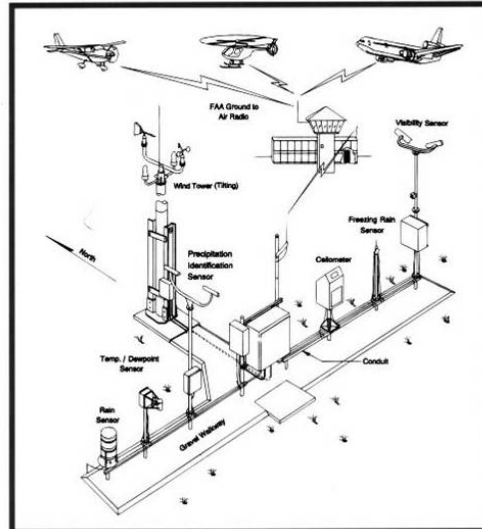




Automated Surface Observing System

Standby
Power
Options



Automated Surface Observing System (ASOS) General System Description



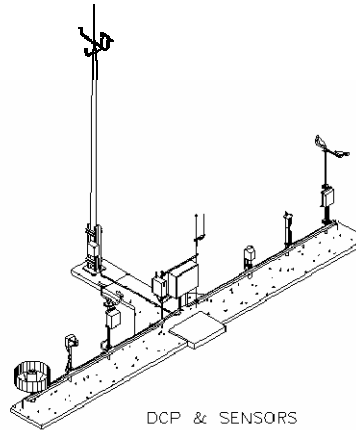
- Self contained group of sensors and data gathering equipment that produces an automated weather observation
- Weather observations support aviation, climate data, non government weather operations, public consumption, etc.
- Initial deployment began in 1991 and continued through 1997
- Located at 884 sites nationwide, normally at airports
- System has two distinct subsystems: Field installed equipment (DCP & *Sensor Group*) and an indoor processor (ACU) with peripherals
- Separate facility power for DCP & Sensors and ACU



ASOS Data Collection Package (DCP) & Sensors



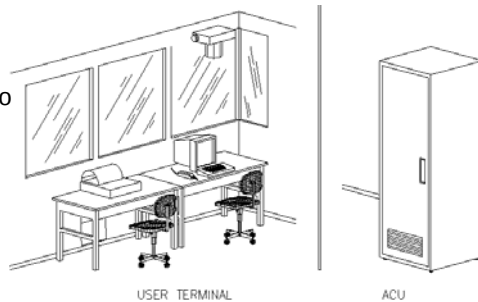
- Sensors continuously measure and collect data
- Located on the airport field close to the runway
- Initially UPS designed to back up group for 10 minutes
- *Currently plan to install Standby Engine Generator to backup DCP & Sensor Group for 72 hours*



ASOS Acquisition Control Unit (ACU)



- Uses sensor data to create weather observations
- Located in a building somewhere on the airport
- Disseminated in the following ways:
 - Ground To Air (GTA) radio
 - Telephone line to a central data repository
 - Local displays on the airport, for pilot briefing, air traffic control, & weather forecasters
 - Public access dial phone lines
- Initially UPS designed to back up ACU (only) for 10 minutes
- 3 options under consideration to extend backup power to 72 hours





New Standby Power Requirement



- Katrina devastated the Gulf of Mexico Region of the US
 - ASOS were destroyed by the storm and ensuing flooding
 - Many ASOS lost power for extended periods of time
 - Days passed before power was restored in many locations
 - Large quantities of data were not captured and/or lost
- Significance of missing data
 - Wind speed and direction, pressure, temperature, rainfall amount, etc.
 - Insurance companies require the official weather data from NWS to determine claim liability
 - Construction code enforcement authorities need data to establish safe building practices
 - Climate research community requires data for future models and past history
 - Emergency operations need current weather data and accurate weather forecast



New Standby Power Requirement



- Congress mandated an uninterrupted supply of data for several NOAA NWS mission critical weather systems, including ASOS in coastal areas
 - Service Assessments for Hurricanes Isabel (2003), Charley (2004) and Katrina (2005) identify that ASOS is vulnerable to failure during severe weather events due to commercial power and telecommunication outages.
 - Interpretation: Provide standby power and communications in the event of natural disasters in coastal areas
 - 150 coastal ASOS sites identified
 - DCP Solution: Standby Engine Generator Systems (LP)
 - ACU Solution: TBD



ACU Option Comparison



	Battery Bank to power the existing UPS	Hydrogen Fuel Cell	Engine Generator System (LP)
Purchase	Highest	Midrange	Lowest
Weight	Highest Weight (approx. 3000 lbs; may require floor support)	Not an issue - stored outside	Not an issue – stored outside
Fuel Storage/ease to replenish	Special battery venting to outside required; difficult to replenish	Must be stored outside; easy to replenish	Must be stored outside; easy to replenish
Installation costs	Installation by NWS; additional construction to support weight possible	Site prep work; cabling to ACU	Site prep work; cabling to ACU
Recurring cost	Quarterly testing; Batteries replaced every 4 - 5 yrs (> \$8.5K)	Limited maintenance costs yearly	Quarterly maintenance & testing; periodic replacement parts
Storage space indoors	Approximately 42 sq ft.	All equipment stored outside	All equipment stored outside



Estimated Cost - Initial Procurement (less Installation & Maintenance)



	Estimated Cost ea.	Qty	Total
Battery Backup	\$ 14,000	135	\$ 1,890,000
Engine Generator System	\$ 4,300	135	\$ 580,500
Hydrogen Fuel Cell	\$ 5,500	135	\$ 742,500



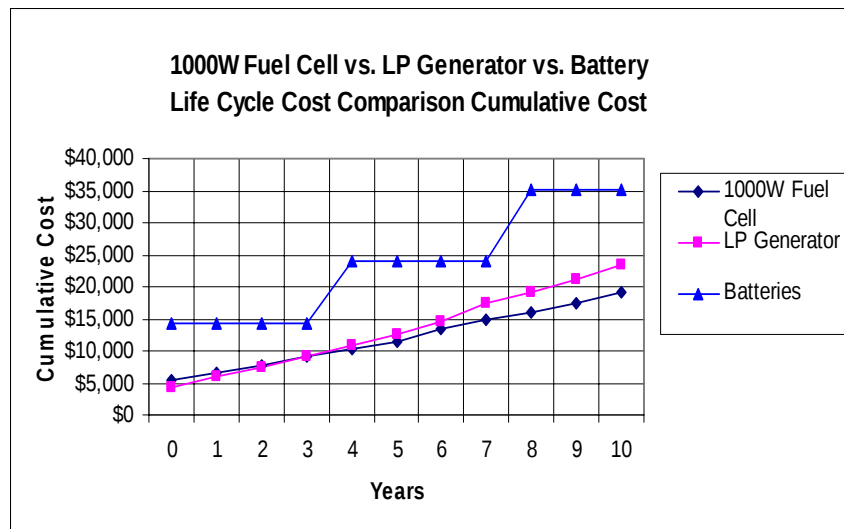
Life Cycle Cost Comparison Assumptions (less installation)



Battery	Engine Generator	Fuel Cell
Estimated Initial Cost: \$14,000	Estimated Initial Cost: \$4,300	Estimated Initial Cost: \$5500
No additional maintenance requirements	4 hrs/qtr maintenance @ \$75.50/hr	2 hrs/qtr maintenance @ \$75.50/hr
Battery replacement every 4 years	Engine overhaul @ yr 7 (20% initial cost)	6 yr cartridge replacement @ ~ \$550
3% escalation per year	Annual fuel cost \$300	Annual fuel cost \$530
	3% escalation per year	3% escalation per year

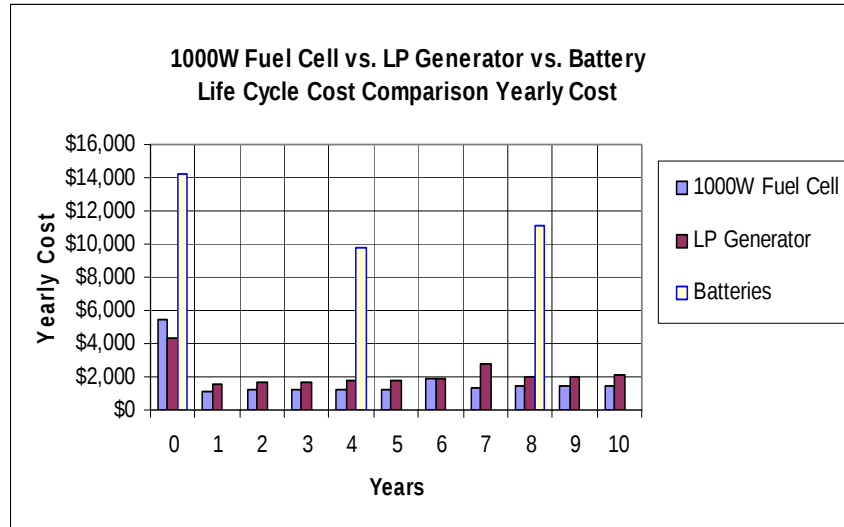


Life Cycle Cost Comparison Cumulative (less Installation)





Life Cycle Cost Comparison Yearly (less Installation)



Year 0		1000W Fuel Cell	LP Generator	Battery Option
	Hardware Cost Estimate	\$5,500	\$4,300	\$14,236
Year 1	Maintenance	\$604	\$1,283	\$ -
	Fuel & Tank Rental	\$530	\$300	\$ -
subtotal		\$1,134	\$1,583	\$ -
Year 2	Maintenance	\$622	\$1,321	\$ -
	Fuel & Tank Rental	\$546	\$309	\$ -
subtotal		\$1,168	\$1,630	\$ -
Year 3	Maintenance	\$641	\$1,361	\$ -
	Fuel & Tank Rental	\$562	\$318	\$ -
subtotal		\$1,203	\$1,679	\$ -
Year 4	Maintenance	\$660	\$1,402	\$ -
	Fuel & Tank Rental	\$579	\$328	\$ -
	New Batteries			\$ 9,832
subtotal		\$1,239	\$1,730	\$ 9,832
Year 5	Maintenance	\$680	\$1,444	\$ -
	Fuel & Tank Rental	\$597	\$338	\$ -
subtotal		\$1,276	\$1,782	\$ -
Year 6	Maintenance	\$700	\$1,487	\$ -
	Fuel & Tank Rental	\$614	\$348	\$ -
	Cartridge Replacement	\$550		\$ -
subtotal		\$1,865	\$1,835	\$ -
Year 7	Maintenance	\$721	\$1,532	\$ -
	Fuel & Tank Rental	\$633	\$358	\$ -
	Generator Overhaul	\$0	\$860	\$ -
subtotal		\$1,354	\$2,750	\$ -
Year 8	Maintenance	\$743	\$1,578	\$ -
	Fuel & Tank Rental	\$652	\$369	\$ -
	New Batteries			\$ 11,067
subtotal		\$1,395	\$1,947	\$ 11,067
Year 9	Maintenance	\$765	\$1,625	\$ -
	Fuel & Tank Rental	\$671	\$380	\$ -
subtotal		\$1,437	\$2,005	\$ -
Year 10	Maintenance	\$788	\$1,674	\$ -
	Fuel & Tank Rental	\$692	\$391	\$ -
subtotal		\$1,480	\$2,065	\$ -
Total Cumulative Cost:		\$19,050	\$23,307	\$ 35,135