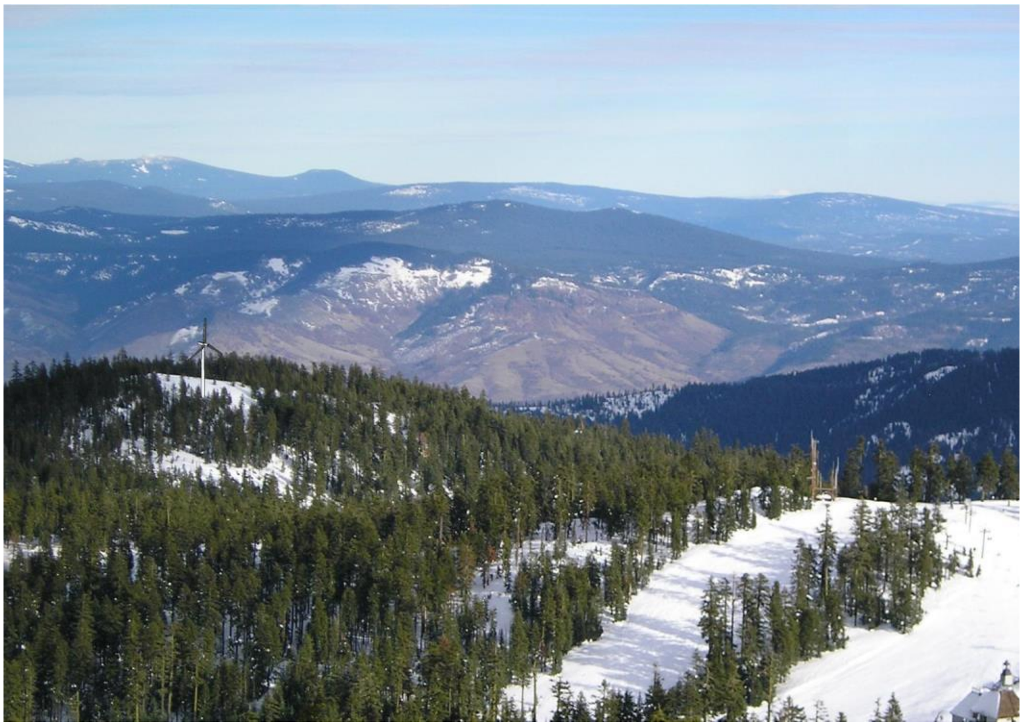
2015 Update to the 2010 Preliminary Net-0 Resort Feasibility Study

Prepared for

The Mount Ashland Ski Resort
Ashland, Oregon



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(original report SES job#1101, 1/27/2010)

1/26/15
Job#1502

1.0 Executive Summary

This report updates the results of our original 2010 Preliminary Feasibility study which investigated transforming the Mount Ashland Ski Area (the mountain) into a Net-0 resort, by way of on-site renewable energy generation and facility energy conservation. For the purposes of the study, we define a Net-0 resort as one that produces as much energy as it consumes in a typical year. It is believed that achieving this Net-0 status could be a valuable marketing tool for the resort, make it a showcase renewable energy project, and eliminate the area's energy costs while significantly reducing its carbon footprint.

The renewable energy producing systems explored in the original study included several types of solar and wind electrical generation plants. This update re-addresses the fixed-PV and Wind options, and is supplemented by a Wind Harvest study (SES job#1402) completed this month which included 2-years of wind monitoring at the top of Ariel lift. The study report is available online at www.sharpenergy.net)

An industrial wind turbine placed within the mountain's lease area appears to offer the most cost-effective renewable energy production source for the mountain. Finding a properly sized, Class 1 rated turbine and environmental opposition are viewed as significant obstacles to this approach. A large-scale, fixed PV panel system is another investor friendly option, and is recommended if funding sources (perhaps Crowd-sourced) can be secured. Pacific Power, the electrical utility servicing the mountain, has a 17.5kV high-voltage feeder line buried by the road servicing the mountain, and is expected to buy-back any and all of the electricity produced there. Used in combination with appropriate conservation measures, it appears that either approach could allow the mountain to achieve a Net-0 status within about eighteen months.

2.0 Target Annual Energy Use/Production

The mountain's energy use for a typical year was quantified in a Technical Analysis Study (TAS) performed by Sharpe Energy Solutions under funding by the Energy Trust of Oregon (ETO) in 2010 (SES job#1009). That study reported a current annual energy consumption for the mountain of about 360MWh in electrical, and 6,600 Therms in propane. This translates to a current annual energy use of approximately 550MWh.

That TAS also explored energy-saving Energy Efficiency Measures (EEMs) that could be implemented as part of a Net-0 project to save the mountain about 152MWh in electricity and 4,900Therms in gas annually. This results in an equivalent total energy savings of about 296MWh. For the purposes of this revised study, it is assumed that EEMs will be implemented to reduce energy-use by 200 MWh. Utilizing these assumptions, the mountain's future energy use, and thus its on-site renewable energy production target, is assumed to be [550-200]= **350MWh/yr**.

3.0 Renewable Energy Producing Systems

3.01 Solar

Overview

Solar technology continues to improve and solar energy system prices continue to drop. There is currently a push, particularly at the Federal level, to bring renewable energy production facilities online as quickly as possible. As a result, this could be a very good time for the mountain to pursue this type of project assuming reliable funding sources can be established. The solar electric production options explored in our original study included fixed, tracking, or concentrating PV; and tracking dish CSP driven electrical generators. Because tracking and concentrating PV systems are be prone to freeze-up and ice damage, only an elevated south-facing, fixed-rack PV system, with a tilt of 30 degrees was addressed in this study. Possible locations for such an array field include the south side of the mountain just below the top of Aerial lift, over the parking lot, or other open un-treed areas.

Most of the world's solar electricity is currently being produced by PV systems. PV installations have a proven track record, and easily qualify for all currently available cash incentives and tax credits. Large facility installed costs have dropped to about $3.5/watt, and panel production rates have improved to over 1.5kW/100ft^2. To meet the mountain's target production of 350MWh/ year, assuming the optimal 1.4 local production capacity (MWh produced/nameplate kW) and a 20% winter production reduction due to icing, a new PV field would need to be rated at about 300kW-dc. Based on recent information provided by the ETO, a system of this size could be expected to cover about 30,000sf of land area (<1 acre), and have an installed cost of about $1.2M including racking costs.

Potential Obstacles

The PV system's required coverage area might trigger the need for a full Environmental Impact Study (EIS), at a significantly higher cost and time commitment than the preferred Environmental Assessment (EA). It is significant, however, that the current Federal stance seems to be to fast-track renewable installations on Federal lands, which could ease requirements. A $60k EIS cost was used in our analyses based on very preliminary discussions with environmental consultants, and needs verification if a project is pursued. Public opposition to the project will certainly complicate and add cost to the review process. Winter deicing of the PV project is another likely obstacle assuming cold weather and snow will someday return.

Preliminary Finances and Incentives

For a **300kW fixed PV** System with a 25 year service life-
Probable Installed Cost= $1.2M plus an assumed $60k environmental study = $1,260,000
ETO Cash incentive = $80,000; Federal Tax Credit = $360,000
Installed System Net Cost = **<u>$ 820,000</u>**
Estimated Maintenance Costs= $5,000/year
Annual energy production= 300kW x 1.4 x 0.80= 336MWh/yr
<u>Anticipated Income</u> = 366,000kWh x $.10/kWh= **<u>$ 36,600/yr</u>**
<u>Simple Payback</u> = <u>22 yrs</u>

3.02 Wind

Overview

Wind generation is the fastest growing sector of the renewable energy production market. A variety of new HAWTs and VAWTs are being produced, and installed costs continue to come down. The ski area, located in the area traditionally known as "Windy Gap", is well positioned for utilizing this powerful resource. Again, because of the push on the Federal level to bring renewable energy production facilities online as quickly as possible, this might be a good time to pursue a wind energy project.

Potential Obstacles

Because of the area's extreme winds and wind gusts, wind generator selection will be difficult. The smallest Class 1 (minimum class for this location) Horizontal Axis Wind Turbine (HAWT) generator available for pricing was the industrial 1.5MW GE unit, similar to the large industrial turbines seen along the Columbia gorge. These are viewed as harmful to bird populations, would be visible from Ashland and the Pacific Crest Trail, and will likely encounter stiff environmental opposition. The smaller Community produced Vertical Axis Wind Turbines (VAWT) are low-profile, bird-friendly, and not expected to be opposed. Environmental reviews are expected to be lengthly for the HAWT, but expedited for the VAWT options. HAWT placement will need to take into account potential ice-throw and required clear-areas; possibly limiting operation during ski hours. Ice-throw is not expected to be an issue with the VAWT.

Preliminary Finances and Incentives

The economics of this project were analyzed in our Mt. Ashland Wind Harvest report (job#1402). In that report we recommend the mountain consider utilizing existing mountain employees and community members to develop, test, manufacture and eventually sell small bird-friendly Vertical Axis Wind Turbines (VAWT) to harvest the high energy winds. The other recommended approach is to install a 2.5MW GE turbine with full de-icing and fail-safe braking. The financial details below are documented in that report.

For a **GE 2.5-103 Class 1 HAWT** with a 15-20 year service life-
Installed Cost= $5.5M plus $60k environmental study = $ 5,560,000
Cumulative incentives & tax credits = $1,160,000
Installed System Net Cost = **$ 4,400,000**
Typical Annual Maintenance Costs = $5,000/year
Anticipated Annual Energy Production = 5,286 MWh/yr
Anticipated Income = 5,286,000kWh x $.10/kWh= **$528,600/yr**
Simple Payback→ <u>8 yr simple payback</u>

For a **Community-produced 2kW VAWT** with a 10-20 year service life-
Projected Installed Cost= $32,000
Cumulative incentives & tax credits = $8,000
Installed System Net Cost = **$ 24,000**
Typical Annual Maintenance Costs = $1,000/year
Anticipated Annual Energy Production = 9,300 kWh/yr
Anticipated Income = 9,300kWh x $.10/kWh= **$ 930/yr**
Simple Payback→ <u>25 yr simple payback</u>