

**(RFA) AEA-2014-007**

# **Integrated Biomass Heat Storage & Distribution**

## **APPLICANT CONTACT INFORMATION**

### **Shaan Seet Inc.**

James Carle, General Manager  
PO Box 690, Craig, AK 99921  
(907) 826-3251, ssinc@aptalaska.net

## **PROJECT PARTNERS**

### **UNIVERSITY OF ALASKA FAIRBANKS, COOPERATIVE EXTENSION and ALASKA WOOD ENERGY DEVELOPMENT TASK GROUP: KAREN PETERSEN**

Ms. Petersen will serve on the project's Technical Advisory Committee, which will review key project milestones. Ms. Petersen will also disseminate new industry knowledge generated by the project.

(907) 821-2681, kpetersen@alaska.edu

### **US FOREST SERVICE, BIOMASS ROADMAP COORDINATOR: ROBERT DEERING**

Mr. Deering will serve on the project's Technical Advisory Committee, which will review key project milestones. He is one of the principle architects developing the Forest Service's Tongass Biomass Roadmap, an aggressive regional strategy to convert 30% of the region's fossil fuel heating over to biomass heat within ten years.

(907) 957-1077, rcdeering@gmail.com

### **ENERGY ACTION: WYNNE AULD**

Ms. Auld will provide project management assistance.

(907) 744-1085, wynne@energyactionllc.com

## **TOTAL PROJECT COST**

**TOTAL Project Cost:** \$265,439

**Grant funds requested:** \$210,839

**Match committed:** \$54,600 (\$39,600 cash; \$15,000 in-kind)

**% Match:** 26%

**PREVIOUS APPLICATION TITLES OR NUMBERS:** None

**1. PROJECT SUMMARY**

The Integrated Biomass Heat Storage & Distribution Project (“The Project”) is an innovative strategy for sourcing and distributing wood pellets to consumers in remote communities. The Project diversifies available energy sources by integrating residential wood pellet sourcing and distribution with commercial infrastructure investment, and by innovative use of fuel storage and delivery devices. This technology innovates in the field of solid biomass fuel sourcing, storage, and distribution.

The Project is a direct response to state and regional planners’ strategic, targeted effort toward biomass space heat in Southeast Alaska (SE). The SE Integrated Resource Plan (IRP) concludes that “the region should pursue policies and programs to encourage the conversion of space heating to biomass,” especially the “regional adoption of wood pellet technology.” The Study reports that a 30% pellet conversion program in SE would save \$900 million over 50 years, while requiring only \$85 million in capital expenditures” (SE IRP, 1-4). Meanwhile, USDA, the State Division of Forestry, and others have launched the Tongass Biomass Roadmap, an aggressive regional strategy to convert 30% of the region’s fossil fuel heating over to biomass heat within ten years.

The Project addresses a cornerstone of the Region’s biomass energy development: the residential sector. This sector accounts for over 60% of SE’s heat demand, yet few of AHFC or AEA’s programs target support for this sector.

**1a. Project Description:**

The Project’s “energy technology” diversifies energy sources available on Prince of Wales Island (POW) by integrating residential wood pellet sourcing and distribution with commercial infrastructure investment, and by innovative use of fuel storage and delivery devices. This integrated energy technology innovates in the field of solid biomass fuel sourcing, storage, and distribution. The specific equipment components of the Project are:

**1) Baseload demand:** Installation of a small commercial wood pellet heat system at the Shaan-Seet Hotel: This baseload demand enables bulk purchase (8+ tons) of wood pellets per order. The Shaan-Seet Hotel will use up to 22 tons of pellets per year.

**2) Biomass fuel storage & distribution:** A bulk storage container will bank bulk wood pellets so that they are readily available and affordable to residential consumers, and corn caddies will distribute wood pellets from the biomass fuel storage to individual homes. Corn caddies are affordable, commercial devices for agricultural products that are light enough to haul with a light duty pickup. The project includes purchase of five caddies.

The Project’s energy technology will constitute its debut in Alaska: although wood pellet heat is a widespread technology, there are no known Alaskan projects where integrated commercial and residential infrastructure investment enable cost-effective biomass sourcing. Additionally, although bulk wood pellet storage for residential purchases has been widely acknowledged as a strategy to reduce sourcing costs and uncertainty, there are no known communities in the state that have such an application. Finally, although grain wagons and corn caddies are highly commercial devices for agricultural products, there are no known Alaskan applications using these devices to source, store, and distribute biomass fuels. The current TRL is 5: the basic project components have been shown to perform reliably in their distinct applications. The anticipated TRL is 9: integrated market transformation proven through successful operations.

**Feasibility:** The economics of home heating and known consumer preferences suggest that this project is highly feasible. We have obtained price quotes from multiple pellet suppliers in Ketchikan and the Pacific Northwest, and feels confident in its ability to reliably source and distribute pellets for less than \$375/ton, offering an 18% savings over fuel oil (equivalent of \$3.72/gal versus \$4.38/gal). At these prices, the average homeowner will save about \$415 per year, which generates a simple payback on wood pellet stove installation of 7.2 years (\$3K stove



**Baseload Demand**  
*SS Hotel Boiler*



**Fuel Storage**  
*Trailer with auger*



**Fuel Distribution**  
*Corn Caddy*

installation/\$415 savings = 7.2 yrs; 587 gal. annual fuel consumption calculated from PNW-GTR-827). When oil prices reach \$4.75 per gallon, pellet stove conversion would have a simple payback of less than 5 years.

Pellet stoves offer operational benefits over wood stoves – they are thermostatically controlled and have auto-light options, offering a close substitution for oil heat devices. A market study of Alaskan consumer preferences confirms residents’ interest in biomass home heat: Alaskan consumers’ willingness to pay for biomass heat devices ranges from \$1-3K; their willingness for daily O&M is 15-30 minutes; and a fuel oil price of \$4-5 per gallon should be sufficient to induce most homeowners to heat with wood pellets. This technology meets or exceeds these metrics: pellet stove conversion costs about \$3K; pellet stove daily O&M takes less than 15 min; the local price of fuel oil is \$4.38/gal) (Nicholls, et. al. PNW-GTR 826). More than 100 communities in SE Alaska alone face these market conditions. Project feasibility of wood pellet heating at SS Hotel has been confirmed by a separate study completed by Energy Action (2013). Technical service providers are available on POW to install and maintain biomass heat systems.

**Benefits:** The project’s potential benefits are local, regional, and statewide in scope.

- **Energy savings, with renewable, reliable, regional fuel:** Wood pellet purchasers will save more than 18% on fuel costs by heating with pellets instead of oil. If 5% of households on POW convert to pellet heat (148 households), \$61K annual savings is expected to be retained by local homeowners.
- **Regional economic development:** If 5% of households on POW convert to pellet heat (148 households), \$948K would circulate in the regional economy annually through pellet fuel purchases.
- **Job creation:** One part time job is expected to be created in the operation and maintenance of the project infrastructure and wood pellet distribution business, with a value of \$30K.
- **Consistent with the region’s cultural fabric:** SE Alaska knows forestry better than any other region in the state. This evolution of the forest products industry will capitalize on existing human resources and equipment, as well as the phenomenal forest resources, a boon to the cultural fabric of SE Alaska.
- **A bridge to the long-term energy plan:** The long- and mid-term energy plans for the Region include widespread conversion to biomass heat. This project serves the 10 year Biomass Roadmap Coordination Project, and is a bridge to long-term plans to heat with micro-chips, a biomass fuel which may become available in the future, and may offer more cost saving and local benefits.

**1b. Project Innovation:** The Project will expand the investment potential of wood pellet fuel sourcing and distribution in remote Alaskan communities, and that knowledge will be immediately applied through the project partnerships with UAF Extension and the SE Biomass Roadmap Coordinator. Since the equipment proposed is very affordable, expanded knowledge of its operational performance would substantiate investment in other communities across Alaska. Additionally, numerous reports and market studies have concluded with the promise of wood pellet energy under surveyed market conditions, but how will consumers respond? This project will monitor consumer response to readily available, accessible, and affordable wood pellet heat.

**1c. Project Site and Demonstration Environment:** SE Alaska is unique. Nearly all of its communities are remote, with principal access by barge, plane, and ferry. Among other things, regional energy is characterized by high space heating costs, and conversion of fuel oil space heat to electric space heat in those communities with access to hydroelectric generation (SE IRP 1-38). Prince of Wales Island is a typical SE Alaskan community: it is remote, has high space heat costs, and has some relatively inexpensive hydroelectric generation. The proposed project is a prototype for more than 100 other regional communities facing similar energy challenges under similar conditions. The particular project site is a 100’ x 75’ graded and graveled lot owned by SS, located near downtown Craig at 501 Main Street. The lot is easily accessed by large trucks as well as residential-scale pickups. This lot is owned by Shaan-Seet, Inc, and surrounds its offices. There are no plans to divest the property.

**1d. Priority:** The project meets the following priority considerations:

1. The application is submitted by an Alaska Corporation (organization), Shaan-Seet, Inc.
2. The project is submitted in partnership with UAF.

3. The project has 26% matching funds committed from the applicant.
4. The project has widespread deployment potential in SE Alaska and the State, as indicated by the Biomass Roadmap Project, SE IRP, and USFS Publications PNW-GTR-827 & PNW-GTR-826.
5. The project involves heating efficiency (including production, transmission, and use), and energy storage.

## 2. Technology Validation and Data Collection

### 2a. Objectives:

#### Key performance metrics include:

- Number of households converting to wood pellet heat; dates and amounts of purchases
- Biomass storage and distribution operating metrics: personnel hours, freight cost, equipment O&M cost, equipment downtime, wood pellet flows
- Residential consumer values and attitudes (consumer surveys)

#### A successful project will:

- Attract and retain 5% of POW households (148 residences) as wood pellet customers over 5 years
- Accurately track key metrics associated with biomass storage and distribution
- Track residential key preferences, attitudes, and barriers to wood pellet heat over time (5 years)
- Serve as a model for scalable introduction of this new technology regionally and statewide

### 2b. Data Collection:

- Number of wood pellet customers will be tracked annually for 5 years by the administrative team at SS.
- Personnel at SS will track key metrics associated with biomass storage and distribution. The administrative team at SS will track material flows using order logs. Personnel hours will be tracked using a work log. Freight cost will be tracked according to invoices by the administrative team. Equipment O&M costs will be tracked by labor hours and material costs; downtime will be recorded in a log.

The wood energy consumer survey from PNW-GTR 826, which has been approved for use by the UAF Institutional Review Board, will be adapted for the Project. The survey will be conducted annually for 5 years; results will be published in short white papers annually and at the end of the 5 year period.

## 3. Project Schedule and Project Budget

Go/ No-Go	Milestones	Date		
X	EETG grant award & business plan approval	1/2/2014		
X	Negotiate pellet supply agreement (FOB)	1/15/2014		
	Select key equipment	1/30/2014		
	→Technical Advisory Team -- Equipment Review	1/30/2014		
	Complete 30% project design	2/30/14		
	→Technical Advisory Team -- 30% Design Review	2/30/14		
	Begin construction management	3/1/2014		
	Complete 100% project design	4/30/2014		
	→Technical Advisory Team -- 100% Design Review	4/30/2014		
	Begin construction, source all equipment	5/1/2014		
	Complete construction & commission systems	7/15/2014		
	Launch pellet distribution business	8/1/2014		
	Ongoing monitoring, annual surveys	ongoing		
COST CLASSIFICATION	a. Boiler Project Cost	b. Pellet Storage & Distribution	c. Project Monitoring	c. Total Project Cost
<i>formula</i>	A	B	C	(A + B + C)
Admin, legal, and monitoring costs	\$15,487	\$10,000	\$50,000	\$75,487
Engineering fees	\$8,000	\$2,500	\$0	\$10,500

INTEGRATED BIOMASS HEAT STORAGE & DISTRIBUTION– Shaan-Seet, Inc.

Construction	\$11,324	\$5,000	\$0	\$16,324
Equipment & Materials	\$31,595	\$62,500	\$0	\$94,095
Freight	\$6,447	\$5,096	\$0	\$11,543
Construction Contractor Profit	\$11,000	\$1,250	\$0	\$12,250
<b>SUBTOTAL</b>	<b>\$84,353</b>	<b>\$86,846</b>	<b>\$50,000</b>	<b>\$221,199</b>
<i>Contingencies</i>	\$16,871	\$17,369	\$10,000	\$44,240
<b>TOTAL</b>	<b>\$101,224</b>	<b>\$104,215</b>	<b>\$60,000</b>	<b>\$265,439</b>

<b>TOTAL PROJECT COST</b>	\$265,439
<b>TOTAL MATCH</b>	\$54,600
<b>EETG GRANT FUNDS REQUESTED</b>	\$210,839
<b>% MATCH</b>	26%
<b>Cash Match -- Shaan-Seet, Inc.</b>	\$39,600
<b>In-kind Match (personnel hrs)-- Shaan-Seet, Inc.</b>	\$15,000

<b>In -Kind Match -- Equip. Rates</b>	
n/a -- no equipment match	
<b>In Kind Match -- Personnel</b>	
Exec. rate	\$35/hr
Admin. rate	\$25/hr
Maint. rate	\$23/hr

**4. Project Team Qualifications**

- **James Carle, Shaan-Seet, Inc. Project Manager:** The General Manager of SS since 2009, Carle provides oversight for SS’s diversified business activities, including the Shaan-Seet Hotel, forest management, gas station, rock quarry, and rental units. Carle will manage the project, including project monitoring.
- **Wynne Auld, Energy Action. Project Consultant:** Auld is a biomass thermal energy consultant and the owner of Energy Action. She specializes in working biomass heat project planning and forest-products business development. Auld will assist the project manager with project management.
- **Karen Petersen, UAF. Project Technical Advisory Team:** Petersen serves as Professional Staff for UAF’s Cooperative Extension & Alaska Wood Energy Development Task Group. She received her Master’s from UAF Department of Alaska Native Studies and Rural Development. Because she lives on POW and heats with wood pellets, she is also personally qualified to advise the team on project development.
- **Bob Deering – Mechanical Engineer – U.S. Coast Guard (on detail to U.S. Forest Service). Project Technical Advisory Team:** ~15 years’ experience with renewable and wood energy, covering all aspects of combustion technology from feasibility analysis to design, construction, and operation, fuel sourcing, project financing, and community outreach. One of the principle architects developing the USFS’s Tongass Biomass Roadmap.

**5. Discussion of Commercialization of Funded Technology**

The project advances the market conditions for the largest consumer sector in Alaska – residences – by providing a model for cost effective fuel sourcing to remote communities. The residential pellet heating market potential in SE alone is 135,793 tons per year (PNW-GTR-827, Table 7). Since residential heat accounts for 60% of the region’s heat demand, the total market potential for the region is 226K tons of pellets. Meeting planning efforts for a 30% conversion to biomass heat is about 67K tons of pellets.

The Project’s Technical Advisory Team – Petersen of UAF and Deering of the Biomass Roadmap Coordination Project – will enable the Project to incorporate the best available practices and technology, as well as disseminate the Project results immediately. Deering’s role as the Biomass Roadmap Coordinator suggests the project findings will be applied immediately.

**6. Signed Applicant Certification:** “By signature on this application, I certify that we are complying and will comply with the amount of matching funds being offered.”

X 