



Sandia National Laboratories Severe Weather Lessons Learned

2011 FR Workshop

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Background and Outline

- **Severe Arctic Blast throughout the U.S. in Feb 2011**
- **Record low temperatures in NM to -37° F**
- **Natural Gas heating supply cut off to many communities, businesses, KAFB, and SNL**
- **EOC activation of Situation Analysis Team**
- **Facilities, Program, and Emergency Response organizations responded exceptionally well**
- **Several Key Lessons Learned**
- **List of Standards and Guides for Severe Weather Hazards Preparation**

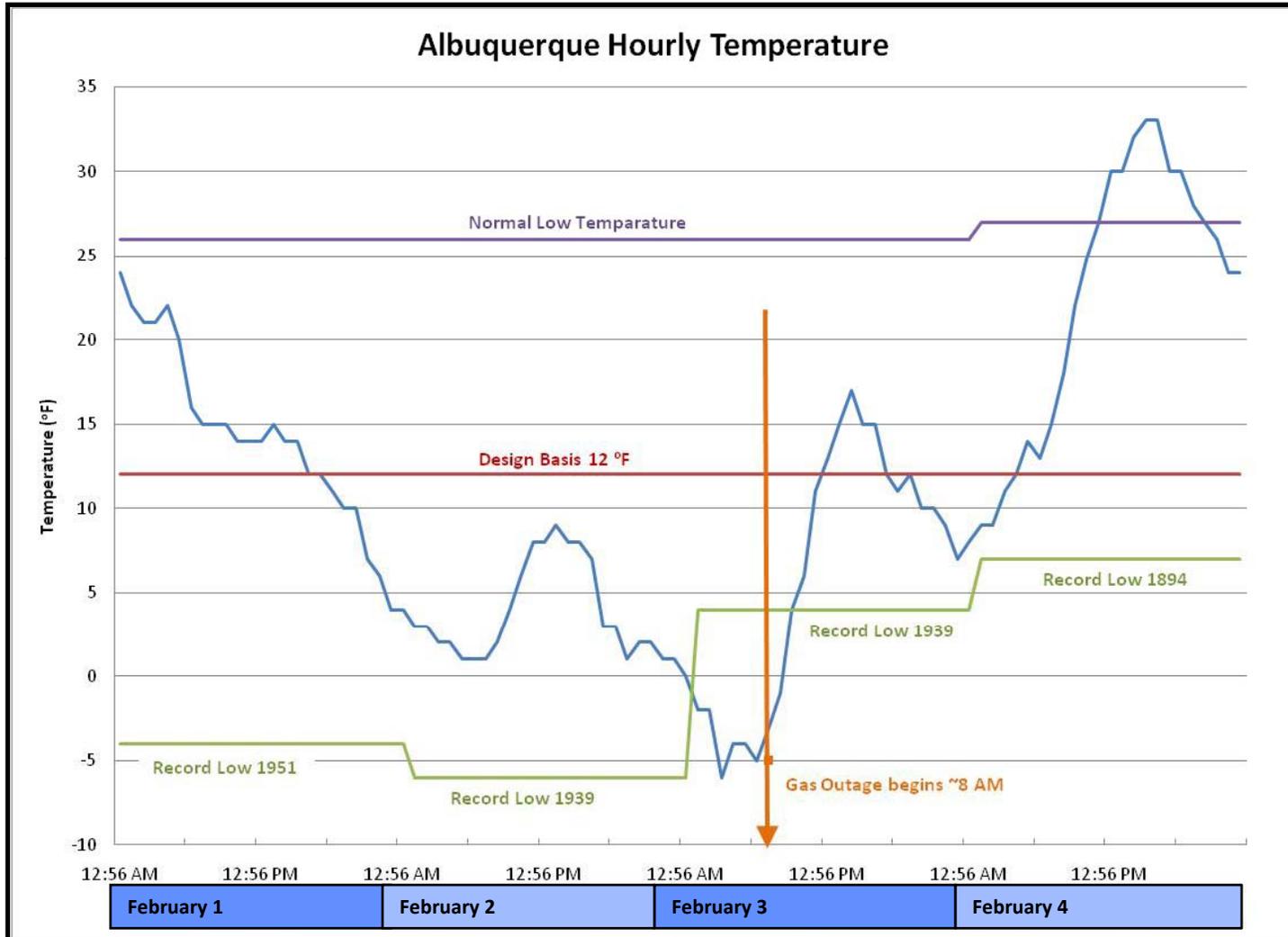


SNL/New Mexico





Facility Design Basis Requirements and Actual Temperature Profile





Many organizations actively engaged throughout the freeze events



PETL
(Bldg. 701)



NG Operations
(Bldg. 870)

- **EOC** – Year-round partnership that really paid dividends during the crisis.
- **Logistics** – Equipment preparation
- **Procurement** – Contractor support for repairs
- **ES&H** – Hazard identification for job planning
- **Security** – Surveillance of buildings (looking for leaks and providing key service)
- **Line Management** – Active support
- **Line Staff** – Particularly those that supported efforts to stand up the fire-suppression systems
- **SSO Personnel** – Interface with KAFB, NM Gas Co, and AHJ for isolating fire-suppression systems.



MESA Fab
(Bldg. 858)



CINT
(Bldg. 518)



Weather Forecast

Date	Events	FMOC Response
Jan. 29 and 30	Weather forecast indicated snow and subfreezing temperatures were expected for most of New Mexico.	<ul style="list-style-type: none">• Snow-removal equipment prepared, and resources scheduled.
Feb. 1	Start of 88 hours of subfreezing temperatures.	<ul style="list-style-type: none">• Preventive measures included heat-loading buildings by eliminating “night setback” mode and monitoring building condition using FCS.• Snow-clearing activities begin.





Example Actions Taken Before Gas Outage

- **Prior to Freeze – Ventilation conditions set back to 50% exhaust, 50% outside makeup air**
- **During Outage – 0% heating, 15% exhaust to retain heat in building, while providing some exhaust for lab spaces**
- **Operations Manager contacts line to scale back operations**
- **Surveillance in building – Line staff, FMOC, and security officers**



Curtailment and Outage

Date	Events	FMOC Response
Feb. 2	The NM Gas Co. asks for voluntary curtailment of demand. PNM notifies SNL of potential power disruption. Freeze damage to heating and sprinkler systems begins.	<ul style="list-style-type: none">• Strategic session held to determine response to gas and electrical curtailment requests.• Systems put into “night setback mode” at 6:00 a.m. to conserve gas.• Key facilities notified of potential
Feb. 3	Gas supply to SNL and KAFB shut off. 	<ul style="list-style-type: none">• Notifications begin to line management.• Trailer MO88 converted into FMOC Emergency Operations Center.• Lab space exhaust ventilation closed.• Office buildings switched to 0% outdoor air.• Water system pumps circulating to prevent freeze.• Sprinkler systems isolated.• Fire patrols begin.• FMOC begins 24/7 coverage.





Recovery Actions

Date	Events	FMOC Response
Feb. 3 (cont'd.)	Gas service begins to be restored. Decision made to close SNL/NM on February 4.	Boiler restarts commence, building by building. Recovery actions begin to restore systems and repair damage.
Feb. 4 through Feb. 10	Outdoor high temperatures above freezing.	Recovery actions continue until all systems are restored.





Estimated Costs and Impacts

- **Costs associated with staff sent home**
 - Inclement Weather (Feb. 1)
 - Gas Shutdown – Lab Closure (Feb. 3 and 4)
- **Total Costs of Infrastructure Response and Repair Exceed \$1M**
 - Emergency Response (Heating, water damage, fire-suppression systems, surveillance)
 - Subcontractor support
 - Emergency Operations and Security
- **191 facility fire-suppression systems isolated and returned to service**
- **113 facilities with reported leaks**
- **More than 450 work orders related to leaks**
- **~8,000 hours of labor**



Key Lessons Learned

- **Knowledge of buildings, operations, effects of decisions, and points of contact is critical.**
- **Notification process from the NM Gas Co. was informal.**
- **Access to user-controlled rooms complicated access for assessment and repair.**
- **Coordination among the EOC, the FMOC “war room,” and senior management was very effective.**
- **SNL actions minimized damage and time lost and facilitated recovery activities.**
- **Ensure evaluation/preparation for unexpected events**



Improvement Actions

- **Incorporate lessons learned into an FMOC Emergency Operations Plan.**
 - Document strategic and operational plans.
 - Describe DOE and EOC interactions to building-specific system effects and line customer communications.
- **Improve utility curtailment plans and communication strategies with public utilities.**
- **Revisit sitewide utility backup strategy.**
- **Lean Six Sigma analysis of event/improvements**
- **Management meetings with NM Gas Company**



Resources

- **DOE-STD-1064-94, Guideline for Good Practices for Seasonal Facility Preservation at DOE Facilities**
- **DOE G 433.1-1, Seasonal/Severe Weather and Adverse Environmental Conditions Maintenance**
- **HSS Operating Experience Summary, 2004-19**
- **FEMA.gov/Hazards/Winter Storms and Extreme Cold**
- **Emergency.CDC.gov/Disasters/Winter Guide**
- **National Safety Council.org**
- **American Red Cross.org**
- **American Automobile Association.com**