

Subject: Notes from wind forum at North House

Folks: Below are Marco Good's excellent notes from the wind forum April 14 at the North House Folk School.

On Wednesday, April 14, in the blue building at North House Folk School, Bonnie Hundreiser of the Arrowhead Regional Development office in Duluth got the movers and shakers together from across the state who have an interest and some really valuable information in large-scale community wind power development. A forum including presentations from a bunch of acronymous organizations and the real people who spoke for them took place between 1 and 4 PM, which was followed by an enthusiastic perusal of a new preliminary wind velocity map of much of Cook County by those who could stay and were interested.

After an introduction by Ms. Hundreiser, Jim Boyd of our CCLEP (Cook County Local Energy Project) Wind Working Group spoke, updating local attendees (at least as numerous as the traveling presenters and those who accompanied them) on our progress in assessing Cook County's interest in and availability of wind potential. He explained that we had two primary functions-(1) to assist private landowners in siting and permitting their wind generator projects (small wind) and (2) to explore the possibilities of Community-based Big Wind, and to begin the process of implementation and installation of such projects. With regard to small wind, Jim mentioned Jeremy Lopez' work with summarizing the local ordinances and state requirements that apply to private installations. CCLEP has these summaries available, and is available to assist landowners in developing their small wind projects.

The rest of this particular forum was dedicated to big wind projects. The second presenter was Lana Fralich, the City of Silver Bay's administrator, who shared her experiences and observations with developing alternative energy projects in and around Silver Bay. She outlined plans for her work with Bruce Carman, their Lead Project Developer, utilizing wind power at the mine's tailings basin, for biomass development, for waste heat recovery from the plant, and for possible manufacture of biodiesel. To assist in their research and development, they have received grants from Iron Range Resources and from the Minnesota Pollution Control Agency.

Any development of wind resources, especially on the North Shore of Lake Superior, has to pay close attention to avoidance of migration routes of raptors and other birds that tend to follow the ridges just above the Lake, since they follow the shoreline down toward Duluth while heading south rather than flying across the Lake. Anna Peterson, a graduate student from the University of Minnesota, Duluth spoke next about her research with Gerald Neimi from the Department of Natural Resources mapping bird migration with the volunteer assistance of local birders. Observers are stationed at intervals along the shoreline at eight observations sites for seven hours a day during the period of

prime migration in the fall of the year to record the location, direction, and flight height of migrants. At Hawk Ridge above Duluth, as many as ninety thousand raptors and 180,000 other species have been counted passing through the base of this migration funnel. The maps Ms Peterson presented were graphic representations of probable flight paths of raptors, which should be carefully considered when choosing potential wind sites for monitoring.

The next presenter to speak was Melissa Peterson from Windustry, a nonprofit group headquartered in the Twin Cities. Windustry assists the large-scale development of wind projects which are community based. Ms. Peterson began her presentation by outlining the requirements that a community ought to meet, in order to be successful in producing wind energy for commercial use. She explained that Minnesota is one of the Nation's leading states for wind generation, and that fully one fourth of our wind projects are community-owned, with a total of 119 megawatts (MW) under the auspices of an organization called C-BED (Community-Based Economic Development) which helps implement the provisions of the 2005 State legislation requiring that a substantial portion of alternative energy development be based in the communities for whom it produces that energy.

Ms. Peterson actually began her talk by enumerating the requirements for successful community wind generation developments. They are: (1) a one-year period of monitoring wind speed to determine the value of the resource in the proposed location, (2) access to the existing power grid, and (3) determination of the cost of capital, and locating its source. The unique thing about wind energy is that the capital cost (approximately \$ 2 Million/ KW) is almost the entirety of the expense to produce it. Maintenance costs are small compared to the money that comes in once the windmill is installed. Melissa pointed out that leases procured from private landowners commonly yield a ninety percent return. With Community-Based Wind projects, local economies usually gain 3.5 times the number of jobs and five times the money than a project developed by outside energy companies.

She then went on to illustrate the advantages and possibilities of community projects by showing slides of successful wind farms that are producing power in Minnesota and elsewhere. In Moorhead, there is a project with two 750 MW turbines, where 98% of local customers have elected to pay an extra amount on their utility bills to bring in green power. The White Creek project, an effort of five utilities consisting of eighty-nine 2.3 MW Siemens turbines has been built to demonstrate the economy of scale possible with a large project. The Trimont Wind Farm in Jackson, Mn. turned the development of their project over to an investor, and retained the lease rights, starting what came to be called the Minnesota Flip model for rewarding an investor with lease payments for the first ten years after installation, thereafter flipping the lease back to the community.

Ms. Peterson then showed a flow-chart she called the Community Wind

Toolbox which is an outline of the concurrent steps that need to be taken in permitting and installing big wind projects, or hoops that need to be jumped through, as preparations are made to initiate wind production on a community-based project. Planning begins with the wind resource assessment where 20 temporary towers are erected or existing towers in the area might be utilized to mount anemometers at intervals of 40, 60 and 80 meters in height, as well as weather vanes to measure wind speed and direction. In places where multiple towers are to be built, they need to be sited at a distance of five rotor diameters in a north-south direction and 3 rotor diameters in an east-west direction. Generally speaking, power purchase agreements (PPA) need to be arranged with the power company, usually in the neighborhood of from 4 to 6.5 cents per kilowatt-hour. The issue of interconnection of power grids needs to be considered. The organization in Minnesota called the MISO system (Midwest Independent System Operator) has a queue for selling and providing electricity.

Anna and Melissa, Jim and Bonnie then took questions. The issue of maintenance cost arose, and Melissa shared the figure of \$20-50,000 for a 1.5 MW turbine. The potential for radio and other wireless signal interference also was raised, and Melissa's response was that sometimes location of towers for repeaters needs to be located to direct signals around the wind tower areas. On the migration season for birds, there was general agreement that August 1-Nov. 15 was the period that needs to be considered in case the need for shutting down generators during that time needs to be considered. Loss of revenue during that time would need to be accounted for. With regard to preliminary findings on raptor mortality from wind turbines, one real advantage is with tubular towers, rather than steel lattice, which was an attractive nuisance for birds roosting. Collisions with rotors have so far been found to be minimal where such structures are in operation. George Crocker from REDI (the Rural Energy Development Initiative) , who was to speak later in the forum, made the important point that site control is the only guarantee the community has to protect it from having a commercial developer swoop in and take the resource.

After the break, Frank Frederickson from Minnesota Power and Joe Buttweiler from Arrowhead Electric Cooperative provided some valuable information regarding the possibilities of bringing Cook County's wind resource to market. Mr. Frederickson echoed the necessary considerations that the previous speakers had, adding that part of the expense of installation is in building roads to access the site. He stated that the transmission line access and capacity (the line into the county from Shroeder is currently at capacity) is a key consideration. He reiterated the importance of bird migration, wetlands protection and scenic considerations. He also stressed the importance of lining up the financing and supply of turbines, and that the power companies should be offered review of the supplier/manufacturer of the unit being considered.

Mr. Buttweiler then took his turn, speaking for the Arrowhead Electric Coop, Cook County's rural provider, which is, as he was quick to point out, a

distribution-only co-op, working to distribute power for Great River Energy, who has a goal of 25% renewable energy sources by the year 2025. GRE is looking for the lowest-cost project(s) to provide that power, and they would like to install 900 megawatts of wind power within their service area. Location of wind units would be somewhat limited in Cook County by their size (the amount of power they would produce) and their proximity to existing transmission lines. The main transmission line, he stated, runs along highway 61 to Co.Rd. 7, up to Hedstrom's Mill, and eastward from there to Colville, where it ends.

Dr. Mike Mageau from UMD's Geography Department then spoke. He brought two large copies of his computer-generated color map of projected average annual wind speeds along the North Shore. His upcoming study (to be partially funded by a grant to CCLEP of \$10,000 from the Sustainable Energy Partnership) will monitor wind speed at a few locations the CCLEP wind group will select from the probable prime locations on his map. His research began five or six years ago when he monitored wind speed on a forty-foot tower in Grand Portage while on the Coastal Zone Project with Dr. Stacey Stark. What they found there was a big surprise to everyone who had been following the Minnesota Commerce Department's 2006 map. The Commerce Department projected a peak of 12 MPH there, yet Mageau and Stark found an average of 14-15 MPH at just 40 feet above ground level. At higher sites, there was an average of 15-20 MPH, which in some scattered locations along the Shore would possibly exceed the average of 17 MPH that is reported at Buffalo Ridge in SW Minnesota, where the most wind development has occurred in Minnesota to date. At a height of 80 meters on the north side of some of the ridges here, Mageau projects the possibility that averages could possibly meet or exceed an average of 20 MPH, with a power density of 400 watts/ square meter.

George Crocker from REDI and the North American Water Office then took the floor. REDI is a statewide organization that has grown from the Southwest Initiative Foundation (SWIF) which was originally funded by the McKnight Foundation, to help communities attractive for their wind potential organize to maximize the benefits they might receive from such development. Mr. Crocker began by outlining the financial parameters of large-scale wind projects. Usually the capital cost of a wind project is \$2,000/KW. So, a one-Megawatt project initially costs two million dollars which can be financed to be paid off over a ten year period, since as soon as the unit comes on line, at 35% efficiency, it will produce \$200,000 worth of electricity annually at the current rate. This is where the concept of front loading, or financing to allow a ten-year term for servicing the debt, comes in. The idea of REDI providing loans to evaluate feasibility of projects is, George acknowledged, a non-starter when compared to the availability of grants for the same purpose.

While acknowledging Mr. Frederickson's assertion that economy of scale makes larger projects (i.e. wind farms) generally more efficient, he also recognized the geographically diffuse location of prime wind locations along and

upland from the North Shore, which would necessarily conspire against placement of multiple units together in the same location. The existing location of power lines, being also relatively spread out and limited in their capacity, would also suggest the practical installation of single or small numbers of towers, with generators (possibly reconditioned) smaller than the standard 1.5 or 2.5 MW units which are considerably larger and heavier and more difficult to install in remote locations. If the unit(s) were small enough to transmit power on a three-phase distribution line, which might run closer to the project than the transmission line, the expense of upgrading or construction of \$200,000-500,000/mile power lines could be avoided. Mr. Crocker closed with the strong suggestion that Federal stimulus money is available to grant up to 30% for capital costs if it is practical to anticipate groundbreaking by the end of next year.

There was a closing session of questions, most of which were directed toward the power company guys, Frank from Mn.Power, and Joe from AEC. Stuart Oberg from Grand Portage wondered if there was any way to get the power to come on rather than going out when the wind blows. Jim Boyd from our CCLEP wind group suggested that the tone of Mr. Frederickson's presentation was negative about the possibilities for incorporating North Shore generated power into the scheme for Northern Minnesota. Frederickson stated that his intention was not to come across in a negative way. Mike Mageau asked him also if he didn't see the constraints of contracts currently binding the lion's share of power production, consumption and distribution to coal generation possibly changing in the near future, with the potential of carbon credits upcoming to change the financial terms of the equation. His response was that he thought those conditions might well change the formula. Someone else wanted to know what the power companies were willing to do to actually help communities implement their own green energy projects.

The last question was perhaps answered in deeds more than words in part by Don Stead, director of Arrowhead Electric Co-op and Joe Buttweiler, who not only actively attended the whole meeting from 1-4, but also stayed for the after-meeting session of site selection by members of The Wind Working Group, Mike Mageau, George Crocker, and Melissa Peterson. The local folks present poured over Mageau's map, which was large enough to provide enough detail to locate areas of high potential. After we circled ten possible areas for consideration, briefly identifying the particular advantages and disadvantages of each that came to mind, Joe agreed to take the map and identify ownership of the land proximate to those high wind (also generally high elevation) locations. If a few of those locations are at once privately owned, away from migratory flyways, near to transmission lines, out of the viewshed of large numbers of people (i.e. the highway) and otherwise unlikely to elicit local opposition, they should be assigned for monitoring by Dr. Mageau and his students.

In the words of Jim Boyd, "Maybe we'll start to move out of the 'Hey, this might be a good idea' stage to 'how might we actually make something happen.'"