EXECUTIVE SUMMARY

AEA Village Energy Efficiency Program – '10-'12

From August 2010 to August 2012 the following nine rural Alaskan communities received energy efficiency upgrades, consisting of lighting, weatherization, and/or mechanical measures, to community buildings:

Chignik, Deering, Kiana, King Cove, Kokhanok, Manokotak, Shishmaref, Teller, and Togiak

Total Program Grant Funds: $1,175,000

Description/Execution of Project:

The Village Energy Efficiency Program (VEEP) was implemented through a strategic method of collecting local general community information, public building energy audit data and implementing designed retrofits in order to provide the best improvement options for best payback.

Project Execution:

- Alaska Building Science Network (ABSN) made initial contact with local city and tribal government offices via e-mail and phone teleconference to describe ABSN's role as project "Technical Service Provider". The initial teleconference was instrumental in order to identify primary local staff contacts, grant priorities, building information, local concerns and preliminary audit site visit coordination.

- ABSN followed up with each community to coordinate an audit site visit in which one or more energy raters traveled to the community to complete weatherization (Wx), heating (Hx), and lighting energy (Lx) audits in all identified priority buildings.

- In most cases, the Wx & Hx energy audits relied on AkWarm software to develop an "As-Is" rating for each building to identify the most cost-effective energy saving improvement measures for each building. Lighting audits were generally entered into an Excel spreadsheet or "Lighting Tally sheet" document developed by ABSN for similar analysis. Additional hard copy building notes, drawings and photos were provided by each rater to support the audit process.

- Upon completion of the audits, ABSN reviewed all energy efficiency "Improvement Options Reports" to determine scope of work for each community based on best payback measures, local input and budgets available. All recommended weatherization, lighting, and/or mechanical upgrades were provided to each community for review and approval. Upon local approval, a "Request to Proceed" form was then submitted to

Alaska Energy Authority (AEA) for final approval. Procurement of all necessary Wx, Hx and Lx materials soon followed to include tools and miscellaneous supplies necessary to complete the energy efficiency upgrades, to include shipping to each community.

- Next came scheduling of upgrade work, which generally included ABSN Field Manager sub-contractors as well as various private mechanical and weatherization contractors to complete work.

- In most cases, building retrofit work involved use of local maintenance staff labor that received all necessary Wx, Hx and Lx energy efficiency trainings and participated in building retrofit work.

- After the various upgrades were completed, Field Managers would compile Post-rating reports for each building based on the energy efficiency measures that were accomplished. These reports are the basis for calculating the projected electrical and heating fuel energy savings for each building upgraded.

Successes and Accomplishments:

This summary highlights the accomplishments of the Village Energy Efficiency Program (VEEP) for nine rural Alaskan communities.

As of August 30th, 2012, Alaska Building Science Network (ABSN) completed weatherization, lighting, and mechanical energy audits and upgrades in these nine VEEP communities: Chignik, Deering, Kiana, King Cove, Kokhanok, Manokotak, Shishmaref, Teller, and Togiak. A total of 70 public buildings and 37 school district owned buildings received energy audits. Of those, 52 public buildings (approximately 109,154 square feet) received energy efficient lighting, weatherization, and/or mechanical retrofits, while the communities of King Cove and Manokotak were retrofitted with 68 and 23 LED street light fixtures, respectively. Approximately 125 local community maintenance staff participated in weatherization, lighting, and mechanical energy efficiency trainings and upgrade work across the nine VEEP communities.

The various energy efficiency and conservation measures resulted in a grant wide total projected electrical energy savings of 220,425 kWh (*see Figure 1)* and $110,067 electrical energy cost savings, while a projected 24,238 gallons (*see Figure 2*) of heating fuel and $139,571 in fuel cost savings. The total combined electrical energy and heating fuel cost savings for all VEEP communities is projected at $249,638 (*see Figure 3*). These calculations are based on actual local fuel and electricity rates which averaged 59 cents/kWh and $5.71 per gallon for # 2 diesel heating fuel. These results achieved a projected simple pay back of 4.71 years on the entire $1,175,000 VEEP grant (or 5.38 years when In-kind contributions are included).

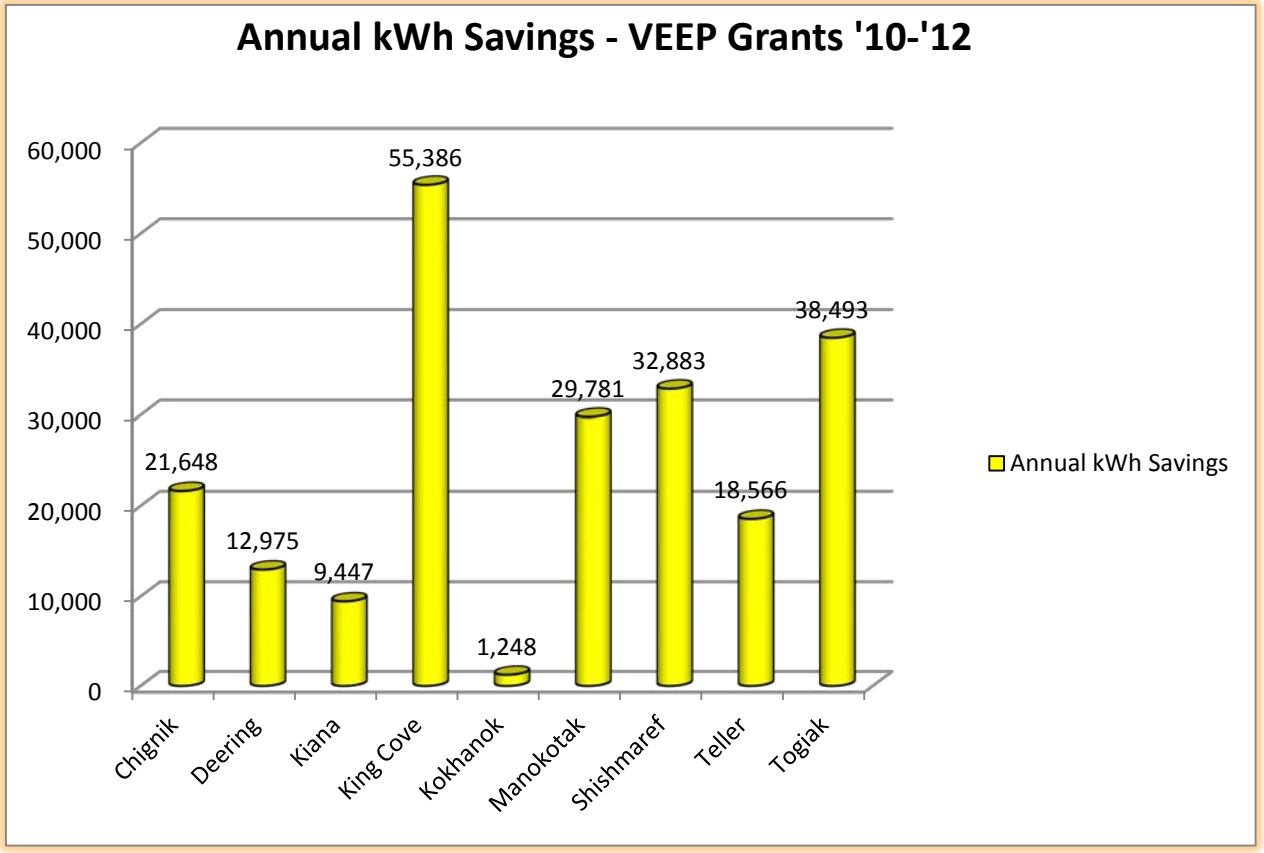

Figure 1 – Annual kWh savings (all measures) for all VEEP communities.

Further analysis revealed a village average 4.81 years simple payback on completed measures based on actual VEEP village budgets. When accounting for the additional village-wide In-kind expense contribution per community (i.e. total project cost to support these projects) the same calculation reveals an average of 5.47 years simple payback (*see Figure 4*).

The In-kind contributions highlight another significant accomplishment of these projects, which proved valuable toward extending the reach of these grants and energy efficiency measures completed. Various local In-kind contributions include village maintenance staff payroll, local transportation & fuel cost, and ABSN field staff lodging. To further maximize value, some communities opted to purchase additional materials to include building retrofits not afforded by the grants. Throughout the duration of these projects a (modest) estimate of $167,112 was contributed In-kind by the nine VEEP communities. ABSN worked vigorously to negotiate and encourage these contributions where possible in an effort to best utilize VEEP funds in each community.

Another accomplishment occurred in our multi-grant communities that received a combination of EECBG, VEEP and, on some occasions, funds received by Bristol Bay Native Association – Tribal Energy Program EECBG program. In those cases, ABSN worked to consolidate audit and upgrade activities which served to extend and maximize the reach of all funds that were applied to those communities.

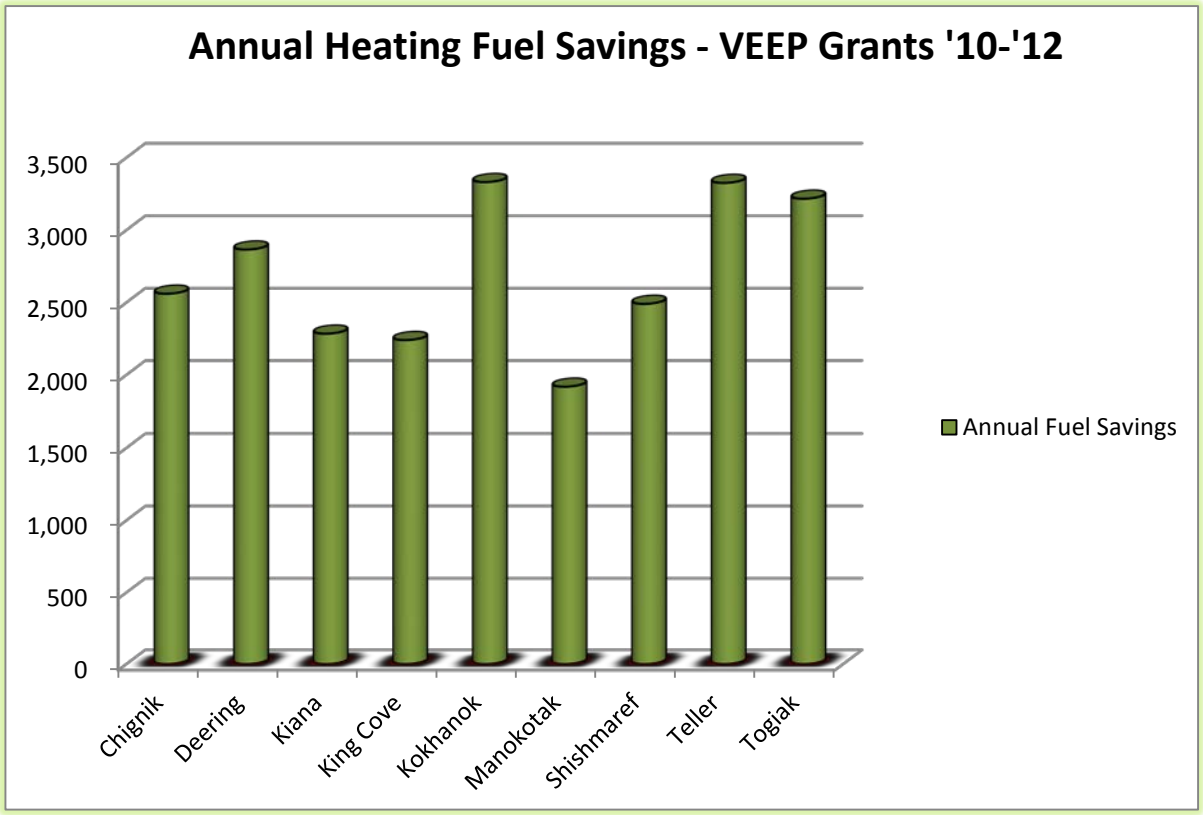

Figure 2 – Annual fuel savings in gallons (Wx &Hx) for all VEEP communities.

Issues and Problems Discovered / Lessons Learned:

The following information summarizes challenges and problems encountered during the two year period of the VEEP grants.

Since August 2010, the cost to deliver work outlined in these grant contracts increased considerably over the two year period. During that time, we noticed a steady increase in materials costs, airfare, and freight charges which made it difficult to budget energy audits and upgrade work. For example, various insulation product costs increased by 15-30%, while fluorescent lamp costs increased approximately 100% during that same period of time. These ever-increasing costs made it challenging to deliver even basic energy efficiency measures within budget. Despite these challenges, ABSN continued to work with communities in an effort to select the most cost effective energy efficient measures which provided the best payback, while meeting the priorities identified by each community. To do so, ABSN utilized bulk purchasing of tools and materials. Further efforts were made to charter air cargo carriers to serve multiple communities and maximize freight services while negotiating discounted back-haul agreements to conserve funds. ABSN continued to leverage In-kind donations and services from village-based and regional entities to include city, tribal, Alaska Native corporations, housing authorities, churches and school districts in an effort to extend the reach of these grants.

Our biggest challenge came during the 2012 construction season in efforts to complete work by the August 30th, 2012, end of construction deadline. Summer in Alaska is often a difficult time to find available trained workers due to numerous other seasonal job opportunities available. Often we were in direct competition with the commercial fishing season, or other construction projects which sharply reduces the available local labor pool. During that time, much of the village leadership personnel and decision makers are also unavailable thus making it difficult to do the planning necessary for these types of projects. Thankfully, many local city, tribal government, and school district administrative staff stepped up to coordinate all of the necessary local support to deliver these projects, often on short notice.

Other challenges included identification, selection, and availability of American made products for compliance with "Buy American" provisions outlined in the VEEP program. To do so, ABSN communicated closely with vendors during the procurement process to provide adequate documentation, ensuring that all products met Buy American requirements where applicable, and that all Buy American waivers were understood and applied appropriately when necessary.

An ongoing challenge occurred in efforts to receive local village labor reimbursement invoicing from village entities in a timely manner. This often led to increased ABSN staff time to acquire invoices, to include unexpected accounting challenges and general unnecessary strain on both the community and ABSN staff resources. To eliminate this issue, ABSN added language in our Labor Reimbursement Agreement form stating that the reimbursement invoice must be received by ABSN within 15 days of completion of projects or it will be considered an in-kind contribution if not adhered to by the agreed upon pay schedule. This approach resolved most of the labor reimbursement invoicing challenges.

Despite these and other challenges, ABSN worked to the best of our ability to deliver these projects and meet the expectations of the communities in which we served.

Tips and Traps:

- Project planning and implementation should take into account subsistence, commercial fishing and other seasonal activities which affect local available labor pool and local staffing support. Generally the construction season conflicts with these other seasonal activities, which is often unavoidable.

- The ABSN Weatherization Program utilized a regional multi-village approach for conducting energy audits, materials bulk purchasing, shipping and ultimately scheduling weatherization and mechanical upgrade work for VEEP communities. This approach proved critical to get things done by the August 30th, 2012, End of Construction deadline. This approach also greatly conserved grant funds by enabling discounted materials bulk purchasing, multi-village air cargo and barge deliveries, scheduling Field personnel for multi-village audit and upgrade travel, and reducing ABSN staff time required to coordinate and manage these projects.

- Upon completion of audits/upgrades, final Metrics reporting should begin immediately. Often, the time elapsed between site visits and final reporting was too long which resulted in an information gap. Field personnel should submit reports within two weeks of the audit & upgrade travel to avoid this gap.

- Plan, plan, plan! Weather delays, travel mishaps, no-show local labor, sick Field personnel will affect project planning and execution. Ensuring materials are shipped well in advance of scheduled upgrades while having a back-up plan for absent Field personnel and local laborers proved critical for successful delivery of these projects. Such flexibility and careful planning helped the program to work around weather/travel delays, while minimizing unanticipated costs to the grant to include air carrier change fees, lodging, transportation and additional Field personnel per diem expenses.

Benefits to Alaska:

The successes and accomplishments outlined above emphasize substantial energy cost savings benefits to local communities. With annual increases in heating and electrical utility costs in rural Alaska, these benefits become more substantial over the lifetime of the energy efficiency measures installed in each building. Even the smallest energy efficiency improvement measures can make an impact on the cost of heating or lighting in a building.

Given these results, the VEEP program served somewhat as a demonstration project by showcasing the energy efficiency cost savings that can be achieved through public use facility building retrofits. Such projects that target public facilities provide direct economic benefits and relief to local city government entities which often struggle to pay utility bills. Similarly, the State of Alaska Power Cost Equalization (PCE) Program benefits due to reduced electricity consumption in community facilities which are eligible for PCE subsidies.

Additional benefits to Alaska include:

- Local job creation during the audit and upgrade phase in each community.
- An enhanced statewide maintenance labor pool who received significant weatherization, mechanical and energy efficient lighting retrofit training hours and certifications as a result of these projects.
- Statewide building usage “behavior” changes by getting people to turn lights off and turn down the heat when buildings are not in use.
- A general increase in energy conservation awareness and outreach in communities served.

Combined Annual Energy Cost Savings – VEEP Grants ’10-’12

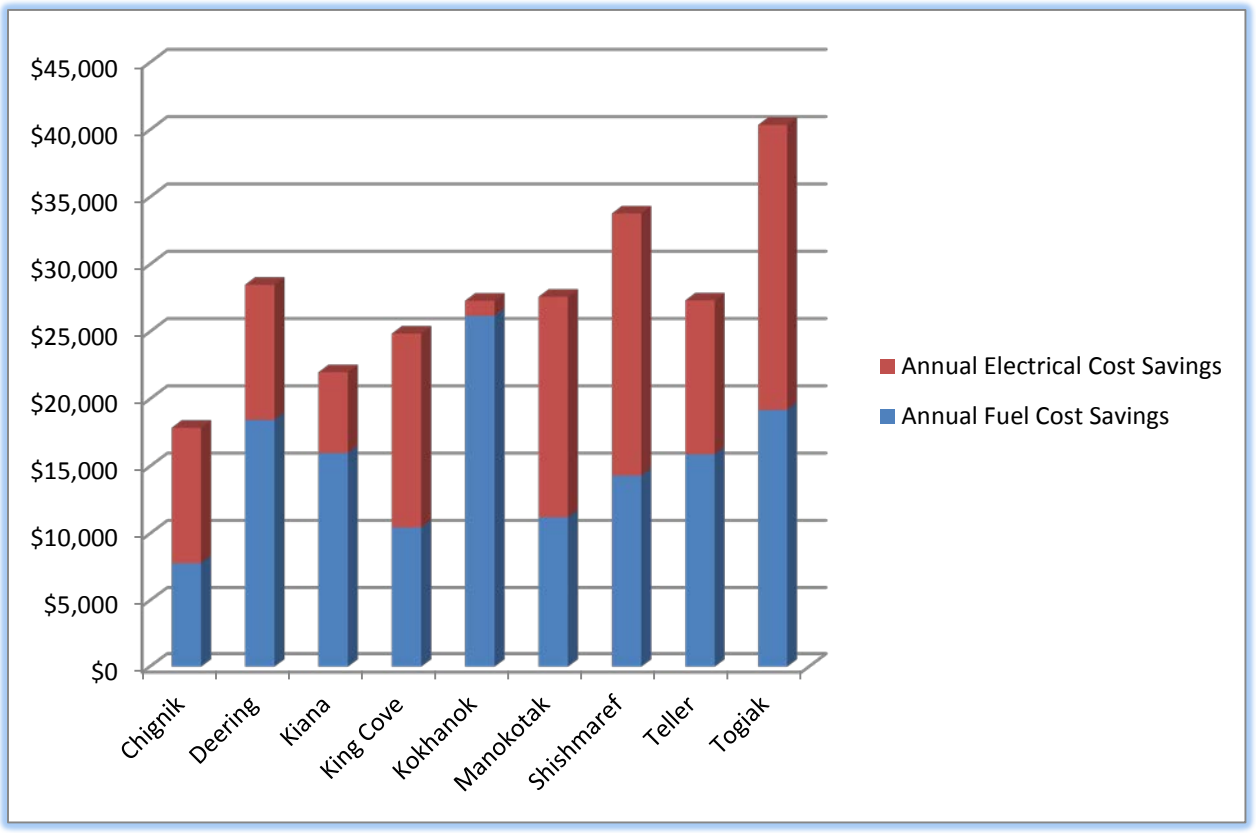

Figure 3 – Combined Annual Electrical and Fuel Cost Savings for all VEEP Communities.

Recommendations for Further Actions:

Although every effort was made to ensure the most cost-effective measures were completed, not every building achieved the maximum energy efficiency upgrade potential due to budget constraints. To achieve maximum benefit of the work done under the VEEP, we strongly urge local community leaders to seek additional funding to complete any additional retrofits not achieved by this program. Even where outside funding is not available, we encourage local city and tribal governments to consider budgeting for additional building retrofits prioritizing those measures that provide the quickest payback.

Regardless of the funding source, now is the time to continue moving forward on those additional retrofits since many of the initial audits have been completed and paid for under the VEEP grants, especially when considering the trained local work force that is already in place in most communities served. Now is the time to seize on that momentum, since communities will not have to absorb expenses for audits and work force technical training.

Additional technical training, education and certifications for public facility maintenance staff and operators will be beneficial in making sure that the various energy efficiency measures installed are maintained. Such trainings include general building maintenance and repair, boiler/mechanical maintenance & repair, as well as lighting retrofit and repair. Such trainings would go a long way to ensure that upgraded buildings continue to operate efficiently. It is important to emphasize that the retrofits should not be considered a "one-time deal" and that continued maintenance will be required in making sure that the maximum energy savings benefits are achieved throughout the life of the measures installed.

In addition, a locally trained workforce will encourage local hire and reduce the need to bring in contractors from outside for repairs and routine maintenance. Local hire will also help to avoid the often higher cost of sub-contracting the work to those from outside of the community.

Simple Payback All Measures – VEEP Grants '10-'12

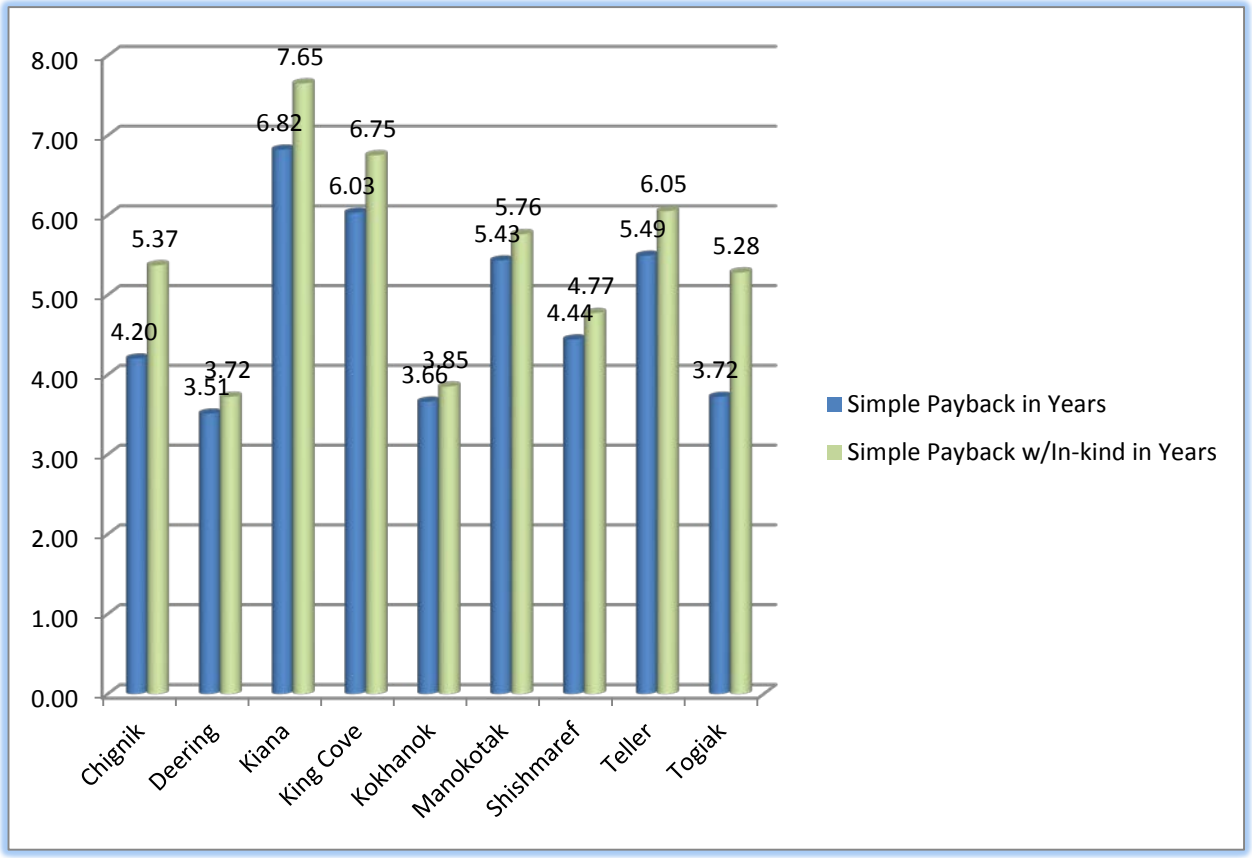

Figure 4 – Simple Payback in years (all measures) for all VEEP communities.

It would also be a benefit to the communities to implement some type of monitoring program and process through which we could obtain actual energy saving data. Though it would be unrealistic to monitor each village, case studies of a sampling of villages would help to solidify actual energy savings and benefits of the lighting, weatherization and heating measures implemented in the program.

Conclusions:

Although there were many obstacles and challenges throughout the two year grant period, the staff and contractors at ABSN are pleased to report the work completed in the nine VEEP communities. The success of this project is attributed to the hard work and commitment of ABSN staff, various program partners, State of Alaska agencies and technical experts who supported these projects. Over the course of the projects, ABSN built strong partnerships with our VEEP communities, to include local and regional city and tribal governments, state agencies, housing authorities, and school districts to complete these projects. Additionally, ABSN established strong working relationships with our vendors, freight companies and various subcontractors who contributed greatly toward the success of this program. Most critical is the local support provided by the recipient communities, whom, without their support and buy-in, these projects would not have been possible. ABSN of course encourages the State of Alaska to continue allocating funds toward these types of programs that provide energy audits and retrofits for public use facilities.

AEA Village Energy Efficiency Program – Summary of Savings For All Grant Activities: VEEP ’10-’12

With Building Use Estimates of 7 hrs/day, 250 days/year:
Energy Costs by AkWarm Library & Alaska PCE Report FY 2011

VILLAGES	Grant Total	Annual Savings (kWh) (By Grant =Total)	Electricity Cost per kWh (w/out PCE) (By Grant = Ave)	Annual Village-wide electrical savings (dollars) (By Grant =Total)	Annual Savings (Gal) (By Grant =Total)	Heating fuel oil -Diesel #2-cost per gallon (By Grant =Ave) AkWarm Library	Annual Village-wide fuel savings (dollars) (By Grant = Total)	Annual energy cost savings (dollars) - All Measures	Simple Payback (Years)	Village-wide In-kind valuation (dollars)	Simple Payback (Years) - incl In-kind
Chignik	**$75,000**	21,648	$0.4646	$10,057	2,561	$3.05	$7,811	**$17,868**	4.20	$20,935	5.37
Deering	**$100,000**	12,975	$0.7737	$10,038	2,866	$6.44	$18,457	**$28,495**	3.51	$6,074	3.72
Kiana	**$150,000**	9,447	$0.6352	$6,000	2,285	$7.00	$15,995	**$21,995**	6.82	$18,280	7.65
King Cove	**$150,000**	55,386	$0.2600	$14,400	2,241	$4.67	$10,465	**$24,866**	6.03	$17,870	6.75
Kokhanok	**$100,000**	1,248	$0.9000	$1,123	3,332	$7.86	$26,190	**$27,313**	3.66	$5,263	3.85
Manokotak	**$150,000**	29,781	$0.5500	$16,380	1,919	$5.85	$11,226	**$27,606**	5.43	$8,882	5.76
Shishmaref	**$150,000**	32,883	$0.5921	$19,470	2,491	$5.75	$14,323	**$33,793**	4.44	$11,200	4.77
Teller	**$150,000**	18,566	$0.6159	$11,435	3,326	$4.78	$15,898	**$27,333**	5.49	$15,349	6.05
Togiak	**$150,000**	38,493	$0.5498	$21,163	3,217	$5.97	$19,205	**$40,369**	3.72	$63,259	5.28
VEEP TOTALS	$1,175,000	220,425	-----	$110,067	24,238	-----	$139,571	$249,638	4.81	$167,112	5.47
VEEP Averages	**-----**	**24,492**	**$0.5935**	**$12,230**	**2,693**	**$5.71**	**$15,508**	**$27,738**	**4.71**	**$18,568**	**5.38**

$249,638	Projected Annual Energy Cost Savings (dollars) all Measures
$1,175,000	Total VEEP Grant Funds
$1,342,112	Total Project Cost (Incl. Village In-kind Contributions)
4.71	Simple Payback (yrs) on entire VEEP Grant
5.38	Simple Payback (yrs) on entire VEEP Grant (Incl. Village In-kind Contributions)