
- Air conditioning needs
- Available time to charge
- Guarantee

E-Bus Characteristics

Power: ~ 200 kW
Batteries capacity: 200–350 kWh (autonomy between 100 & 220 kms), normally located on the roof.
Note: eBus Prototype with bat. ~500 kWh
Length: 9-18 meters.
Passenger capacity: 50-150.

E-Bus energy consumption (kWh/km)

Energy consumption is very sensitive to different variables, which considerably conditions the autonomy of the vehicle, shown in the graph below.



		eBUSES			
Consumption (GWh)		25	50	100	500
Performance (kWh/km)	0,7	0,875	1,75	3,5	17,5
	1	1,25	2,5	5	25
	1,3	1,625	3,25	6,5	32,5
	1,5	1,875	3,75	7,5	37,5
	2	2,5	5	10	50

Considering average distances traveled

Total Cost of Ownership Models

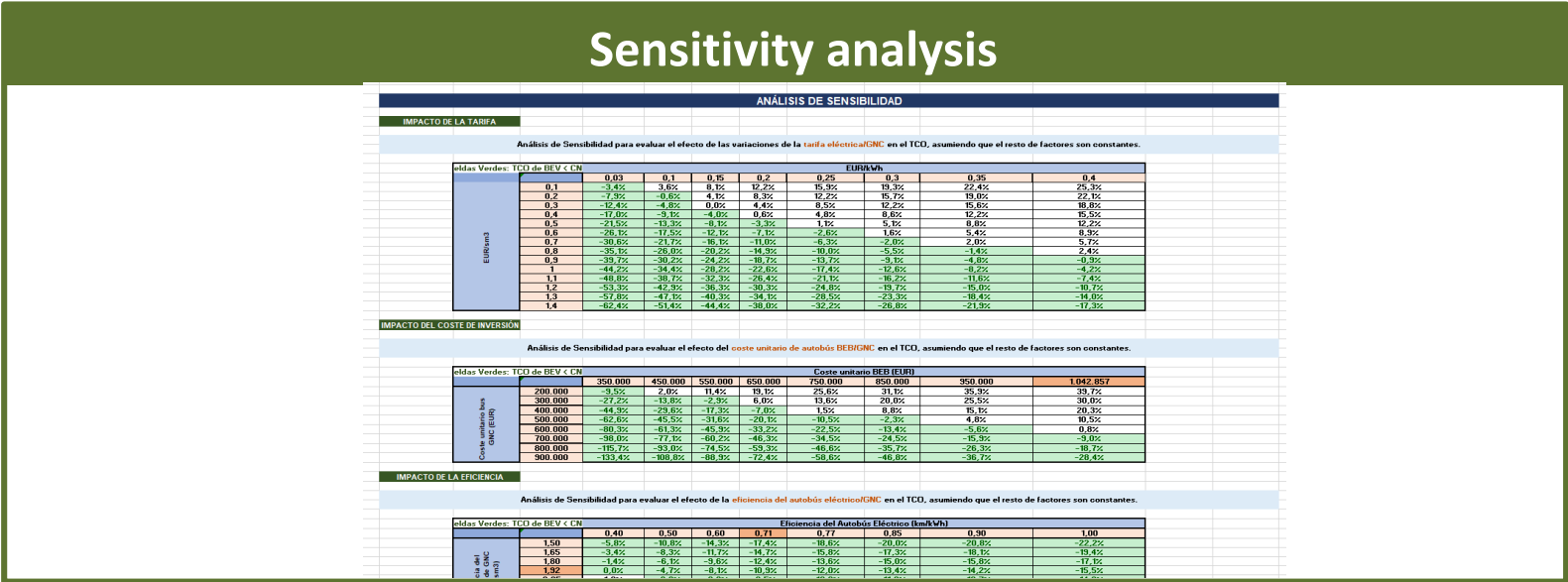
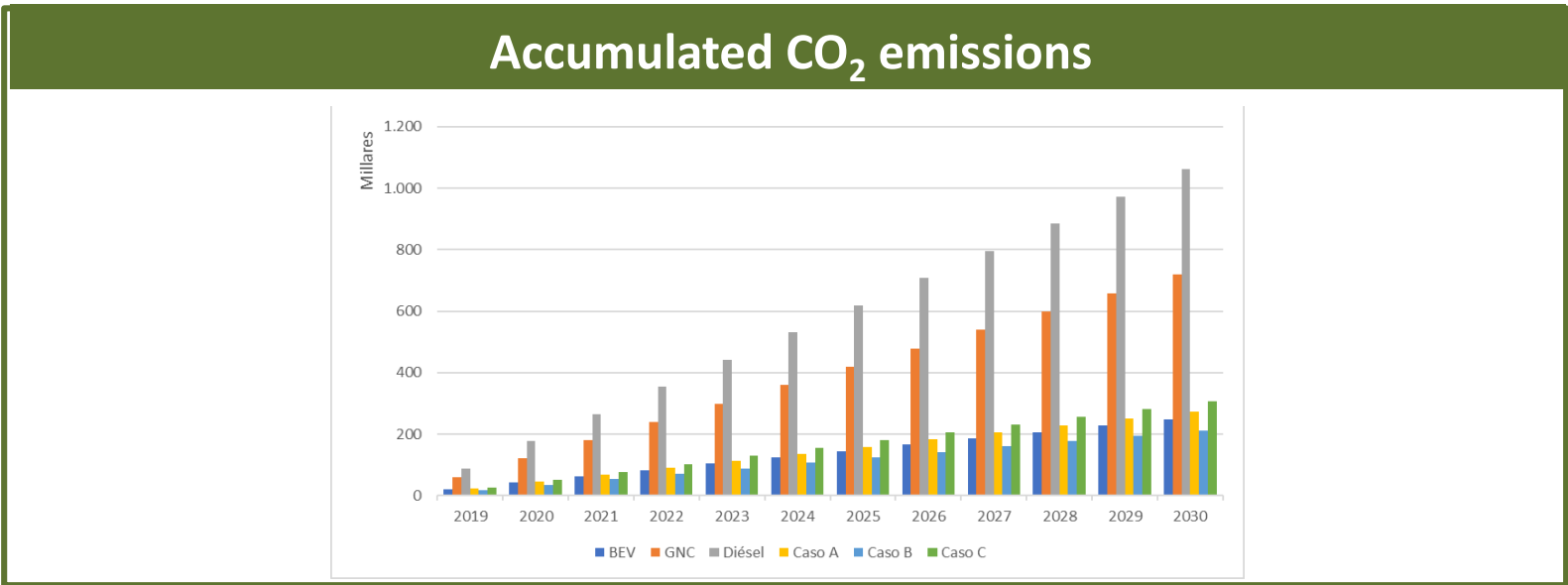
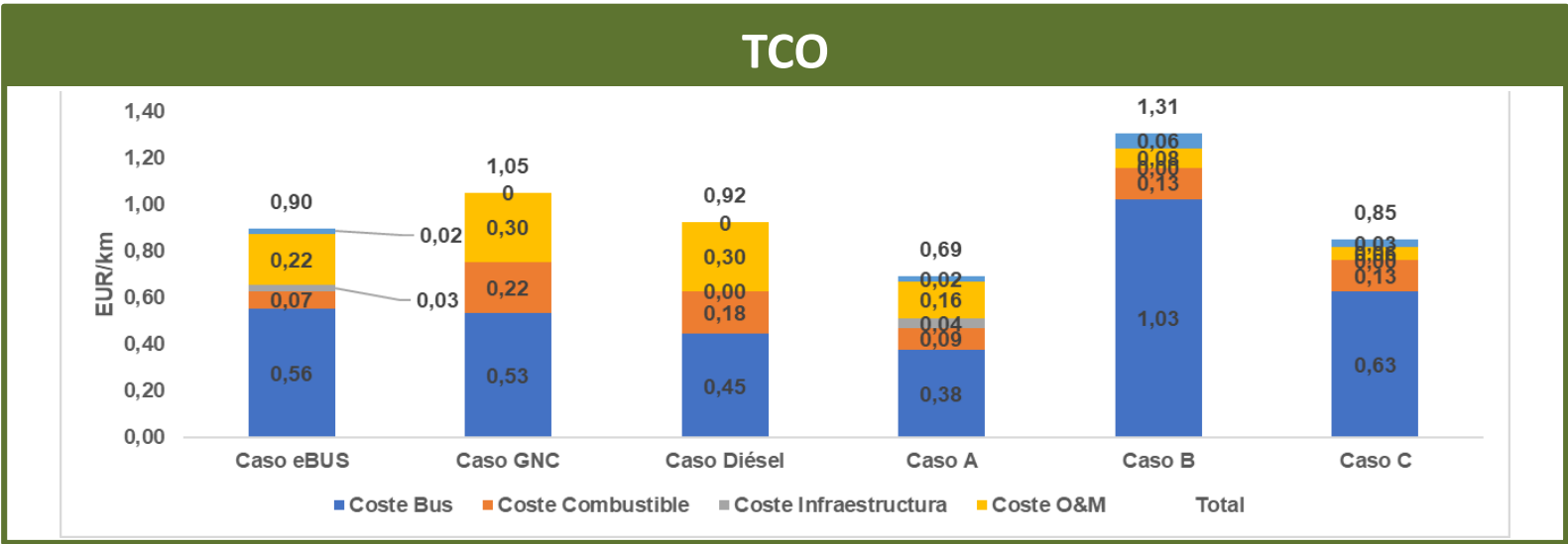
- Aim is to inform investments and operational models of electric fleets including charging infrastructure
- TCO tool** enables the economic evaluation of electrification strategies
- Ability for **sensitivity analyses** across key variables & scenarios.



USER INTERFACE

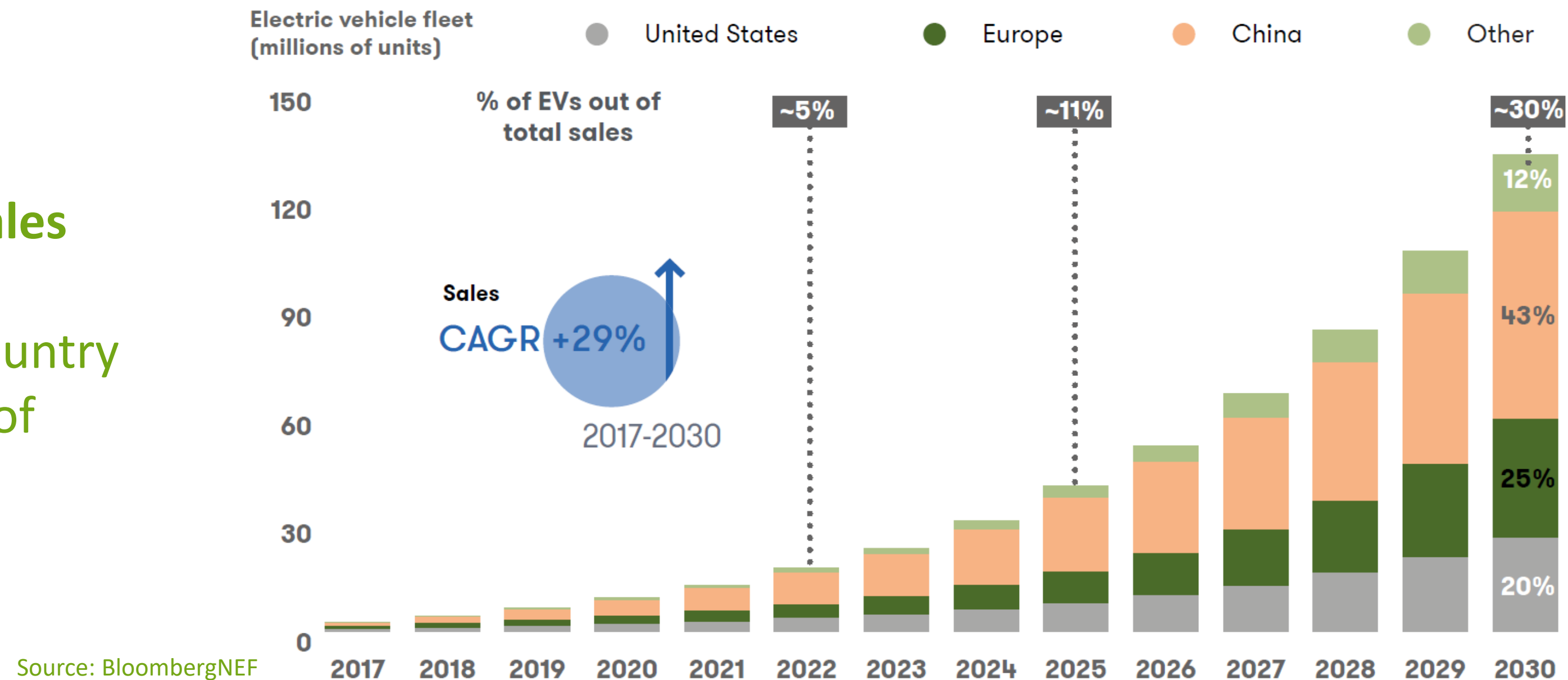
CASO DE ANÁLISIS			Casos		
Inputs externos	Autobús	Vida útil (años)			
		Distancia media recorrida anualmente (km)			
	Batería	Tamaño de la batería (años)			
		Vida útil (año de reemplazo)			
		Tasa de Descuento Anual (%)			
Inputs específicos	CAPEX	Coste por unidad (EUR)			
		Coste de la infraestructura (EUR)			
	OPEX	Coste de combustible	€/kWh	€/sm3	€/L
		Eficiencia del autobús	km/kWh	km/kWh	km/kWh
		Coste anual de funcionamiento (EUR)			
	Emisiones	Media de emisiones CO2	kg/kWh	kg/L	kg/sm3
		Coste asociado a emisiones	€/kgCO2	€/kgCO2	€/kgCO2
		Coste en salud pública	€/kgCO2	€/kgCO2	€/kgCO2
			0	0	0

RESULTS



Electric Vehicles - Forecasts

Fleet and annual sales of EV by region/country (millions of units)



MAIN GROWTH DRIVERS

1. Cost

Today battery cost accounts for **35%- 40%** of total EV price. Expected battery cost reduction leads to EVs reaching **parity** with conventional vehicles in total cost of ownership **before 2025**.

2. Number of models available

Expected to **double** by 2020 accelerating adoption.

3. Range Autonomy

Greater energy density and battery efficiency will allow a longer range, thus reducing range anxiety.

4. Air Quality and Climate Change policies

The momentum that these kind of policies are acquiring, including restrictions to conventional vehicles will favour EVs.

EV Charging Partnerships

- First **partnership project** is a £7.3m pilot in two of Scotland's Local Authorities
- The pilot will demonstrate the benefits of **DNO-led delivery** of Universal Strategic Public Charger Network



SPEN CEO Frank Mitchell launching partnership with First Minister of Scotland Nicola Sturgeon 29th August 2019

Efficiency

- Optimised locations to minimise cost for customers
- Priming the market
- More chargers, less cost, faster delivery

Pace / Scalability

- Increase in number of public chargers in Lanarkshire by 400% by March 2021
- Delivering 25% increase in public charging capacity in Scotland within 6 month period

Universal Community Access

- Rural, suburban and urban locations
- Delivering where commercial market will not deliver
- Ensuring no one is left behind in the low carbon transition

Project PACE is an innovative trial of a DNO-led delivery model for the roll-out of EV chargers

Electrify Everything First...

To achieve a Net Zero future:

- Need to reduce reliance on natural gas
- Need to accelerate electrification of heating
- Need to dramatically increase renewable generation capacity
- **Need to accelerate electrification of transport**

Therefore...

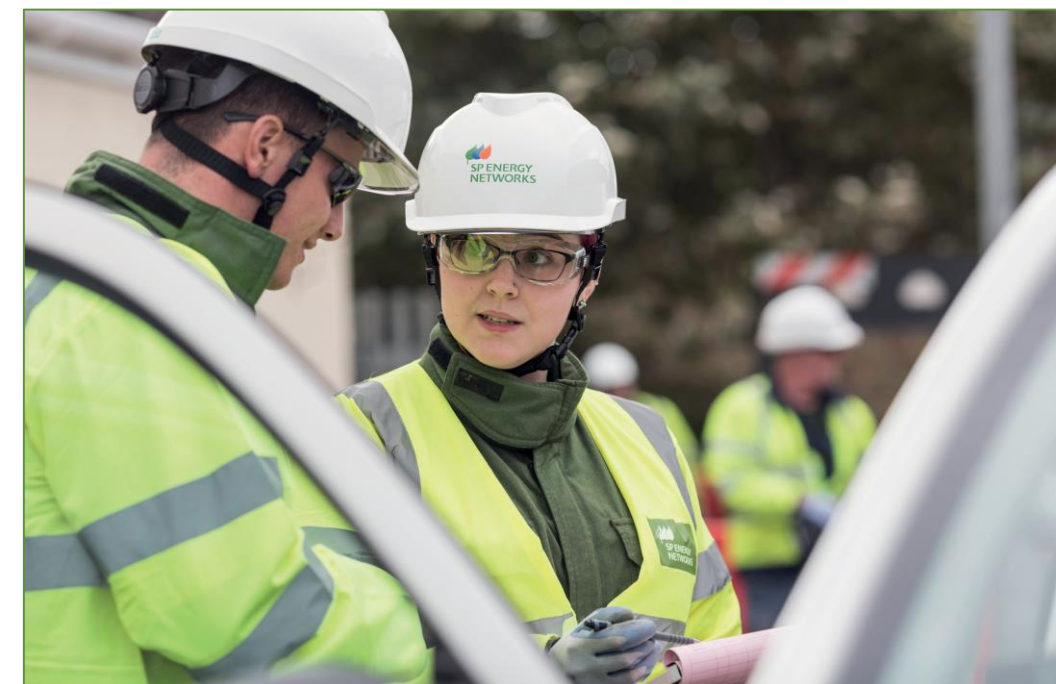
- Electrification is a **critical enabler** for both cleaner supply and cleaner demand
- Significant investment in electricity networks, both transmission and distribution, **is fundamental to all Net Zero achievements**

ScottishPower tomorrow...

At ScottishPower, we're creating a greener future from behind the plug.

Committed to speeding up the transition to cleaner electric transport, improving air quality and over time, driving down bills – to deliver a **better future, quicker** for everyone

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Better future, quicker