

# Swedish Electromobility Centre

## Fuel cell heavy duty trucks

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## Two studies about Fuel Cell Trucks

2017-2018 (delayed)

- Can fuel cells become a mass produced option globally for heavy duty trucks 2030+?  
An exploratory study  
Magnus Karlström, Hans Pohl, Elna Holmberg, Anders Grauers

2019-

- Hydrogen fuel cell trucks 2030 – next step  
Hans Pohl, Magnus Karlström  
Partners: RISE Viktoria AB, SEC, AB Volvo, Scania CV AB, Trafikverket

# Can fuel cells become a mass produced option globally for heavy duty trucks 2030+? An exploratory study

## Part 1

Total Cost of Ownership study

Compare FCV, BEV, ICE, ERS  
(Electric Road Systems)

Year: 2030+

Main case Germany, long haul

But also Regional, City distribution  
And India, USA, China

## Part 2

A qualitative assessment of other factors  
influencing the outcome

## Description of TCO study

Exploratory

Simplified (for example no lifetime issues with fuel cells, batteries and hydrogen storage)

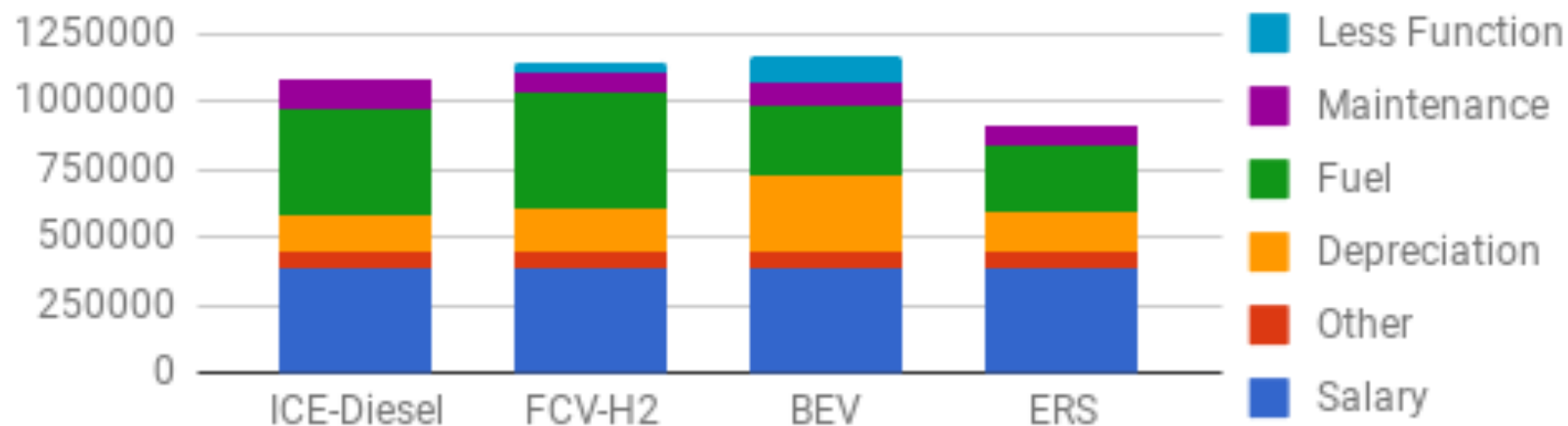
Data based on publicly available literature

Discussed with stakeholders

Ownership cost of first owner of Heavy Duty Truck

## Preliminary Result TCO Germany Long Haul (€)

### Long Haul



7 years, Germany, Long Haul, 500 km between refueling, 130 000 km/year  
 Diesel: 0,15 €/kWh, Elec.: 0,22 €/kWh H2: 0,20 €/kWh  
 Fuel cell: 51 €/kW Battery: 150 €/kWh

## Preliminary conclusion one: Factors with high total cost impact

	Low total cost impact	High total cost impact
<b>High uncertainty</b>	Cost of fuel cell system Cost of hydrogen storage Cost of electric machine	<b>Cost of hydrogen, electricity, diesel</b> <b>Residual value of BEV, FCV</b> <b>Less transport efficiency</b> <b>Km between refuelling</b> <b>Battery life length</b> <b>Cost of Battery</b>
<b>Low uncertainty</b>	Not Listed	Total mileage Cost of HEV powertrain Powertrain efficiencies Maintenance costs



## Preliminary conclusion two

€/km for different fuels much more important  
than powertrain costs, such as fuel cell cost

## Preliminary conclusion three

TCO consequences  
If less tkm or m<sup>3</sup>km  
because  
of extra weight/volume of battery/hydrogen storage

## Preliminary conclusion four

City and regional better (TCO) for FCV than long haul  
compared with ICE

However, ERS even better

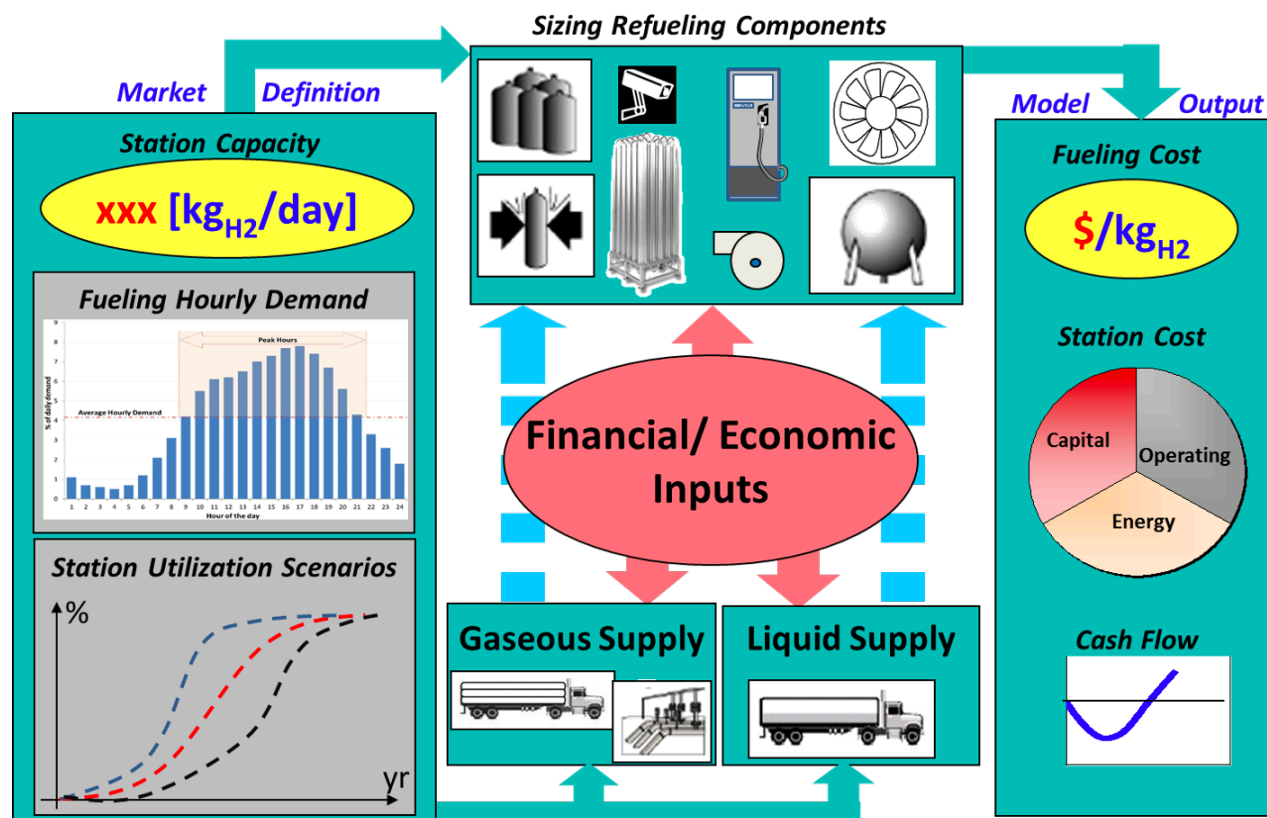
## Hydrogen fuel cell trucks 2030 – next step

- This application aims to enable another step towards a solid understanding of the conditions for fuel cell trucks to become a mainstream option.
- The proposed project will use new driving data from trucks as an input to enhance the quality of the analysis.
- More specifically, three energy-related topics will be addressed;
  - fuels and infrastructure,
  - plug-in fuel cell trucks
  - and applications
    - Now we narrow the study to cover conditions in city and regional use and more specific applications, such as refuse collection

## Fuels and infrastructure

- The previous study highlighted that the cost of fuel is very important for truck applications
- To keep the costs down, the charging or refuelling station should be used as many hours per day as possible.
- Our ambition in this project is to improve the quality of the cost of fuel assessments, mainly through case studies based on real world truck use data.

# Example: HEAVY-DUTY REFUELING STATION ANALYSIS MODEL (HDRSAM)



## Industry group signs MOU to develop and test hydrogen fueling hardware for heavy-duty vehicles

- Hydrogen suppliers & fuel cell electric vehicle (FCEV) automakers, Air Liquide, Hyundai, NEL, Nikola Motor, Shell and Toyota have signed a Memorandum of Understanding (MOU) for hydrogen fueling components for the purpose of testing state-of-the-art heavy duty (HD) hydrogen fueling hardware to assist in standardization and speed to market for fuel cell electric trucks.
- Under the MOU, the cross-industry group of both vehicle and infrastructure companies will test pre-commercial 70MPa hydrogen heavy duty vehicle high flow (H70HF) fueling hardware for future Class 8 (40 Ton) trucks.

## Preliminary conclusions



# Questions

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