Türkiye Cumhuriyeti
Bilim, Sanayi ve Teknoloji Bakanlığı

HYDRA ENERGY

Fuel Cell System for Telecom Applications: A Low Cost Green Back-up Power System Alternative to Diesel Generators

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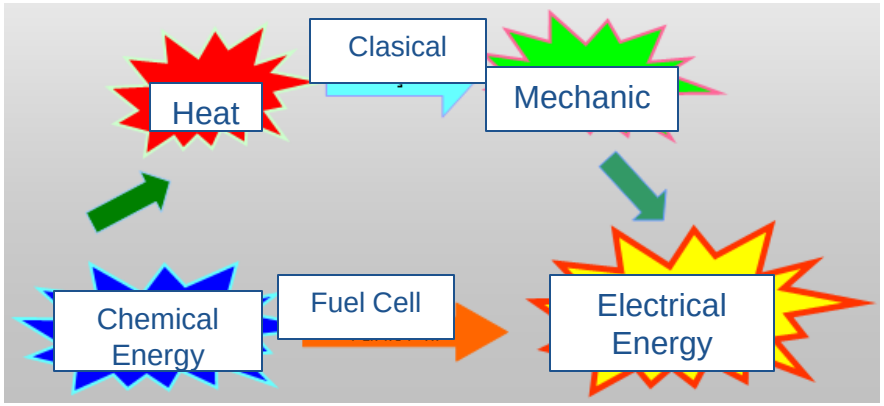
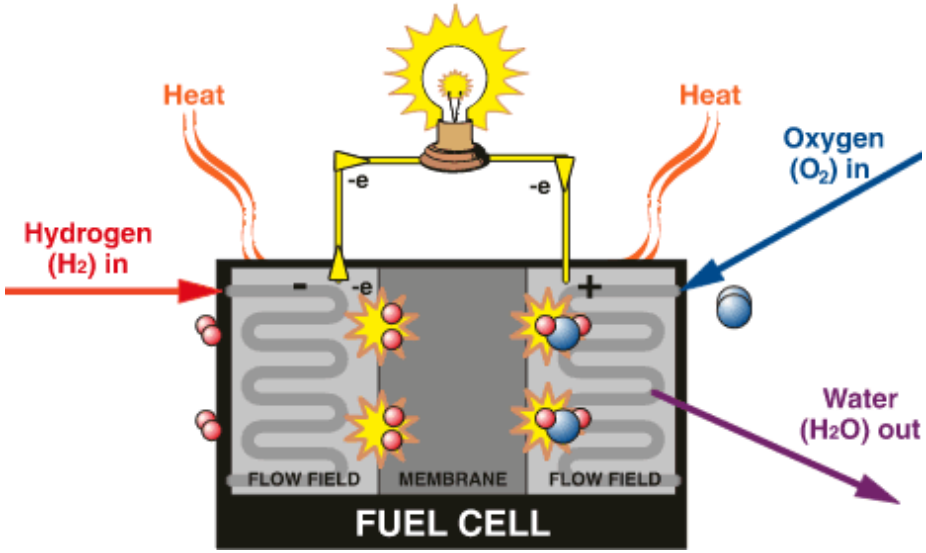
General Definition

Fuel cell is a device that converts the chemical energy of a fuel (hydrogen, natural gas, methane, alcohol, gasoline, etc.) and an oxidant (air or oxygen) directly into electricity. This process happens without combustion.

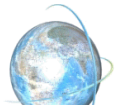
A fuel cell operates electrochemically through the use of an electrolyte, just like a battery, but it does not run down or require recharging. It is like a generator in that it operates as long as the fuel is supplied; but unlike a generator, it is simple, quiet, clean and has few moving parts.

Chemical Energy (H_2 and O_2 - Air) → Electric Energy + Heat + Water





Benefits of Fuel Cells for Telecommunication and Back Up Power Applications



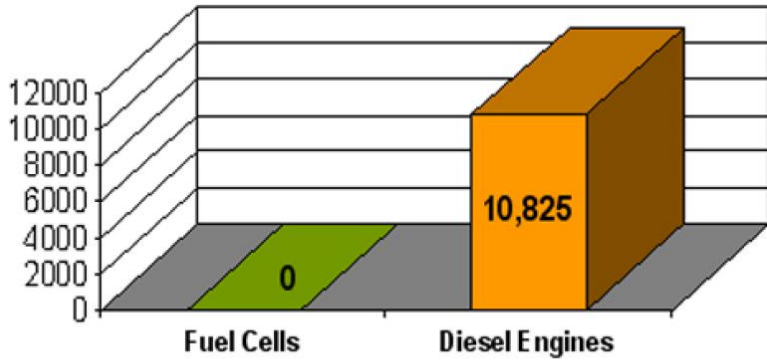
- **Environmental –** Unlike generators, fuel cells do not use combustion and therefore there are no NOx, SOx or particulate emissions from the unit. So the Fuel Cells provide Clean Energy and hence the Green Energy.
- **Cost –** Over the lifetime of the unit can offer cost savings over existing technologies**.** This include: maintenance, repairs, transport and disposal
- **Reliability** - In many cases, fuel cells are able to offer higher reliability and MTBF (Mean Time between Failures) and there is no degradation of voltage over time. Failures tend to be less critical and easily dealt with.
- **Fuels -** The majority of these systems operate on hydrogen (in this instance the only emission is water), which can be generated from renewable sources (electrolysis) or from reformed hydrocarbons (methanol, propane, ammonia and natural gas).
- **Temperature Tolerance –** Unlike batteries, fuel cells do not degrade a high temperatures and their range can be between - 40°C and +50°C without any cooling required.
- **Integration –** Fuel cell systems provided as either a standalone unit similar in size to a small refrigerator (for applications like base stations) or can be inserted in existing 19” racks. So Fuel Cells are fit for outdoor as well as indoor applications.
- **Maintenance** – Fuel cells have very few moving parts which reduces the need for regular maintenance.
- **Autonomy** – Fuel cells are able to operate as long as there is available fuel, so whether an 8 hour, 1 day or 3 day extended runtime is required, enough fuel can be stored onsite.
- **Remote monitoring –** Fuel cells can be fully monitored from one central location alerting the operator as to when the system is in use and how long before refuelling is required to ensure no downtime.
- **Space requirement –**The space required for the same period of runtime is considerably less for fuel cells than for battery banks. Fuel cells do not require cooling like batteries which eliminates the need for spacious cooling systems.

Environmental Impact of Fuel Cell Based System

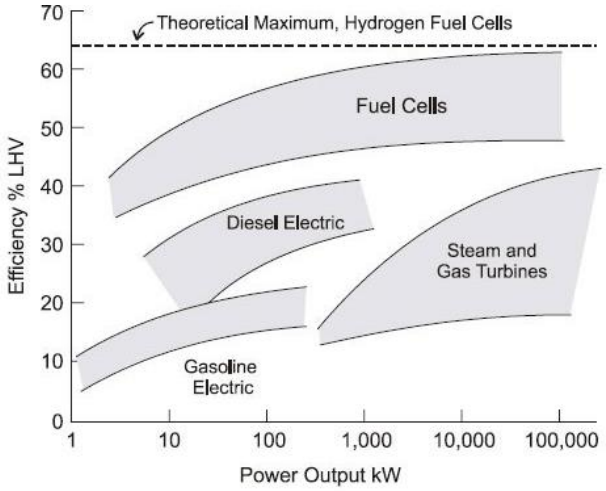
- First, distilled water is the only byproduct of the electrochemical process taking place in the fuel cell, whereas diesel engines produce polluting exhaust fumes.

- Second there are no toxic wastes to be disposed, such as acids and lead present in all batteries.

- Lastly the elimination of logistics related activities allow for an intrinsic benefit on the environment not needing to transport any fuel to the site.

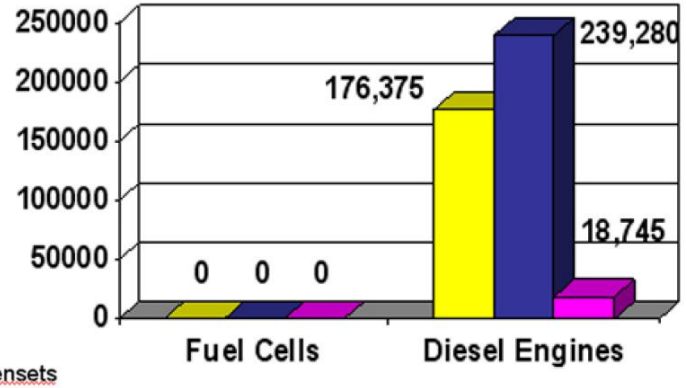


Tons of Carbon Dioxide

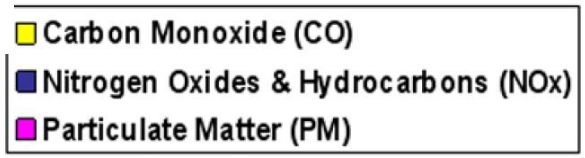


Efficiency Comparison (www.micro-vett.it)

Pounds of Emissions



Assumptions:
- 1,000 sites
- 20kW Diesel-fueled Gensets
- 150 hours runtime per year
- 5 years



Project Details

- We investigated innovative electrolyte membrane for polymer electrolyte membrane fuel cells. Fuel cell's membrane is most critical component for efficiency and life time.

- Our developed membrane performance is very high. Also, the cost of our membrane is much lower than commercial membranes. National patent is approved. International patent procedure is continuing. We developed a fuel cell prototype with our membrane a year ago.

- This project name is "**Fuel Cell for Telecom Applications: A Low Cost Green Back-up Power System Alternative to Diesel Generators"**

- **Target of the project is development of Fuel Cell System to provide back up power critical communication network infrastructures in wireless, fixed and broadband telecom applications.**

- Batteries are relatively inexpensive for 1 to 2 hours of backup power. However, batteries are not ideal for longer duration backup power applications because they can be expensive to maintain, unreliable after aging, temperature sensitive and hazardous to the environment after disposal. Diesel generators are capable of longer duration backup power. However, generators can be unreliable, maintenance intensive, and emit high levels of pollution and greenhouse gases into the atmosphere.

Thank You for Your Attention

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