

Aberdeen Schools Hydrogen Challenge Evaluation

Project Summary

Arcola Energy aimed to deliver Hydrogen Challenge workshops in both Primary and Secondary school classes, engaging with at least 40 classes of 25-30 students for a total of over 1000 individuals engaged, the overall aim being to increase participants understanding of the technology and science behind hydrogen fuel cells and inform them of fuel cell based projects in their local area.

In actuality Arcola Energy delivered 41 workshops in both Primary and Secondary schools to a total of 1212 individuals.

Arcola Energy also organised a Final Event with over 150 attendees including 100+ school students, 20+ teachers, 15 facilitators, University of Aberdeen's Shell Eco-Marathon team with their -award-winning- vehicle, representatives from the Scottish Hydrogen and Fuel Cell Association and Barney Crockett, the Lord Provost of Aberdeen, as prize-giver.

Prizes included LEGO Robotics Kits, Renewable Energy Education Kits, Fuel Cell Science Kits, Fuel Cell Model Vehicles, Electronics/Programming Equipment, Trophies and Team Member Prize-bags, the total prize fund being in excess of £2,500.



UoA Shell Eco-Marathon Team



Final Event Prizes



Lord Provost with Prize-Winners

Hydrogen Challenge Workshop Summary

The Hydrogen Challenge is Arcola Energy's flagship "Design, Build, Race" team activity, challenging participants to build the most energy efficient model vehicle from LEGO components and a Hydrogen Fuel Cell powered electric motor. Each 1.5-2 hour workshop consists of a 20-30 minute presentation followed by self-lead discovery and experimentation. Participants are challenged to design and build a vehicle that will go as far as possible on a limited fuel supply and encouraged to take an iterative approach, testing and redesigning several times throughout the workshop to improve their distance travelled over time.

The workshop explores renewable energies, hydrogen, fuel cells and the possibilities they offer for a low-carbon future in a fun, hands-on way and is designed to inform and inspire the next generation of renewable energy engineers, guiding them towards careers in engineering, environmental sciences and the development of cleaner, greener transport. Key learning outcomes include hydrogen, fuel cell, electrolysis, iteration-based scientific enquiry, designing for efficiency, mechanical engineering, gears and ratios and renewables vs fossil fuels.

The Hydrogen Challenge is the only STEM activity of its kind, putting actual hydrogen and fuel cells into the hands of young people, custom-designed LEGO kits and 2watt hydrogen fuel cells designed by Arcola Energy are used in the workshop.

Regional/City-wide deliveries culminate in a Final Event in which the teams with the most efficient vehicles from each workshop are invited to represent their school at a high-profile final event, competing against other schools. Prizes are awarded to the schools whose teams win 1st, 2nd and 3rd place.



Workshop Presentation, Building and Racing

Arcola Energy has been involved in hydrogen fuel cell education for over 10 years, delivering hands-on learning to more than 100,000 young people from Aberdeen to Abu Dhabi and Ireland to Indonesia.

Schools Involved

Glashieburn Primary, Brimmond Primary, Heathryburn Primary, Broomhill Primary, Aberdeen Grammar, Braehead Primary, Bucksburn Academy, Cults Academy, Middleton Park Primary, Albyn School Primary, Manor Park Primary, Cults Primary, Skene Square Elementary, Northfield Academy, Kaimhill Primary, Mile End Primary, Holy Family Primary

Local Content

The presentation delivered as part of each workshop acted as a vehicle for disseminating the rules and practicalities of participation as well as background on the case for, science behind and local uses of hydrogen and fuel cells.

FUEL CELLS & HYDROGEN IN ABERDEEN



27 Toyota Mirais





Road Sweepers & Waste Trucks

Aberdeen is leading the Hydrogen Revolution

- 10 Hydrogen Buses
- 50+ Fuel Cell Electric Vehicles
- 2 Hydrogen Refuellers
- Hydrogen Maintenance Facilities
- Commercial and Municipal Vehicles
- Planned 40+ vehicles in 2020



Vans & Commercial Vehicles



2 Refuelling Stations

Fuel Cells and Hydrogen in Aberdeen presentation slide

Evaluation Method

Evaluation was conducted in several ways including, numbers attained, scores out of 5 from teacher feedback forms and key-word occurrence from participant feedback forms.

We also sought to create an annually reoccurring programme, making relationships locally to support the project beyond 2019.

Evaluation Outcome

We aimed to engage with at least 1000 students, 40 teachers, 20 schools & 100 families, we achieved totals of –

- 1212 students - 21% above target.
- >41 teachers - Based on 1 per workshop, in actuality many workshops had 2 teachers in the room and additional teachers attended the final event.
- 17 schools - Unfortunately below target, mainly due to short booking period and term-dates.
- >101 families - Based on only families for finalists counting as 'engaged', in reality this is much higher but difficult to quantify.

Scores out of 5 from teachers –

- Total questionnaires returned – 9
- Average score for workshop logistics and delivery - 4.6/5
- Average score for workshop content - 3.7/5

Keyword occurrence on attached Feedback Evaluation document, highest occurring answers below –

- What did you enjoy? - Making Cars x 177.
- What did you learn? - About Hydrogen Technology & Hydrogen Fuel x 82.
- Tell us about your engineer - Helpful & Encouraging x 128.
- What to improve? - Nothing x 80.
- Thoughts/Comments? - None x 116.



Legacy

Arcola Energy have developed, and hope to maintain, a good working relationship with Aberdeen City Council, the Lord Provost of Aberdeen, Hydrogen Aberdeen, University of Aberdeen and University of Aberdeen's Shell Eco-Marathon Team "PrototAU". We are currently discussing plans for an annually re-occurring delivery celebrating Aberdeen as the silver city of the UK's Hydrogen Revolution.

Whilst we have not had any formal talks post-project, there was considerable support for the project and many teachers, students and local officials expressing their hope that the project would continue. We have several planned engineering projects taking place in Scotland over the next 24 months, this will include an allocation for public engagement and dissemination, the upshot of this being that even if we do not create the annual programme straight away, we already have budget lined up for another Aberdeen Schools Hydrogen Challenge in 2020/21.