

WILD SALMON CENTER

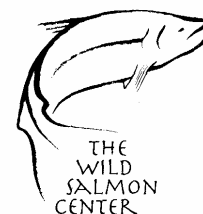
# Small-Scale Renewable Energy and Salmon Conservation in Kamchatka

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WHITE PAPER



*A model for Kamchatka? 7.5 kW wind-diesel hybrid turbines for community electrification, Krasnoe Island, Archangelsky District (Bergey Windpower Co.)*



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Preliminary Report



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## **SMALL-SCALE RENEWABLE ENERGY AND SALMON CONSERVATION IN KAMCHATKA**

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### **Introduction**

Throughout the Russian Far East, the development of extractive fossil fuel industries is seen as the linchpin for economic development and the generation of hard capital reserves. Because the fossil fuel infrastructure of drills, pipelines, derricks, mines, and access roads poses a grave threat to the wild salmon stocks and the ecosystems on which they depend, the Wild Salmon Center is formulating policy and technical recommendations to meet the region's energy and development needs while ensuring the protection of salmon habitat for posterity.

While regional governments present fossil fuel extraction as the road to social and economic development, there is abundant evidence that even "successful" large-scale energy projects will not benefit the communities in regions adversely affected by the concomitant environmental degradation, especially not indigenous communities with little access to political influence. However, alternative energy technologies implemented at the local and regional levels will alleviate the region's crushing energy shortages while providing residents with jobs, skills, and much-needed capital investment.

The Wild Salmon Center hopes to integrate two of its principal roles in Kamchatka – protecting salmon habitat and promoting sustainable economic development – by promoting appropriate energy technologies to meet local needs. Small-scale renewable energy technologies can provide power to biological research stations, monitoring facilities, and rural and indigenous villages. By assisting in the development and propagation of these technologies, the Wild Salmon Center can provide electricity for research and monitoring efforts, assist local populations in sustainable development, and generate political capital and goodwill toward the creation of salmon refuges, thereby preserving the wild salmonid populations of the Russian Far East.

In this white paper, we discuss prospects for renewable energy technologies in a range of highly valuable salmon habitats in Kamchatka, emphasizing the joint role of powering scientific and monitoring stations, and meeting rural electrification needs by providing battery charging to rural communities.

## **Methodology**

With resources provided in a grant from the Oak Foundation, the Wild Salmon Center assessed the applicability of small wind turbines, photovoltaics, and other renewable energy technologies for remote science and monitoring facilities on the Kamchatka Peninsula, as well as small indigenous or rural communities in these remote regions. The Wild Salmon Center is examining both site-specific applicability of particular technologies, and the overall state of renewable energy developments in the region, to determine next steps in its efforts to develop energy solutions for its facilities, while formulating strategies to address energy development at the strategic level.

The inquiry into these topics has taken the form of interviews in Kamchatka with renewable energy advocates and implementers, analysis of site-specific meteorological data in Kamchatka, conversations and correspondence with suppliers, and due-diligence background checks on potential partners.

## **Findings**

Principal findings of the Wild Salmon Center's inquiry indicate:

- Large-scale energy trends in the Russian Far East, including the development of gas pipelines in Sakhalin, western Kamchatka and the Sea of Okhotsk, and the expansion of geothermal energy development in Kamchatka, will have a major impact on the future of vital salmon habitat. In order to succeed in its mission of preserving the “last, best Pacific salmon ecosystems in the world,” Wild Salmon Center must develop strategies to help shape these regional energy developments to protect the richest and most ecologically valuable regions from poorly overseen energy extraction schemes. This may entail working with energy developers, government ministries and local NGO partners.
- In remote regions in Kamchatka which the Wild Salmon Center and its partners hope to monitor or protect with salmon sanctuaries, indigenous or rural communities rely on expensive and unreliable diesel generators for electricity. Larger settlements mostly produce electricity with inefficient power plants burning fuel oil. Depending on local conditions, renewable energy technologies could make significant contributions to alleviating energy shortages and freeing residents from the costs and risks associated with importing fuel.
- Sites with particularly valuable salmon habitat in the Kamchatka Peninsula have sufficient windpower for off-grid, non-commercial, battery-charging applications in the 3 – 10 kW range. These regions include the western coast of Kamchatskaya Oblast and the Koryak Autonomous Okrug, as well as the Zhupanova watershed on the east coast of Kamchatka. However, further on-site data collection is required to ascertain the viability of particular technologies.
- Information about renewable energy developments in the Russian Far East is scattered and not always verifiable. There is evidence of scattered commercial and off-grid windpower applications and proposals, but no central information source

about renewable energy developments, and even leading technologists and meteorologists are unsure of the state of windpower and photovoltaic research.

- Various individuals in regional government agencies have indicated their enthusiasm for research in renewable energy, but no single agency has emerged as a viable partner. However, having even individual supporters located within agencies may prove valuable in gathering data and contacts.
- Russian manufacturers of renewable energy technologies are largely untested, but offer significant price and political advantages. U.S. and international manufacturers offer better reliability and presumably high-quality manufacturing and customer support, at substantially higher prices once import tariffs and shipping are included.

### **Site-Specific Information**

At three regions in the Kamchatka Peninsula, the Wild Salmon Center sees opportunities to implement renewable energy technologies to meet science and monitoring needs, with possible extension to community electrification through battery-charging stations.<sup>1</sup> While the specific energy needs of residents will vary based on population density, available infrastructure, and settlement trends (some populations are semi-nomadic), shortcomings, unreliability and high cost characterize the energy sector in Kamchatka.

#### *Cape Utkholok*

On the western coast of the Koryak Autonomous Okrug, the Utkholok and Kvachina rivers meet on the headlands of Cape Utkholok. The Wild Salmon Center is developing a permanent scientific research and monitoring station on the Utkholok River, a mostly uninhabited region that requires helicopter or ATV access. Predicted electrical needs of the station include lighting (incandescent), which can be DC voltage, refrigerator/freezer, computing, satellite phone charger, GIS units and miscellaneous additional appliances. Most are battery-operated portable equipment, for which batteries will have to be charged with AC power. A nearby tent camp on the Kvachina River is not scheduled to include permanent facilities.

Initial meteorological data from this region, provided by the state meteorological service (Hydromet) and a private windpower developer show wind speeds sufficient for battery-charging non-commercial wind turbines at elevations of 12-18 m. These data, collected at standard 10 m meteorological towers, indicate wind speeds averaging 4.3-4.7 m/s at wind tower heights. Generally speaking, winds in the region are highest in autumn and early spring, sloping to a near-lull in July. On a daily basis, the highest winds are in mid-afternoon, at 1500 hrs local time, in almost every location.

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<sup>1</sup> Battery charging stations as community electrification systems are discussed in "Battery Charging Stations," a presentation delivered by Michael Bergey of Bergey Windpower Co., at the National Renewable Energy Laboratory's Village Power '97 conference, April 14-15, 1997, Arlington, Virginia. In such a system, villagers charge car or truck batteries at a local wind-diesel station, and run household appliances and lighting from the battery. The proceedings of Village Power '97 are available in NREL publication NREL/CP-440-23409, available for purchase from NREL, Attention: Conferences, 1617 Cole Boulevard, Golden, CO 80401.

Should the Wild Salmon Center choose to investigate a renewable energy option for this science station, a 3.5 kW or higher wind turbine on an 18 m tower would provide sufficient electricity for most functions. In combination with a small diesel generator for backup, a wind turbine could meet the scientific and residential electricity needs of the station. Because of the sparse population of the region, community electrification is unlikely in the immediate vicinity of the Utkholok station. However, if a pilot project is successful, it could serve as a model for nearby communities including Ust-Khairuzova, Kovran and Tigil.

#### *Zhupanova River*

On the Zhupanova River in eastern Kamchatskaya Oblast, the Wild Salmon Center proposes a range of structures, including an existing lodge, a science station, and a number of float camps for overnight camping during downriver salmon surveys. The existing Cedar Lodge is a large wooden construction with double-occupancy rooms, private bath/shower for each room, and sauna. Electrical power at this site is provided by an existing 10 kW diesel generator which charges battery banks. The Zanzur science site is a more rustic facility with seasonal electrical needs for lighting and science equipment.

The Wild Salmon Center's renewable energy prospects initially appear strong on the Zhupanova River site. The current holder of the sportfishing concession on the river is an advocate of renewable energy, and based on initial wind data from 1994-2001, wind speeds are good. However, the means of data collection — with a windsock, measured by hand — introduces a great element of variability and human error. Further research would have to be conducted on a site-specific basis to determine whether the wind resource is sufficient to power a turbine.

The region is sparsely populated, and there are few options for assisting communities with their electrical needs.

#### *Kol River*

The Kol River watershed is situated in a sparsely populated, but salmon-rich region in the south-west Kamchatskaya Oblast. The Wild Salmon Center proposes a science and angling station on the Kol to serve its scientific work and open the area to angling ecotourism. The only current populations on the watershed are seasonal hunters and fishers, and industrial fish processing plants on the coast.

There is little data on the wind or solar resources of the region. Any possible use of renewable energy technologies would require at least a year of meteorological monitoring in advance of committing to a technology.

North of the Kol is the regional center of Sobolevo, the heart of the natural gas processing and refining industries. Because Sobolevo is the terminus of a new natural gas pipeline leading from the offshore gas fields in the north, there is a newly rehabilitated gas-fired power plant providing power to the local grid. In the Sobolevski District, villagers are on the local grid or receive their power from private diesel generators.

### **Region-Wide Policy Development:**

Small-scale renewable energy technologies offer exciting options for providing power to remote science stations, angling camps and rural villages, but they comprise only a small component of an integrated energy sector strategy that will meet the region's crushing energy shortfalls while protecting salmon habitat.

On a regional basis, Kamchatka faces large energy sector choices characterized by an expansion in natural gas development on the west coast, oil prospecting and untapped coal reserves in the northwest, and large geothermal reserves near the regional capital, Petropavlovsk-Kamchatski, in the south-east. Improperly managed, the development of these energy resources could pose grave threats to salmon habitat protection in the Kamchatka Peninsula – natural gas pipelines run across rivers and disrupt stream dynamics; oil derricks and tankers present the risks of spills; coal and geothermal exploration can cause sediment or slurry run-offs into water systems. Yet the energy sector is essential to Kamchatka's economic and social development, and the regional government strongly favors expanding the role of oil and gas in the regional economy.

The challenge for the Wild Salmon Center and other conservation groups is to enable Kamchatkans to develop energy resources while maintaining a high level of environmental management and conserving the most valuable ecosystems for posterity. Kamchatka does have a history of experimentation in renewable energy, mostly in the geothermal field. The Mutnowski geothermal plant has operated since the 1960s and is being expanded with assistance from the European Bank for Reconstruction and Development and the United Nations Development Programme. Past experiences with wind energy were less successful. Soviet-era wind turbines have been poorly sited, installed and maintained, and those failures are still visible around Kamchatka. Local skepticism about alternative energy is associated with the unsuccessful experiences of the past.



**Figure 1** Decrepit Soviet-era wind turbine, Yelizovsky District

## **Prospects:**

Due to uncertainties over funding sources and no full assurance that wind resources are sufficient at project sites, the Wild Salmon Center cannot yet commit to implementing renewable energy technologies at a given site.

This does not mean that the Wild Salmon Center will abandon its interest in renewable energy solutions for its science and ecotourism facilities; nor does it mean that no additional movement can progress. On the contrary, there are very specific steps that can be undertaken to provide workable, reasonably priced windpower and other renewable energy solutions that will meet not only salmon conservation and science needs, but also the needs of rural and indigenous communities on the Kamchatka Peninsula. These following steps will reduce the risks of uncertainty, and enable a solution that meets scientific needs while accelerating the development of renewable energy in the region.

1. The Wild Salmon Center and partner organizations should construct 10 m meteorological stations in highly valuable salmon watersheds. These are necessary not only for researching wind and solar resources, but also for the fundamental environmental data gathering that is at the heart of the conservation mission. Coordination with Hydromet may allow these data to be shared with the Russian meteorological service, and generate trust and goodwill for the future.
2. While making purchases of scientific equipment and other electrical equipment for its Kamchatka stations, the Wild Salmon Center should conduct energy audits of facilities based on the equipment to be purchased. Whether or not the research stations are to be powered by renewable energy or fossil-fuel generation, energy efficiency will reduce the demands to build larger energy infrastructure, and thus cut costs dramatically over time.
3. The Wild Salmon Center should engage in continuing negotiations and discussions with promising providers of renewable energy technologies appropriate for use in Kamchatka. As the Wild Salmon Center conservation and science programs for the next five years are defined, it may be able to present to potential donors a proposal for a network of small wind turbines and towers and photovoltaic battery chargers, as part of a coordinated renewable energy strategy. This makes a coherent case for long-term renewable energy research as a vital element in salmon conservation.
4. The Wild Salmon Center should embark on a public outreach campaign, emphasizing the energy sector, to foster understanding of its mission and improve environmental management around energy development regions in the Russian Far East, while establishing secured protected areas free of development. With the clear understanding that the energy sector is seen as a linchpin for economic development, WSC should position itself not as an enemy of the energy industry, but as an advocate for environmental responsibility (in pipeline construction, road building, etc.) and research and development in the fields of off-grid renewable energy and rural electrification through distributed generation.

5. At the strategy level, the Wild Salmon Center should work with environmental and energy policy groups conducting research on the impact of the predicted oil and natural gas boom throughout the Russian Far East. These groups include traditional partners like Greenpeace, Pacific Environment and Sakhalin Environment Watch, as well as groups like the Nautilus Institute, which has conducted workshops on the future of energy policies in Northeast Asia.