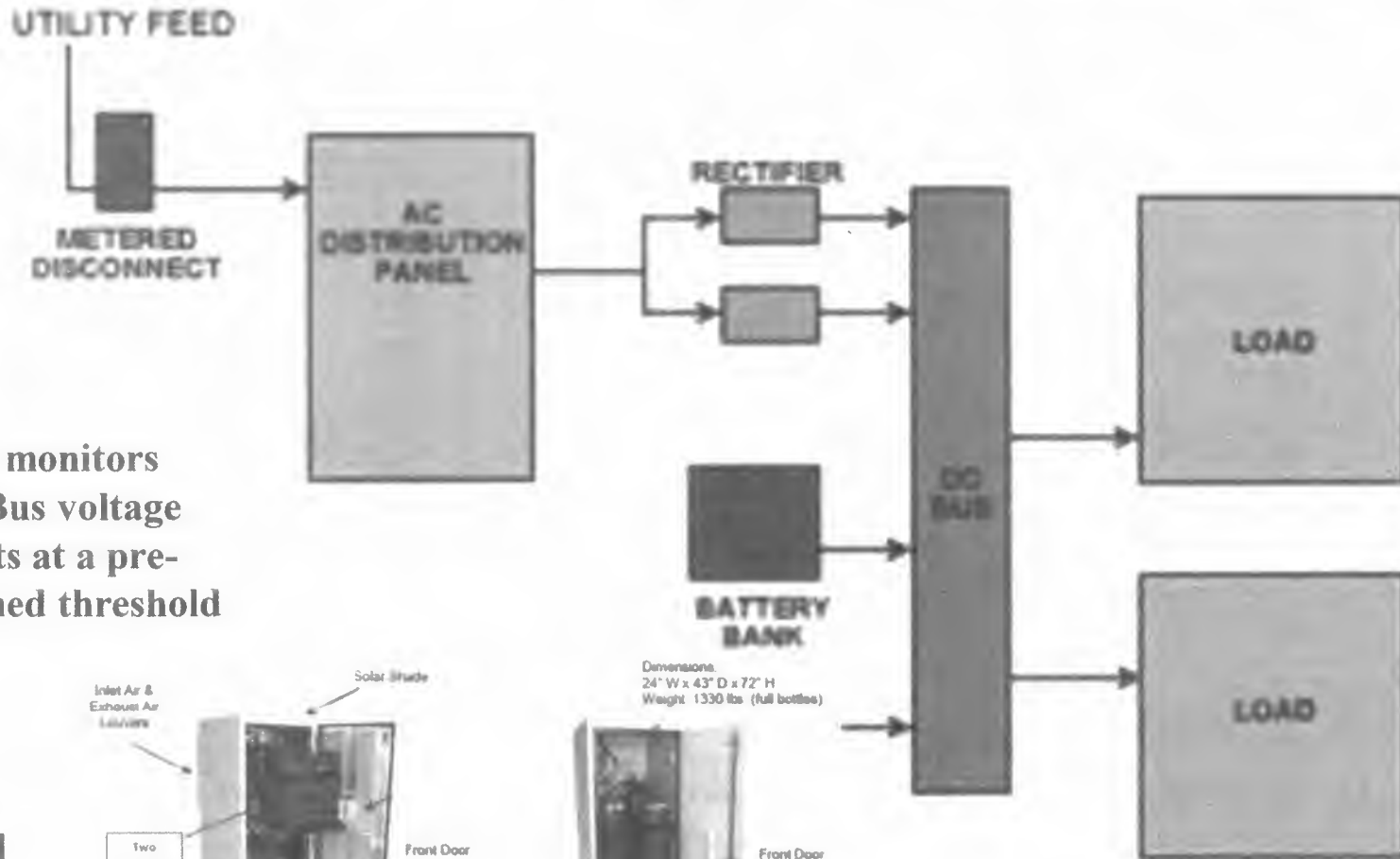
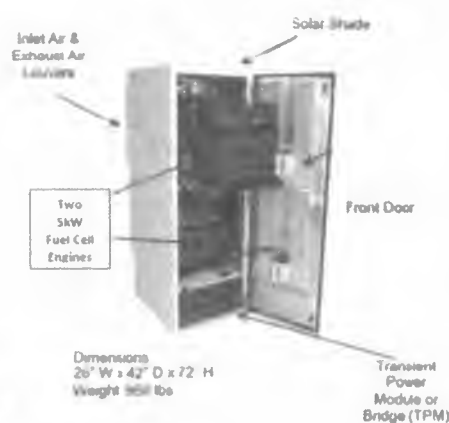


Block Diagram – Telecom Application



Fuel cell monitors the DC Bus voltage and starts at a pre-determined threshold

10kW Fuel Cell Engine



Product Certifications - Meet or Exceed Codes and Standards

- Alteryg's products are fully tested, certified, and listed by CSA Group to ANSI/CSA FC 1-2014 (US version of the international IEC62282-3-100:2012 Stationary fuel cell power systems - safety)
- CARB certified and listed as zero emissions generator
- Alteryg Products Meet or Exceed the Requirements of:
 - State Fire and Uniform Building Codes, International Fire Code
 - NFPA 1 – Uniform Fire Code
 - NFPA 2 – Hydrogen Technologies Code
 - NFPA 55 – Standard for storage, use, and handling of compressed gases and cryogenic fluids in portable and stationary containers, cylinders, and tanks
 - NFPA 853 – Standard for the installation of stationary fuel cell power systems
 - NFPA 70 – National Electric Code (NEC)
 - ANSI/CSA FC-1 – Standard for Stationary Fuel Cell Power Systems
 - UL-Underwriters Laboratories, as part of FC 1: UL991 – Safety Controls, UL1741 – Converters and Controllers, UL 60950-1 - Electrical Safety
 - Federal Communications Commission (FCC) Part 15, Class A devices
 - NEBS requirements for backup power generators

Alteryg is an active in the following groups and associations

- CSA Standards Committees for fuel cells
- US Delegate to the IEC Technical Committee TC105 for fuel cell technologies
- National Fire Protection Association (NFPA)
- Telecommunications Industry Association (TIA) for fuel cell implementation.



System
Approval



Gas
Approval



FCC
Approval

General Questions

- **How much hydrogen in a standard 63” steel cylinder?**
 - Typically stored at 2400 psi, contains 300 cubic feet
- **Will hydrogen catch fire?**
 - Hydrogen is lighter than air and diffuses rapidly. It is a flammable gas, however, at any temperature on Earth it is a vapor that is 14 times lighter than air that rises about 45 mph and readily dissipates due to its light weight. The fuel evacuates the area if it escapes containment, it readily dissipates in the air until it is no longer flammable and leaves no residues or other contaminants. There are no requirements to report to the EPA any amount of hydrogen that escapes into the environment. Hydrogen burns at 4% to 75% concentration.
- **How much heat does fuel cell produce?**
 - The fuel cell is about 50% efficient (vs an internal combustion generator <30% efficiency). At full power, the maximum temperature of the fuel cell stack is about 60 deg C and the exhaust air is < 50C (122F)
- **How does a First Responder shut fuel cell off?**
 - The fuel cell has an on/off power switch on the front of the unit. The fuel storage cabinet has a manual valve on the exterior of the cabinet to shut off the supply of gas to the fuel cell cabinet. This will shut off the fuel cell and requires manual intervention to restore power.

Q&A

- **What monitoring does the fuel cell system do?**
 - System has built in hydrogen leak detector, it if senses concentration of 2% it closes all fuel valves, shuts off fuel supply. System generates a Gen Fail alarm that gets reported on a dry contact.
- **What can be monitored? Dry contacts can be monitored for:**
 - Low fuel alarm for programmable threshold, 1000 psi is close to 40%. Fuel pressure is monitored. Pressure is converted to a % fuel level.
 - Gen Fail: contact closure alarm
 - Gen Run: power outage, fuel cell running

Hydrogen is 14.4 times lighter than air and 12 times lighter than gasoline vapor

Hydrogen is 22 times weaker than the explosive power of gasoline

gTNT/M³
Energy of Explosion
Volume related
gTNTm3(STP)

