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TFFF Impacts on Lake County:

An Analysis of Energy Savings and Energy Project Impacts

Background. A major problem with evaluating community capacity-building projects is that most of the outputs are soft changes in behavior and increased levels of social capital, which is notoriously difficult to measure. Logic models for capacity-building suggest that more effective group leadership skills will ultimately lead to changes in measurable economic outcomes like job creation, median household income, or total assessed property values. While this may hold over the long term, all else being equal, the reality is that economic outcomes within a community tend to be swamped by the far greater forces of macroeconomic cycles and structural changes in industries and regions. Specifically, the effects of the Great Recession (likely the defining economic event in most of our lifetimes), have been to overwhelm positive changes by the FILP program in community measures like employment, median household income, school enrollment, lodging sales, new construction permits, property values, or even the number of Chamber of Commerce members.

Lake County is in south-central Oregon on the California border. It is a Great Basin, high desert land, historically dependent on logging and ranching for its economic base. Normally, the economic prospects for an isolated, resource-dependent county would be stagnant to a slow decline as timber harvests diminish and technology slowly reduces labor requirements. Lake County has clearly been impacted by the Great Recession, but there is a flurry of activity and a sense of optimism in the county seat of Lakeview as the county embraces a strategy of alternative energy development.

Lake County was an early participant in the FILP program, as well as RDI's CORE entrepreneurship program. When community leaders began to focus on the potential for alternative energy projects, TFFF supplied financial support for the Lake County Resource Initiative, a new nonprofit organization aimed at sparking collaborations around alternative energy.

This analysis looks at existing, planned, and reasonably expected alternative energy projects and the impacts that may occur to Lake County residents and its economy.

Existing Projects. There are 22 existing alternative energy projects which have come into being due to the technical assistance provided by the Lake County Resource Initiative and for which data are available. In addition, there are at least six additional projects for which data was not available or are in the process of construction. These are 1) a ground heat pump which will be installed as part of the new library, 2) a 75 kw solar electric project that will be built onto the new hospital in addition to its geothermal heat, 3) a new log home with solar radiant hot water heating, 4) a demonstration greenhouse heated with solar hot water at the Paisley school, 5) a demonstration solar electric project, and 6) a demonstration ground water heat pump for the exhibit building, both at the Lake County Fairgrounds.

Table 1 shows the 22 existing projects with data. There are only a limited number of opportunities to easily convert properties to geothermal heat. They are facilities that overlie the hot water aquifer, and in at least one case, make use of drinking water wells that accidentally struck hot water and were capped in the past. The net annual savings column represents the value of the annual energy savings as reported by the customer, less the cost of an allowance for operations and maintenance. O&M may be for replacing pump motors every 7-10 years, for maintenance performance audits, or for occasional

repairs. Remember that these energy savings are realized by the customer only after the project costs are re-paid, a period of one to as many as seven years. Note, too, that because our interest is the welfare of Lake County, federal and state tax credits are subtracted from the gross project cost.[1] Finally, note that the two Lake County solar electric projects sell their electricity under an Oregon feed-in tariff law at very high, nonmarket rates of $.49/kwh.

Table 1: Value of Existing Small Projects

Project	Gross Project Cost	Net Annual Energy Savings	Net Present Value of Energy Savings Over Project Life
Geothermal Heat Projects			
Home 1	$4,100	$5,200	$99,000
Ranch 1	$60,000	$5,300	$74,000
Home 2	$3,000	$1,300	$24,000
Ground Source Heat Pumps			
Ranch 2	$12,000	$3,800	$80,000
Home 3	$15,000	$3,800	$77,000
Home 4	$10,000	$3,800	$81,000
Home 5	$12,000	$3,800	$80,000
Home 6	$17,000	$3,800	$75,000
Fish & Wildlife Building	$100,000	$12,500	$163,000
Well Water Heat Pumps			
Home 7	$12,000	$3,800	$80,000
Home 8	$12,000	$3,800	$80,000
Solar Hot Water Heat			
Home 9	$12,000	$4,800	$78,000
Business 1	$80,000	$23,200	$359,000
Solar Electric Projects			
Off Grid 1	$22,000	$1,300	$11,000
Off Grid 2	$22,000	$1,300	$11,000
Off Grid 3	$4,500	$1,800	$29,000
Off Grid 4	$5,000	$2,800	$66,000
Ranch Off Grid	$15,000	$4,200	$66,000
Lake County Fairgrounds	$60,000	$14,400	$161,000
Lake County Road Shop	$60,000	$14,400	$161,000
Business 2	$160,000	$4,400	$4,000
Business 3	$30,000	$1,700	$19,000
Total Existing Projects	$727,600	$125,200	$1,858,000

Notes:
1) Assumes project life of 30 years for geothermal heat, 40 years for heat pumps, and 25 years for solar projects.
2) Annual energy savings is net of O&M costs and after project cost payback.
3) Assumes 7% interest on unpaid project cost balances and 3% social discount rate.

The net present value pulls the value of all future energy savings to the present, using a social discount rate of three percent.[2] Due to federal and state fiscal policies that encourage alternative energy deployment, each project provides a valuable return to its owner over its project life. In fact, the net present value is nearly $1.9 million in total. This may be thought of as an increase in the wealth of

[1] The federal tax credit is generally 30 percent of project cost. The State tax credit can be as high as 35 percent, and public entities can pass it through to tax-paying individuals and get a 25.5% credit.
[2] If this sounds low, remember that it is an inflation-free, tax-free rate similar to the return to long-term municipal bonds, averaged over the last several decades.

these county residents and organizations. If real estate markets were operating perfectly, the values of these properties would increase by that amount. It is easy to recognize that a home with very low heating costs is worth more than a home which may have heating costs of $4,000 per year. Remember that the energy savings are large in Lake County because most space heating is done with fuel oil or propane gas delivered to the property. Fuel oil cost $3.65 per gallon delivered in Lake County in November 2011.

Another way to look at the results of Table 1 is that these projects owners will have an additional $125,000 in their pockets each year after the project costs are repaid. Although this will not appear in county statistics as an increase in income, it has the same net effect. Money not spent on fuel oil and propane will likely be spent for other goods and services within the county. These energy savings are conservative because they assume real energy prices will remain constant over the 25 to 40 year project life[3].

Projected Small Energy Projects. Using these actual projects as a template, LCRI made conservative projections of rates of adoption of similar projects over the next decade. LCRI would continue to provide technical assistance to owners, and local contractors would have $1.8 million of project installation work. These 140 projected new projects would bring an additional $9.2 million of net present value in energy savings to Lake County homeowners over the next 50 years. Again, these estimates use conservative estimates of technology adoption, and the cost of solar projects is apt to decline further as production of heating tubes and photovoltaic panels increases.

Table 2: Value of Expected Future Small Projects

Project		Gross Project Cost Each	Net Annual Energy Savings	NPV of a Project in Year of Construction	Net Present Value of Energy Savings Over Project Life
Residential Ground Heat Pumps	80	$12,000	$3,800	$80,000	$5,890,183
Residential Solar Hot Water	50	$12,000	$4,300	$70,000	$3,232,112
Residential Solar Electric	10	$22,000	$1,300	$11,000	$101,581
TOTAL		**$1,780,000**			**$9,223,876**

Notes:

1) Heat pump projects assumed at 4/year for four years, then 10/year for 6 years.

2) Solar Hot Water assumed at 5/year for 10 years; solar electric assumed 1/year for 10 years.

3) Based on actual energy savings of typical installations, with real energy prices constant & 3% discount rate.

Lake County Hospital/Schools Geothermal Loop. The Town of Lakeview facilitated the funding of a feasibility study of using geothermal resources to heat three different parts of Lakeview done in 2009. This has led to the formation of a citywide geothermal heating district in August of 2011. The first activity is the construction of a loop from wells on the south end of town with 183 degree water to the hospital and four public schools. The loop returns past the industrial park to be injected back into the aquifer. Geothermal heating capacity was part of a $22 million hospital renovation and upgrade.[4] The Town of Lakeview procured a $1 million grant from federal stimulus funds that covered nearly all the cost of retrofitting the older part of the hospital and the four schools for geothermal heating. Lakeview can secure a 40 year loan at 4% interest from USDA-RD for the rest of the system cost. Table 3 shows the economics of this project. The net annual energy savings of $83,000 and total net present value of

[3] The Anderson study made the overly optimistic assumption that energy prices would increase 6% per year, which the author judges highly unlikely in inflation-adjusted terms from already high current price levels.

[4] Passing the hospital bond was another significant outcome by FILP graduates.

$1.9 million are a significant community improvement that will either save resident tax dollars or improve health care and education service quality, while eliminating some 800 tons of carbon emissions annually. The results could be improved slightly if either industrial park buildings or a greenhouse operation make use of 130 degree tailwater on the return loop and spread fixed costs accordingly.

Table 3. Lakeview Hospital/School Geothermal Loop

Capital Costs	
Retrofitting existing hospital & 4 schools	$1,043,000
Systems Costs - piping, wells, pumps, eng., etc.	$2,500,000
Total Cost	$3,543,000
less Fed Stimulus Grant	-$1,000,000
less OR Business Energy Tax Credits	-$350,000
Net Total Cost to District	**$2,193,000**
Operating Costs	
Debt Service Payment @ 4%, 40 yr	$111,000
Operating Costs	$84,000
Total Annual Cost	**$195,000**
Annual Energy Savings @ $3.25/gal.	$277,875
Net Annual Energy Savings	**$82,875**
Net Present Value @ 3%, 40 yr.	**$1,916,000**

Note: Operating costs and fuel cost assumed constant in real terms
Source: *Geothermal Heating Feasibility Study*, Anderson Engineering, Lakeview, 2009

A Caution about Conflicting Programs. LCRI has aggressively pursued all possible means of alternative energy development, and it should be commended for entrepreneurially taking advantage of all tax credit, grant, and loan opportunities. A side effect is that programs may be working at cross-purposes in a couple of cases. For instance, the economics of the downtown geothermal district hinges on the large energy cost savings that can be achieved by it. Yet LCRI also entered into a contract with South Counties Oregon Economic Development District to promote a $300,000 business energy efficiency and renewable energy loan fund. Weatherization cost estimates have been performed for over 50 downtown buildings, the same ones being considered for geothermal heat. If businesses take the loan for geothermal retro-fit, fine. However, they may weatherize instead, which has the effect of sharply reducing the potential energy savings from a geothermal retro-fit.

Similarly, a residential geothermal district is another possibility. Yet SCOEDD also has a woodstove replacement program that subsidizes installation of wood pellet stoves or heat pumps. Both programs are serving worthy goals of reducing air pollution and improving energy efficiency, but homes with heat pumps or new pellet stoves will not likely pay to join a geothermal district. The only recommendation here is to be aware of the interplay between programs and the way that a smaller program could serve to undermine a much larger geothermal effort that requires a high proportion of enrollment for success. The upside is that should both improvements be made, weatherized homes will require less hot water for heat and allow the geothermal capacity to be spread over more buildings.

Stewardship Contract/Biomass Energy Project. A major success for LCRI that has yet to bear fruit is the collaborative forest planning that has been ongoing since 1998. LCRI got involved and helped get a historical sustained yield unit on the Fremont-Winema National Forest re-authorized in 2002. The quarterly meetings with industry and environmental representatives in a broad collaboration led to the signing of a 10 year, renewable stewardship contract between the USFS and Collins Company. This is a major collaborative accomplishment between traditionally divisive partners that is matched in only a handful of places nationally. This contract encouraged Collins to invest $6.8 million in a new small diameter sawmill, which helped retain some 65 mill jobs in Lakeview.

The 20 year MOU and 10 Year Stewardship Contract helped assure supply that led to a biomass project. After two feasibility studies and a change in corporate ownership over several years, a company called Iberdrola committed to constructing a 26.8 MW, roughly $90 million biomass energy plant that will utilize the waste from the sawmill and other woody material from forest thinning. Its boiler water can be pre-heated geothermally from nearby wells. Ground was broken a year ago and foundations were laid to meet the requirement for the first year of a larger Oregon Business Energy Tax Credit. Unfortunately, the combination of a very wet year with lots of hydropower generation, falling natural gas prices, and a new requirement that green energy for California be generated within the state has meant that Iberdrola could not secure a power purchase agreement. The project is temporarily on hold until a contract can be signed, and will then need another 19 months for plant construction. When finished, the plant is expected to generate some 20 jobs in the plant and another 50-75 part-time jobs in the woods.

Utility-Scale Energy Projects. There are numerous large utility-scale energy projects proposed for Lake County. They are in various stages of development, with the biomass plant, Obsidian Finance solar, Lakeview geothermal unit, Surprise Valley Electric Coop Paisley geothermal plant, Christmas Valley National Guard solar and Ormat Adel/Plush geothermal plant being the most likely to see completion. The wind projects are all on BLM land and will require lengthy environmental review. Several of the projects have slowed development due to problems obtaining financing under current conditions. Table 5 lists the projects. While cost, employment, and tax benefits can be estimated with typical industry standards, most projects seem too early in the planning process to warrant the effort.

Potential Benefits. The biomass plant and larger geothermal plants will create significant numbers of permanent jobs to operate. All will create large numbers of construction jobs, but many jobs with constructing wind projects and to some degree geothermal projects require specialized skills by workers from outside the region. One of the most significant benefits to the community will be the streams of property tax revenues that will flow to schools, counties, and other taxing districts. These funds have the effect of lowering pressure to increase taxes on residential properties, and improve the quality of education and other services. This can be of significant importance to the long-term sustainability of the communities in Lake County.

The projects also vary in the degree to which LCRI's help led to their proposal. The wind projects would tend to happen anyway, as the industry has many players involved in exploration and development, and success rests largely with the presence of a wind resource, nearby transmission capacity, and environmental review by the public land agency. LCRI was more involved in attracting developers for the biomass and geothermal projects. Nevertheless, a clear conclusion is that TFF investment in LCRI has led to a high probability that large investments will be made into the new industry of alternative energy in this community.

Table 5. Potential Utility Scale Projects

Project	Size (MW)	Location	Project Cost	Annual Operations Cost	Op. Jobs	Status
Iberola Woody Biomass	26.8	Lakeview	$90 million		68	Construction stalled pending power contract
Geothermal Projects						
Ormat/Nevada Geothermal	35	Adel/Plush Goose Lake	$140 million	$2-3 million	30	Injection well drilled, 248 degree water
Ormat/Nevada Geothermal	30-35	Valley		$2-3 million	20-30	Leased land, test drilling 5000 ft.
Ormat/Nevada Geothermal	30-35	Adel		$2-3 million	20-30	Planning
Ormat/Nevada Geothermal	30-35	Glass Butte		$2-3 million	20-30	Seeking permit from BLM
Surprise Valley Electric Coop	3	Paisley			2	Callahan Ranch, well drilled @ 238 degrees, 1200 GPM, will add tilapia farm w 5 jobs, grow to 10 MW
Solar Electric Projects						
Obsidian Finance	2	Lakeview	$12 million	$25,000		Have power purchase agreement
Obsidian Finance	2	Lakeview	$12 million	$25,000		Have power purchase agreement
Obsidian Finance	5	Christmas Valley	$22 million	$35,000		could expand to 8 MW
Obsidian Finance	2	Bly	$12 million	$25,000		
Greenwing Energy	20	Christmas Valley	$120 million			5 years out, needs transmission line, financing
Element Power		Christmas Valley				land purchased
Interject Power		Christmas Valley				
Wind Energy Projects						
Aero Power, LLC		Abert Rim				speculative, 3 met towers applied for
Oregon Community Wind	10	Big Valley				POD sumitted to BLM, wind data collecting
Oregon Power Solutions		Juiniper Mt.				speculative, 2 met towers
Ridgeline Energy	400	Winter Rim				EIS required on Fremont-Winema NF
Sacramento MUD		Abert Rim				speculative

Summary. Between the existing small alternative energy projects that have been built, the hospital/school geothermal loop now in progress, and the set of additional small projects estimated to be built in the next decade, there is a total of $13 million in net present value of energy savings that will be realized in Lake County. These are an economic benefit to the community that is directly comparable to the cost of investments made by TFFF in the FILP and grants to Lake County Resource Intitiative and infrastructure projects.

Added to that $13 million should be the economic benefits of building the collaborative agreement that led to a long-term stewardship contract to manage 500,000 acres of nearby national forest. This agreement provides the federal authorization for procuring feedstock to both a $6.8 million sawmill and a $90 million biomass energy plant that will be completed in the next couple of years. The direct benefits (or increase in net social welfare) are not easily estimated in this quick study for technical reasons, but the larger concept of economic impacts includes adding perhaps 65 more jobs, tens of millions of dollars in economic activity, and significant streams of property tax revenues[5]. It is also probable that two or more small geothermal and solar electric plants will be generating within the next three years. The delays in project implementation speak more to the state of the economy and the slowness of environmental permitting processes than to any failure on Lake County's part.

[5] The Anderson (2010) study overestimates indirect employment due to a flaw in the underlying IMPLAN county model. The Heider study uses an absurdly high employment multiplier of six and makes the confusing step of combining one-time construction employment with permanent operations jobs, and its employment impacts should be disregarded.

Other significant but less measurable outcomes of the FILP program are the passage of a $22 million hospital improvement bond election, the new library project, and the creation of the Lake County Community Foundation. These improvements increase access to health care and health outcomes with it, demonstrate a commitment to lifelong education, and increase community capacity for future improvements.

The inescapable conclusion is that FILP created the capacity for Lake County to take several significant steps forward in improving its community infrastructure and with them the ability to sustain itself over time. FILP also helped build enough community consensus around a vision for the future to unleash the creative energy of two community sparkplugs. Lake County Resource Initiative, with broad community support, has become a transformative force that is educating its residents, saving many of them significant amounts of money, improving the environment, and creating a new economic base, all at the same time. The United States has created a set of economic subsidies designed to transform the energy sector, and Lake County is nimbly taking advantage of this opportunity set. That these positive changes should come in the midst of the Great Recession is all the more remarkable.

Recommendations for TFFF.

1. The fact that a leadership program cannot change conditions in the local economy in the face of a global downturn is no reflection on FILP. Macroeconomic forces will nearly always trump those factors that can be changed locally.
2. It is very likely that other FILP communities have non-traditional outcomes that can be measured and help evaluate the social and economic returns to the TFFF investment. In some cases the outcomes may include intermediate outputs such as grant funds secured for the community or additions to community facilities constructed. TFFF should investigate other communities to the extent needed to satisfy the TFFF Board about the program's worth or to the extent needed to communicate the success of the FILP program to others in the philanthropic and rural development professional communities.
3. There are very likely other rural Oregon communities who could pursue alternative energy as a development strategy. Few may be able to match Lake County's set of energy resources, and few will have the institutional capacity for catalyzing change that LCRI represents. However, there may be other opportunities, such as low head hydro projects, tidal energy, or converting surplus juniper into pellets for heating. TFFF should focus first on isolated communities that rely on fuel oil and propane. This is important, because it greatly increases the potential for energy savings by converting away from these high-priced alternatives. The economic returns for communities heated by natural gas will be much lower.
4. Find ways to support other communities in their investigation of alternative energy and action planning of a development strategy. Here are two possible models:
    a. Fund a broad Peer Exchange Program. Under this program, communities could quickly get travel expenses of say, up to $2,500, reimbursed for teams of a minimum of four FILP grads from a community to visit a community that has addressed some problem or opportunity that they are grappling with. This could mean a visit to Lake County to study alternative energy development.
    b. Fairfield, Iowa is a national best practice community in the area of entrepreneurship development. Every year, Burt Chojnowski organizes a simple two day conference in Fairfield that aims to show visitors what makes the place special. It attracts 30-50 folks each year, which makes for good discussions. TFFF could support Lake County to organize a similar event, while also supporting travel for teams from FILP communities. The program might include time to allow visiting teams to start an action planning process for their community and share it with the larger group.
5. Consider ways for TFFF to help finance the adoption of alternative energy technology projects at the homeowner/small business level. Meet with other current potential funders like USDA-RD, EDA, OECD, BIA, OMEN, economic development districts, community action agencies,

and commercial banks to explore ways to collaborate. Perhaps an organization like OMEN could host a micro-loan program for rural alternative energy projects. Perhaps TFFF could leverage a weatherization program like SCOEDD offers.

6. Lake County has a great asset in the capacity-building skills of Jim Walls and Bob Rogers. Jim is a former RC&D coordinator. This means he is highly experienced in fostering collaborations around natural resource use, and he knows how to apply for and administer grants. Bob Rogers has already had a successful career as an engineer and certified auditor within the energy arena. He has a very practical sense of what will be both technically and financially feasible. Together they have rigorously examined many opportunities and publicized those they consider win-win options. TFFF would do well to consider how to fund alternative energy technical assistance capacity elsewhere. It could begin by funding LCRI to conduct classes in Lakeview and perhaps do reconnaissance trips to nearby communities. Perhaps a program specialty could be developed for RARE Americorps students with backgrounds in business or engineering. Perhaps Extension, the manufacturing extension service in Oregon, or even SCORE could host a program.

Recommendations for Lake County.

Here are a few thoughts specific to Lake County:

1. The geothermal pipeline from the wells north of Lakeview must travel over a mile to access the downtown geothermal district. Properties along the pipeline path should also be considered for inclusion in the district. For instance, if it follows the highway, the pipeline would pass perhaps 30 residences and several motels. Spreading the fixed cost of the geothermal distribution system over more customers will lower payments and improve net energy savings.
    a. The route passes an affordable housing development which may be eligible for assistance by USDA-RD for the cost of retrofitting the heating system for geothermal water.
2. For the same purposes of improving economic feasibility, make every effort to add the Pepsi plant and other industrial park customers to the hospital/school tailwater loop from the southern end of Lakeview for space heating.
3. Similarly, investigate the feasibility of a greenhouse and/or aquaculture business to the industrial park to add another cascading use of lower temperature water on the return end of the school/hospital geothermal loop. Seek out entrepreneurs to pursue this opportunity. This option has the side benefit of increasing the health of residents by making more local fresh vegetables available in off seasons.
    a. Conduct a similar investigation of a greenhouse operation by the prison facility using tailwater from the Warner Creek Correctional Facility geothermal loop prior to injection back into the aquifer.
    b. Is it possible to add similar businesses to tailwater use at commercial geothermal projects proposed in Lakeview, Christmas Valley, Adel, and Bly? Economies of scale may exist for a single business to operate greenhouse or aquaculture operations at multiple county locations. I know a tilapia operation is proposed for the Paisley geothermal plant being constructed by the Surprise Valley Cooperative.
4. The Town of Lakeview needs to pursue ways to obtain synergies between the separate north and south geothermal loops, to lower costs and/or increase heating capacity. Similarly, economies of scale in the administration of the geothermal district should lower operating costs for both loop projects.
5. Explore using young people to help increase the rate of installations in Lake County residences.
    a. Could more AmeriCorps students be used to conduct audits and weatherizations in low income homes or with grant funding to install heat pumps and the like? Care must be

taken to ensure this doesn't step on the toes of professional certified installers in the community.

b. Could similar activities be done by high school vocational education students apprenticing with local certified installers to learn alternative energy skills?

6. Lake County and its cities should consider funding LCRI with a portion of added property tax revenues from larger alternative energy projects, e.g. the biomass, geothermal electric and solar electric projects. LCRI is the catalyst for the county's best economic development strategy. It appears a good bet that Jim Walls and Bob Rogers could leverage more growth with more funds.
7. Recognize the strategic importance of the Hunters Springs property to the City of Lakeview. Sitting at the north entrance to town with geothermal water and a geyser, Hunters Springs could be an important symbol of a community that is focused on alternative energy. If a new development could be built with a geothermal swimming pool, soaking tubs, modest conference space, and perhaps a few lodging rooms, it would become a focal point for teams of visitors seeking to learn about Lake County's successes. The geyser might even replace the Tall Man as a symbol of the town. In addition, having a place for a nice hot swim in the winter adds the crowning touch to days of winter recreation in the area. It could leverage tourism, much like the Warm Springs Resort in Idaho City, Idaho used to do. (That facility closed some years ago and residents are now seeking ways to re-open it in a more modern way.)
8. A natural complement to the community website project now underway in Lakeview might be to seek ways to provide community wi-fi in the downtown core and parks. This is a fairly easy way to add an amenity to the town for young folks and entrepreneurs.

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