

Energy Solution Provider

## 2013 – Seismic Instrumentation Technology Symposium

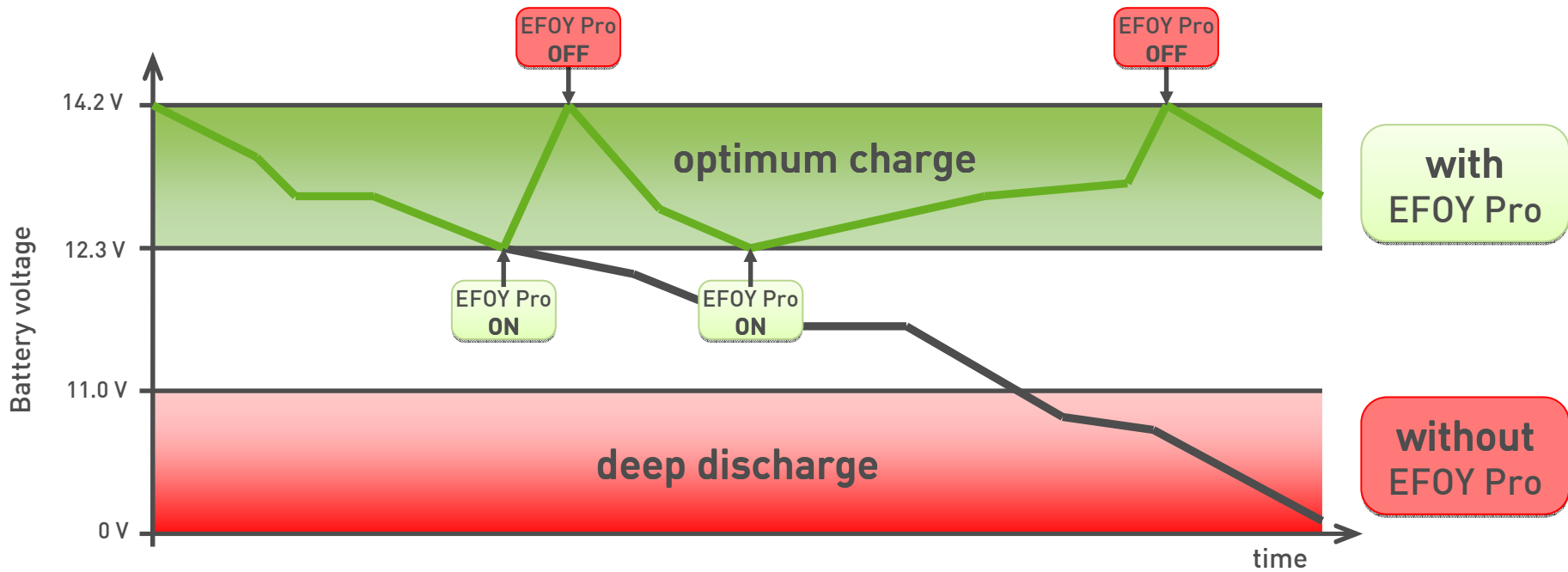
### EFOY Pro Fuel Cell Solutions for Cold Climates

February 2013

# Agenda

1. EFOY Fuel Cell Technology
2. EFOY Pro Energy Solutions
3. SFC Energy performance test facility
4. Cold Climate References

# EFOY Pro Fuel Cells: Technology

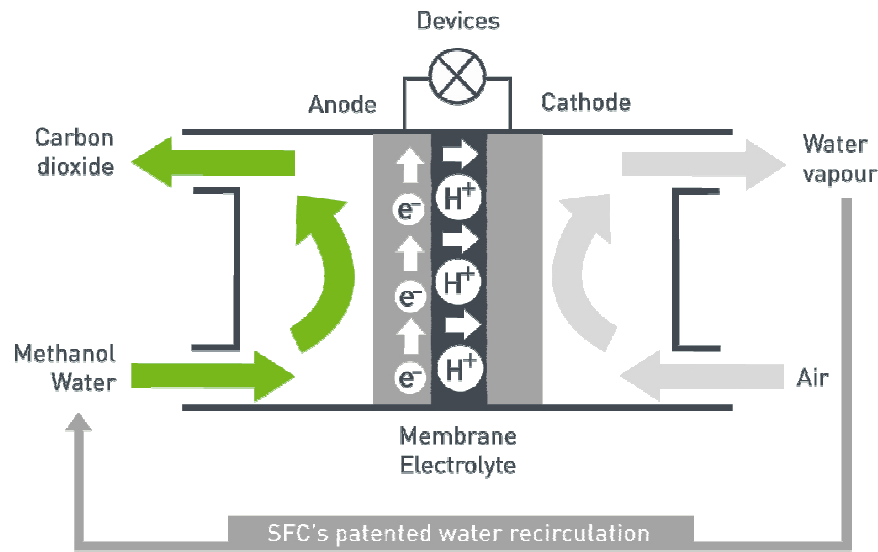


# EFOY Pro Fuel Cells: Functional Principle

**Anode side**

Catalyst oxidizes methanol with water, results:

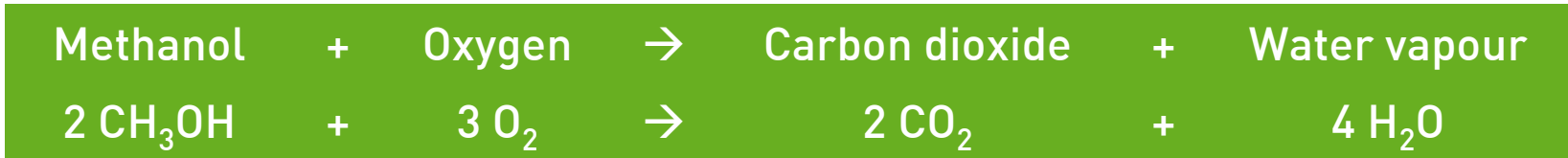
- Carbon dioxide
- Hydrogen-protons (H+), move to cathode side
- Electrons (e-), generate the power



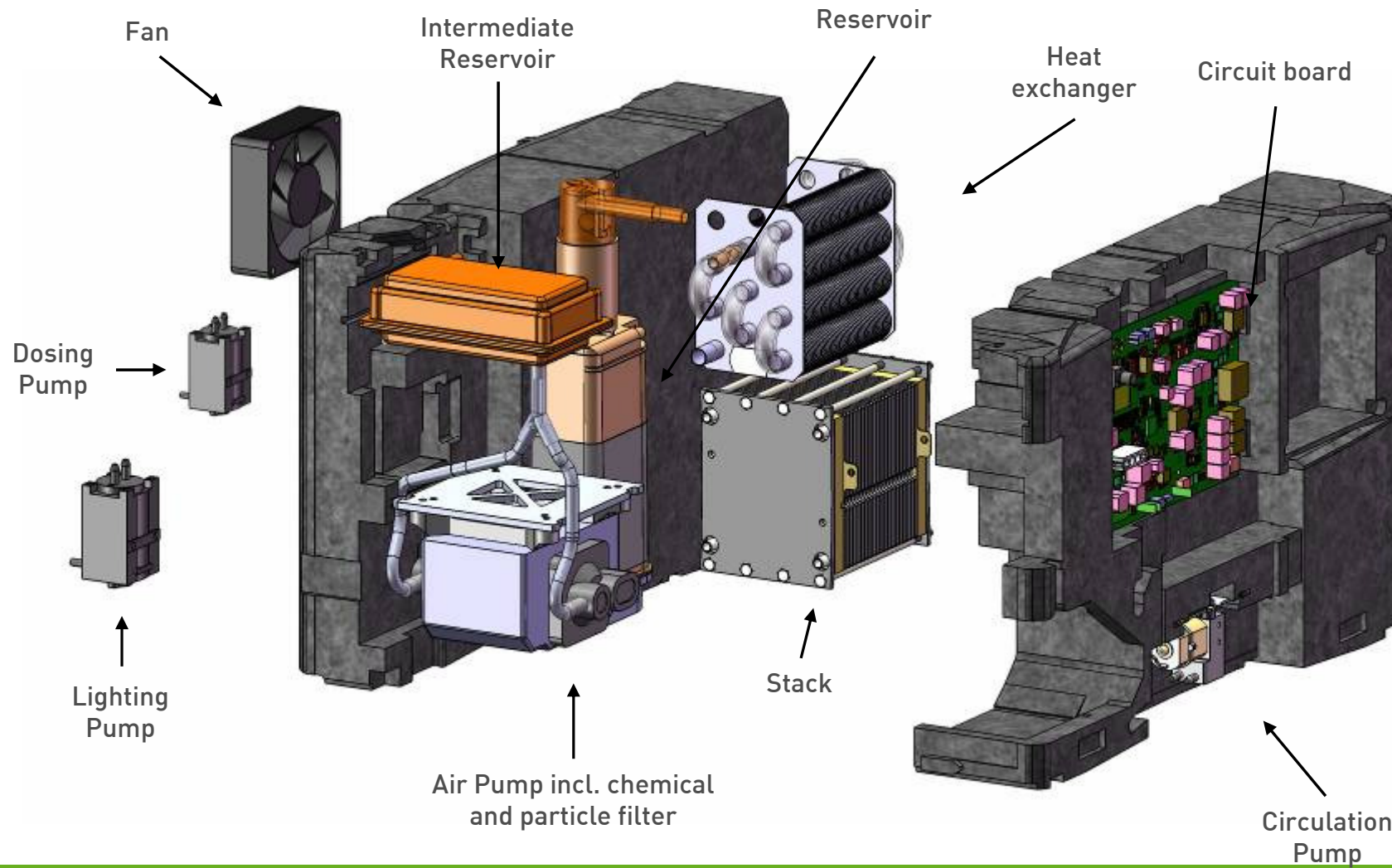
**Cathode side**

- Protons, electrons and Oxygen (air) react to water (vapour)
- Water vapour gets cooled by the heat exchanger (Water reclaiming)

Diagram of a direct-methanol fuel cell



# EFOY Pro Fuel Cell: Components



# EFOY Pro Fuel Cells: Data Sheet



	EFOY Pro 800	EFOY Pro 800 Duo	EFOY Pro 2400	EFOY Pro 2400 Duo
Max. nominal power	45 W	45 W	110 W	110 W
Min. nominal power	25 W	25 W	80 W	80 W
Nominal Current @ 12 V / 24 V	2,1 A / 1,05 A	2,1 A / 1,05 A	6,7 A / 3,3 A	6,7 A / 3,3 A
Weight	8,0 kg/ 17.6 lbs	8,3 kg/ 18.3 lbs	9,0 kg/ 19.8 lbs	9,3 kg/ 20.5 lbs
Warranty	24 Month / 4.500 hours			
Operating Temperature	-20 to +50 °C (-4 to +122 °F)			
Fuel Consumption	0.9 l/kWh			
Dimensions (l x w x h)	433 x 188 x 278 mm (17 x 8 x 11 in)			



# EFOY Fuel Cell: Product Quality & Safety

- 🔌 Operation inside rooms
- 🔌 Very easy handling
- 🔌 Quick exchange of EFOY fuel cartridges
- 🔌 No hazardous emissions
- 🔌 Silent like a PC
- 🔌 TÜV certificate\*



\* The German TÜV is an independent, internationally well recognized Technical Inspection Association certifying on safety, reliability and quality (e.g. ISO 9000)

# EFOY Fuel Cartridges

## EFOY fuel cartridges:

- 🔌 2 standard sizes
- 🔌 High energy density (1.4 kWh per kilogram)
- 🔌 Ultra pure methanol



10 litres  
11,1 kWh

28 litres  
31,1 kWh



Note: EFOY fuel cartridges must be used within three years from the initial date of delivery



# Power Generation with High Energy Density

Different ways to provide 11 kWh electricity

**Methanol**



**Weight: 16 lbs.**  
**Volume: 10 l**  
**1400 Wh/kg**

**Hydrogen**



**Weight: 170 lbs.**  
**Volume: 60 l**  
**130 Wh/kg**

**Lithium-ion batteries**



**Weight: 220 lbs.**  
**Volume: 60 l**  
**100 W/kg**

**Lead-acid batteries**



**Weight: 540 lbs.**  
**Volume: 140 l**  
**40 Wh/kg**

Methanol combines superior energy density with easy handling and low cost.

# SFC's Product Portfolio



## Industry



**Pro Series**  
Made by SFC

## Consumer



EF0Y COMFORT

## Defense & Security



Over 27,000 units sold

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# EFOY ProCube: Energy solution for regular environment

- 🔌 All-in-one energy solution
- 🔌 Ready for use immediately
- 🔌 Suitable for outdoor applications (IP34)
- 🔌 Solar charge control (max. 10 A) with integrated low voltage disconnect
- 🔌 800 x 600 x 410 mm
- 🔌 12 V (24 V with Conversion kit)



# EFOY ProEnergy Box: Power for Extreme Weather Conditions

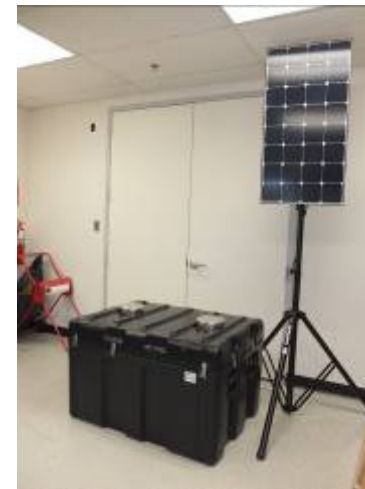
Approved for -40 °C /°F



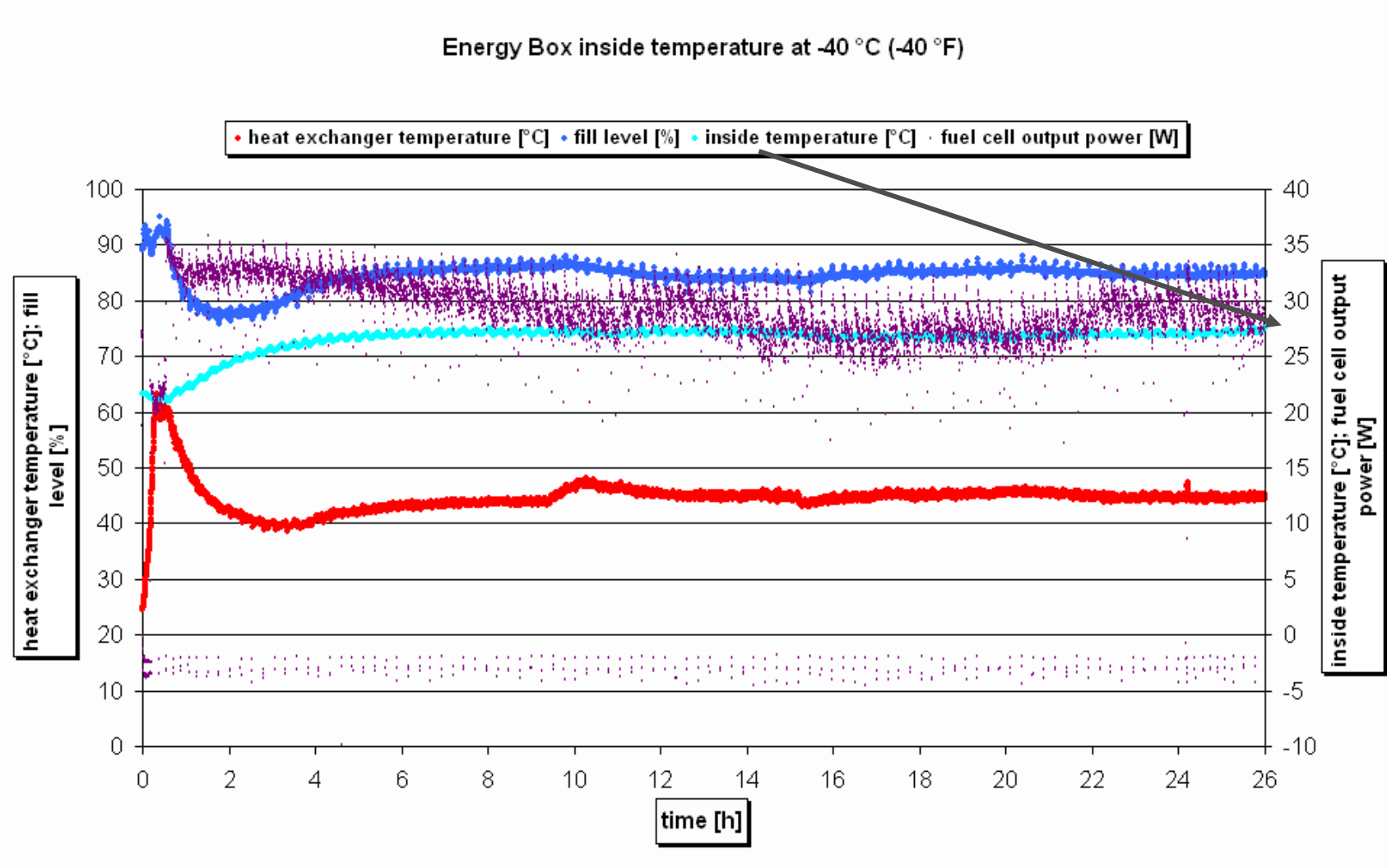
SMALL Energy Box: 258 days @ 10W continuous (2x 28l fuel cartridges)

LARGE Energy Box: 516 days @ 10W continuous (4x 28l fuel cartridges)

# EFOY ProEnergyBox: Power for Extreme Weather Conditions

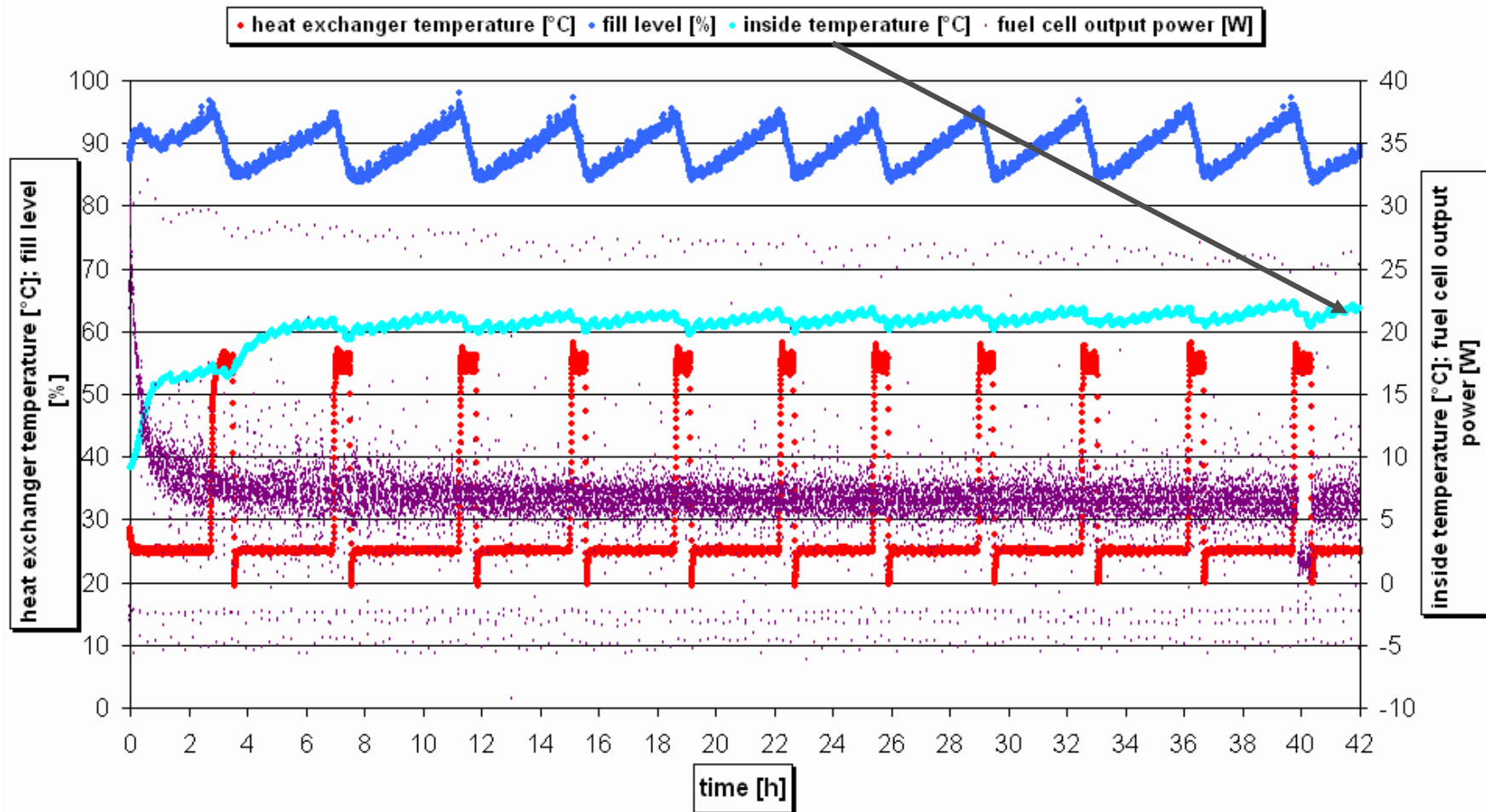


# Test Graphs – EFOY cold running



# Test Graphs – EFOY anti freeze protection

Energy Box inside temperature at -40 °C (-40 °F)





# Accessories: GSM Modem GSM-2-SMS



- ⚡ Alarm message via SMS or Email
- ⚡ Web-based platform – allows remote access, control and monitoring of all connected EFOY Pros



**Pro Series**  
 Made by SFC

**udomi** ● competence in fuel cell systems

Brennstoffzellen | Hilfe | Administration Abmelden

Sortieren nach:  Anzeigen:  Alle Geräte abfragen

Gerätename	Letzte Report-Daten (UTC+1)	Batteriespannung	Stromstärke	Betriebsstunden	Cartridge	Status	Status IO Alarm	GPRS Status
ProCube-ESR17	30.11.2011 13:39:58	12.87V	0.0A	2353.9h	above sensor	no error	--	Online

# Product Features New EFOY Pro Generation



- ⚡ Longer Autonomy → EFOY Pro Duo
- ⚡ Up to 40% Reduced Operating Costs
- ⚡ 22% More max. output power
- ⚡ 50% Increased Guaranteed lifetime
- ⚡ Increased Operating Temperature up to +50 °C
- ⚡ Easy Configuration → New Remote Control



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# 1. SFC Energy Production and R&D



# 1. SFC Energy test laboratories



# 1. Alpha Prototype test @ -40°C continuous



🔌 SFC climate chamber (-50°C possible)

🔌 Long-term test at -40°C

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# Application Scenarios: Remote Sensors



Meteorological Station  
(Greece)



Seismological Measurements  
(France)



Permafrost Measurements  
(Austria)



# Application Scenarios: Remote Sensors



Avalanche Detection  
(Switzerland)

Landesamt für Natur,  
Umwelt und Verbraucherschutz  
Nordrhein-Westfalen



Water Flow and Gauge Measurement  
(Germany)

# Application Scenarios: Remote Sensors



Water Flow and Gauge Measurement (GER)



Polar- and Sea Research (Neumayer Station Antarctica)



Water Flow and Gauge Measurement (France)

# Application Scenarios: Telecommunication



Base Transceiver Station (Austria)



Internet via Radio Link Mast, EFOY Pro in Insulated Outdoor Box (Norway)

# Application Scenarios: Telecommunication



Repeater Stations EFOY Pro in Insulated Outdoor Box (Norway)



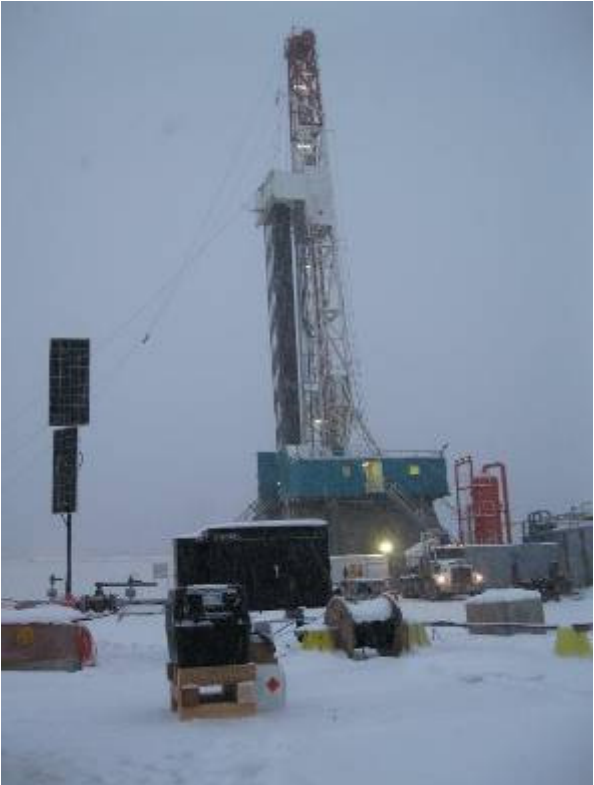
Repeater Stations EFOY Pro in Insulated Outdoor Box (Norway)

# Application Scenarios: Telecommunication



## Internet & Communications for First Nations, BC CAN

# Application Scenarios: Oil & Gas



Communication for Oil & Gas site, Northern Alberta CAN

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Thank you for  
your attention !