*Slide 0*

Good day everyone, today we’re going to talk about Utilizing Hydrogen Fuel Cell. My name is Pandu, this is Rubie and Benny.

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First before we start we need to know about our current situation of energy sources. Our current energy source is fossil fuel. However, fossil fuel has some problems as our main energy source. First, fossil fuel is a limited resources. It also emits large amount of CO2 which affects global warming. The demand for fossil fuels are also keep increasing throughout the year.

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Other problems such as air pollution, oil spill, greenhouse gas and how society are too dependent for fossil fuels are also part of their problems.

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Lastly, the reserves can’t keep up with the demand for fossil fuel. From the data, it is estimated that oil reserves will only last for around 53.3 years from 2014 while the demand keeps increasing throughout the year.

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Because of this, an alternative energy must be developed. One example of alternative energy that we choose is fuel cell

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Here are the list of problem that we will discuss in this presentation:

* What is hydrogen fuel cell
* Where hydrogen fuel cell is utilised
* Is hydrogen fuel cell safe
* Does hydrogen fuel cell emits higher GHG compared to fossil fuel?
* Is hydrogen fuel cell efficient?
* How does it cost?
* What is the impact towards society?
* Is developing hydrogen fuel cell a good choice for sustainable development?
* What kind of improvement can be made?

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Fuel cell is a device that can generate electricity by using chemical reaction. It consists of electrolyte and electrodes that act as a catalyst. One of the advantage of using fuel cell is that the reaction generates little pollution

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Here is a brief talk about fuel cell history. First fuel cell is invented as ‘gas battery’ in 1839 by William Grove and developed later to be the current fuel cell in 1889. Throughout the years, there are notable developments for fuel cell. For example

* 1990: Large stationary fuel cell were developed for commercial and industrial location
* 2007: Fuel cell began to be sold commercially as APU
* 2008: Honda began leasing FCX fuel cell electric vehicle
* 2009: First commercial 2 MW power to gas installation in Falkenhagen

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The schematic on how fuel cell works is: first the hydrogen enters at anode where it strips off their electron by chemical reaction. The electrons then provides current to the electric wire and generates electricity. The protons goes through the electrolyte and combines with the electron and oxygen in the cathode and forms water.

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One of the most important properties for electrolytes is that it must only permits the appropriate ions to transfer between anode and cathode.

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Next is where fuel cell is utilised. Fuel cell is utilised as primary and backup power generation for commercial, industrial and residential scale. They are categorised into three areas: portable, stationary and transportation.

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Examples of their applications in our life are:

* Automobiles
* Submarines
* UPS
* Notebook computer chargers
* Base load power plant
* Emergency power system

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Hydrogen fuel cell are still being developed and as a result many designs to improve their properties had been made. Examples of hydrogen fuel cell types are:

* Proton exchange membrane fuel cell: Where it use proton conducting membrane as electrolyte
* Phosphoric acid fuel cell: Where it used phosphoric acid as electrolyte
* Molten carbonate fuel cell: This fuel cell operates at high temperature (650oC) and use lithium carbonate as electrolyte

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So then, what more can we do to improve fuel cell? A an example of quick overview on which part can be improve are:

* How to find a better way to store hydrogen
* Designing a better catalyst
* Improving durability of fuel cell

This we will discuss it more in the next part