Well-to-Wheel A Comparison of Propulsion Systems

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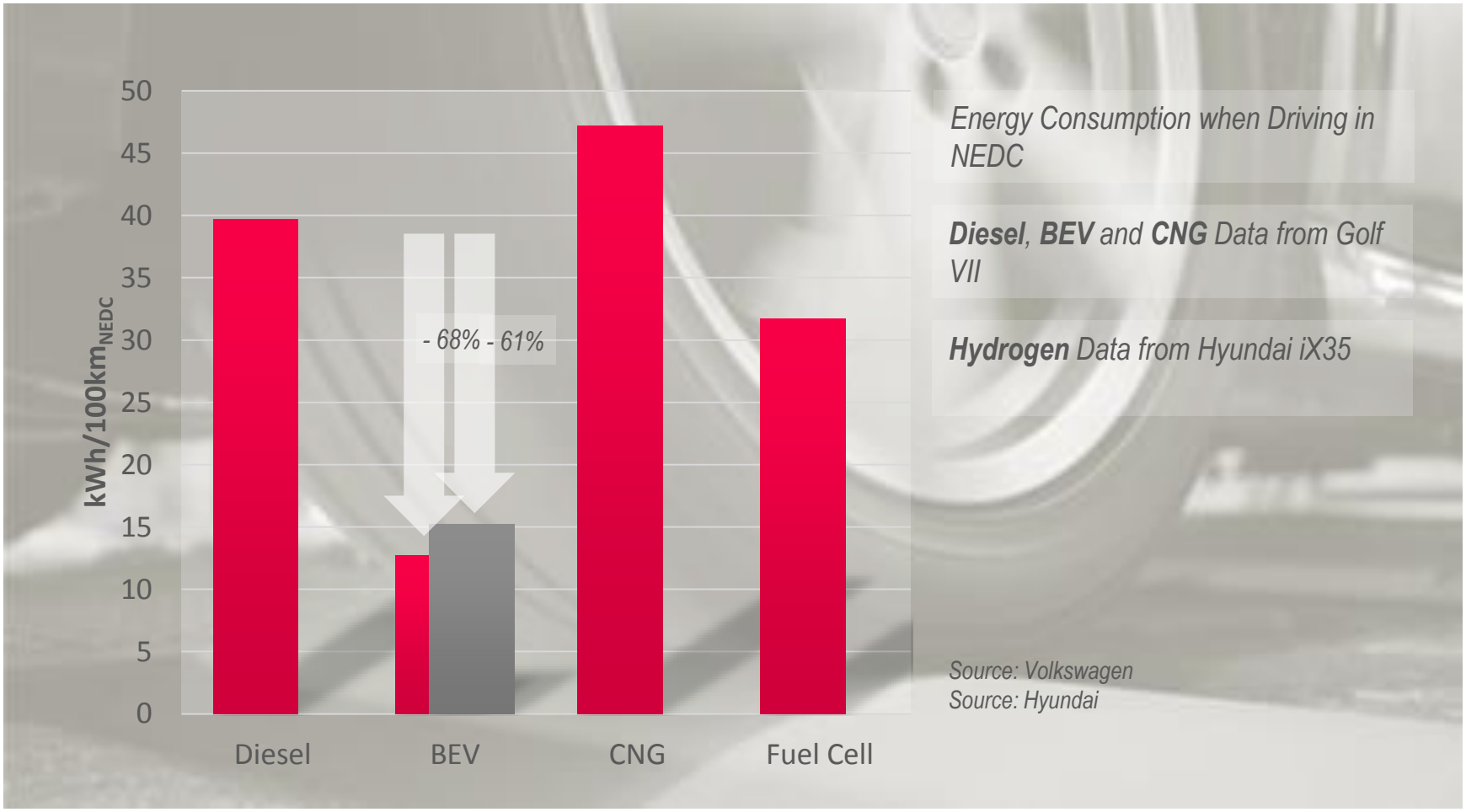
Introduction

- Well-to-Wheel (W2W) Assessment
  - Environmental Impact of Production, Transport and Consumption of Energy Carrier for Vehicles
- Comparison of Propulsion Systems Requires W2W
  - **Diesel**
  - **Battery Electric Vehicle (BEV)**
  - Compressed Natural Gas (CNG)
  - Fuel Cell

Energy Consumption

Tank-to-Wheel



Energy Consumption when Driving in NEDC

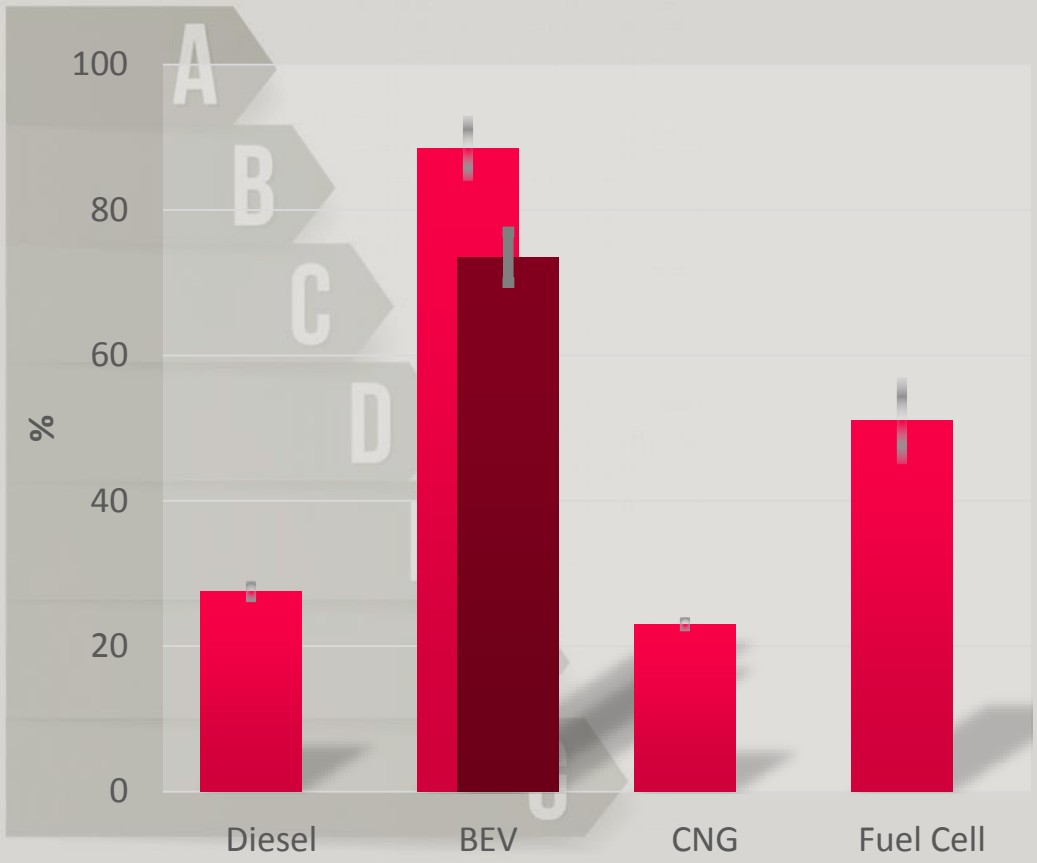
***Diesel**, **BEV** and **CNG** Data from Golf VII*

***Hydrogen** Data from Hyundai iX35*

Source: Volkswagen
Source: Hyundai

Efficiency

Tank-to-Wheel



Efficiency when Driving in NEDC

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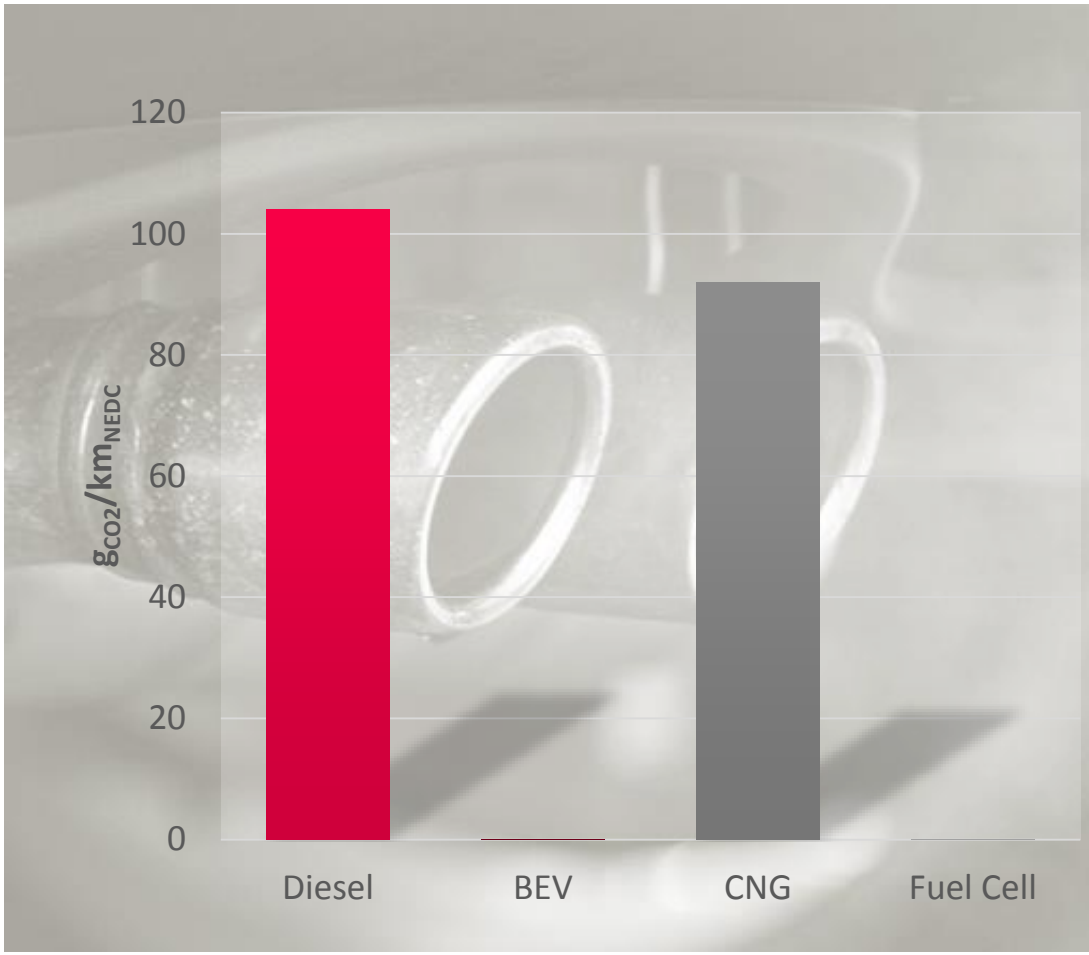
CO_2 Emissions

Tank-to-Wheel (local)



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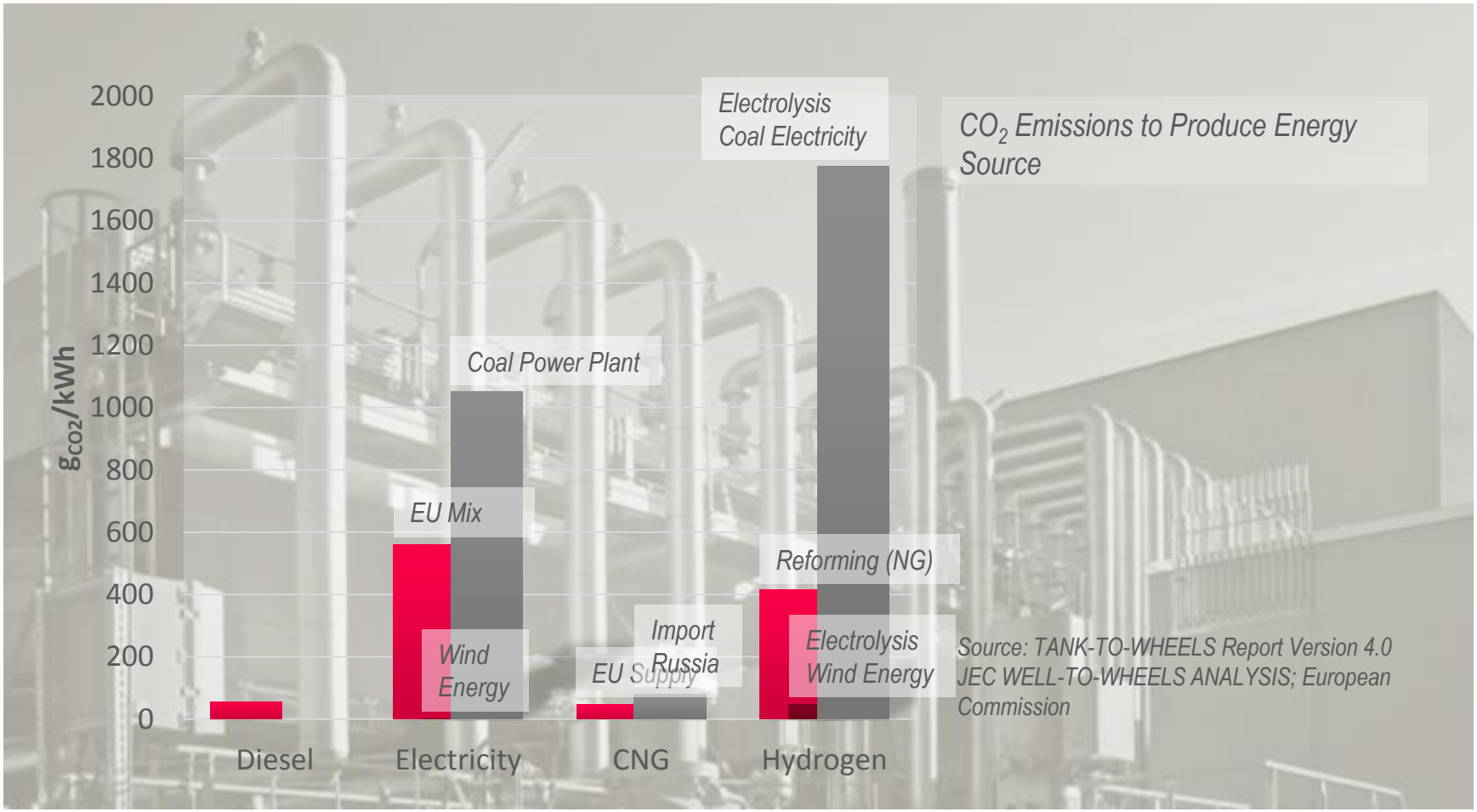
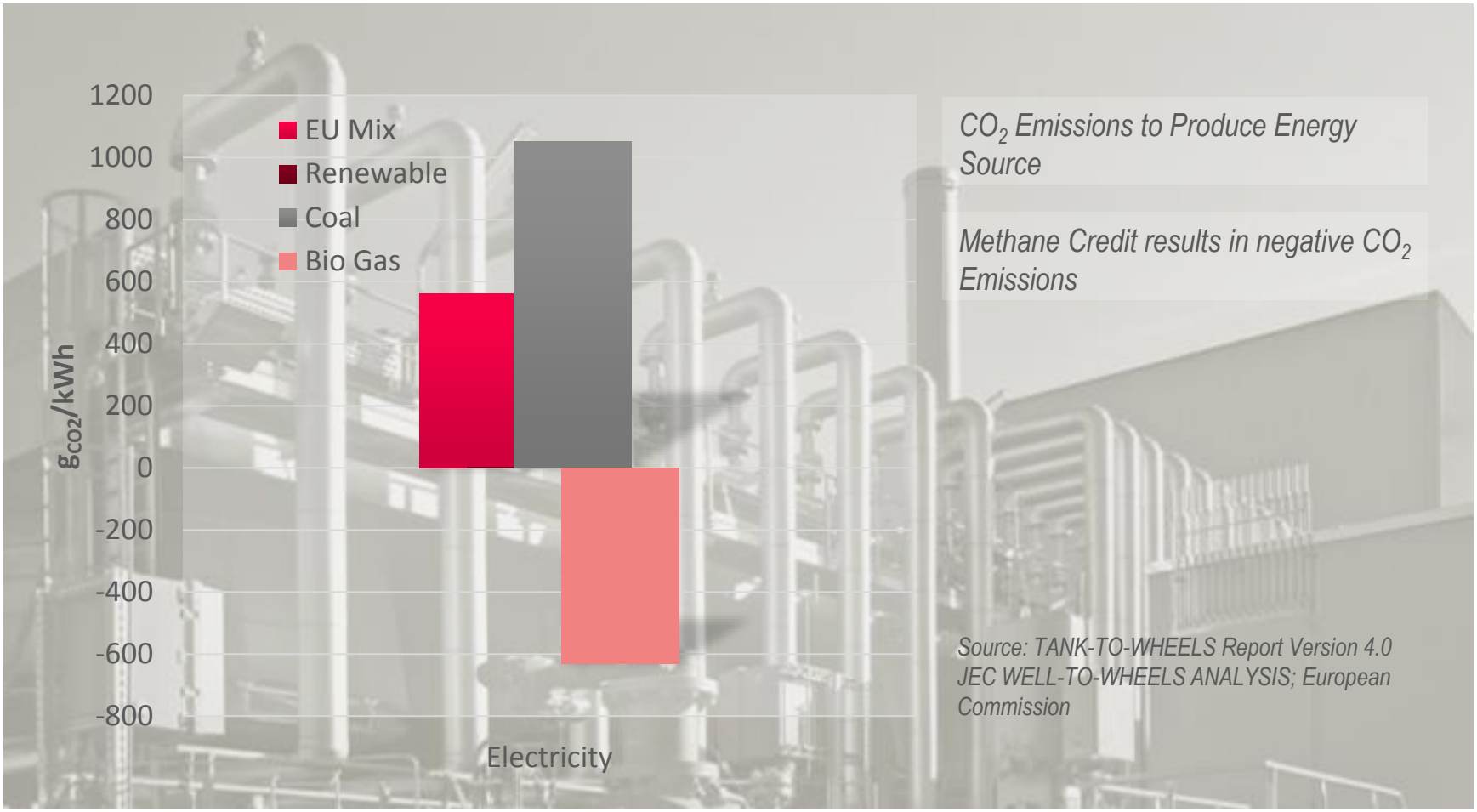
CO_2 Emissions

Well-to-Tank



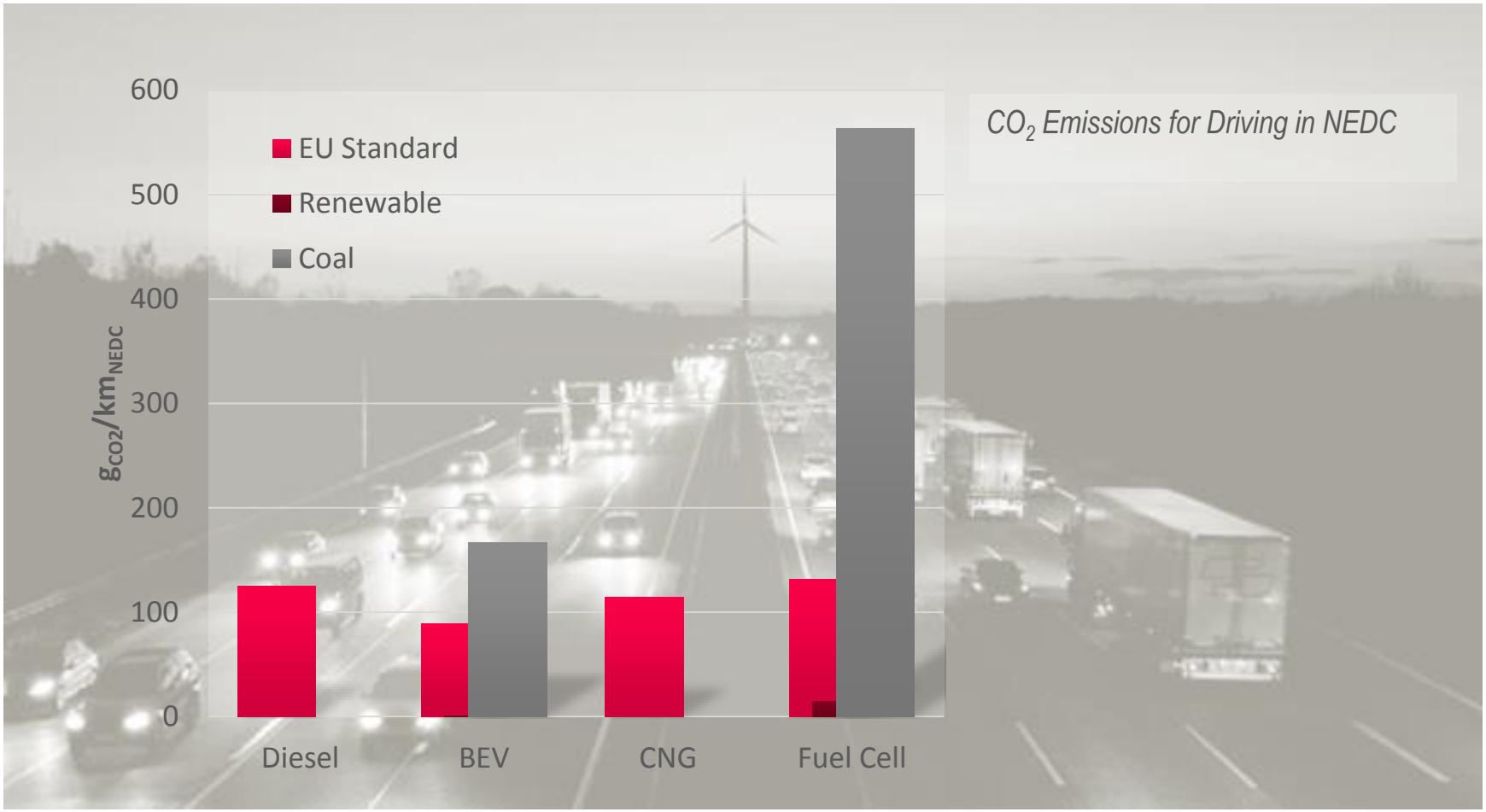
CO_2 Emissions

Well-to-Tank



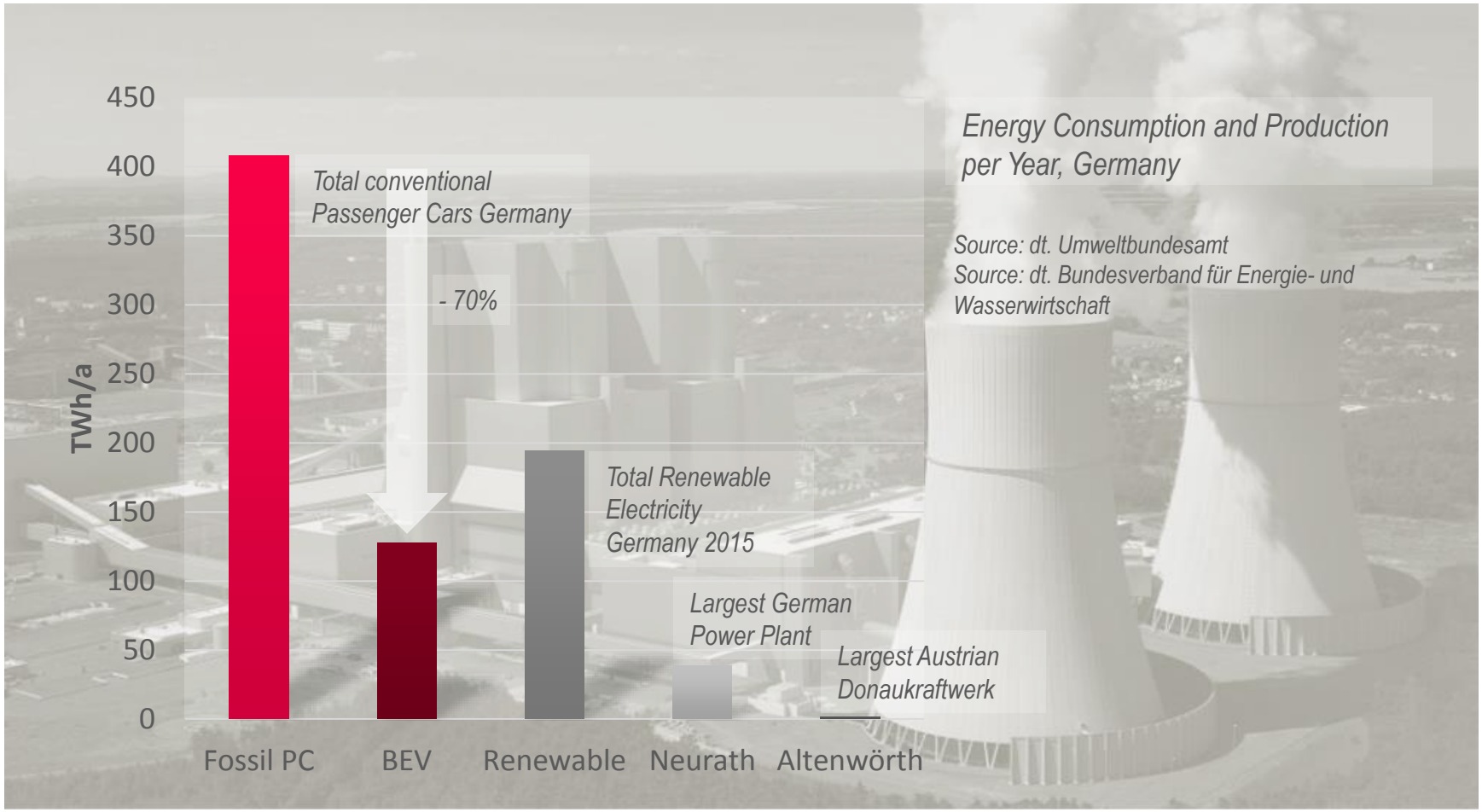
CO_2 Emissions

Well-to-Wheel



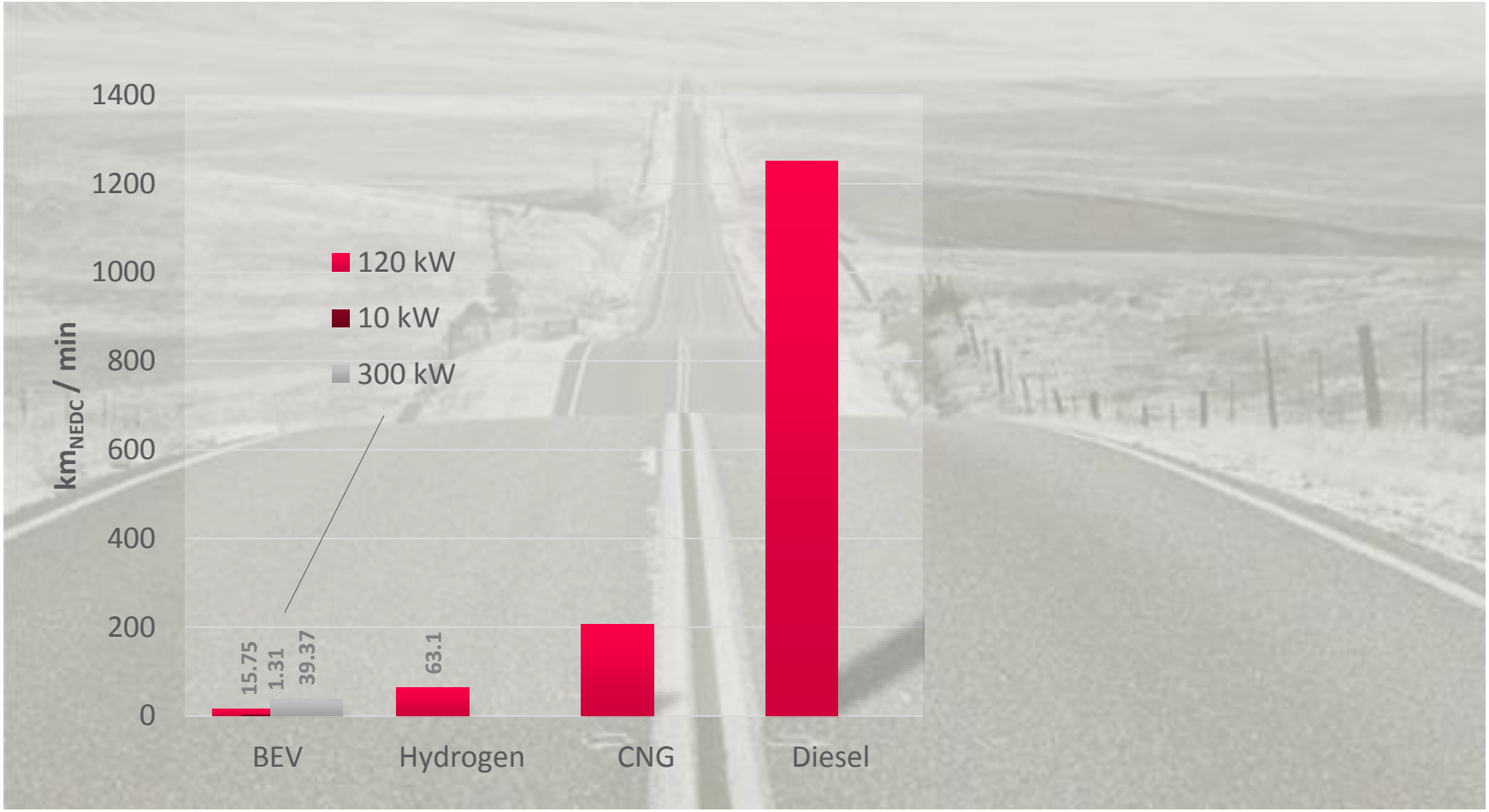
Electricity

Production and Consumption



Refuelling

Mileage after 1 Minute



Summary

- T2W: BEV more efficient than Diesel
  - BEV RD efficiency difficult to quantify
- W2T: Significant scatter band of CO_2 - Emissions
- W2W: Benefit for BEV in Europe
  - Fuel Cell W2W comparable to Diesel
- 100% BEV fleet requires ~15% more electricity
  - Renewable supply seems feasible