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## GOOD STORY

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### **Critical Infrastructure Restoration: The Three-Phased Power Restoration Plan After the American Samoa Tsunami**

#### **SUMMARY**

The Joint Field Office (JFO) collaborated with the American Samoa Power Authority (ASPA) and other partners to develop and implement a three-phased power restoration plan for American Samoa after an earthquake, tsunami, and flooding struck the islands on September 29, 2009. The plan outlined a three-phase response plan to address American Samoa's short-, mid-, and long-term power needs.

#### **BACKGROUND**

##### ***The American Samoa Tsunami***

On Tuesday, September 29, 2009, at 6:48 a.m. Samoa Standard Time (SST), an earthquake with an 8.1 magnitude struck in the Pacific Ocean approximately 120 miles from the Samoan islands. The earthquake generated tsunami waves, the first of which struck the American Samoan island of Tutuila at 7:08 a.m. SST. The tsunami flooding resulted in 34 deaths, and 131 people reported to hospitals or clinics with injuries. Thousands of people were left without shelter or food, while more than 1.2 million cubic feet of debris was strewn across the islands.

Critical infrastructure throughout American Samoa suffered major damage due to tsunami wave inundation. Flood waters reached up to 9 feet at the Satala power plant. Saltwater and oil residue from transformers entered the generator engines, rendering many of them nonfunctional. Damage to the plant's power supply capability left half of the American Samoa population without sufficient electrical power.

American Samoa is an unincorporated territory of the United States. It has a total land area of 77 square miles and a population of approximately 65,000 people. American Samoa is located in the South Pacific Ocean 2,400 miles from Hilo, Hawaii, and 4,500 miles from San Diego, California.

The Satala power plant is a 13,215-square-foot building located on the coastline in the village of Satala on the island of Tutuila. Prior to the tsunami, it was a primary source of power for the shipyard, the waterfront industrial area, and the power grid on the eastern end of the island. In total, the Satala power plant provided 23 megawatts of power to American Samoa.

##### ***The Federal Response to the Tsunami***

The Federal response began immediately after the earthquake in American Samoa, before the National Oceanic and Atmospheric Administration's Pacific Tsunami Warning Center issued the first tsunami warning for this disaster. Federal Emergency Management Agency (FEMA) Region IX activated its Regional Response Coordination Center to level 1 at 6:57 a.m. SST (11:57 a.m. Pacific Daylight Time). The National Response Coordination Center also activated to level 1 with selected emergency support functions (ESFs). FEMA Region IX worked with American Samoa Governor Togiola Tulafono to submit an expedited

request for a major disaster declaration. President Barack Obama issued the declaration (FEMA-1859-DR) hours after the tsunami on September 29, 2009. In addition, the Federal government established an air bridge to push critical emergency resources to American Samoa. The air bridge offered the quickest means for moving Federal resources across the large distance between American Samoa and the continental United States and Hawaii.

### **Response to the Power Outages**

The loss of the Satala power plant left the island of Tutuila without sufficient electrical generation for up to 50% of its customer base. The territory also suffered frequent rolling blackouts for a month after the disaster. To address immediate power needs, the ASPA installed several small standby generators at critical facilities, such as hospitals and water pressure boosting stations. The ASPA also increased the Tafuna power plant's reserve capacity from 80% to near 100%. This additional power demand on the Tafuna power plant increased the potential for a collapse of the territory's entire power supply. Once the ASPA triaged the power loss, ESF-3 (public works and engineering) and its partners collaborated with the ASPA to develop and implement a three-phased power restoration plan to compensate for the loss of the Satala power plant.



**Damage to the Satala Power Plant**

### **GOALS**

The three-phased restoration plan helped successfully restore power to American Samoa without causing further damage to the island's infrastructure. The plan provided the framework for ASPA and response organizations to restore power to critical facilities, while limiting the number of blackouts throughout the island of Tutuila.

### **DESCRIPTION**

#### **Development of the Power Restoration Plan**

FEMA, the U.S. Department of Energy (DOE), U.S. Army Corps of Engineers (USACE) as part of ESF-3, private sector entities, and ASPA representatives assembled a power restoration task force to assess damages at the Satala power plant and to develop a strategy to restore power in American Samoa. After assessing the damage to the plant, the task force identified several potential challenges relating to restoring power to the islands. It needed to prioritize where to install the generators and to determine the most effective way to connect them to the damaged grid. In addition, the task force recognized the logistical challenges related to transporting both large and small generators from the continental United States to American Samoa, a distance of approximately 6,900 miles.

For more information on logistical movement and coordination during the American Samoa earthquake and tsunami, please see the *Lessons Learned Information Sharing Lesson Learned* [Logistics Movement and Coordination: Deploying a Staging Group Supervisor to Provide Management Support to Incident Support Bases and Staging Areas](#).

On October 4, 2009, the task force developed the three-phased plan to restore the American Samoa power infrastructure to its pre-tsunami operational level. The plan outlined the acquisition, delivery, and installation of priority generators at critical locations across the territory, as well as the reduction of the Tafuna power plant's overall operational capacity. The plan consisted of three phases:

- Phase I: Implement a "band-aid" to damaged power infrastructure. Install up to twenty-three 24 – 640-kilowatt generators with transformers to provide triage power delivery to critical facilities.
- Phase II: Reduce the Tafuna power plant operational load by installing up to ten 1-megawatt generators in strategic locations utilizing external fuel tanks and transformers. This was designed to stabilize the power grid for a period of up to 18 months or longer.
- Phase III: Repair damages to, or replace, the Satala power plant.

### ***Phase I Implementation***

Phase I required airlift operations for the delivery and the installation of generators leased by FEMA and ASPA. FEMA logistics personnel coordinated the air shipment of 46 small- to mid-sized FEMA generators and 10 leased generators. USACE personnel and ASPA staff members installed these generators at critical life-saving and life-sustaining locations. These locations included public facilities, shelters, government and community agencies, sewer and water treatment plants, emergency management and response facilities, and schools.

### ***Phase II Implementation***

Phase II began on October 27, 2009, when ASPA contracted for twenty-seven 1-megawatt generators and worked with FEMA to install them at the Satala and Tafuna power plants. These generators provided interim power to American Samoa for 18 to 24 months. This alleviated the strain that had been placed on the Tafuna power plant and provided critical power coverage until the Satala power plant could be repaired during Phase III.

On November 27, 2009, FEMA and ASPA activated eighteen 1-megawatt generators at the Satala power plant and another nine generators at the Tafuna power plant.

This ensured that American Samoa never suffered a complete power failure as a result of the disaster and that power was fully restored by early December. As of June 2011, ASPA continues to utilize leased generators to compensate for the loss of power that resulted from the tsunami.

### ***Phase III***

ASPA expects that Phase III of the power restoration will take several years to fully implement due to permitting challenges and legal issues. In 2010, ASPA identified a 1.024-acre property to rebuild the Satala power plant. ASPA owns the land and has leased it to StarKist Tuna since March 2000. ASPA selected this location because the American Samoa government had already issued some of the same permits necessary to locate a power plant for the StarKist Tuna plant.



**Transportation of One-Megawatt Generator**

As of June 2011, ASPA is carrying out the demolition of the old Satala power plant while it continues to work on permitting for the new plant, which it estimates to cost between \$52 and \$92 million. In addition, ASPA has replaced the generators from Phase II with more cost effective generators. ASPA plans to complete construction of the new plant in 2 to 4 years.

## REQUIREMENTS

### *Keys to Success*

#### **Logistical Support**

The Federal government established an air bridge to push critical emergency resources to American Samoa. The air bridge offered the quickest means for moving Federal resources across the large distance between American Samoa and the continental United States and Hawaii. In addition, the Federal government established a sea bridge to support long-term power restoration needs.

#### **Private and Public Sector Coordination**

USACE, DOE, and their partners coordinated effectively during the planning and execution of the power restoration plan. Each agency provided valuable information in its area of expertise.

#### **Funding**

FEMA provided funding for the power restoration plan. As of October 2010, FEMA is spending approximately \$7.6 million on temporary power generation (Phase II). However, cost could exceed \$25 million because temporary generators are being rented. In addition, FEMA's public assistance program plans to pay 90 % of the costs to rebuild the Satala power plant.



**Inspection of Installed Generators**

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