Cella Energy Ltd

*From Ivory Tower to Pillar of Commerce*

Stephen Bennington

*CEO*
Cella Material

We store hydrogen in a simple plastic pellets

Heat them to 100°C and the hydrogen is quickly released

Plastic like material, safe to handle easy to process
Carbon Emissions

- Energy supply: 40%
- Road Transport: 22%
- Business: 17%
- Residential: 15%
- Other: 6%
Fuel Cell Electric Vehicles

• Most vehicle manufacturers are rolling out ‘affordable’ fuel cell vehicles in 2015 – 17
• Prototype vehicles have the same performance and range as gasoline vehicles and have been tested by consumers over hundreds of thousands of miles
• Early markets in fork lifts and other heavy lift vehicles

Honda Clarity
Hydrogen Storage

‘Hydrogen storage on a vehicle is problematic because, in order to achieve a reasonable energy density, it must currently be stored as a liquid at low temperature or as a compressed gas, the latter requiring a large and expensive tank.’

The King Review of low-carbon cars Part 1 – October 2007
Started with a £300K award from the STFC in 2007
Initial Research

The idea

Neal Skipper, UCL

Me, Semi-UCL
Hydrogen Storage and Nanotechnology

- Hydride enclosed in a polymer shell
- Retains structure over many hydrogenation cycles
- Choose a hydrogen permselective polymer
- Filters impurities from hydride decomposition
- Delivers clean hydrogen stream
- Prevents oxidation
Initial Research

Students

Arthur Lovell, UCL

Zeynep Kurban, UCL
Initial Research
Initial Research
Initial Research

- 1-3 mm diameter
- Very porous shell
- 50-200 nm pores extending through bulk
The Start of the Business

The Entrepreneur: May 2010

Stephen Voller, Not UCL
The Start of the Business

5th August 2010
The Start of the Business

First Funding: September 2010

Harry Swan, Not UCL
The Start of the Business

First Employees: January 2011

Tom Headen, UCL

Atahl Nathanson, UCL
The Start of the Business

Incorporation of the company: January 2011
The Start of the Business

British scientists 'invent artificial petrol' that could cost just 90p per GALLON (and there's no carbon)

A revolutionary synthetic fuel which costs just 90p per gallon and will run in existing cars could spell the end of sky-high prices at the pumps.

With current petrol prices at 128.8p per litre, the new hydrogen-based fuel would offer much-needed respite for motorists.

But critics argue that it will be years before it becomes widely available.

As it is hydrogen-based, it produces no greenhouse gases at all so an added advantage is it could help nations slash the size of their carbon footprint.

It is hoped the technology, developed in a top secret programme at an English laboratory, could spell the end of dramatic petrol price fluctuations.

Cella Energy, which developed the new fuel, at Rutherford Appleton Laboratory in Oxford, is confident that it will run in existing cars.
The Start of the Business

Second Round of Funding from Space Florida: September 2011
The Start of the Business

Start negotiations with NASA on Space Act Agreement:
September 2011
The Start of the Business

On the road: Selling
The Start of the Business

Awards
Laboratories and Offices

New UK Laboratory: January 2012
Laboratories and Offices

New US Laboratory: February 2012
Where are we now

- 6 patent applications
- 20 employees in two laboratories
- Some revenue
- Partnerships with major Automotive, Aerospace and Chemical companies
- Now raising more money
The Value Chain

Boron mining and intermediate chemical production → Ammonia Borane production and recycling → Cella materials and processing → Cartridge Manufacture → Flow System Manufacture → Longer lasting batteries

Cella Energy’s intellectual property

Reducing diesel emission → Zero emission vehicles
Fund Raising – the valley of death

• Fund raising requires a coherent and watertight business plan
• Government funding TSB/DECC etc can be useful
Cella Material

- Polymer / hydride nano-composite
- Plastic like, easy to handle and process
- Speeds up hydrogen release by a factor of 10
- Protects the hydride from water vapour
- Prevents melting and foaming
- Switched to Freeze drying and tablet coating
- Can now make 50 kg per day
Pelletized Cella Material

Millimetre sized beads can be pumped like a fluid

• Ideal for large scale applications like vehicles
• Refuelling is done with inexpensive pumps
• The beads are pumped to a hot-cell where the hydrogen is released
• The waste beads are stored in waste tank for removal and regeneration
Cella Pelletized Materials

- Minimizes infrastructure costs
- Familiar customer experience
- Safe and simple to use – no high pressures
Battery replacement

Our initial market is small electric surveillance Unmanned Aerial Vehicles

- More than 50,000 small electrically powered vehicles are in service currently
- Set to move into civilian markets

The design has the pellets built into the wing. It is simple solid-state and easy to replace.
Battery Replacement

As the production of the material and system scales-up the costs reduce.

The same technology can be used for:
- Soldier portable power
- Consumer electronics
Material ready

Develop Prototypes

Initial testing

Field trials

Spring 2013

Summer 2013

Autumn/Winter 2013

2014
Climate change
Security of energy supply