



## American Samoa

# Energy Action Plan

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Tim Bodell of the American Samoa Environmental Protection Agency and Charles Visser of NREL wrote strategy 4 on geothermal power and David Herdrich of ASREC wrote strategy 5 on hydroelectric power.

### **NOTICE**

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## DOCUMENT OVERVIEW

This document describes the five near-term strategies selected by the American Samoa Renewable Energy Committee (ASREC) during action-planning workshops conducted in May 2013, and outlines the steps being taken to implement those strategies — see Table 1, below.

Each option is tied to a priority identified in the draft *American Samoa Strategic Energy Plan* as being an essential component of reducing American Samoa’s petroleum consumption. The actions described for each strategy are meant to provide a roadmap to facilitate the implementation of each strategy. This document is intended to evolve along with the advancement of the projects and will be updated to reflect progress.

**Table 1. American Samoa Petroleum Reduction Strategies**

STRATEGY	ACTIONS	STRATEGY DEADLINE
Strengthen the institutional capacity of ASREC	<ul style="list-style-type: none"> <li>• Hire a part-time coordinator</li> <li>• Develop proposal(s) for submission to the Empowering Insular Communities (EIC) grant program</li> </ul>	July 10, 2013
Make Manu’a 100% renewable energy dependent by 2016	<ul style="list-style-type: none"> <li>• Deploy photovoltaics (PV) on Ofu and Ta’u</li> <li>• Conduct initial engineering studies for a transition to 100% renewable energy on Manu’a</li> </ul>	October 1, 2016
Deploy wind and solar power on Tutuila	<ul style="list-style-type: none"> <li>• Conduct a prefeasibility study for grid integration</li> <li>• Issue a request for proposal (RFP) for a grid integration study</li> <li>• Determine the viability of issuing RFPs for wind and solar independent power producers (IPPs)</li> </ul>	October 1, 2016
Assess the potential for geothermal power on Tutuila	<ul style="list-style-type: none"> <li>• Conduct preliminary evaluation (Phase I)</li> <li>• Conduct resource confirmation (Phase II)</li> </ul>	October 1, 2016
Develop hydroelectric power resources	<ul style="list-style-type: none"> <li>• Develop a proposal for a feasibility assessment of the Fagatogo Hydroelectric Complex for submission to the EIC grant program</li> <li>• Develop an engineering design/architectural design, and access and trail design proposal, for the next round of funding based on the results of the feasibility study</li> <li>• Develop a restoration proposal for the next round of funding based on the results of the engineering and architectural design work</li> </ul>	October 1, 2015

## TABLE OF CONTENTS

Document Overview .....	i
Table of Contents .....	ii
American Samoa Renewable Energy Committee .....	1
Vision.....	1
Mission.....	1
Directive.....	2
The Energy Action Planning Process .....	2
Strategy 1. Strengthen the Capability of ASREC Members to Manage and Implement Priority Actions .....	3
Action 1. Hire a part-time coordinator .....	3
Action 2. Develop proposal(s) for submission to the EIC grant program .....	4
Strategy 2. Assist Manu’a Toward Energy Independence .....	5
Action 1. Initiate deployment of PV for Ofu and Ta’u .....	5
Action 2. Conduct initial engineering studies for a transition to 100% renewable energy on Manu’a....	6
Strategy 3. Assess Feasibility of Wind and Solar Deployment for Tutuila .....	7
Action 1. Conduct prefeasibility study for grid integration .....	7
Action 2. Issue RFP for a grid integration study.....	8
Action 3. Determine the viability of issuing RFPs for wind and solar IPPs.....	8
Strategy 4. Assess the Potential for Geothermal Power for Tutuila.....	9
Action 1. Perform preliminary evaluation of geothermal power potential on Tutuila .....	10
Action 2. Perform validation phase exploration of Tutuila geothermal potential .....	11
Action 3. Perform resource confirmation phase .....	11
Action 4. Perform resource development phase.....	11
Strategy 5. Assess Hydroelectric Power Resource Development Potential .....	12
Action 1. Develop a proposal to conduct a feasibility assessment of the Fagatogo Hydroelectric Complex and, if feasible, an engineering and architectural design for restoration work for submission to the EIC grant program. ....	13
Action 2. Develop a restoration proposal for the next round of funding based on the results of the engineering and architectural design work .....	14
Appendix: ASREC Energy Task Force Members and Other Contributors to the Action Plan.....	15

## **AMERICAN SAMOA RENEWABLE ENERGY COMMITTEE**

The American Samoa Renewable Energy Committee (ASREC) was established by Executive Order 004-2010 on June 7, 2010, as amended by Executive Order 009-2013 on April 18, 2013.

### **Vision**

Create a sustainable future by reducing dependence on fossil fuels.

### **Mission**

Enhance the well-being of our citizenry, ensure energy and economic security through energy independence and diversification, and improve environmental quality. Educate all stakeholders on the importance of our vision by embracing conservation, energy efficiency and alternative energy. The ASREC will be a forum for considering options and offering guidance related to the achievement of its energy goals through policy, projects and programs.

As stated in Executive Order No. 004-2010, and amended by Executive Order No. 009-2013, the ASREC's mission includes the following objectives:

1. Reduction of reliance and expenditures on fossil fuels.
2. Development of indigenous and renewable energy sources.
3. Improvement of energy generation infrastructure.
4. Resource preservation, restoration and enhancement.
5. Training and education regarding energy efficiency and conservation.
6. Development of funding and financial strategies for sustainability and economic development.
7. Engagement in national and regional efforts to address island energy concerns.
8. Develop funding and financial strategies for sustainability and economic development.
9. Engage in national and regional efforts to address island energy concerns.
10. Support energy literacy curriculum in all educational institutions.
11. Develop a vision, mission and goals for reducing dependence on fossil fuels, improving energy efficiency and developing renewable energy resources.
12. Establish an organizational structure to appropriately develop a comprehensive, long-term strategic energy plan for American Samoa.
13. Work with territorial and federal officials to secure technical assistance in the form of expertise and funding in order to move the Committee's mission forward.

## Directive

Due to fluctuating energy prices and natural disasters such as the September 2009 earthquake and tsunami, American Samoa has focused attention on the need to develop alternatives to its near-100% reliance on petroleum by implementing energy efficiency and renewable energy technologies. The ASREC is undertaking a concerted effort to address current energy and environmental challenges. Due to American Samoa's geographic isolation, nonrenewable resources are extremely limited and subject to volatility in pricing and availability. Energy security is fundamental to American Samoa's economic future and quality of life. Consequently, creating a stable investment atmosphere remains challenging, while the quality of life for residents and visitors continues to be affected.

American Samoa's indigenous resources are abundant and should be considered to achieve energy diversity. Through appropriate study and discussion, the ASREC will determine cost-effective alternatives that will successfully support the Committee's vision.

The ASREC is a nonregulatory advisory group sponsored by the current Administration, composed of local volunteers from multisector stakeholder communities, and supported by federal agencies. The ASREC first convened in November 2010.

## THE ENERGY ACTION PLANNING PROCESS

In the summer of 2010, the U.S. Department of the Interior (DOI) Office of Insular Affairs (OIA) funded the National Renewable Energy Laboratory (NREL) to conduct an initial technical assessment for American Samoa. The *American Samoa Initial Technical Assessment Report*<sup>1</sup> was published in 2011, and was used by the ASREC as the starting point for developing the draft *American Samoa Strategic Energy Plan*, which was completed in 2012. With recent changes in the Administration, current ASREC members are reviewing the draft strategic plan with the intention of creating a final version by July 2013.

In May 2013, the ASREC conducted energy action planning workshops, with support from NREL staff, to identify the near-term strategies that would be likely to have the greatest impact on reducing American Samoa's petroleum consumption. Those strategies are described in detail in this document.

Unlike the strategic energy plan, which established the overall long-term goals for energy consumption and generation in American Samoa, this action plan selects a handful of specific strategies that are achievable in the short term (1-3 years), details the strategies in feasible incremental steps, identifies the stakeholders and desired outcomes, identifies the organizations and individuals responsible for implementing the actions, and sets a timeline for each step.

When evaluating technology options, the ASREC focused on mature, proven technologies that are commercially available and financially viable today. Care was taken to ensure that the actions selected

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<sup>1</sup> <http://www.nrel.gov/docs/fy11osti/50905.pdf>

were not duplicating existing efforts and that they leveraged work in other agencies and organizations as much as possible.

This action plan is a living document that will be regularly updated by the task force. Programs and strategies will be modified or replaced as the task force gathers new information about different approaches to reducing petroleum consumption and as new technologies for generating electricity and reducing transportation fuel consumption emerge, or existing, but previously impractical, technologies become commercially viable.

## **STRATEGY 1. STRENGTHEN THE CAPABILITY OF ASREC MEMBERS TO MANAGE AND IMPLEMENT PRIORITY ACTIONS**

In order for the ASREC to function more effectively, the Committee members have determined that a part-time coordinator should be hired to help manage the overall efforts of the ASREC and to help identify potential funding for priority projects. This is necessary as all members of the ASREC are employed in full-time positions with responsibilities that prevent them from devoting the time required to coordinate ASREC efforts.

**Goal:** Strengthen the ASREC's ability to implement high-priority actions by hiring a part-time coordinator and pursuing grant funding for priority activities.

**Overall responsibility:** Mark Kneubuhl and Tim Jones.

### **Potential challenges:**

- American Samoa Territorial Energy Office (TEO)/American Samoa Government procurement process may be too slow to implement a contract for hiring a coordinator by July 1
- TEO does not have a grant writer on staff.

**Overall deadline:** July 10, 2013.

### **Action 1. Hire a part-time coordinator**

The purpose of this action is to develop a proposal and hire a part-time coordinator for ASREC. Once funding is obtained, the coordinator will assist the ASREC in conducting its required business to meet the objectives established in the Governor's Executive Order. The ASREC Coordinator will assist the ASREC with organizational and facilitation duties, scheduling committee meetings, tracking deadlines and milestones under the action plan, posting documents to the ASREC website (to be hosted on the TEO website) and coordinating ASREC member comments on the draft strategic energy plan. The coordinator will work with NREL to ensure that ASREC comments on the strategic energy plan are incorporated into a final plan.

**Responsible for coordinating implementation:** Mark Kneubuhl.



**Specific actions and timeline:**

1. Develop a description of the duties of the coordinator. **[Mark Kneubuhl to submit to Tim Jones, by May 17]**
2. Develop a proposal for submission to TEO. **[Mark Kneubuhl, by June 1, 2013]**
3. Complete TEO review of the proposal. **[Tim Jones, by June 15, 2013]**
4. Put a subcontract in place. **[Tim Jones and Mark Kneubuhl, by July 1, 2013]**

**Reporting on progress and measuring impact:** Report progress at the ASREC meeting scheduled for June 18, 2013. **[Tim Jones and Mark Kneubuhl]**

**Estimated action funding:** \$25,000

**Action 2. Develop proposal(s) for submission to the EIC grant program**

Many of the actions identified through this action plan will require funding for implementation. The purpose of this strategy is to obtain initial funding to implement priority actions identified in strategies 2 through 5 of this action plan.

**Responsible for coordinating implementation:** Director of TEO. TEO will be the lead organization in preparing the grant. The American Samoa Power Authority (ASPA) and the American Samoa Environmental Protection Agency (ASEPA) will provide technical input as needed.

**Specific actions and timeline:**

1. ASREC members will communicate via email to narrow the list of potential proposals to be developed. **[ASREC members, by June 1, 2013]**
2. The director of TEO will develop the draft proposal(s) and present the list at the next ASREC meeting on June 18, 2013, for discussion. **[Tim Jones, by June 18, 2013]**
3. Prioritize the proposal(s) to be included in the submission. **[ASREC, by June 18, 2013]**
4. Submit the final proposal(s) to OIA no later than July 10, 2013. **[Tim Jones, by July 10, 2013]**

**Reporting on progress and measuring impact:** Report progress at the general ASREC meeting scheduled for June 18, 2013.

**Estimated action funding:** None needed to prepare the proposal(s).



## STRATEGY 2. ASSIST MANU'A TOWARD ENERGY INDEPENDENCE

The power cost on Manu'a is 50% higher than that on Tutuila and the grid is small enough that some of the existing 1.8 MW of Samsung panels available for use by ASPA could be used on both Ofu and Ta'u. If combined with sufficient energy storage (and possibly additional wind generation), a hybrid PV-storage system could provide baseload power. Only baseload power generation will have the cost-saving impact that the people of American Samoa seek. Implementing this idea would also save Tutuila \$400,000 a year in power subsidies to Manu'a and would reduce ASPA's costs associated with fueling and maintenance on Manu'a. Additionally, it could likely be completed within the Administration's time frame.

**Goal:** The goal of this strategy is for Manu'a to obtain 100% of its electrical power from renewable energy by October 1, 2016, at a lower cost to ASPA than the business-as-usual case.

**Overall responsibility:** The director of TEO shall be responsible for coordinating this effort. ASPA, ASEPA and the American Samoa Historic Preservation Office (ASHPO) shall provide technical expertise, logistical support and permitting support/coordination. The American Samoa Community College (ASCC) will help coordinate a public outreach campaign.

### **Potential challenges:**

- The director of TEO has not yet been confirmed. This may present challenges to program implementation if the director is not confirmed by the next hearing in July 2013
- Manu'a is remote. Transportation is unreliable and challenging, and communication can be difficult
- There is a lack of trained staff on the islands. Operation and maintenance of equipment will be difficult and will require training for staff
- The best locations for PV are very near to the coast. Salt spray is likely to be a significant problem, causing corrosion and requiring increased maintenance.

**Overall deadline:** October 1, 2016.

### **Action 1. Initiate deployment of PV for Ofu and Ta'u**

Action 1 focuses on the initial deployment of PV on Ofu and Ta'u based on technical, economic and social data gathering, and hybrid power-system analysis utilizing HOMER software modeling.

**Responsible for coordinating implementation:** Director of TEO.

### **Specific actions and timeline:**

1. Gather load, wind and solar data, and current system cost data from ASPA and the Stanford studies.  
**[Director of ASPA, by June 15, 2013]**
2. Estimate potential load growth associated with the relocation of government offices, population growth and demand increases. Develop business-as-usual growth and high-load-growth scenarios.  
**[Director of ASPA with input from Tim Jones and TEO, by July 1, 2013]**

3. Conduct HOMER analysis including solar, wind, diesel and battery storage options. **[NREL with input from ASPA, by July 1, 2013 (dependent upon ASPA providing requested data)]**
4. Assess the costs and benefits of off-grid distributed, on-grid distributed and centralized generation options. Determine which deployment approach will be pursued. **[Director of ASPA with support from NREL or other consultants and input from ASREC members, by August 1, 2013]**
5. Identify funding needs. **[Director of ASPA, by August 1, 2013]**
6. Identify sites and secure land leases, preferably on government lands if pursuing the centralized system or on-grid distributed system options. **[Director of ASPA, by September 1, 2013]**
7. Create a plan for remote monitoring of equipment. **[Director of ASPA, by September 1, 2013]**
8. Specify additional equipment needs (remote monitoring, batteries, inverters, fencing, mounting and civic works). **[Director of ASPA, by September 1, 2013]**
9. Develop and begin conducting community outreach materials and programs to better understand social issues related to energy usage, renewable energy technologies and energy conservation. **[ASCC, by October 1, 2013]**
10. Complete the environmental assessment, PRNS, and National Environmental Policy Act (NEPA) process. **[Director of ASPA in coordination with Ameko Pato (ASEPA) and David Herdrich (ASHPO), by December 31, 2013]**
11. Develop RFP and hire contractor to install Phase I. **[Director of ASPA, by February 1, 2014]**
12. Initiate ASPA staff development and training program. **[Director of ASPA, by February 1, 2014]**

**Reporting on progress and measuring impact:** Report progress at the general ASREC monthly meetings.

**Estimated action funding:** To be determined based on analysis conducted as part of the action.

## **Action 2. Conduct initial engineering studies for a transition to 100% renewable energy on Manu'a**

Building on action 1 and work completed by Stanford University, evaluate the technical, economic and social feasibility of a transition to 100% renewable energy on Manu'a.

**Responsible for coordinating implementation:** Director of TEO, working closely with ASPA.

### **Specific actions and timeline:**

1. Conduct a grid integration study for Manu'a for a larger project if pursuing grid-connected options. **[Director of ASPA, by December 31, 2014]**
2. Conduct a hydro storage study. **[Tim Jones, by June 2014]**
3. Develop system and design specifications for renewable, storage and control technologies. **[Director of ASPA, by March 2015]**
4. Procure equipment (storage systems, wind turbines, and inverters, etc.). **[Director of ASPA, by December 2015]**

5. Install and commission equipment. **[Director of ASPA, by October 2016]**

**Reporting on progress and measuring impact:** Report progress at the general ASREC monthly meetings.

**Estimated action funding:** To be determined based on studies conducted in items 1, 2 and 3 above.

### **STRATEGY 3. ASSESS FEASIBILITY OF WIND AND SOLAR DEPLOYMENT FOR TUTUILA**

The incorporation of renewable energy technologies, initially at lower levels, but increasing in overall contribution over time, is a critical part of reducing the amount of fuel imported for power generation in American Samoa. There are many renewable energy opportunities for American Samoa, although more detailed project and resource assessments are needed to confirm the viability of specific options for development. Wind and solar energy have the potential to play a significant role in supplying electrical energy to American Samoa. Available wind and solar resources combined with a high level of existing infrastructure and high energy costs make wind and PV technologies attractive potential additions to the current generation portfolio.

**Goal:** The goal of this strategy is to increase the amount of wind and solar energy deployed on Tutuila to a total of 5 MW.

**Overall responsibility:** The director of ASPA shall be responsible for coordinating this effort. ASEPA and ASHPO shall provide technical and permitting support and coordination.

**Potential challenges:**

- Impact of geothermal study results on the viability of this strategy
- Funding for studies and equipment
- Dispersal and accessibility of the RFP identified in action 2 below to the appropriate potential bidders
- Quality of bids received from the RFP identified under action 2 below.

**Overall deadline:** October 1, 2016.

#### **Action 1. Conduct prefeasibility study for grid integration**

The purpose of this activity is to conduct a preliminary analysis of the impact of integrating solar, wind and energy storage up to 80% penetration. The analysis will be conducted by Yunicos (Germany).

**Responsible for coordinating implementation:** ASPA.

**Specific actions and timeline:**

1. Study results submitted to ASPA. **[Yunicos, by July 1, 2013]**
2. Results presented to ASREC. **[Director of ASPA, by July 16, 2013]**

**Reporting on progress and measuring impact:** Report progress at the general ASREC meeting scheduled for July 16, 2013.

**Estimated action funding:** Study is already funded and under way.

## **Action 2. Issue RFP for a grid integration study**

Integrating large-scale variable renewable generation presents several potential challenges for small island grids like the ASPA power system. With no electrical interconnection to neighboring systems, the island of Tutuila must manage its system frequency independently. To maintain adequate system performance during unexpected grid events, the spinning reserve requirement for the island of Tutuila is 5 MW in order to provide sufficient power should the largest ASPA unit unexpectedly trip off. The loss of a single generator unit in the ASPA system can have a significant impact on system performance due to its small size. This characteristic makes it necessary to accurately capture and model the dynamic capabilities of each existing diesel generator and future wind and PV units, other unique characteristics of the ASPA system (load dynamics, under-frequency load shedding UFLS schemes, etc.), and performance of ASPA's automatic generation control (AGC), which is responsible for scheduling and dispatching each unit to maintain system stability in different time scales (seconds-minutes-hours).

**Responsible for coordinating implementation:** Director of ASPA.

### **Specific actions and timeline:**

1. The director of ASPA will develop the draft RFP and send to NREL for review. NREL will provide final comments on the RFP to ASPA. **[Director of ASPA, by May 22, 2013]**
2. Issue RFP. **[ASPA, by May 30, 2013]**
3. Vendors will submit proposals to ASPA. **[ASPA procurement office, by July 1, 2013]**
4. NREL will assist with review of proposals and provide comments to ASPA. **[Stephanie Savage and Vahan Gevorgian, by July 15, 2013]**
5. Select a vendor. **[Director of ASPA, by August 1, 2013]**
6. Put a contract in place. **[ASPA procurement office, by Sept 1, 2013]**
7. Complete the study. **[Consultants, by March 2014]**
8. Present results to ASREC. **[Director of ASPA, by March 2014]**

**Reporting on progress and measuring impact:** Status updates provided by ASPA Director at each ASREC monthly meeting.

**Estimated action funding:** Provided by OIA under previous award.

## **Action 3. Determine the viability of issuing RFPs for wind and solar IPPs**

Action 3 will be based on the results of actions 1 and 2 above and the results of the geothermal assessment. If a significant and viable geothermal resource is discovered, then wind and solar energy development will not be pursued. If no viable geothermal resource is discovered, action 3 will determine the appropriate scale of wind and solar projects.

**Responsible for coordinating implementation:** Director of ASPA with input from ASREC committee members.

**Specific actions and timeline:**

1. Create wind and solar resource maps for Tutuila based on ASPA’s existing anemometer and pyranometer data. **[Director of ASPA with potential support from NREL or a consultant, by January 1, 2014]**
2. If the investigation of geothermal energy advances to the resource confirmation stage, this strategy will be delayed for approximately two years or until such time as resource confirmation for geothermal energy is completed. **[ASREC committee decision, by October 31, 2013]**

**Reporting on progress and measuring impact:** November 2103 ASREC meeting.

**Estimated action funding:** To be determined based on outcomes of studies.

## **STRATEGY 4. ASSESS THE POTENTIAL FOR GEOTHERMAL POWER FOR TUTUILA**

Tutuila, the most populous island in American Samoa, has no active volcanism and no reported surface evidence of hydrothermal activity. However, evidence of very young (post-cultural) volcanic activity on Tutuila, together with evidence of recent active extensional rifting associated with the volcanism, suggests that Tutuila may have hidden hydrothermal resources. The tectonic setting and such young volcanics on Tutuila make it very likely that a subsurface magma chamber and elevated temperatures exist beneath Tutuila. A comprehensive exploration program is necessary to confirm the geothermal potential of Tutuila and to determine whether hidden hydrothermal systems capable of commercial development exist on Tutuila. Slim-hole temperature gradient drilling will be required to confirm the presence of heat at economically attractive depths. With positive confirmation of a sufficiently shallow thermal resource, an exploration program could be conducted using multiple geologic tools and data sets to locate potential hydrothermal systems.

**Goal:** Determine the potential for geothermal energy to provide baseload power for Tutuila.

**Overall responsibility:** Tim Bodell, ASEPA.

**Potential challenges:**

- The results of the study may be that either there is no geothermal resource or that it may be uneconomic to exploit the resource
- Development costs require a large economy of scale to enable feasibility. Therefore 10-MW to 30-MW of power generation are targeted to warrant development economics
- Exploitation of the resource may not be possible due to directional drilling technologies
- Exploitation of the resource may not be viable due to conservative, scientifically driven, risk-managed investigation methods. Phase 2 (resource validation) may not yield satisfactory evidence

to justify the cost of the large exploration drilling rig that would be required for phase 3 (resource confirmation)

- A hydrogeological condition common to other tropical volcanic environments called “rain shield effect” may mask the thermal gradient with an isothermal zone up to several thousand feet deep. In this case exploitation of the geothermal reservoir could still be economically viable but more costly to diagnose
- The domination of high saline water in the deep subterranean could make resistivity geophysical exploration methods less reliable
- Land ownership, land access and resource royalty issues.

**Overall deadline:** October 1, 2016.

### **Action 1. Perform preliminary evaluation of geothermal power potential on Tutuila**

The goal of this action is to conduct a preliminary evaluation that will assist ASREC in understanding the potential for geothermal power to be economically developed on Tutuila. Phase 1 includes extensive research, light detection and ranging (LiDAR) interpretation, development of a three-dimensional conceptual reservoir model, on-site reconnaissance and recommendations for more invasive site investigations.

**Responsible for coordinating implementation:** Tim Bodell, ASEPA.

#### **Specific actions and timeline:**

1. Determine land use, permitting, land encroachment and steam royalties following preliminary design of proposed geothermal facilities.
2. Develop a draft work plan/work scope and budget for hiring a consultant to conduct the Phase 1 study. **[Tim Bodell, completed]**
3. Arrange for funding of the Phase 1 study through ASPA. **[Tim Bodell and director of ASPA, completed]**
4. Award contract to consultant and issue notice to proceed. **[ASPA procurement, by June 7, 2013]**
5. Hold kick-off meeting between ASPA, ASEPA and consultant. **[ASPA, by June 18, 2013]**
6. Consultant provides preliminary recommendation to ASPA. **[Consultant, by August 1, 2013]**
7. Consultant submits draft report to ASPA. **[Consultant, by September 15, 2013]**
8. Team provides peer review and comments to consultant. **[NREL, ASPA, ASEPA and others, by September 30, 2013]**
9. Consultant submits final preliminary evaluation report to ASPA. The final report will summarize results of the geologic research, LiDAR interpretation, conceptual reservoir model, a step-by-step risk-managed exploration program, and conceptual costs and schedule of phases of development. **[Consultant, by October 31, 2013]**

**Reporting on progress and measuring impact:** Report progress at the general ASREC monthly meeting.  
[Tim Bodell]

**Estimated action funding:** \$80,000

## **Action 2. Perform validation phase exploration of Tutuila geothermal potential**

Action 2 includes more comprehensive on-site exploration including soil gas sampling, more refined geologic mapping, groundwater geochemistry and magma tellurics.

**Responsible for coordinating implementation:** ASPA with ASEPA technical assistance.

### **Specific actions and timeline:**

1. Work with geothermal development experts to develop a scope of work for more detailed geology, geophysics and geochemistry investigations appropriate to Tutuila to validate the resource prior to deep drilling. **[ASPA, by July 10, 2013]**
2. Identify potential funding sources and develop firm budget estimates, and begin the grant-writing process. **[ASPA with ASEPA technical support, by July 2013]**
3. Write and issue an RFP, select a partner company, and manage the scientific validation phase that will include investigating surface geology, geophysics and geochemistry. **[Director of ASPA with assistance from ASEPA and NREL, by October 2013]**
4. Prepare surface investigation validation phase report. **[Scientific consulting experts, by February 2014]**

**Reporting on progress and measuring impact:** Report progress at the general ASREC monthly meeting.  
[Tim Bodell]

**Estimated action funding:** \$320,000

## **Action 3. Perform resource confirmation phase**

Based on results of the validation phase, develop and execute a thermal gradient and/or slim-hole drilling exploration program. **[By November 2014]**

**Reporting on progress and measuring impact:** Report progress at the general ASREC monthly meeting.  
[Tim Bodell]

**Estimated action funding:** \$1.5 million to \$3 million.

## **Action 4. Perform resource development phase**

Design, develop and install production wells, injection wells, steam galleries and/or hot water collection piping, conventional steam or binary power plant facilities, depending on the results of the resource verification and production analysis.

**Estimated action funding:** \$7 million to \$18 million, potentially provided by an independent power producer. **[By November 2016]**



## STRATEGY 5. ASSESS HYDROELECTRIC POWER RESOURCE DEVELOPMENT POTENTIAL

Hydroelectric power is a potential source of renewable baseload power and has the potential to serve as a power storage system for solar and wind technologies. Wind and solar generation are economical and clean sources of energy for American Samoa. However, wind and solar energy production is intermittent and variable by nature. Energy produced by wind turbines varies as a function of wind speed and weather patterns. Energy from solar resources can change rapidly when clouds pass overhead. As a result, other dispatchable generation resources need to quickly vary their output to match power grid energy needs in response to wind and solar output variations. Hydro generation is inherently able to vary its output quickly in response to dispatch signals from the grid operator. Additionally, it has the potential to serve as backup power for critical infrastructure, such as water wells and water treatment plants, in the event of a natural disaster.

**Primary goal:** The goal of this strategy is to develop available hydroelectric power resources as baseload power and/or as storage for solar and wind technologies, and potential backup power for critical infrastructure in the event of natural disasters.

**Secondary goal:** Restore the historic Fagatogo Hydroelectric Complex to provide baseload power for the grid and/or storage for solar and/or wind technologies, and/or to provide backup power for the Fagatogo water filtration plant and ASPA wells, and create economic development by promoting the complex as an educational/heritage tourism site and trail.

**Overall responsibility:** The director of ASPA shall be responsible for coordinating the effort for the larger goal of developing potential hydroelectric sites that are not considered to be historic properties. This action plan will focus on the secondary goal; additional action plans may be developed to address the general goal at a future time.

The director of ASHPO shall be responsible for coordinating the effort for the secondary goal. ASPA shall provide technical support and coordination.

### **Potential Challenges:**

- Land disputes
- Cost may be deemed too high due to the results of the feasibility study.

**Overall deadline:** October 1, 2015.

## **Action 1. Develop a proposal to conduct a feasibility assessment of the Fagatogo Hydroelectric Complex and, if feasible, an engineering and architectural design for restoration work for submission to the EIC grant program.**

The proposal will be for a team of engineers to assess the feasibility of restoring the Fagatogo Hydroelectric Complex to provide hydroelectric power. The scope of work will include the following:

- Draining and dredging of the existing reservoirs to allow for a thorough engineering assessment
- Restoration of the existing access trail to provide safe access to the pipelines and reservoir sites for the assessment, for draining and dredging work, for potential restoration work, for educational site visits and for economic development through heritage tourism
- Assessment of the integrity of two existing reservoirs (if a potential third reservoir is discovered it will be added to the scope)
- Assessment of the existing cast-iron pipeline
- Assessment of the existing hydroelectric plant building
- Assessment of using the power produced as baseload and backup power for the ASPA water filtration plant and/or ASPA wells
- Assessment of the potential of using the upper reservoir(s) for power storage
- A cost-benefit analysis of the total proposed hydroelectric plant restoration project effort based on potential capacity (kilowatts) that can be realized and energy (kilowatt-hours) over a complete seasonal cycle and potential fuel savings to ASPA. The analysis will also take into account potential economic benefits the site may have for heritage tourism and the potential savings from using the hydroelectric plant as baseload and backup power for the ASPA water filtration plant and/or ASPA wells
- Engineering and architectural plans and cost estimates for restoration of the complex
- A video documentary of the work done on this project for educational and heritage tourism promotion purposes.

ASHPO will be the lead organization in preparing the grant proposal. ASPA will provide technical input as requested.

**Responsible for coordinating implementation:** Director of ASHPO.

### **Specific actions and timeline:**

1. Identify any additional specific tasks that the proposal will cover. The director of ASHPO will develop the proposal and present it at the next ASREC meeting on June 17, 2013, for discussion and adoption. **[Director of ASHPO, by June 18, 2013]**
2. Submit proposal. **[Director of ASHPO, by July 10, 2013]**

3. Assuming the proposal is funded, ASHPO with the assistance of ASPA will issue an RFP for the assessment. **[ASPA procurement assisted by director of ASHPO, by September 2013]**
4. Select contractor. **[ASPA procurement assisted by director of ASHPO and TEO, by October 2013]**
5. Complete assessment and final report. **[Consultant, by May 2014]**

**Reporting on progress and measuring impact:** Report progress at the general ASREC monthly meetings.

**Estimated action funding:** \$400,000

## **Action 2. Develop a restoration proposal for the next round of funding based on the results of the engineering and architectural design work**

Action 2 builds on action 1 above and focuses on completing the restoration of the Fagatogo Hydroelectric Complex by acquiring a contractor through an RFP process.

**Responsible for coordinating implementation:** The director of ASHPO shall be responsible for coordinating the writing of the proposal. ASPA shall provide technical support and coordination.

### **Specific actions and timeline:**

1. The director of ASHPO will develop the proposal and present it to the ASREC meeting in June 2014 for discussion and adoption. **[Director of ASHPO, by June 2014]**
2. Submit proposal. **[Director of ASHPO, by July 10, 2014]**
3. Assuming the proposal is funded, ASHPO with the assistance of ASPA will advertise an RFP for the restoration work. **[ASPA procurement assisted by director of ASHPO, by September 2014]**
4. Select a contractor. **[ASPA procurement assisted by director of ASHPO, by October 2014]**
5. Complete restoration work. **[Selected contractor, October 2015]**

**Reporting on progress and measuring impact:** Report progress at the general ASREC monthly meetings.

**Estimated action funding:** Funding for action 2 will be dependent upon the outcome of action 1.

## APPENDIX: ASREC ENERGY TASK FORCE MEMBERS AND OTHER CONTRIBUTORS TO THE ACTION PLAN

- Chair: **Timothy Jones**, representing the Territorial Energy Office
- Vice Chair: **Utu Abe Malae**, representing the American Samoa Power Authority
- **Tim Bodell**, representing the American Samoa Environmental Protection Agency
- **David Herdrich**, a renewable energy stakeholder
- **Mark Kneubuhl**, a renewable energy stakeholder
- **Ameko Pato**, representing the American Samoa Environmental Protection Agency
- **David Robinson**, representing the private sector
- **Lee Slater**, representing the private sector

### PHOTO CREDITS

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## NATIONAL RENEWABLE ENERGY LABORATORY — LEADING CLEAN ENERGY INNOVATION



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