

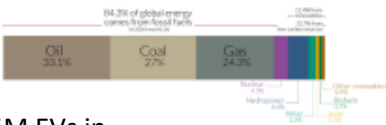
Study Committee C3

Power System environmental performance C3
11153_2022

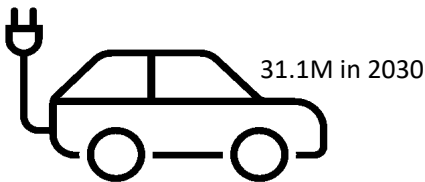
Assessment of Life Cycle Emissions from Battery (BEV) as compared with DME-fueled Compression Ignition Engine Vehicles

David Byrne
EirGrid Plc

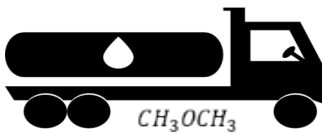
Motivation



2.5M EVs in 2020 (2.5% of global car sales)



11.2M in 2025



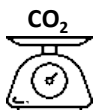
- Non-toxic ✓
- Non-carcinogenic ✓
- Non-teratogenic ✓

Objects of investigation



Understand Fuel and Vehicle Pathways

Quantify vehicle Emissions and Energy Intensities

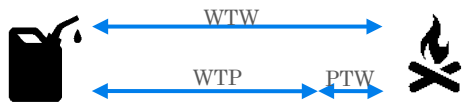


Approach Optimised Technologies through the Introduction of Variances

Experimental setup

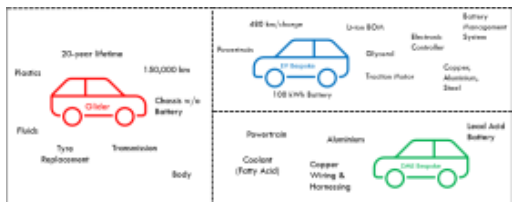


REET® + Excel = LCA

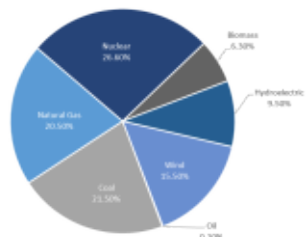


Base Scenario

$$BS \text{ Design} = (WTW)_{\text{Fuel}} + (WTW)_{\text{Glider Attributes}} + (WTW)_{\text{Bespoke Vehicle Attributes}}$$



European Average Electricity Mix 2020



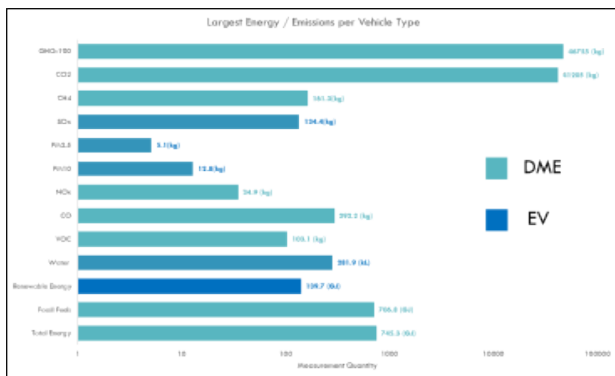
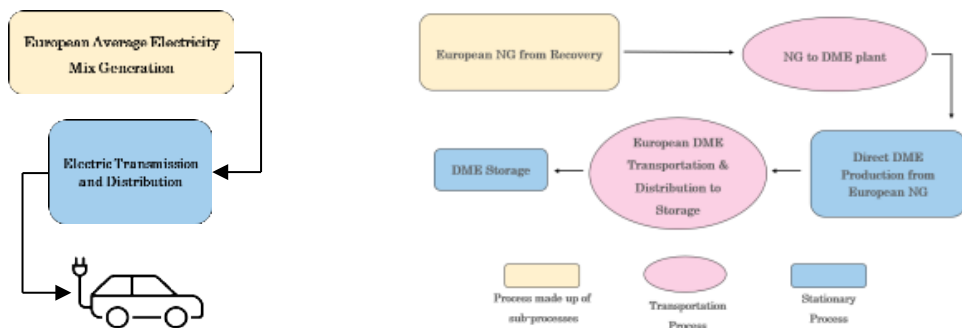
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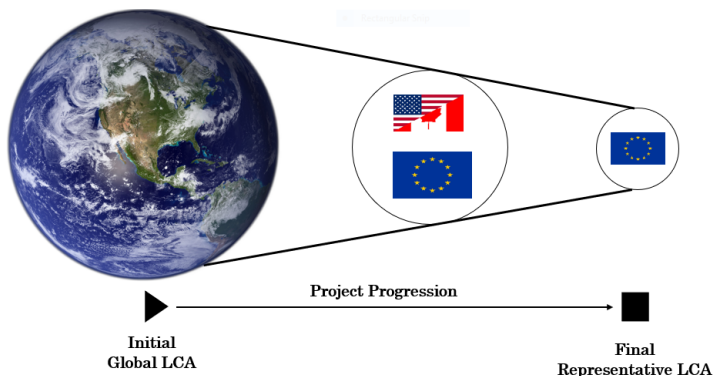
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Base Scenario



Variance Scenario



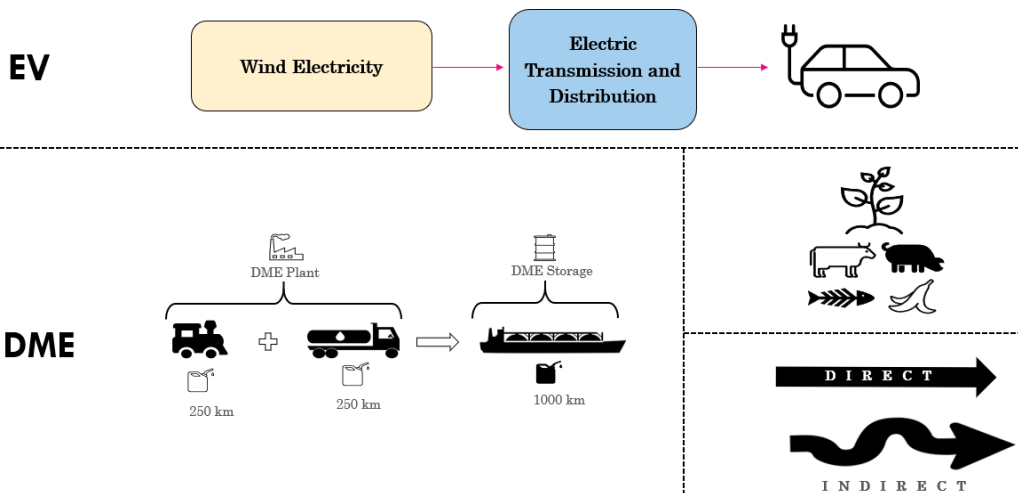
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Variance Scenario



DME			
Measurement	BS	Value	Unit
Total Energy	3	745.3	GJ
Fossil Fuels	3	706.8	GJ
VOC	4	103.1	kg
CO	3	292.2	kg
NOx	3	34.9	kg
CH4	4	161.3	kg
CO2	3	41205	kg
GHG-100	3	46755	kg

EV			
Measurement	BS	Value	Unit
Renewables	2	139.7	GJ
Water	1	281.9	kL
PM10	2	12.8	kg
PM2.5	2	5.1	kg
SOx	1	134.4	kg

	North America		Europe	
	EV	DME	EV	DME
Total Energy (GJ)	494.4	745.3	489.3	739.0
Total Emissions* (Tonnes)	30.10	41.85	29.18	41.29

Conclusion



- EV & DME fuelled vehicles are not environmentally benign
- DME fuelled vehicles emit ~41% more emissions than EVs over the course of their entire life-cycle
- EVs consume ~50% less energy than a DME fuelled vehicle over their lifecycle