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for security and sustainability



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Energy Projects

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ACCESS & INFORMATION IN THE DPRK: EXPERIENCE IN CONDUCTING THE NAUTILUS UNHARI VILLAGE RURAL ENERGY SURVEY

Work described in this paper was carried out by the Nautilus Wind Power Team (Jim Williams, Chris Greacen, Mick Sagrillo, Tim Savage, David Von Hippel, and Peter Hayes), in collaboration with North Korean counterparts.

Introduction

During a three-week mission during September and October of 1998, and on a follow-up mission during September/October of 2000, teams of specialists from the Nautilus Institute for Security and Sustainable Development, working with teams of engineers and villagers from the Democratic People's Republic of Korea (DPRK), undertook a collaborative humanitarian project to apply renewable energy technologies—in this case wind power generators made in the United States—in a flood-affected rural village in the DPRK. These second and third of three missions to date on the project included an initial rural energy survey of both household and non-household energy use. The overall goals of the project have been to bring more reliable, renewable-resource-based electricity supplies and energy efficiency measures to the village, and to demonstrate that a collaborative project involving technicians and organizers from the DPRK and from the United States could be carried out successfully and in an atmosphere of cooperation and trust. The specific goals of the rural energy survey component of the project have been¹:

- 1) To provide the quantitative information on electric energy and power demand in the host village of Unhari needed in order to plan and implement connections of the wind energy system to electrical loads in the village;
- 2) To obtain an overview of energy use (as well as other services) in Unhari in order to identify additional opportunities for application of energy-efficiency and renewable energy measures; and
- 3) To train and provide practical experience to DPRK specialists in the conduct of rural energy surveys in order to improve DPRK capacity for and understanding of such survey efforts.

Norms and Expectations

Under "normal" conditions in which a rural energy survey would be applied (for example, in a society with relatively open access to information), the expectation for a rural energy survey would include:

¹ Please see D.F. Von Hippel et al (2001), [Rural Energy Survey in Unhari Village, the Democratic People's Republic of Korea \(DPRK\): Methods, Results, And Implications](http://www.nautilus.org/dprknew/Unhari_Survey.pdf). Nautilus Institute Report available as http://www.nautilus.org/dprknew/Unhari_Survey.pdf.

- Researchers and interviewers would have access to the target population controlled only by the decisions of the individual householders as to whether to participate in the survey.
- Researchers would be allowed to choose (through a statistical process) which areas to sample, and which households to visit.
- The types of questions asked by the researchers would not be constrained by local authorities.
- Householders would be allowed to respond to questions in an environment free from any official coercion or pressure.

In addition to the above norms, "Best Practices" for the type of survey we wished to carry out would include random sampling of households, the use of interview forms/instruments designed to international standards, and the use of well-trained, professional interviewers who would ask and record the responses to questions without bias. Ideally, we would have liked to carry out interviews with a statistically significant number of households in the village, with access to those households unfettered by official constraints. For data quality control, again ideally, we would have liked to use a combination of continuous data compilation and processing to reveal inconsistencies in data, combined with selected visits to households, and follow-up visits where the information collected was unclear or inconsistent.

As we arrived at Unhari to conduct the survey and carry out other project activities, our expectations were modest. Collection of only a subset of the information that the survey form was designed to gather, and in a relatively few households (perhaps 10) would probably have sufficed, strictly speaking, to provide the data needed to appropriately design how the output of the wind power system would be used. This level of data collection would probably not have provided an adequate overview of energy use in Unhari, or been an adequate demonstration of cooperation between our team and our DPRK counterparts, but we probably would have found it (grudgingly) acceptable, and it is probably fair to say that we would not have been surprised to end up with a survey much more limited than what was actually carried out.

Information Sought During the Survey (and Related Work)

The household portion of the survey covered a variety of topics, including household demographics, dwelling characteristics, past and present fuels use, space heating equipment, electricity grid connections and tariffs, electric end-uses, use of electric lighting, use of automotive batteries to provide electricity, use of non-electric lighting, use and ownership of electric appliances, sources of fuels used in the household, household economics, water use, and other topics. The non-household portion of the survey was designed to round out an "energy balance" for the village by obtaining information on the amount and timing of energy use in schools, a clinic, agriculture, local transportation, and local services. We examined appliances and other equipment, took voltage and frequency readings in households and elsewhere, and obtained coal samples. We also obtained physical information about the village (measurements) in order to assess the material requirements for several proposed additional projects, including a water purification system and a sewage collection and treatment system.

In addition to the information above (and access to the villagers and village leaders that provided it), we often sought access to residential dwellings, other buildings, and village infrastructure in order to be able to verify what we were told. We gathered

considerable information from observation of the countryside as we drove to the project site, and by asking our DPRK colleagues about what we saw.

The Information Acquisition Process at Unhari

The process of information acquisition at Unhari—specifically, the rural energy survey component of the project—began well before the September 1998 mission with the negotiation and signing of a pre-mission Memorandum of Understanding (MOU) that specified that a survey was to take place. In preparation for the mission, detailed sets of interview questions for both the household and non-household surveys were prepared and printed out (in multiple copies). Once on the ground at Unhari, the Nautilus Mission Leaders began the process of negotiating access and arrangements for the survey. This process required considerable patience and negotiation during an anxious first few days, as our requirements, including specifically why (for funding and technical reasons) we needed the information, were relayed first to our immediate counterparts, and then to village leaders. Interestingly, one element that did not require negotiation was the content of the survey. We provided the draft survey forms to our counterpart, who found them acceptable. After several days, we were given the go-ahead to proceed. In practice, this delay was necessary because it allowed the villagers to observe that our side of the "quid pro quo", the provision of the wind power hardware, was actually proceeding, making them more amenable to the intrusion of the survey.

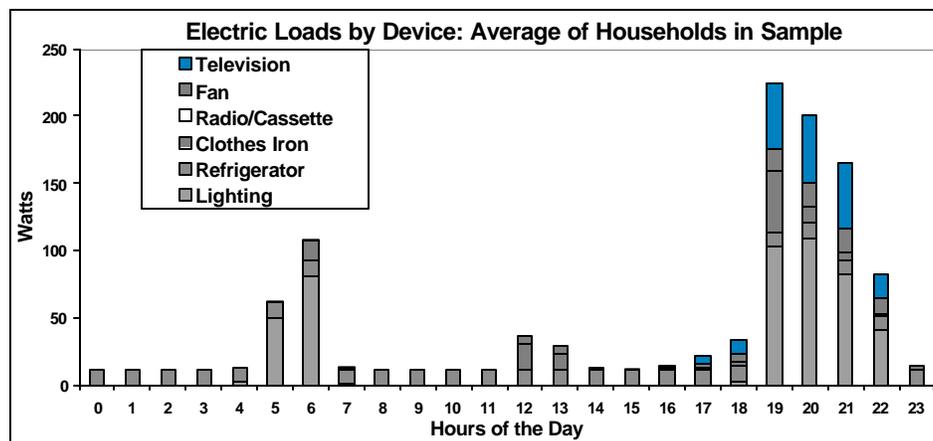
On-site, the rural energy survey was carried out primarily by a team of North Korean interviewers, and guided by a member of the Nautilus project team. The North Korean team was trained (briefly) to perform the household surveys, shown how to fill out the forms, and a Nautilus team member accompanied the North Korean survey team on the first several interviews, as did one or more village officials. For the household portion of the survey, the interviewers used a survey instrument (form) assembled for the purpose by Nautilus. The survey instrument was based on similar instruments developed by the World Bank and other international organizations. In addition to asking the questions on the survey form, and recording householders' responses, the survey team took a variety of physical and electrical measurements during the interview process. At the beginning of the survey, the number of homes that we would be allowed to sample was unknown, but as it turned out, with relatively minimal urging, the North Korean team simply kept going through nearly the end of the mission, until a total of 67 households were surveyed. Some of these households were selected by local authorities (including a majority of the homes in the block of dwellings that were candidates for connection to the wind power system), but, after some negotiation, authorities also allowed interviews in homes in other portions of the village, which were selected by a random sampling process. A Nautilus team member continuously logged data (into an Excel workbook) as it was produced, which allowed the spotting of both trends and problems with the interview process, and the addition of several additional questions to the survey. A North Korean team member was also invited to participate in the data entry process (and did).

The non-household portion of the survey was less structured, consisting of interviews with village and other local leaders, plus some site visits (to a clinic and kindergarten). Information was also obtained in a follow-up mission to Unhari in September/October of 2000. During that mission, brief follow-up interviews with

selected householders were carried out, and additional interviews with village leaders were used to clarify data about which questions remained after the 1998 mission.

Data from both portions of the survey were processed initially on site at Unhari to guide the final configuration of the electric loads served by the wind power system. Perhaps the defining moment, as well as the high point, of the data gathering process, was on the second to last day of the 1998 mission, in the midst of heated discussions about how many households could be connected to the wind power system, when a graph like that shown below (Figure 1) was displayed and explained to our DPRK counterparts and village leaders. The graph convinced the DPRK side to agree to the Nautilus team's recommendations. It is more than likely that this agreement would not have been reached had North Korean team members not played an integral role in the collection of the data behind the graph.

Figure 1: Example of Data Use in Joint Nautilus/DPRK Project Decision-making



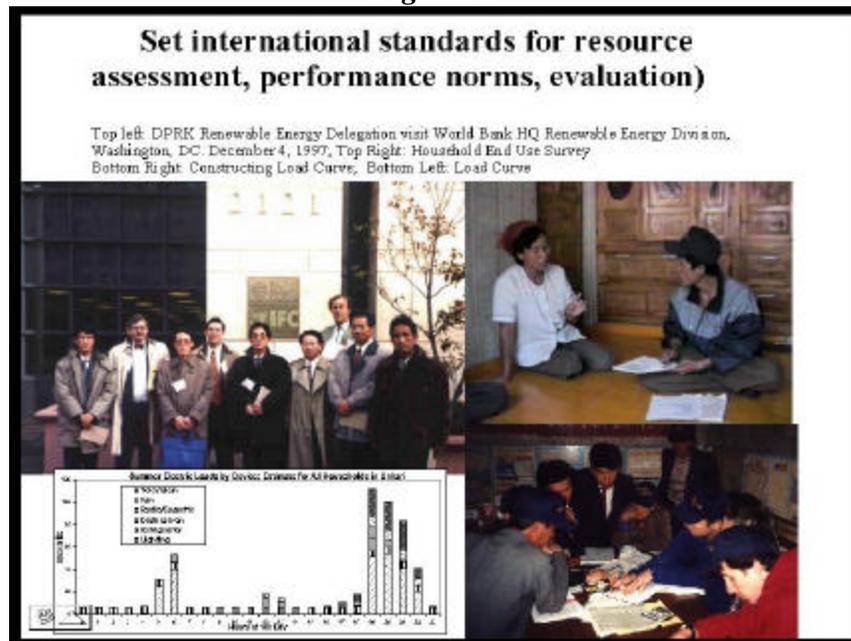
As a summary of approaches that did and did not work:

- With a very few, minor, minor exceptions, all of the data related to the survey (and, for that matter, to other aspects of the project) were ultimately collected if access to the information had been specified as an element of a previously-negotiated MOU.
- Involving North Koreans in the information gathering process, and carefully explaining both the process and the need for the information in the context of the broader project, seemed crucial to obtaining access. DPRK colleagues must clearly understand the link between their provision of information and their receiving something (hardware, training) that they need. Involving North Korean colleagues in the processing of collected data also seemed to set our counterparts more at ease, as did a generally relaxed and open manner.
- Detailed review and processing of data on-site, by people with a strong feel for what sorts of answers are reasonable (plausible) and which aren't, is crucial to the success of a data gathering effort in the DPRK. It is extremely difficult to get follow-on questions answered reliably without an in-person visit. The more patient and thorough one is about explaining why data are needed, and both explaining and demonstrating how the data are to be used, the better the odds are of getting good cooperation and useful data.

- Other than the immediate vicinity of the wind-power system, we were generally denied access to most other parts of the village, except those few installations—a kindergarten and a clinic—specifically included in the MOU. We were allowed to ask questions and receive answers about other areas, but when we asked to visit them (the village rice mill, for instance), we were politely told that people were "too busy" there.

Figure 2 summarizes, in pictorial form, the process of data gathering at Unhari, starting with the reinforcement of international norms in data gathering with a visit to the World Bank, and ending with the collation and use of survey data to make project decisions.

Figure 2:



The Unhari project also involved information collection not directly related to the rural energy survey. Specific and general observations from other information collection activities include:

- Our access to measurements of frequency and voltage fluctuations on the power grid—taken in hotel rooms, during visits to households, and in the course of the installation of the wind power system—were very illuminating (pun intended) regarding the status of the power grid.
- As a part of the project, fairly continuous anemometer data were collected, despite the location of the site in a highly militarized area.
- We found that in some cases, especially with more senior engineers, we sometimes had less difficulty getting responses to direct questions, or clarifications or corrections of information we had already, but more difficulty acquiring data prepared internally in the DPRK. We have, however been surprised on occasion by data provided, sometimes unbidden, but DPRK colleagues. There seemed to be, up through September of 2002, at least, a slow-but-steady trend toward being more forthcoming

both with data and regarding the technical problems faced by the DPRK in its energy sector.

- We found a number of opportunities to collect "lateral information", including observations of what was once a sizable steel production plant being dismantled for scrap, and a survey of the use of transport equipment/modes as we drove to and from the project site.

Anecdotes and Conclusions

There are so many anecdotes from our visits to Unhari that it seems difficult to choose one. One interesting illustration of an instance where some flexibility in data gathering was requested, explained and granted occurred on the last day of our 2000 mission. We had been exploring various options for follow-up missions to Unhari, and one proposal that had caught the interest of the engineers and villagers alike—after some explanation—was the possibility of installing a low-maintenance biological waste treatment system. In order to estimate the materials requirements of the system, we needed reasonably accurate measurements of the village area that would be covered by a sewage collection system. We requested these measurements, and, as everyone else was frantically busy with final details, the ex Farm Manager, still the most respected figure in the village, took it upon himself to accompany the author to do the measurements. Between us, with a long tape measure, we mapped out the village, despite the fact that neither of us could speak the other's language.

Similarly, we asked to collect and test water samples to demonstrate the need for a water purification system. After some initial reluctance ("our water comes from a well—it is very good), we were allowed to do so, and the results (shown in Figure 3) seemed to be appreciated by the villagers.

One example of an instance in which there was a significant conflict over information provision, and in which a work-around was ultimately negotiated, had to do with the installation of "ground rods" on the towers used for the wind turbines. In a May 1998 mission in which the Unhari site was evaluated and selected, a dispute arose in which North Korean engineers insisted that the proper place to install a ground rod (a lightning protection device) was inside the building where a wind speed datalogger was to be placed, rather than at the foot of the tower on which the anemometer was mounted (as per standard U.S. practice). The Nautilus team requested (in fact, before the mission), a copy of the DPRK electricity laws and electrical code regulations so that we could make sure installations conformed to DPRK laws, but this request was denied. The heated dispute over the placement of the ground rod, which escalated to the point where some of the DPRK engineers felt that their engineering integrity was being challenged, was temporarily settled by an agreement to place the ground rod as specified by the DPRK engineers, but to consult other international codes before the September/October (1998) mission to determine how to permanently place the ground rods. Ultimately, Russian (and U.S.) codes were provided, and the DPRK engineers were convinced that the ground rods should be installed at the feet of the wind power towers. Part of the process of reaching both temporary and permanent agreements in this dispute was a "side" conversation between the leaders of the project teams on the two sides, in which the DPRK team leader was gently reminded of the potential political ramifications of an injury due to improper placement of safety equipment.

Figure 3: Water Samples Tested for Coliform (fecal origin) Bacteria: Four Samples at Left are From Unhari Water Supplies (yellow color indicates contamination)



Other anecdotes include working on top of a 40 foot tower in a considerable breeze with a Korean engineer, trusting that he will be as careful as you will (Figure 4), and looking out every day at the cabbage patch that hosts the windmill towers, and counting, in Korean, with the Farm Manager and other villagers as the windmills, one by one, were hauled up onto their towers and switched on.

Figure 4:



A few overall conclusions:

- Be patient and unfailingly polite, even when being insistent. Explain the needs for access and information thoroughly at each step, and tie those explanations in to both pre-existing agreements and the overall goal of the project. Follow through on your promises as well as your expectations. Figure 5 shows an example of both the delivery of the promised reward for data access and the tangible application of the data gathered—in this case, determining how many households could be connected to the wind power grid—from the DPRK perspective.

Figure 5: "Trust but Verify—Installing New CFL Bulbs, 9/2002



- In instances where you have the opportunity to work directly with technical people, offer training in the use of tools and methods that might be basic, but which North Koreans might not have access to. The (made in China) tape measures, \$8 multi-meter, scale, Frisbee, and other small tools that we left with our counterparts seemed very much appreciated (Figure 6). Also, the hard work of Americans alongside DPRK counterparts is very much noted and appreciated. See Figure 7 for an example.

Figure 6: Training at Every Step, Every Level: Wind Turbine Power-house Training

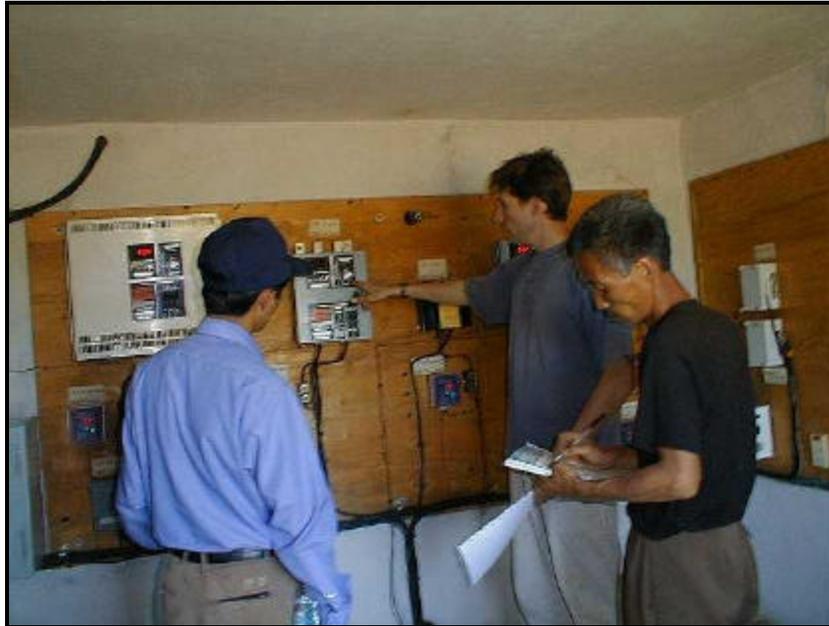


Figure 7: Installing "Ground Rods" at Unhari



- Review and process data as you get it, and ask questions about it before you leave. Make your questions very clear, and explain why, based on your own experience, you are asking them, and why they are important for the project.

