



Hydrogen powered vehicles in Swindon: The UK's first commercial scale solar-powered hydrogen production and refuelling facility

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Project Aims and Objectives

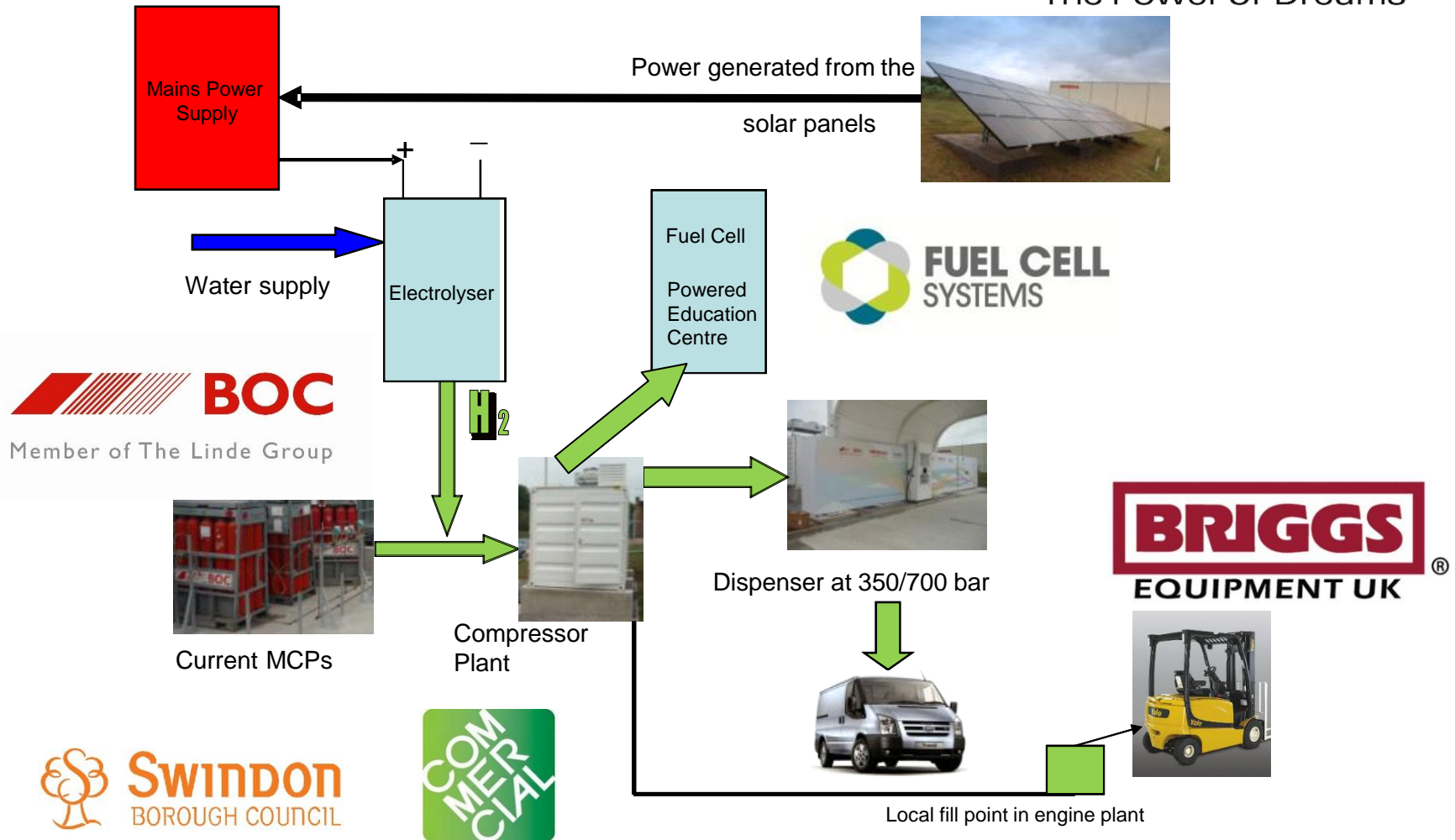
- Install an electrolyser to make hydrogen from solar PV on site
- Provide a range of “useful” vehicles to use the on site generated hydrogen
 - TRANIST panel vans for maintenance activities
 - TRANSIT panel vans for delivery vehicles
 - Fork Lift trucks for materials handling
- Demonstrate stationary power opportunities for on site generated hydrogen
 - Education centre powered and heated by a fuel cell
- Build the case and evidence that hydrogen is an option TODAY



Project Partners and their roles

HONDA

The Power of Dreams



Benefits



Member of The Linde Group

- Hands on experience of installation in the UK
- Customer service facilities and set up
- Integration of innovative approach within standard business operation



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Benefits

- 70% reduction in CO2 emission on average
- Localised Air Quality improvements
- Reduced time between DPF regeneration
- Staff engagement

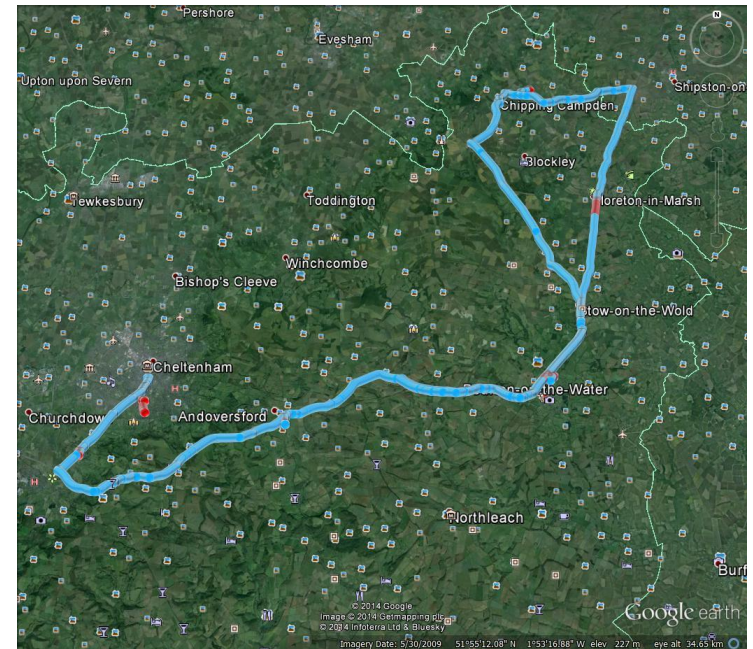


35% improved energy efficiency in real world journey

Total day trip mileage of 85 miles in “ECO Mode” with average speed at 17.3 mph

- Actual data showed 46.2 miles/kg for Hydrogen alongside 103 mpg Diesel. Equivalent to 39mpg
- Diesel only trip was 25.4 mpg
- Total energy use = 4245 kJ/mi v Diesel only 6593 kJ/mi

Gave 35% operational saving (attributed to speed limiter and more efficient use of energy)



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Benefits



- Environmentally “sound” temporary building
- No need for grid connection
- Remote control and operation
- Silent operation of power and heat generation
- Zero Local Air quality emissions
- Bespoke facilities



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Benefits

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- Extended use and run time
- Better utilisation of equipment
- Future savings in maintenance contract
- Staff engagement



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Lessons Learned

- Hydrogen refuelling equipment is more reliable the more regularly it is used
 - Have a plan that ensures you have vehicles and uses at the same time as installing the hydrogen generation and refuelling equipment
- Green tariff electricity will give the same CO2 reduction as direct connection
 - On site generation of hydrogen and localised use is the most CO2 efficient route to “green” fuel
 - It is possible to radically reduce CO2 emissions and deliver air quality improvements and have full duty cycles (unlike BIOMASS; GAS; higher standard vehicles, electric etc)
- Co-ordinated engagement between partners put Swindon at the heart of the project



Hydrogen use TODAY!

- Vehicles
 - Direct replacement of hydrocarbon fuel with hydrogen
 - Uses combustion technology (reduces technical risk and cost)
 - No range anxiety (diesel is always available when hydrogen is not)
 - Light Commercial vehicles, mini buses, HGV, Agricultural
 - Fuel cell technologies
 - No need to change duty cycle (in comparison to electric alone)
 - Materials handling, Buses
 - On their way passenger cars, hybrid electric vehicles
- Stationary power and heat
 - Back up power; temporary buildings, commercial building CHP
- Access to hydrogen is key:
 - Delivered – for back up power; low use levels
 - On site generation – direct connections or via grid
 - ZERO in use emissions and very low carbon



“Supervisory Approach” for any diesel vehicle

- Determine options for amount of hydrogen on board storage
 - Assess duty cycle; identify key emission reduction requirement; determine weight and space limitations
 - Estimate on board hydrogen storage capacity
 - Determine budget versus results requirement
- Design specific, safely engineered solution
 - One off design for vehicle type
 - One off engine calibration exercise
- Install “optimised for use” hydrogen system
 - Full ECU controlled system or supervisory approach
- Supply VSO registered vehicle for use



Next steps

- Post project commitments:
 - Operation and maintenance costs
 - On going cost for hydrogen
 - Creating local economic value for Swindon
- Partners exploitation plans
 - Opportunities for Logistics Centres and Warehousing
 - Other hydrogen refuelling stations
 - More vehicle take up
 - Opportunities for temporary buildings

