

## Remote Power for Remote Wilderness

### Propane used for engine generators and fuel cells at Kenai Fjords and Denali National Parks

**H**undreds of thousands of visitors come to Kenai Fjords National Park to view marine wildlife, dramatic inlets, and the Harding Icefield. Likewise, 120,000 visitors venture into Denali National Park and Preserve to experience the world-renowned wildlife viewing and sub-arctic environs. To address the needs of so many visitors, the facilities require careful planning. Design of the visitor centers must accommodate power, HVAC, restroom, and drinking water facilities.

The very wild nature that makes these locations fascinating presents substantial challenges in addressing visitor needs, demanding an environmental focus and minimal impact ideally suited to on-site propane-fueled power generation. Engine generators and fuel cells can provide reliable sources of energy independent of grid-related restrictions and costs, combining environmentally sound electricity generation with the ability to utilize waste heat. These technology installations also provide an additional point of interest for park visitors. Demonstrating off-grid power generation with reduced noise and pollution, and operating fuel cell systems also provide in-the-field study of performance and promote new energy alternatives to an interested public.

The Propane Education & Research Council is working with the National Park Service on several projects: *Provide Fuel Cell Power to Remote Nature Center at Kenai Fjords National Park, Seward Alaska (Docket 10864)*, *Installation and Operation of an Enhanced Off-Grid Solid Oxide Fuel Cell at Exit Glacier, Alaska (Docket 11687)*, *5kW Continuous Duty Rated Propane Generator at Exit Glacier, Kenai Fjords National Park, Alaska (Docket 11724)*, and *Install Technically Advanced Propane Generator System at Denali Visitor Center (Docket 11795)*.

#### Project Objectives

Collectively, these projects seek to:

- Demonstrate and promote the advantages of propane distributed generation equipment
- Explore and improve the operation of propane generators and fuel cells
- Develop knowledge and experience for future remote applications for propane
- Educate the public about propane as a positive energy source

#### Public Promotion: the Promise of Propane

Visited by 150,000 people each year, the Exit Glacier Nature Center in Kenai Fjords National Park provides an excellent opportunity for broad public exposure.

The fuel cell installed in the Nature Center, the first in Alaska to operate in an off-grid location, is on public display and features interactive screens that explain fuel cell operation and show real-time data. This interactive educational experience generates interest and awareness of propane applications and fuel cell technology.



The Exit Glacier Nature Center



The Denali Visitor Center, site of many propane distributed generation installations

**Provide Fuel Cell Power to Remote Nature Center at Kenai Fjords National Park, Seward Alaska (Docket 10864), and Installation and Operation of an Enhanced Off-Grid Solid Oxide Fuel Cell at Exit Glacier, Alaska (Docket 11687):** Since 2003, the fuel cell installation in Kenai Fjords National Park has shown an off-grid power generator with reduced noise and pollution. The fuel cell reduces noise, air emissions, and potential hazardous spills due to the elimination of diesel generators at the site.

Advancing technology of fuel cells in the household range and subsequent operation, like the 5 kW units at the Nature Center and Exit Glacier, presents an opportunity to gain information that will transfer to other fuel cells using propane as the fuel for the reformer. These projects will provide data on fuel cells that can be utilized in other off-grid locations.

**Project Status of Docket 10864:** Installed in 2003, a 5 kW solid oxide fuel cell was used to provide all electricity and heat for the Kenai Fjords Nature Center, and power a well water pumping system. When the fuel cell was not running, the existing diesel genset provided all power.

**Project Status of Docket 11687:** At the end of the 2005 season, the 5kW Acumentrics fuel cell was removed and completely reworked, including a new generation cell stack. With startup in late July 2006, the fuel cell system ran for more than 1,600 hours, which is a potential new field record of performance for solid oxide fuel cells.

**5kW Continuous Duty Rated Propane Generator at Exit Glacier, Kenai Fjords National Park, Alaska (Docket 11724):** A 5kW continuous-duty propane generator allows the Exit Glacier area of Kenai Fjords National Park to run off of one fuel source (propane) and shows that a 5 kW generator can produce reliable power with peak loads well in excess of 5 kW due to the battery configuration of the generator package.



The Kenai Park solid oxide fuel cell

The system is integrated with the existing propane tanks and fuel cell. Cycling of the well pump and water pressure system will demonstrate that power fluctuations such as those in rural homes can be accounted for with such a system.

**Project Status:** An Onan heavy-duty genset with a four-cycle liquid-cooled spark ignited engine was installed in May 2006. Currently, unit operation is excellent and performance data continues to be collected. In addition, staff at the site capitalized on the fuel supply and installed a propane heater for the outside restroom, illustrating how

known applications for propane systems may branch out into additional sales opportunities.

**Install Technically Advanced Propane Generator System at Denali Visitor Center (Docket 11795):**

The planned hybrid power generation system includes a generator, propane tank, batteries, inverters, switchgear, solar panel array, and proposed wind generator, with an educational display explaining the system.

**Project Status:** An Onan heavy-duty genset unit has been selected, and installation is scheduled for summer 2007. Engineers are exploring the installation of platinum long-life spark plugs and an extended air filter. Due to the operating conditions, oil changes will be done only once per year along with general system maintenance. The duty cycle in the hybrid system is such that a lower-cost genset was able to be used at the site. Other options to advance propane generator technology and maintenance in park applications are being explored as well. Performance results will provide a baseline against which to measure future generator performance improvements and identify points of improvement in standard generator systems.

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**For More Information:**

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