RURAL ENERGY SURVEY IN UNHARI VILLAGE, THE DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA (DPRK): SUMMARY OF METHODS, RESULTS, AND IMPLICATIONS

ANNEXES

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Annexes

A. Household Survey Instrument Used in Unhari Rural Energy Survey

DRAFT QUESTIONNAIRE FOR USE IN US-DPRK VILLAGE WIND ENERGY PILOT PROJECT

Nautilus Institute for Security and Sustainable Development

Prepared by: David Von Hippel (Modified in response to findings of survey team)
Date Last Modified: 10/3/98

CONTENTS OF THIS WORKBOOK BY WORKSHEET

QUESTIONNAIRE SHEET #1: SURVEY COVER PAGE

[TO BE FILLED IN BY INTERVIEWER OR OTHER SURVEY STAFF]

Family Identification Number: _ _ _ _ _ _

Interview Date: __/__/__

Interviewer's Name: _____

Supervisor's Name: _____

1- 1	Name of Respondent:	_____	**1-1**
1- 2	House Number:	_____	**1-2**
1- 3	Locality:	_____	**1-3**
1- 4	Address:	_____	**1-4**
1- 5	Area within Village [1] = North [2] = South [3] = East [4] = West		**1-5**
1- 6	Type of Housing Construction [1] = Stone and mortar [2] = Brick and mortar [3] = Wood [4] = Thatch [5] = Other (Specify)	_____	**1-6**
1- 7	Morphological Zone [1] = Higher ground [2] = Flood plain area [3] = Village Center [4] = East Village [5] = Other (Specify)	_____	**1-7**

QUESTIONNAIRE SHEET #2: SOCIAL/DEMOGRAPHIC DATA

2- 1	Name of Respondent:	**2-1**
2- 2	Sex of the Respondent: [1] = Male [2] = Female	**2-2**
2- 3	Age of the Respondent:	**2-3**
2- 4	Education Level of Respondent: [1] = Never attended school [2] = Primary School (1 - 6 years) [3] = Middle School (7 - 9 years) [4] = High School/Vocational School (10 - 12 years) [5] = College Education [6] = Post-graduate Education	**2-4**
2- 5	Respondent's Relationship to head of household [1] = Head of the household [2] = Head of household's wife or husband [3] = Daughter [4] = Son [5] = Daughter-in-law [6] = Son-in-law [7] = Other (Specify)	**2-5**
2- 6	How many people usually eat and sleep in the dwelling in the following age groups?	
2- 6a	Less than 6 years	**2-6a**
2- 6b	7 to 17 years	**2-6b**
2- 6c	18 - 40 years	**2-6c**
2- 6d	41 - 60 years	**2-6d**
2- 6e	61 years and older	**2-6e**
2- 6f	TOTAL	**2-6f**
2- 7	Does your household usually prepare meals for the household's own consumption? [0] = No, [1] = Yes If "No" go to 2-9	**2-7**
2- 8	Who usually prepares meals for the household? (codes from 2-5)	**2-8**
2- 9	What is the highest educational level among the adults members of your household? [1] = Never attended school [2] = Primary School (1 - 6 years) [3] = Middle School (7 - 9 years) [4] = High School/Vocational School (10 - 12 years) [5] = College Education [6] = Post-graduate Education	**2-9**
2- 10	How many persons in your household earn income?	**2-10**

QUESTIONNAIRE SHEET #3: HOUSING UNIT DATA

3- 1	Main Type of Dwelling Unit [1] = Row House (wood construction) [2] = Row House (brick construction) [3] = Row House (wood and brick construction) [4] = Semi-detached house [5] = Single detached house [6] = Apartment [7] = Other (Specify) _____	**3-1**
3- 2	Is the house occupied year-round or seasonally [1] = Year-round: go to question 3-3 [2] = Seasonally--enter months during which occupied	**3-2**
3- 3	Is part of your house used for to provide services or goods for use by non-household members? [0] = No [1] = Yes	**3-3**
3- 4	If part of your house is used to provide services or goods to others, please indicated type: [1] = Hair salon or barber shop [2] = Food or beverage shop [3] = Produce market [4] = Laundry [5] = Furniture-making or cabinet shop [6] = Food processing (apart from household needs) [7] = Sewing/tailoring [8] = Other Handicrafts [9] = Brickmaking [10] = Other (Specify) _____	**3-4**
3- 5	Please indicate the total number of window openings in your dwelling.	**3-5**

3- 6	Please indicate the total number of window openings with double glazed, thermal pane or storm windows (enter "0" if none).		**3-6**
3- 6a	Please indicate the total number of window openings with single-glazed windows (enter "0" if none).		**3-6a**
3- 6a2	Please indicate the total number of window openings with windows with plastic film coverings (enter "0" if none).		**3-6a2**
3- 6b	Please indicate the total number of window openings with wood shutters or other coverings only (no glazing) (enter "0" if none).		**3-6b**
3- 7	Please indicate the total number of doors opening to the outdoors (include sliding doors or porch doors, but exclude doors to enclosed, heated areas).		**3-7**
3- 7a	Please indicate the total number of or storm doors (enter "0" if none).		**3-7a**
3- 8	Please indicate the approximate age of your dwelling in years.		**3-8**
3- 9	Please indicate the number of total rooms in your dwelling unit.		**3-9**
3- 10	Please indicate the number of bedrooms in your dwelling unit.		**3-10**
3- 11	What are the total square meters of main living space in your dwelling unit?		**3-11**
3- 12	What fraction (percentage) of the main living space is heated in winter?		**3-12**

QUESTIONNAIRE SHEET #4: IDENTIFICATION OF CURRENT FUEL TYPES USED

Please indicate which of the following fuels your household has used for any activity during the past 12 months.

Coding: [0] = Not used; [1] = Used

		Not Used	Used	
4- 1	Electricity from grid			**4-1**
4- 2	Electricity from car battery			**4-2**
4- 3	Electricity from small batteries			**4-3**
4- 4	Kerosene			**4-4**
4- 5	LPG			**4-5**
4- 6	Charcoal			**4-6**
4- 7	Coal			**4-7**
4- 8	Coal briquettes			**4-8**
4- 9	Firewood			**4-9**
	Other Biomass and Crop Residues			
4- 10	Rice husks or stalks			**4-10**
4- 11	Collected leaves, twigs, or grass			**4-11**
4- 12	Other crop residue (specify)			**4-12**
4- 13	Other biomass fuel (specify)			**4-13**

QUESTIONNAIRE SHEET #5: IDENTIFICATION OF FUEL TYPES USED IN THE RECENT PAST

Please indicate which of the following fuels your household has used for any activity during the past 10 years.

Coding: [0] = Not used; [1] = Used

		Not Used	Used	
5- 1	Electricity from grid			**5-1**
5- 2	Electricity from car battery			**5-2**
5- 3	Electricity from small batteries			**5-3**
5- 4	Kerosene			**5-4**
5- 5	LPG			**5-5**
5- 6	Charcoal			**5-6**
5- 7	Coal			**5-7**
5- 8	Coal briquettes			**5-8**
5- 9	Firewood			**5-9**
	Other Biomass and Crop Residues			
5- 10	Rice husks or stalks			**5-10**
5- 11	Collected leaves, twigs, or grass			**5-11**
5- 12	Other crop residue (specify)			**5-12**
5- 13	Other biomass fuel (specify)			**5-13**

QUESTIONNAIRE SHEET #6: HOME HEATING

6- 1 What is the main source of heating for your dwelling unit? **6-1**

[2] = Central home heating system--coal
[3] = Fireplace--wood or biomass

[5] = Fireplace--coal briquettes
[6] = Ondol (sp?) stove system (wood/biomass)

[8] = Ondol (sp?) stove system (coal briquettes)
[9] = Ondol (sp?) stove system (electric)

[11] = Individual kerosene space heaters
[12] = Other (Specify) _____

2 For those who answered [1] or [2] _____
to Question 6-1 (others go to Question 6-3), are you able to adjust the temperature setting?

[1] = Yes

6- Do you think that your household _____ **6-2a**

[1] = Not adequate heat when needed
[2] = Just enough heat

[4] = The heat is too hot some of the time

6- If you can adjust the temperature _____ **6-2b**

set (in degrees centigrade) when people are at home?

6- when no one is at home? _____ **6-2c**

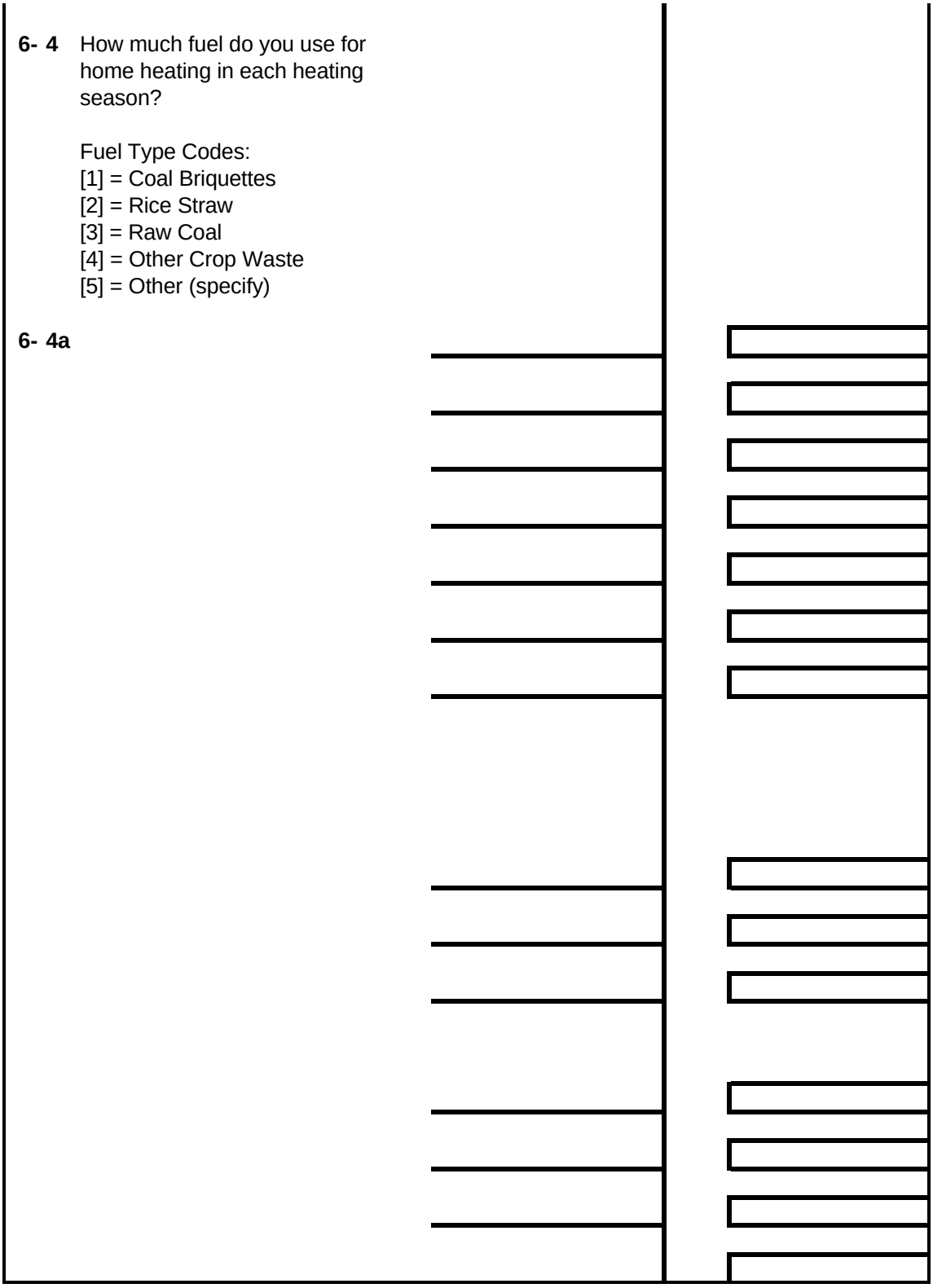
2d when everyone is asleep? _____

6- 3 _____ **6-3**
heat your dwelling?

6- 4 How much fuel do you use for home heating in each heating season?

Fuel Type Codes:
[1] = Coal Briquettes
[2] = Rice Straw
[3] = Raw Coal
[4] = Other Crop Waste
[5] = Other (specify)

6- 4a



QUESTIONNAIRE SHEET #7: ELECTRICITY CONNECTION AND CONSUMPTION

7- 1	Do you currently have electricity service from a local grid? [0] = No [1] = Yes If you answer "Yes" to this question, go to Question 7-2. If you answer "No" to this question, go to Question 7-3.	**7-1**
7- 2	How many years has your household been using electricity? (If more than 15 years, enter 16)	**7-2**
7- 2a	Who collects your household electricity bill? [1] = Electric utility company [2] = Housing office or other government office [3] = Included in housing payment [4] = Other, specify	**7-2a**
7- 2b	What is the average cost of of electricity per month for your household (Won)	**7-2b**
7- 2c	If electricity use by your household is metered, what is the total kWh consumed by your household per month?	**7-2c**
7- 2d	How many households share the electricity bill with your household? **[GO TO THE NEXT QUESTIONNAIRE SHEET]**	**7-2d**
7- 3	Has your household had electricity from a local grid within the last 15 years? [0] = No [1] = Yes	**7-3**
7- 3a	If your answer to 7-3 was "Yes", how many years ago did you last have electricity?	**7-3a**

QUESTIONNAIRE SHEET #8: CURRENT ELECTRICITY END-USES AND SERVICES

Does your household use electricity for the following purposes?

Coding: [0] = Not used; [1] = Used

		Used	
8- 1	Cooking		**8-1**
8- 2	Boiling water for drinking, tea, coffee		**8-2**
8- 3	Lighting		**8-3**
8- 4	Fan		**8-4**
8- 5	Television		**8-5**
8- 6	Refrigeration		**8-6**
8- 7	Leisure appliances (radio, tape player)		**8-7**
8- 8	Iron		**8-8**
8- 9	Washing Machine		**8-9**
8- 10	Air Conditioning		**8-10**
8- 11	Water pump (domestic use)		**8-11**
8- 12	Water Heater (for bathing/washing)		**8-12**
8- 13	Is electricity used to provide goods or services for other?		**8-13**
8- 14	If electricity is used to provide goods and services for others, what type of activity is it used for? [1] = Hair salon or barber shop [2] = Food or beverage shop [3] = Produce market [4] = Laundry [5] = Furniture-making or cabinet shop [6] = Food processing (apart from household needs) [7] = Sewing/tailoring [8] = Other Handicrafts [9] = Brickmaking [10] = Other (Specify)		**8-14**
8- 15	During the past month, how many times has the electrical current failed?		**8-15**
8- 16	Please indicate how frequently the following problems occur, using these codes: [1] = daily, [2] = weekly, [3] = monthly, [4] = rarely, [5] = never.		**8-16**
8- 16a	Voltage drops (dimming of lights)		**8-16a**
8- 16b	Unscheduled power cut		**8-16b**
8- 17	When a power outage occurs, what do you use? [1] = Kerosene lamp [2] = Candles [3] = Generator [4] = Other (specify)		**8-17**

QUESTIONNAIRE SHEET #9: PAST ELECTRICITY END-USES AND SERVICES

NOTE: THIS SHEET WAS NOT USED IN THE UNHARI SURVEY

If you answered "Yes" to question 7-3, when electricity service was available, did your household use electricity for the following purposes?

Coding: [0] = Not used; [1] = Used

		Not Used	Used	
9- 1	Cooking			**9-1**
9- 2	Boiling water for drinking, tea, coffee			**9-2**
9- 3	Lighting			**9-3**
9- 4	Fan			**9-4**
9- 5	Television			**9-5**
9- 6	Refrigeration			**9-6**
9- 7	Leisure appliances (radio, tape player)			**9-7**
9- 8	Iron			**9-8**
9- 9	Washing Machine			**9-9**
9- 10	Air Conditioning			**9-10**
9- 11	Water pump (domestic use)			**9-11**
9- 12	Water Heater (for bathing/washing)			**9-12**
9- 13	Was electricity used to provide goods or services for other?			**9-13**
9- 14	If electricity was used to provide goods and services for others, what type of activity was it used for? [1] = Hair salon or barber shop [2] = Food or beverage shop [3] = Produce market [4] = Laundry [5] = Furniture-making or cabinet shop [6] = Food processing (apart from household needs) [7] = Sewing/tailoring [8] = Other Handicrafts [10] = Other (Specify)			**9-14**

QUESTIONNAIRE SHEET #10: ELECTRIC LIGHTING

10- 1 Please tell me how many light bulbs are used each day in your household, as well as the capacity of each and the times that they are used during a usual weekday. If you currently do not have electricity supply, and If you answered "Yes" to question 7-3, when electricity service was available, tell me how many light bulbs you used to use each day in your household, as well as the capacity of each and the times that they were used during a usual weekday.

Capacity (Watts)	Number of Bulbs	Times bulbs are used during a usual weekday	Number of Bulbs	Total Hours
			10-1-5BW	**10-1-5BH**
5		[for example, 6:00 - 9:00, 17:00 - 22:00]		
			10-1-10BW	**10-1-10BH**
10				
			10-1-25BW	**10-1-25BH**
25				
			10-1-40BW	**10-1-40BH**
40				
			10-1-60BW	**10-1-60BH**
60				
			10-1-75BW	**10-1-75BH**
75				
			10-1-100BW	**10-1-100BH**
100				

10- 2 Please tell me how many fluorescent lamps are used each day in your household, as well as the capacity of each and the times that they are used during a usual weekday. If you currently do not have electricity supply, and If you answered "Yes" to question 8-3, when electricity service was available, tell me how many fluorescent lamps you used to use each day in your household, as well as the capacity of each and the times that they were used during a usual weekday.

Capacity (Watts)	Number of Lamps	Times lamps are used during a usual weekday	Number of Lamps	Total Hours
			10-2-10FW	**10-2-10FH**
10		[for example, 6:00 - 9:00, 17:00 - 22:00]		
			10-2-18FW	**10-2-18FH**
18				
			10-2-20FW	**10-2-20FH**
20				
			10-2-36FW	**10-2-36FH**
36				
			10-2-40FW	**10-2-40FH**
40				

QUESTIONNAIRE SHEET #11: AUTOMOTIVE BATTERY

11- 1	If your household uses automotive batteries, are they the: [1] = Main source of electricity [2] = a supplemental source of electricity [0] = Do not use		**11-1**
11- 2	Does your household use automotive batteries for the following end-uses? [0] = No [1] = Yes		
11- 2a	Television		
11- 2b	Lighting		
11- 2c	Radio and cassette tape recorder		
11- 3	What size battery does your _____ Volts, Amps		
11- 3a	Interviewer enter: [1] = Volts, [2] = Amps		
11- 4	How much does your household spend (in Won) per battery (to buy the battery)?		
11- 5	How long did your previous battery last, in years?		
11- 6	How much does each recharge cost (Won)?		
11- 7	How long does a typical recharge last (days)?		
11- 8	How many hours do you wait for a typical recharge?		

QUESTIONNAIRE SHEET #12: NON-ELECTRIC LIGHTING

12- 1	How does your household use non-electric lighting equipment? [0] = Does not use [1] = Supplement to electricity lighting [2] = Supplement to battery-powered lighting [3] = Only source of lighting	**12-1**
12- 2	How often does your household use the following non-electric lighting equipment? [0] = Never [1] = Rarely [2] = Occasionally [3] = Always [4] = Only when grid electricity is cut off	
	Kerosene wick lamp	
12- 2a	Number owned	
12- 2b	Hours used per day (average)	
12- 2c	Fuel used per month	
12- 2d	Units of fuel use	
	Pressurized Kerosene Lamp	
12- 3a	Number owned	
12- 3b	Hours used per day (average)	
12- 3c	Fuel used per month	
12- 3d	Units of fuel use	
	Candles	
12- 4a	Hours used per day (average)	
12- 4b	kg of candles used per week	

QUESTIONNAIRE SHEET #13: ELECTRIC APPLIANCE OWNERSHIP AND USAGE

Note to interviewers: If the respondent currently does not have electricity supply, and If they answered "Yes" to question 7-3, please ask them to answer the questions on appliance use below based on the period in the past when electricity was available.

13- 1	Refrigerator		
13- 1a	Number owned		**13-1a**
13- 1b	Brand name and model [create list for the brand names/models used in the DPRK]		**13-1b**
13- 1c	Interior size (capacity--liters)		**13-1c**
13- 1d	Watts (nameplate rating)		**13-1d**
13- 1e	Number of years owned		**13-1e**
13- 2	Electric Iron		
13- 2a	Number owned		**13-2a**
13- 2b	Watts (nameplate rating)		**13-2b**
13- 2c1	Average number of uses per week		**13-2c1**
13- 2c2	Average minutes of use per session		**13-2c2**
13- 2d	Usual time of use during the day	[specify start, end time]	**13-2d**
13- 3	Radio or Cassette Tape Player		
13- 3a	Number owned		**13-3a**
13- 3b	Brand name and model		**13-3b**
13- 3c	[Not Used]		**13-3c**
13- 3d	Watts (nameplate rating)		**13-3d**
13- 3e	Number of years owned		**13-3e**
13- 3f	Average hours of use per day		**13-3f**
13- 3g	Usual time of use during the day	[specify start, end time]	**13-3g**

13- 4	Ceiling fan		
13- 4a	Number owned		**13-4a**
13- 4b	Brand name and model [create list for the brand names/models used in the DPRK]		**13-4b**
13- 4c	Size (diameter, in cm)		**13-4c**
13- 4d	Watts (nameplate rating)		**13-4d**
13- 4e	Number of years owned		**13-4e**
13- 4f	Average hours of use per day		**13-4f**
13- 4g	Usual time of use during the day	[specify start, end time]	**13-4g**
13- 5	Table fan		
13- 5a	Number owned		**13-5a**
13- 5b	Brand name and model [create list for the brand names/models used in the DPRK]		**13-5b**
13- 5c	Size (diameter, in cm)		**13-5c**
13- 5d	Watts (nameplate rating)		**13-5d**
13- 5e	Number of years owned		**13-5e**
13- 5f	Average hours of use per day		**13-5f**
13- 5g	Usual time of use during the day	[specify start, end time]	**13-5g**
13- 5h	Number of months used per year		**13-5h**
13- 5i	Setting typically used on fan [1] = High, [2] = Medium, [3] = Low		**13-5i**

13- 6	Floor fan		
13- 6a	Number owned		**13-6a**
13- 6b	Brand name and model [create list for the brand names/models used in the DPRK]		**13-6b**
13- 6c	Size (diameter, in cm)		**13-6c**
13- 6d	Watts (nameplate rating)		**13-6d**
13- 6e	Number of years owned		**13-6e**
13- 6f	Average hours of use per day		**13-6f**
13- 6g	Usual time of use during the day	[specify start, end time]	**13-6g**
13- 6h	Number of months used per year		**13-6h**
13- 6i	Setting typically used on fan [1] = High, [2] = Medium, [3] = Low		**13-6i**
13- 7	Electric Water Pump		
13- 7a	Size (watts) [Enter [0] if not used]		**13-7a**
13- 7b	Brand name and model [create list for the brand names/models used in the DPRK]		**13-7b**
13- 7c	Number of years owned		**13-7c**
13- 7d	Average hours of use per day		**13-7d**
13- 7e	Usual time of use during the day Enter [0] if pump is automatic	[specify start, end time]	**13-7e**
13- 8	Black and White Television [Ask same questions for color, but tally separately]		
13- 8a	Number owned		**13-8a**
13- 8b	Brand name and model		**13-8b**
13- 8c	Size (diagonal cm)		**13-8c**
13- 8d	Watts (nameplate rating)		**13-8d**
13- 8e	Number of years owned		**13-8e**
13- 8f	Average hours of use per day		**13-8f**
13- 8g	Usual time of use during the day	[specify start, end time]	**13-8g**
13- 8h	Number of black and white televisions		**13-8h**
13- 8i	Number of color televisions		**13-8i**

QUESTIONNAIRE SHEET #14: ELECTRIC COOKING APPLIANCE OWNERSHIP AND USAGE

Note to interviewers: If the respondent currently does not have electricity supply, and If they answered "Yes" to question 7-3, please ask them to answer the questions on appliance use below based on the period in the past when electricity was available.

14- 1	Rice Cooker		
14- 1a	Number owned		**14-1a**
14- 1b	Brand name and model [create list for the brand names/models used in the DPRK]		**14-1b**
14- 1c	Watts (nameplate rating)		**14-1c**
14- 1d	Number of years owned		**14-1d**
14- 1e	Number of days used per week		**14-1e**
14- 1f	Number of times used per day		**14-1f**
14- 1g	Usual time of use during the day	[specify start, end time]	**14-1g**
14- 2	Other than a rice cooker, how often does your household use electricity for cooking? [1] = Frequently [2] = Seldom [3] = Never		**14-2**
14- 3	Electric Hot Plate		
14- 3a	Number owned		**14-3a**
14- 3b	Type Code: [1] = single, [2] = double		**14-3b**
14- 3c	Watts (nameplate rating)		**14-3c**
14- 3d	Number of years owned		**14-3d**
14- 3e	Average hours of use per day		**14-3e**
14- 3f	Usual time of use during the day	[specify start, end time]	**14-3f**
14- 4	Electric Oven		
14- 4a	Number owned		**14-4a**
14- 4b	Watts (nameplate rating)		**14-4b**
14- 4c	Number of years owned		**14-4c**
14- 4d	Average hours of use per day		**14-4d**
14- 4e	Usual time of use during the day	[specify start, end time]	**14-4e**
14- 5	How often does your household use the oven for preparing food? [1] = Frequently [2] = Seldom [3] = Never		

QUESTIONNAIRE SHEET #15: NON-ELECTRIC COOKING AND WATER HEATING

15- 1	Apart from electricity, which of the following cooking devices are used in your household? [0] = Only use electricity [1] = Coal briquette stove [2] = Rice straw stove [3] = Raw coal stove [4] = Other crop wastes stove [5] = Other (Specify)		**15-1**
15- 1a	Primary cooking device used		**15-1a**
15- 1b	Secondary cooking device used		**15-1b**
15- 2	How much fuel do you use for cooking (and preparation of tea) each month?		
15- 2a	Primary Fuel Type		**15-2a**
15- 2b	Amount of Primary Fuel Type		**15-2b**
15- 2c	Units of Primary Fuel Type		**15-2c**
15- 2d	Secondary Fuel Type		**15-2d**
15- 2e	Amount of Secondary Fuel Type		**15-2e**
15- 2f	Units of Secondary Fuel Type		**15-2f**
15- 3	Do you heat water for bathing? [0] = No [1] = Yes		**15-3**
	If you heat water for bathing, how much fuel do you use each month for water heating?		
15- 3a	Fuel Type		**15-3a**
15- 3b	Amount of Fuel Type		**15-3b**
15- 3c	Units of Fuel Type		**15-3c**
15- 4	Does your household boil pig feed? [0] = No [1] = Yes		**15-4**
	If your household boils pig feed how much fuel do you use each month to boil pig feed?		
15- 4a	Fuel Type		**15-4a**
15- 4b	Amount of Fuel Type		**15-4b**
15- 4c	Units of Fuel Type		**15-4c**

QUESTIONNAIRE SHEET #16: ELECTRICITY AND OTHER FUEL USED IN THE HOUSEHOLD TO PROVIDE GOODS AND SERVICES FOR OTHERS

Note to interviewers: If the respondent currently does not have electricity supply, and If they answered "Yes" to question 7-3, please ask them to answer questions 16-1 to 16-3 below based on the period in the past when electricity was available.

Similarly, if diesel fuel is not now available, ask the respondent to answer question 16-4 below based on the period in the past when diesel was available.

	If you answered "Yes" to question 3-3 (whether your household provides goods or services for non-household members), please indicate which of the following electrical or non-electric devices are used to provide goods or services for others.		
16- 1	Sewing Machine		
16- 1a	Do you use a sewing machine? [0] = Do not/did not use, [1] = Use (or used when electricity available) [2] = Use non-electric sewing machine		**16-1**
16- 1b	Brand name and model		**16-1b**
16- 1c	Watts (nameplate rating)		**16-1c**
16- 1d	Number of years owned		**16-1d**
16- 1e	Usual time of use during the day	[specify start, end time]	**16-1e**
16- 2	Electric Motor-driven Equipment (such as workshop equipment, food processing devices, and similar)		
16- 2a	Do you use motor driven devices? [0] = Do not/did not use, [1] = Use (or used when electricity available)		
16- 2b	Brand name and model of motor		**16-2b**
16- 2c	Watts (nameplate rating)		**16-2c**
16- 2d	Number of years owned		**16-2d**
16- 2e	Number of hours used in a typical day (count only time when motor is on)		**16-2e**
16- 2f	Usual time of use during the day	[specify start, end time]	**16-2f**
16- 3	Other electric equipment		
16- 3a	Do you use other electric equipment? [0] = Do not/did not use, [1] = Use (or used when electricity available)		**16-3a**
16- 3b	If you use or used other electric equipment, what type did you use (please specify)?		**16-3b**
16- 3c	Brand name and model of equipment [create list for the brand names/models used in the DPRK]		**16-3c**
16- 3d	Watts (nameplate rating)		**16-3d**
16- 3e	Number of years owned		**16-3e**
16- 3f	Number of hours used in a typical day (count only time when device is on)		**16-3f**
16- 3g	Usual time of use during the day	[specify start, end time]	**16-3g**

16- 4	Diesel generator or motor		
16- 4a	Do you use a diesel motor or generator? [0] = Do not use [1] = Use (or did use when fuel was available)		**16-4a**
16- 4b	Brand name and model of motor [create list for the brand names/models used in the DPRK]		**16-4b**
16- 4c	kilowatts or horsepower (nameplate rating)		**16-4c**
16- 4d	Number of years owned		**16-4d**
16- 4e	Number of hours used in a typical day (count only time when device is on)		**16-4e**
16- 4f	Usual time of use during the day	[specify start, end time]	**16-4f**
16- 4g	Amount of fuel used per week		**16-4g**
16- 4h	Units of fuel used (liters, cans, bottles)		**16-4h**
16- 5	Non-electric heating equipment/device use (brick kilns, stoves for preparing meals for others, food drying ovens, and other end-uses where fuel is burned to provide heat)		
16- 5a	Do you use heating equipment to provide goods or services to others? [0] = Do not use [1] = Use		**16-5a**
16- 5b	Primary device used (specify)		**16-5b**
16- 5c	Secondary device used (specify)		**16-5c**
	How much fuel do you use each month?		
16- 5d	Primary Fuel Type		**16-5d**
16- 5e	Amount of Primary Fuel Type		**16-5e**
16- 5f	Units of Primary Fuel Type		**16-5f**
16- 5g	Secondary Fuel Type		**16-5g**
16- 5h	Amount of Secondary Fuel Type		**16-5h**
16- 5i	Units of Secondary Fuel Type		**16-5i**

QUESTIONNAIRE SHEET #17: SOURCES OF FOSSIL FUELS AND CHARCOAL USED IN THE HOUSEHOLD

17- 1 If your household uses coal, how do you obtain your coal supplies? _____ **17-1** _____
[0] = Do not use
[1] = From local mines/suppliers
[2] = From the government
[3] = Combination of sources

17- 1a How much do you pay for coal, in Won per tonne? _____ **17-1a** _____

17- 2 If your household uses coal briquettes, how do you obtain your supplies? _____ **17-2** _____
[0] = Do not use
[1] = From local manufacturers
[2] = From the government
[3] = Make briquettes from raw coal
[4] = Combination of sources

17- 2a How much do you pay for briquettes, in Won per kilogram? [substitute local measurement if appropriate] _____ **17-2a** _____

17- 3 If your household uses charcoal, how do you obtain your supplies? _____ **17-3** _____
[0] = Do not use
[1] = From local manufacturers
[2] = From the government
[3] = Make charcoal ourselves
[4] = Combination of sources

17- 3a How much do you pay for charcoal, in Won per kilogram? [substitute local measurement if appropriate] _____ **17-3a** _____

17- 4 If your household uses kerosene, how do you obtain your supplies? _____ **17-4** _____
[0] = Do not use
[1] = From local suppliers
[2] = From the government
[3] = Combination of sources

17- 4a How much do you pay for kerosene, in Won per kilogram? [substitute local measurement if appropriate] _____ **17-4a** _____

17- 5 If your household uses LPG, how do you obtain your supplies? _____ **17-5** _____
[0] = Do not use
[1] = From local suppliers
[2] = From the government
[3] = Combination of sources

17- 5a How much do you pay for LPG, in Won per cylinder? [substitute local measurement if appropriate] _____ **17-5a** _____

QUESTIONNAIRE SHEET #18: SOURCES AND TIME BUDGETS FOR COLLECTION OF WOOD FUELS

18- 1	If your household uses firewood, how you obtain your wood supplies? [0] = Do not use [1] = Collect [2] = Purchase from local suppliers [3] = Purchase from the government [4] = Combination of sources		**18-1**
18- 1a	If firewood is purchased, how much do you pay for wood, in Won per kilogram? [substitute local measurement if appropriate]		**18-1a**
18- 2	When your household uses firewood, how many units are typically used per month?		**18-2**
18- 3	What percentage of firewood consumed is:		
18- 3a	Purchased	%	**18-3a**
18- 3b	Collected or produced from household's own trees, fields, or plantations	%	**18-3b**
18- 3c	Collected along roadsides, at construction sites, in fields, or on community land	%	**18-3c**
18- 3d	Collected from the forest	%	**18-3d**
	TOTAL	100%	100%
18- 4	If firewood is purchased, how much do you pay, in Won per kg? [substitute local measurement if appropriate]		**18-4**
18- 5	If firewood is collected, please specify:		**18-5**
18- 5a	The number of trips per month		**18-5a**
18- 5b	The distance from home to the collection site (km)		**18-5b**
	Questions c to l: hours that numbers of men, women, and children spent collecting firewood		
18- 5c	Men: Total hours spent per month		**18-5c**
18- 5d	Men: Number of persons		**18-5d**
18- 5e	Women: Total hours spent per month		**18-5e**
18- 5f	Women: Number of persons		**18-5f**
18- 5g	Children (age 12-16): Total hours spent/month		**18-5g**
18- 5h	Children (age 12-16): Number of persons		**18-5h**
18- 5i	Children (under 12 yrs): Total hours spent/month		**18-5i**
18- 5j	Children (under 12 years): Number of persons		**18-5j**
18- 5k	Total hours spent/month, all persons participating		**18-5k**
18- 5l	Total number of persons participating		**18-5l**
18- 6	If firewood is collected, is it more or less difficult to find firewood now than it was five years ago? [0] = About the same as five years ago [1] = More difficult than five years ago [2] = Less difficult than five years ago		**18-6**

QUESTIONNAIRE SHEET #19: SOURCES AND TIME BUDGETS FOR COLLECTION OF NON-WOOD BIOMASS FUELS

19- 1	If your household uses biomass fuels other than wood (for example, straw or other crop wastes, grasses, leaves and twigs), how do you obtain your supplies? [0] = Do not use [1] = Collect [2] = Purchase from local suppliers [3] = Purchase from the government [4] = Combination of sources		**19-1**
19- 1a	If biomass fuel is purchased, how much do you pay for the fuel, in Won per kilogram? [substitute local measurement if appropriate]		**19-1a**
19- 2	When your household uses non-wood fuels, how many units are typically used per month?		**19-2**
19- 3	What percentage of the fuels consumed is:		
19- 3a	Purchased	%	**19-3a**
19- 3b	Collected or produced from household's own trees, fields, or plantations	%	**19-3b**
19- 3c	Collected along roadsides, at construction sites, in fields, or on community land	%	**19-3c**
19- 3d	Collected from the forest or other wild lands	%	**19-3d**
	TOTAL	100%	100%
19- 4	If biomass fuel is purchased, how much do you pay, in Won per kg? [substitute local measurement if appropriate]		**19-4**
19- 5	If non-wood fuel is collected, please specify:		**19-5**
19- 5a	The number of trips per month		**19-5a**
19- 5b	The distance from home to the collection site (km)		**19-5b**
	Questions c to l: hours that numbers of men, women, and children spent collecting firewood		
19- 5c	Men: Total hours spent per month		**19-5c**
19- 5d	Men: Number of persons		**19-5d**
19- 5e	Women: Total hours spent per month		**19-5e**
19- 5f	Women: Number of persons		**19-5f**
19- 5g	Children (age 12-16): Total hours spent/month		**19-5g**
19- 5h	Children (age 12-16): Number of persons		**19-5h**
19- 5i	Children (under 12 yrs): Total hours spent/month		**19-5i**
19- 5j	Children (under 12 years): Number of persons		**19-5j**
19- 5k	Total hours spent/month, all persons participating		**19-5k**
19- 5l	Total number of persons participating		**19-5l**
19- 6	If biomass fuel is collected, is it more or less difficult to find these fuels now than it was five years ago? [0] = About the same as five years ago [1] = More difficult than five years ago [2] = Less difficult than five years ago		**19-6**

QUESTIONNAIRE SHEET #20: INTERVIEWER NOTES

[Interviewers: Please use this sheet to add any notes from your interview with this respondent that help to better describe the household situation, or provide relay information provided by the respondent that is relevant to the local energy situation or history, but which is not fully reflected in his or her answers to earlier questions.]

20- 1 Interviewer: are additional notes provided below?
[0] = No
[1] = Yes

20-1

INTERVIEWER NOTES:

SUPPLEMENTARY QUESTIONS

20- 2 How many electrical outlets are present in the home? **20-2**

20- 3 How many electrical outlets are set up for use by the wind power system? **20-3**

20- 4 How much water is used by the household, and at what times?

Time (hour of the day)	20-4	Amount (liters)
	Total	

20- 5 Is your household planning to purchase an electrical appliance in the next year? If so, which appliance, and what is the expected cost?

Appliance(s)	20-5	Cost (Won)

20- 6 Is your household planning to purchase an electrical appliance in the next 5 years? If so, which appliance, and what is the expected cost?

Appliance(s)	20-6	Cost (Won)

20- 7 Composition of Household Budgets

20- 7a What fraction of your household's income is spent on food each year? **20-7a**

20- 7b What fraction of your household's income is spent on clothes each year? **20-7b**

20- 7c What fraction of your household's income is spent on entertainment, transport, and other items each year? **20-7c**

20- 8 Voltage at outlets in the household at the time of the interview. **20-8**

B. Non-Household Survey Instruments Used as a Guide in Unhari Rural Energy Survey

US-DPRK VILLAGE WIND ENERGY PILOT PROJECT
Nautilus Institute for Security and Sustainable Development

QUESTIONNAIRE SHEET #V-1: VILLAGE-LEVEL QUESTIONNAIRE ON POPULATION, LAND USE, ECONOMY, LOCATION, AND ELECTRIFICATION

[Interviewer: The following questions should be asked of a village leader, a council of village elders, the village committee, or other persons who would be able to provide an overview of village activities.]

V-1- 1	Village Population Characteristics		
V-1- 1a	What is the total number of households in your village?		**V-1-1a**
	Please indicate the number of households of each of the following types:		
V-1- 1b	Party Cadre Households		**V-1-1b**
V-1- 1c	Households of wage-earning staff workers		**V-1-1c**
V-1- 1d	Households of agricultural workers		**V-1-1d**
V-1- 1e	Specialized households (for example, those providing goods or services to others)		**V-1-1e**
V-1- 1f	Total population of village (persons)		**V-1-1f**
V-1- 2	Village Land-Use Situation		
V-1- 2a	Total Village land area [specify/use local land unit]		**V-1-2a**
V-1- 2b	Cultivated land area		**V-1-2b**
V-1- 2c	Irrigated fields		**V-1-2c**
V-1- 2d	Dry fields		**V-1-2d**
V-1- 2e	Fallow fields		**V-1-2e**
V-1- 2f	Pasture land		**V-1-2f**
V-1- 2g	Land for forest use (or land to be reforested)		**V-1-2g**
V-1- 2h	Forested land		**V-1-2h**
V-1- 2i	Land without forests		**V-1-2i**
V-1- 2j	Land for dwellings		**V-1-2j**
V-1- 2k	Land for household gardens		**V-1-2k**
V-1- 2l	Land for public and other uses		**V-1-2l**
V-1- 3	Economic Development Situation		
V-1- 3a	Average net income per capita (Won)		**V-1-3a**
V-1- 3b	Village gross agricultural output (Won)		**V-1-3b**
V-1- 3c	Village gross industrial output (Won)		**V-1-3c**

May wish to add categories to conform to local situation, or to change output to physical measures (such as tonnes of rice, bricks produced…)]

V-1- 4 Location of the village

V-1- 4a Distance from main highway (km) _____ **V-1-4a** ____

V-1- 4b Distance from common highway (km) _____ **V-1-4b** ____

V-1- 4c Distance to county capital (km) _____ **V-1-4c** ____

V-1- 4d Distance to main area for cutting fuelwood (km) _____ **V-1-4d** ____

V-1- 5 Status of village electrification

V-1- 5a Does your village currently have electric power from the grid? [0] = No, [1] = Yes _____ **V-1-5a** ____

V-1- 5b Did your village formerly have electric power? from the grid? [0] = No, [1] = Yes _____ **V-1-5b** ____

V-1- 5c If your village formerly had electric power but does not have it now, how many years ago was power lost? _____ **V-1-5c** ____

V-1- 5d How many households in the village have, or had, electrical service? _____ **V-1-5d** ____

V-1- 5e Are there, or were there, one or more electricity meters in the village? _____ **V-1-5e** ____

V-1- 5f Who collects, or who collected, local electricity tariffs? _____ **V-1-5f** ____
[1] = Electric utility company
[2] = Housing office or other government office
[3] = Included in housing payment
[4] = Other, specify _____ ____

V-1- 5g What is the name of the area nearest to your village that currently has electric power from the grid? _____ **V-1-5g** ____

V-1- 5h How far away is the area nearest to your village that currently has electric power from the grid (km)? _____ **V-1-5h** ____

V-1- 5i Is there now, or have there been in the past, electricity generation facilities in your village? [0] = No, [1] = Yes _____ **V-1-5i** ____

V-1- 5j If there are or have been electricity generation facilities in the village, please specify which types are or were used? _____ **V-1-5j** ____
[1] = Hydroelectric
[2] = Wind-powered
[3] = Diesel-electric
[4] = More than one of the above (specify) _____ ____
[5] = Others (specify) _____ ____

V-1- 5k If there are or have been electricity generation facilities in the village, how many hours per year are or were they usually used? _____ **V-1-5k** ____

QUESTIONNAIRE SHEET #V-2: VILLAGE-LEVEL QUESTIONNAIRE ON PUBLIC FACILITIES IN THE VILLAGE

[Interviewer: The following questions should be asked of a village leader, a council of village elders, the village committee, or other persons who would be able to provide an overview of village activities.]

	Public Facilities in the Village		
V-2- 1	Village School		
V-2- 1a	Does the village have a school? [0] = No, [1] = Yes		**V-2-1a**
V-2- 1b	Total floor area of school (square meters)		**V-2-1b**
V-2- 1c	Number of electric light bulbs in the school		**V-2-1c**
V-2- 1d	Average wattage of light bulbs in the school		**V-2-1d**
V-2- 1e	Number of fluorescent lamps in the school		**V-2-1e**
V-2- 1f	Average wattage of fluorescent lamps in the school		**V-2-1f**
V-2- 1g	Please indicate other types of electrical equipment used (either now or when electricity was available) in the school. [1] = Refrigerator [2] = Electric hot plate, stove or oven [3] = Electric fan [4] = Other electric devices (specify)		**V-2-1g**
V-2- 1h	What is (or was) the total monthly electricity use in the building, in kWh? ([0] = Don't know)		**V-2-1h**
V-2- 1i	What other fuels are used in the school? [1] = Coal [2] = Coal Briquettes [3] = Charcoal [4] = Kerosene [5] = Candles [6] = LPG [7] = Firewood [8] = Crop wastes or other non-wood biomass		**V-2-1i**
	How much of these other fuels are used each year in the school?		
V-2- 1j	Primary Fuel Type		**V-2-1j**
V-2- 1k	Amount of Primary Fuel Type		**V-2-1k**
V-2- 1l	Units of Primary Fuel Type		**V-2-1l**
V-2- 1m	Secondary Fuel Type		**V-2-1m**
V-2- 1n	Amount of Secondary Fuel Type		**V-2-1n**
V-2- 1o	Units of Secondary Fuel Type		**V-2-1o**

V-2- 2 Village Meeting Hall or Town Hall

V-2- 2a Does the village have a meeting hall? **V-2-2a**
[0] = No, [1] = Yes

V-2- 2b Total floor area of building (square meters) **V-2-2b**

V-2- 2c Number of electric light bulbs in the building **V-2-2c**

V-2- 2d Average wattage of light bulbs in the building **V-2-2d**

V-2- 2e Number of fluorescent lamps in the building **V-2-2e**

V-2- 2f Average wattage of fluorescent lamps in the building **V-2-2f**

V-2- 2g Please indicate other types of electrical equipment used (either now or when electricity was available) in the building. **V-2-2g**
[1] = Refrigerator
[2] = Electric hot plate, stove or oven
[3] = Electric fan
[4] = Other electric devices (specify)

V-2- 2h What is (or was) the total monthly electricity use in the building, in kWh? ([0] = Don't know) **V-2-2h**

V-2- 2i At what time of day is the building usually used? **V-2-2i**
[specify hours, for example 8:00 to 16:00]

V-2- 2j What other fuels are used in the building? **V-2-2j**
[1] = Coal
[2] = Coal Briquettes
[3] = Charcoal
[4] = Kerosene
[5] = Candles
[6] = LPG
[7] = Firewood
[8] = Crop wastes or other non-wood biomass

How much of these other fuels are used each year in the building?

V-2- 2k Primary Fuel Type **V-2-2k**

V-2- 2l Amount of Primary Fuel Type **V-2-2l**

V-2- 2m Units of Primary Fuel Type **V-2-2m**

V-2- 2n Secondary Fuel Type **V-2-2n**

V-2- 2o Amount of Secondary Fuel Type **V-2-2o**

V-2- 2p Units of Secondary Fuel Type **V-2-2p**

V-2- 3 Village Health Clinic

V-2- 3a	Does the village have a health clinic? [0] = No, [1] = Yes		**V-2-3a**
V-2- 3b	Total floor area of building (square meters)		**V-2-3b**
V-2- 3c	Number of electric light bulbs in the building		**V-2-3c**
V-2- 3d	Average wattage of light bulbs in the building		**V-2-3d**
V-2- 3e	Number of fluorescent lamps in the building		**V-2-3e**
V-2- 3f	Average wattage of fluorescent lamps in the building		**V-2-3f**
V-2- 3g	Please indicate other types of electrical equipment used (either now or when electricity was available) in the building. [1] = Refrigerator [2] = Electric hot plate, stove or oven [3] = Electric fan [4] = Other electric devices (specify)		**V-2-3g**
V-2- 3h	What is (or was) the total monthly electricity use in the building, in kWh? ([0] = Don't know)		**V-2-3h**
V-2- 3i	At what time of day is the clinic usually used? [specify hours, for example 8:00 to 16:00]		**V-2-3i**
V-2- 3j	What other fuels are used in the building? [1] = Coal [2] = Coal Briquettes [3] = Charcoal [4] = Kerosene [5] = Candles [6] = LPG [7] = Firewood [8] = Crop wastes or other non-wood biomass		**V-2-3j**

How much of these other fuels are used each year in the building?

V-2- 3k	Primary Fuel Type		**V-2-3k**
V-2- 3l	Amount of Primary Fuel Type		**V-2-3l**
V-2- 3m	Units of Primary Fuel Type		**V-2-3m**
V-2- 3n	Secondary Fuel Type		**V-2-3n**
V-2- 3o	Amount of Secondary Fuel Type		**V-2-3o**
V-2- 3p	Units of Secondary Fuel Type		**V-2-3p**

V-2- 4 Village Dining Hall

V-2- 4a Do some or all of the people in your village eat together in a common dining building? [0] = No, [1] = Yes _____ **V-2-4a** _____

V-2- 4b Please estimate what fraction (percent) of total village meals are eaten in the common dining hall? _____ **V-2-4b** _____

V-2- 4c Total floor area of building (square meters) _____ **V-2-4c** _____

V-2- 4d Number of electric light bulbs in the building _____ **V-2-4d** _____

V-2- 4e Average wattage of light bulbs in the building _____ **V-2-4e** _____

V-2- 4f Number of fluorescent lamps in the building _____ **V-2-4f** _____

V-2- 4g Average wattage of fluorescent lamps in the building _____ **V-2-4g** _____

V-2- 4h Please indicate other types of electrical equipment used (either now or when electricity was available) in the building. _____ **V-2-4h** _____
[1] = Refrigerator
[2] = Electric hot plate, stove or oven
[3] = Electric fan
[4] = Other electric devices (specify) _____ _____

V-2- 4i What is (or was) the total monthly electricity use in the building, in kWh? ([0] = Don't know) _____ **V-2-4i** _____

V-2- 4j At what times of day is the building usually used? [specify hours, for example 8:00 to 9:00, 12:00 to 13:00] _____ **V-2-4j** _____

V-2- 4k What other fuels are used in the building? _____ **V-2-4k** _____
[1] = Coal
[2] = Coal Briquettes
[3] = Charcoal
[4] = Kerosene
[5] = Candles
[6] = LPG
[7] = Firewood
[8] = Crop wastes or other non-wood biomass

How much of these other fuels are used each year in the building?

V-2- 4l Primary Fuel Type _____ **V-2-4l** _____

V-2- 4m Amount of Primary Fuel Type _____ **V-2-4m** _____

V-2- 4n Units of Primary Fuel Type _____ **V-2-4n** _____

V-2- 4o Secondary Fuel Type _____ **V-2-4o** _____

V-2- 4p Amount of Secondary Fuel Type _____ **V-2-4p** _____

V-2- 4q Units of Secondary Fuel Type _____ **V-2-4q** _____

V-2- 5 Public Bathing Facilities

V-2- 5a Do some or all of the people in your village use a village bathing facility? [0] = No, [1] = Yes _____ **V-2-5a** _____

V-2- 5b Number of electric light bulbs in the building _____ **V-2-5b** _____

V-2- 5c Average wattage of light bulbs in the building _____ **V-2-5c** _____

V-2- 5d Number of fluorescent lamps in the building _____ **V-2-5d** _____

V-2- 5e Average wattage of fluorescent lamps in the building _____ **V-2-5e** _____

V-2- 5f Please indicate other types of electrical equipment used (either now or when electricity was available) in the building. _____ **V-2-5f** _____

[1] = Refrigerator
[2] = Electric hot plate, stove or oven
[3] = Electric fan
[4] = Electric water heater
[5] = Other electric devices (specify) _____

V-2- 5g What is (or was) the total monthly electricity use in the building, in kWh? ([0] = Don't know) _____ **V-2-5g** _____

V-2- 5h At what times of day is the building usually used? [specify hours, for example 8:00 to 9:00, 12:00 to 13:00] _____ **V-2-5h** _____

V-2- 5i What other fuels are used in the building? _____ **V-2-5i** _____

[1] = Coal
[2] = Coal Briquettes
[3] = Charcoal
[4] = Kerosene
[5] = Candles
[6] = LPG
[7] = Firewood
[8] = Crop wastes or other non-wood biomass

How much of these other fuels are used each year in the building?

V-2- 5j Primary Fuel Type _____ **V-2-5j** _____

V-2- 5k Amount of Primary Fuel Type _____ **V-2-5k** _____

V-2- 5l Units of Primary Fuel Type _____ **V-2-5l** _____

V-2- 5m Secondary Fuel Type _____ **V-2-5m** _____

V-2- 5n Amount of Secondary Fuel Type _____ **V-2-5n** _____

V-2- 5o Units of Secondary Fuel Type _____ **V-2-5o** _____

QUESTIONNAIRE SHEET #V-3: VILLAGE-LEVEL QUESTIONNAIRE ON OVERALL VILLAGE-LEVEL ENERGY USE

[Interviewer: The following questions should be asked of a village leader, a council of village elders, the village committee, or other persons who would be able to provide an overview of village activities.]

Please estimate monthly use of the following fuels in your village

V-3- 1	Coal		
V-3- 1a	Current monthly use in the Winter		**V-3-1a**
V-3- 1b	Current monthly use in the Summer		**V-3-1b**
V-3- 1c	Monthly use in the Winter as of 5 years ago		**V-3-1c**
V-3- 1d	Monthly use in the Summer as of 5 years ago		**V-3-1d**
V-3- 1e	Units		**V-3-1e**
V-3- 1f	Current price, Won per unit		**V-3-1f**
V-3- 2	Coal Briquettes		
V-3- 2a	Current monthly use in the Winter		**V-3-2a**
V-3- 2b	Current monthly use in the Summer		**V-3-2b**
V-3- 2c	Monthly use in the Winter as of 5 years ago		**V-3-2c**
V-3- 2d	Monthly use in the Summer as of 5 years ago		**V-3-2d**
V-3- 2e	Units		**V-3-2e**
V-3- 2f	Current price, Won per unit		**V-3-2f**
V-3- 3	Charcoal		
V-3- 3a	Current monthly use in the Winter		**V-3-3a**
V-3- 3b	Current monthly use in the Summer		**V-3-3b**
V-3- 3c	Monthly use in the Winter as of 5 years ago		**V-3-3c**
V-3- 3d	Monthly use in the Summer as of 5 years ago		**V-3-3d**
V-3- 3e	Units		**V-3-3e**
V-3- 3f	Current price, Won per unit		**V-3-3f**

V-3- 4	Kerosene		
V-3- 4a	Current monthly use in the Winter		**V-3-4a**
V-3- 4b	Current monthly use in the Summer		**V-3-4b**
V-3- 4c	Monthly use in the Winter as of 5 years ago		**V-3-4c**
V-3- 4d	Monthly use in the Summer as of 5 years ago		**V-3-4d**
V-3- 4e	Units		**V-3-4e**
V-3- 4f	Current price, Won per unit		**V-3-4f**
V-3- 5	Diesel Fuel		
V-3- 5a	Current monthly use in the Winter		**V-3-5a**
V-3- 5b	Current monthly use in the Summer		**V-3-5b**
V-3- 5c	Monthly use in the Winter as of 5 years ago		**V-3-5c**
V-3- 5d	Monthly use in the Summer as of 5 years ago		**V-3-5d**
V-3- 5e	Units		**V-3-5e**
V-3- 5f	Current price, Won per unit		**V-3-5f**
V-3- 6	Gasoline		
V-3- 6a	Current monthly use in the Winter		**V-3-6a**
V-3- 6b	Current monthly use in the Summer		**V-3-6b**
V-3- 6c	Monthly use in the Winter as of 5 years ago		**V-3-6c**
V-3- 6d	Monthly use in the Summer as of 5 years ago		**V-3-6d**
V-3- 6e	Units		**V-3-6e**
V-3- 6f	Current price, Won per unit		**V-3-6f**
V-3- 7	Candles		
V-3- 7a	Current monthly use in the Winter		**V-3-7a**
V-3- 7b	Current monthly use in the Summer		**V-3-7b**
V-3- 7c	Monthly use in the Winter as of 5 years ago		**V-3-7c**
V-3- 7d	Monthly use in the Summer as of 5 years ago		**V-3-7d**
V-3- 7e	Units		**V-3-7e**
V-3- 7f	Current price, Won per unit		**V-3-7f**

V-3- 8	LPG		
V-3- 8a	Current monthly use in the Winter		**V-3-8a**
V-3- 8b	Current monthly use in the Summer		**V-3-8b**
V-3- 8c	Monthly use in the Winter as of 5 years ago		**V-3-8c**
V-3- 8d	Monthly use in the Summer as of 5 years ago		**V-3-8d**
V-3- 8e	Units		**V-3-8e**
V-3- 8f	Current price, Won per unit		**V-3-8f**
V-3- 9	Firewood		
V-3- 9a	Current monthly use in the Winter		**V-3-9a**
V-3- 9b	Current monthly use in the Summer		**V-3-9b**
V-3- 9c	Monthly use in the Winter as of 5 years ago		**V-3-9c**
V-3- 9d	Monthly use in the Summer as of 5 years ago		**V-3-9d**
V-3- 9e	Units		**V-3-9e**
V-3- 9f	Current price, Won per unit		**V-3-9f**
V-3- 10	Straw, Crop Wastes, Leaves and Twigs		
V-3- 10a	Current monthly use in the Winter		**V-3-10a**
V-3- 10b	Current monthly use in the Summer		**V-3-10b**
V-3- 10c	Monthly use in the Winter as of 5 years ago		**V-3-10c**
V-3- 10d	Monthly use in the Summer as of 5 years ago		**V-3-10d**
V-3- 10e	Units		**V-3-10e**
V-3- 10f	Current price, Won per unit		**V-3-10f**

QUESTIONNAIRE SHEET #V-4: VILLAGE-LEVEL QUESTIONNAIRE: LOCAL RESOURCES ASSESSMENT

[Interviewer: The following questions should be asked of a village leader, a council of village elders, the village committee, or other persons who would be able to provide an overview of village activities.]

For the following statements, please indicate whether you:
[1] Absolutely Disagree
[2] Disagree
[3] No opinion
[4] Agree
[5] Strongly Agree

V-4- 1	Currently, collecting firewood is not difficult.	1 2 3 4 5	**V-4-1**
V-4- 2	Currently, collecting firewood is much more difficult than five years ago.	1 2 3 4 5	**V-4-2**
V-4- 3	A generation ago, collecting firewood was absolutely not difficult	1 2 3 4 5	**V-4-3**
V-4- 4	In the future, there will be an even greater shortage of fuelwood than there is now.	1 2 3 4 5	**V-4-4**
V-4- 5	Currently, the burning of straw and stalks does not cause any problems.	1 2 3 4 5	**V-4-5**
V-4- 6	Even more straw and stalks are burned now than five years ago.	1 2 3 4 5	**V-4-6**
V-4- 7	A generation ago, straw and stalks were rarely burned.	1 2 3 4 5	**V-4-7**
V-4- 8	In the future, less straw and stalks will be burned than today.	1 2 3 4 5	**V-4-8**

QUESTIONNAIRE SHEET #V-5: VILLAGE-LEVEL QUESTIONNAIRE: OPEN-ENDED QUESTIONS AND INTERVIEWER NOTES

[Interviewer: The following questions should be asked of a village leader, a council of village elders, the village committee, or other persons who would be able to provide an overview of village activities. In this particular questionnaire, the goal is to get information about village activities, such as village industries, that would be difficult to learn about with a standard set of questions. As a consequence, the questions below are "open-ended", and require the interviewer to formulate and ask follow-up questions as the interview progresses based on the responses of the village leader. Space for interviewer notes on the Village-level Questionnaires is also provided below.

V-5- 1	What industrial activities are currently operating in your village?	**V-5-1**
V-5- 2	What is the annual output of those activities?	**V-5-2**
V-5- 3	What types of fuels are used in industrial activities in the village?	**V-5-3**
V-5- 4	How much of each fuel is used annually?	**V-5-4**
	Please provide the answers to the above questions for a period about five years ago, if circumstances were different.	
V-5- 5	What industrial activities were operating in your village 5 years ago?	**V-5-5**
V-5- 6	What was the annual output of those activities?	**V-5-6**
V-5- 7	What types of fuels were used in industrial activities in the village?	**V-5-7**
V-5- 8	How much of each fuel was used annually?	**V-5-8**
V-5- 9	Interviewer: are additional notes provided below? [0] = No [1] = Yes	**V-5-9**

INTERVIEWER NOTES:

C. Presentation of Selected Detailed Results – Household Survey

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Summary Results: Questionnaire Sheets 1 and 2:

Total number of households surveyed:	67		
Interview Period:	23-Sep-98	to	3-Oct-98

Question 1-5:

Location of Dwelling	Number	Percent
In North Portion of Village	54	81%
In South Portion of Village	13	19%
TOTAL	67	100%

Question 1-6:

All houses constructed of brick and mortar

Question 2-2:

Sex of Survey Respondents	Number	Percent
Survey respondents who were male	40	60%
Survey respondents who were female	27	40%
TOTAL	67	100%

Question 2-3:

Age of Survey Respondents	Number	Percent
Under 20 years old	6	9.0%
20 to 29 years old	4	6.0%
30 to 39 years old	3	4.5%
40 to 49 years old	16	23.9%
50 to 59 years old	36	53.7%
60 to 69 years old	1	1.5%
Over 70 years old	1	1.5%
TOTAL	67	100%

Mean age of respondents	45.67	years
Median age of respondents	50	years
Standard deviation in age of respondents	12.90	years

Question 2-4:

Educational Level of Survey Respondents	Number	Percent	
Never attended school	0	0.0%	
Primary School (1 - 6 years)	3	4.5%	Respondents aged 15, 18, 32
Middle School (7 - 9 years)	14	20.9%	Includes 2 respondents
High School/Vocational School (10-12 yrs)	38	56.7%	aged 14 and 15
College Education	12	17.9%	
Post-graduate Education	0	0.0%	
TOTAL	67	100%	

Question 2-5:

Relationship of Survey Respondents to Head of Household	Number	Percent	Fraction Male	Fraction Female
Head of the household	40	59.7%	85%	15%
Head of household's wife or husband	19	28.4%	5%	95%
Daughter	3	4.5%	0%	100%
Son	5	7.5%	100%	0%
TOTAL	67	100%		

Question 2-6:

Age Distribution of Persons in Households Surveyed	Number	Percent
Less than 6 years*	5	1.96%
7 to 17 years	42	16.47%
18 - 40 years	82	32.16%
41 - 60 years	113	44.31%
61 years and older	13	5.10%
TOTAL	255	100%

* Note that the survey instrument inadvertently listed the first category as "less than 6 years", rather than "6 years and under". However, since the total of all household residents reported matches with the total of the residents by age class, we assume that either the question was interpreted (as intended) as "6 years and under", or there were no six-year olds in the sample.

Question 2-6:

Number of Persons per Household in Households Surveyed	Number	Percent	
2 persons	10	14.9%	
3 persons	16	23.9%	
4 persons	21	31.3%	
5 persons	17	25.4%	
6 persons	3	4.5%	
TOTAL	67	100%	
Implied total persons, surveyed households	255	(cross check)	
Implied mean persons per household	3.81		
Median household size	4		
Standard deviation in household size	1.12		

Question 2-7:
All households reported usually preparing meals for the household's own consumption.

Question 2-8:

Household's Meals Usually Prepared By:	Number	Percent	
Head of the household	1	1.5%	Female head of household
Head of household's wife or husband	65	97.0%	
Daughter-in-law	1	1.5%	
TOTAL	67	100%	

Question 2-9:

Highest Educational Level of Persons Living in Household	Number	Percent
Never attended school	0	0.0%
Primary School (1 - 6 years)	0	0.0%
Middle School (7 - 9 years)	4	6.0%
High School/Vocational School (10-12 yrs)	41	61.2%
College Education	21	31.3%
Post-graduate Education	1	1.5%
TOTAL	67	100%

Question 2-10:

Number of Persons in Household Earning Income	Number	Percent
no persons	2	3.0%
1 person	9	13.4%
2 persons	27	40.3%
3 persons	21	31.3%
4 persons	8	11.9%
TOTAL	67	100%
Implied mean wage-earners per HH	2.36	
Median number of wage-earners per HH	2	
Standard deviation	0.96	

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Summary Results: Questionnaire Sheet 3:

Question 3-1:
All houses were reported to be of the row house/brick construction type, with one exception. The house not reported to be of the row house type was reported as an apartment. In fact, all houses were brick buildings with 2 to approximately six dwelling units in each, and probably somewhere between row houses and apartment buildings in type. Some of the dwellings were on one floor, but most were on two floors, with two rooms on each floor.

Question 3-2:
All dwellings are occupied year-round.

Question 3-3:
65 of the 67 households surveyed reported using part of their homes to provide goods or services for non-household members.

Question 3-4:
Each of the 65 homes reporting that part of their homes were used to provide goods or services for non-household members reported that raising livestock was the "business activity" undertaken.

Question 3-5:

Number of Window Openings in Surveyed Dwellings	Number of Households	Percent of Households
2 windows	2	3.0%
3 windows	0	0.0%
4 windows	52	77.6%
5 windows	7	10.4%
6 windows	5	7.5%
7 windows	1	1.5%
TOTAL	67	100%
Total number of windows reported:	284	

Question 3-6:
Of the 67 households surveyed, two households reported having one double-pane, thermal pane, or storm window each. Other households had no windows of this type.

Total windows of this type reported:	2

Question 3-6a:
All households were reported as having at least some single-glazed windows.

Total windows of this type reported:	278

Households where all of the windows were reported as single-glazed: 63

Question 3-6a2:

A total of	24	Households, or
	35.8%	of the total sample,

were reported as having windows glazed with plastic film.

Total windows of this type reported:	41	
or	14.4%	of all windows in the sample.

Question 3-6b:
No homes were reported as having windows with no glazings (or having only wood or cloth coverings).

Question 3-7:

Number of Outside Doors in Surveyed Dwellings	Number of Households	Percent of Households
1 door	9	13.4%
2 doors	55	82.1%
3 doors	2	3.0%
5 doors	1	1.5%
TOTAL	67	100%
Total number of doors reported:	130	

Question 3-7b:
None of the dwellings in the survey were reported to have storm doors.

Question 3-8:

Age of Dwelling	Number of Households	Percent of Households
6 years	2	3.0%
24 years	65	97.0%
TOTAL	67	100%

Question 3-9:

Number of Rooms in Dwelling	Number of Households	Percent of Households
2 rooms	2	3.0%
4 rooms	62	92.5%
5 rooms	3	4.5%
TOTAL	67	97%

Question 3-10:

Number of Bedrooms in Dwelling	Number of Households	Percent of Households
1 bedroom	2	3.0%
2 bedrooms	65	97.0%
TOTAL	67	100%

Question 3-11:

Square Meters Floor Space in Dwelling	Number of Households	Percent of Households
30 square meters	2	3.0%
40 square meters	1	1.5%
60 square meters	2	3.0%
65 square meters	30	44.8%
67 square meters	1	1.5%
70 square meters	31	46.3%
TOTAL	67	100%

Question 3-12:

Reported Fraction of Floor Space in Dwelling that is Heated	Number of Households	Percent of Households
50 percent	27	40.3%
70 percent	5	7.5%
100 percent	35	52.2%
TOTAL	67	100%

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Summary Results: Questionnaire Sheet 4: Current Fuels Use

Question 4-1:
All households reported using electricity from the grid in the previous 12 months.

Question 4-2:
A total of 16 Households, or 23.9% of the total sample, were reported as having used electricity from an automobile battery in the previous 12 months.

Question 4-3:
A total of 10 Households, or 14.9% of the total sample, were reported as having used electricity from small batteries in the previous 12 months.

Question 4-4:
A total of 1 Household, or 1.5% of the total sample, was reported as having used kerosene in the previous 12 months.

Question 4-5:
No households reported using LPG in the previous 12 months.

Question 4-6:
No households reported using Charcoal in the previous 12 months.

Question 4-7:
No households reported using (raw) coal in the previous 12 months.

Question 4-8:
All households reported using coal briquettes in the previous 12 months.

Question 4-9:
No households reported using firewood in the previous 12 months.

Question 4-10:
A total of 11 Households, or 16.4% of the total sample, were reported as having used rice husks or stalks in the previous 12 months.

Question 4-11:
No households reported using collected leaves, twigs, or grass in the previous 12 months.

Question 4-12:
No households reported using other crop residues in the previous 12 months.

Question 4-13:
No households reported using other biomass fuels in the previous 12 months.

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Summary Results: Questionnaire Sheet 5: Past Fuels Use

Question 5-1:
All households reported using electricity from the grid within the previous 10 years.

Question 5-2:
A total of 11 Households, or
16.4% of the total sample,
were reported as having used electricity from an automobile battery in the previous 10 years.
of these households, 11 also reported having used
electricity from auto batteries in the last 12 months.

Question 5-3:
A total of 7 Households, or
10.4% of the total sample,
were reported as having used electricity from small batteries in the previous 10 years.
of these households, 6 also reported having used
small batteries in the last 12 months.

Question 5-4:
A total of 0 Households, or
0.0% of the total sample,
was reported as having used kerosene in the previous 10 years.

Question 5-5:
No households reported using LPG in the previous 10 years.

Question 5-6:
No households reported using Charcoal in the previous 10 years.

Question 5-7:
No households reported using (raw) coal in the previous 10 years.

Question 5-8:
All households reported using coal briquettes in the previous 10 years.

Question 5-9:
No households reported using firewood in the previous 10 years.

Question 5-10:
A total of 6 Households, or
9.0% of the total sample,
were reported as having used rice husks or stalks in the previous 10 years.
of these households, all 6 also reported having used
rice husks or stalks in the last 12 months.

Question 5-11:
No households reported using collected leaves, twigs, or grass in the previous 10 years.

Question 5-12:
No households reported using other crop residues in the previous 10 years.

Question 5-13:
No households reported using other biomass fuels in the previous 10 years.

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Summary Results: Questionnaire Sheet 6: Home Heating

Question 6-1:
All homes in the survey used an Ondol-type stove system fired with coal briquettes for home heating.

Question 6-2a:
All homes in the survey reported having "just enough" heat.

Question 6-3:

Months per Year that Heating is Used	Number of Households	Percent of Households
10 months	7	10.6%
12 months	59	89.4%
TOTAL	66	100%

(Information for one household was not recorded)

Question 6-4a:
All homes in the survey used coal briquettes as a heating fuel.

Question 6-4b:

Tonnes of heating fuel used per year	Number of Households	Percent of Households
1.8 or 2 tonnes	24	35.8%
between 2 and 2.5 tonnes	1	1.5%
2.5 tonnes	39	58.2%
2.6 or 2.7 tonnes	2	3.0%
4 tonnes	1	1.5%
TOTAL	67	100%
Average amount of heating fuel used:	2.34	
Standard Deviation in amount of heating fuel used:		0.32

Question 6-4d:
A total of 11 Households, or 16.4% of the total sample, reported using rice straw as a secondary heating fuel.

Question 6-4e:
In those households that use rice straw as a fuel:

Average amount of rice straw used:	465	kg
Maximum amount of rice straw used:	1000	kg
Minimum amount of rice straw used:	250	kg

Question 6-5:
All homes in the survey reported heating their dwellings at night.

Question 6-6a:
All homes in the survey used coal briquettes to heat their dwellings at night.

Question 6-6b:

Number of briquettes used per night	Number of Households	Percent of Households
0.3 briquettes	1	1.5%
0.5 briquettes	21	31.3%
0.6 or 0.7 briquettes	3	4.5%
1 briquette	38	56.7%
2 briquettes	4	6.0%
TOTAL	67	100%
Average number of briquettes used:	0.88	
Standard Deviation in number of briquettes used:		0.37

Question 6-7:

Mass of coal briquettes sampled	Number of Households	Percent of Households
2.3 kg	1	1.5%
2.4 kg	10	15.2%
2.5 kg	42	63.6%
2.6 kg	1	1.5%
2.7 kg	1	1.5%
2.8 kg	9	13.6%
2.9 kg	2	3.0%
TOTAL	66	100%
Average mass of briquettes:	2.54	kg
Standard Deviation in mass of briquettes used:		0.14 kg

Question 6-8:

Ratio of Coal to Clay in Briquettes	Number of Households	Percent of Households
3 to 1	37	56.1%
4 to 1	21	31.8%
5 to 1	4	6.1%
6 to 1	2	3.0%
7 to 1	0	0.0%
8 to 1	0	0.0%
9 to 1	1	1.5%
10 to 1	1	1.5%
TOTAL	66	100%
Average ratio of coal to clay:	3.73	
Standard Deviation in ratio of coal to clay:		1.27

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Summary Results: Questionnaire Sheet 7: Electrical Connection, and Questionnaire Sheet 8: Current Electrical End Uses

Question 7-1:
All homes in the survey used are currently served by electricity from the grid.

Question 7-2:
All homes in the survey have had electricity service for more than 15 years.

Question 7-3:
All homes in the survey reported that their electricity bill was collected by a "housing office or other government office".

Question 7-4:
Each household's electricity bill is one won per month. Electricity use is not metered.

Question 8-1:
No homes in the survey reported using electricity for cooking.

Question 8-2:
No homes in the survey reported using electricity for boiling tea or drinking water.

Question 8-3:
All homes in the survey reported using electricity for lighting.

Question 8-4:
A total of 45 Households, or 67.2% of the total sample, reported using electric fans.

Question 8-5:
All homes in the survey reported using televisions.

Question 8-6:
A total of 12 Households, or 17.9% of the total sample, reported using electric refrigerators.

Question 8-7:
A total of 27 Households, or 40.3% of the total sample, reported using leisure appliances such as radios or tape players.

Question 8-8:
A total of 60 Households, or 89.6% of the total sample, reported using electric irons.

Question 8-9 through 8-13:
No homes in the survey reported using electricity for washing machines, air conditioning, water pumping, heating water for bathing, of providing goods or services for others.

Question 8-14:
A response recorded for one household implied that electricity was used in raising livestock, but as the same household was recorded as not using electricity to provide goods or services for others, the response (or the recording of the response) could have been in error (or the question misunderstood).

Question 8-15:

Number of Times in the Past Month that Power was Interrupted	Number of Households	Percent of Households
2.5	1	1.5%
4	3	4.5%
5	49	73.1%
6	10	14.9%
7	4	6.0%
TOTAL Households	67	100%
Average reported times/month power interrupted:		5.2

Question 8-15a:

Typical Reported Length of Power Outages (Hours)	Number of Households	Percent of Households
1.5	1	1.5%
2	5	7.5%
2.5	9	13.4%
3	49	73.1%
4	2	3.0%
5	1	1.5%
TOTAL Households	67	100%
Average reported length of power outage (hours):		2.9

Question 8-16a:

Reported Frequency of Voltage Drops	Number of Households	Percent of Households
Daily	0	0.0%
Weekly	9	13.4%
Monthly	3	4.5%
Rarely	55	82.1%
Never	0	0.0%
TOTAL Households	67	100%

Question 8-16b:

Reported Frequency of Unscheduled Power Cuts	Number of Households	Percent of Households
Daily	0	0.0%
Weekly	67	100.0%
Monthly	0	0.0%
Rarely	0	0.0%
Never	0	0.0%
TOTAL Households	67	100%

Question 8-17:

Lighting Equipment Used During Power Outages	Number of Households	Percent of Households
Kerosene/Diesel Lamp	49	73.1%
Battery Power	14	20.9%
Oil Lamp or Batteries or Both	4	6.0%
TOTAL Households	67	100%

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Summary Results: Questionnaire Sheet 10: Electric Lighting

Question 10-1:

All households have incandescent bulbs

The total number of incandescent bulbs reported by the households surveyed was 212 or an average of 3.16 bulbs per household

Wattage of Incandescent Bulbs Present	Number of Bulbs	Percent of Bulbs
40 Watt	198	93.4%
60 Watt	13	6.1%
100 Watt	1	0.5%
TOTAL	212	100%
Average wattage of incandescent bulbs used:		41.5 watts

Average total hours of bulb use per day per household 11.07 hours

Average hours of bulb use per HH-day for households where per-bulb data was collected 9.81

Average total Watt-hrs of bulb use per day per household 463

Average total Watt-hrs of bulb use per HH-day for households where per-bulb data was collected 409

Question 10-2:

A total of 5 households, or 7.5% of the total sample, reported using fluorescent lights. Of these households, 4 households use 40 W bulbs, and 1 household uses a 20 W bulb, so the average fluorescent wattage is 36 Watts

No households reported having more than one fluorescent fixture

Average total hours of fluorescent bulb use per day per HH 3.80 hours

Average total Watt-hrs of fluorescent bulb use per day per household 140

Average total Watt-hrs of incandescent bulb use per day per household in those households that have fluorescent fixtures: 376

So the average total lighting energy use for those households that have both incandescent and fluorescent lamps is 516 Watt hours per day

The average total lighting energy use in all households, including both incandescent and fluorescent lamps is 416 Watt-hours per day for those households in which per-bulb data were collected, or 473 Watt-hours per day when all households in the survey are included.

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RESIDENTIAL END-USE SURVEY: RESULTS SUMMARY WORKBOOK

Summary Results: Questionnaire Sheet 11: Auto Battery Use, and Questionnaire Sheet 12: Use of Non-Electric Lighting

Question 11-1:

A total of	18	households,
or	26.9%	of surveyed homes,

reported using auto batteries for supplementary electricity.

Question 11-2a:

A total of	5	households,
or	27.8%	of homes using auto batteries,

reported using auto batteries to power televisions.

Question 11-2b:

A total of	18	households,
or	100.0%	of homes using auto batteries,

reported using auto batteries to power electric lights.

Question 11-2c:

A total of	9	households,
or	50.0%	of homes using auto batteries,

reported using auto batteries to power radios or tape players.

Question 11-3 (V):

A total of	17	households used 12 volt batteries, and
	1	household used a 6-volt battery.

Question 11-3 (Ah):

A total of	17	households used 130 Amp-hour batteries, and
	1	household used a 45 Amp-hr battery.

Question 11-4:

Of those who used auto batteries:

Price paid for battery (won)	Number of Households	Percent of Households	
20 Won	1	7.1%	(household with 6-volt battery)
25 Won	1	7.1%	
35 Won	1	7.1%	
40 Won	5	35.7%	
45 Won	5	35.7%	
50 Won	1	7.1%	
TOTAL	14	100%	

Other auto battery users did not report a price for the batteries.

Average price paid for auto batteries:	39.6	Won

Question 11-5:

Average reported lifetime of auto batteries:	2.6	years
Minimum reported lifetime of auto batteries:	1.0	years
Maximum reported lifetime of auto batteries:	5.0	years

Question 11-6:

No homes in the survey reported a cost for recharging batteries.

Question 11-7:

Average reported time that a battery recharge lasts:	12.2	days
Minimum reported time that a battery recharge lasts:	7	days*
Maximum reported time that a battery recharge lasts:	20	days

* Minimum for 12 V batteries. Charge for 6 V battery was reported to last one day.

Question 11-8:

Average reported wait time for a battery to recharge:	12.4	hours
Minimum reported wait time for a battery to recharge:	2	hours
Maximum reported wait time for a battery to recharge:	24	hours

Question 12-1:

Households Use of Non-Electric Lighting	Number of Households	Percent of Households
Do not use	11	16.4%
Use as supplement to grid electricity	52	77.6%
Use as supplement to battery electricity	4	6.0%
TOTAL	67	100%

Question 12-2:

Of the 56 households that used non-electric lighting, all said that they used such lighting only when the grid electricity was not operating.

Question 12-2a:

Number of Wick-type Oil Lamps (Kerosene or Diesel) Owned	Number of Households	Percent of Households
0	13	19.4%
1	10	14.9%
2	38	56.7%
3	5	7.5%
6	1	1.5%
TOTAL Households	67	100%
TOTAL with Lamps	54	80.6%
TOTAL Lamps Owned	107	

Question 12-2b:

The number of hours of lamp use per day was not recorded, as it depended on the timing and duration of power outages.

Question 12-2c:

Average reported household consumpt. of lamp fuel:	1.02	liters/mo. per household
Minimum reported household consumpt. of lamp fuel:	0.3	liters/mo. per household
Maximum reported household consumpt. of lamp fuel:	2.5	liters/mo. per household
Average reported household consumpt. of lamp fuel:	0.56	liters/mo. per lamp
Minimum reported household consumpt. of lamp fuel:	0.13	liters/mo. per lamp
Maximum reported household consumpt. of lamp fuel:	2.00	liters/mo. per lamp

Question 12-3a:

No homes in the survey reported using pressurized-type oil (kerosene or diesel) lamps.

Question 12-4a:

No homes in the survey reported using candles for lighting.

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RESIDENTIAL END-USE SURVEY: RESULTS SUMMARY WORKBOOK

Summary Results: Questionnaire Sheet 13: Electric Appliances

Question 13-1a:

A total of 11 Households, or 16.4% of the total sample, reported owning a refrigerator.

Question 13-1b:

Refrigerator Brands Present	Number of Households	Percent of Households
Toshiba	5	45.5%
OKEAH	3	27.3%
National	2	18.2%
Sharp	1	9.1%
TOTAL	11	100%

Question 13-1c:

All of the refrigerators in the sample had inner volume in the 240 to 280 liter range.

Question 13-1d:

Rated Wattages of Refrigerators	Number of Households	Percent of Households
130 Watts	2	18.2%
200 Watts	5	45.5%
245 Watts	3	27.3%
250 Watts	1	9.1%
TOTAL	11	100%
Average Nameplate Wattage	204	

Question 13-1e:

Number of Years of Ownership of Refrigerator	Number of Households	Percent of Households
1 Year	1	11.1%
2 Years	2	22.2%
4 Years	2	22.2%
5 Years	2	22.2%
7 Years	1	11.1%
10 Years	1	11.1%
TOTAL	9	100%

Question 13-2a:

A total of 56 Households, or 83.6% of the total sample, reported owning functional clothes irons. One household reported owning two irons, and the rest owned one. Non-functioning irons were present in two households, and one household was in possession of a borrowed iron, but no usage data were recorded.

Question 13-2b:

Average reported wattage of clothes irons*:	747.6	Watts
Minimum reported wattage of clothes irons:	200.0	Watts
Maximum reported wattage of clothes irons:	1000.0	Watts

* In some cases, wattages are nameplate wattages. In other cases, wattages are derived from direct measurements of resistance of iron when placed on the setting reportedly used most by the household.

Question 13-2c1:

Average reported weekly uses of iron:	2.88	Sessions
Minimum reported weekly uses of iron:	1	Sessions
Maximum reported weekly uses of iron:	10	Sessions

Question 13-2c2:

Average reported time of use per session of iron:	34.6	Minutes
Minimum reported time of use per session of iron:	15	Minutes
Maximum reported time of use per session of iron:	60	Minutes

Average implied time of use per day of iron:	0.235	Hours
Minimum implied time of use per day of iron:	0.048	Hours
Maximum implied time of use per day of iron:	0.952	Hours

Average implied electricity used for ironing*:	140	W-hr/day
Minimum implied electricity used for ironing*:	11	W-hr/day
Maximum implied electricity used for ironing*:	571	W-hr/day

* Calculations take into account reported or assumed heat setting used on irons.

Question 13-3a:

A total of 24 Households, or 35.8% of the total sample, reported owning a radio or tape player.

Question 13-3b:

Ten different brands were represented among the radios and tape players owned among the sample households. The most common brands were:

Radio/Tape Player Brands Present	Number of Households	Percent of Households
Xing Qiu	5	26.3%
International	5	26.3%
Sankei	2	10.5%
Lenoxx	2	10.5%
Maka	3	15.8%
Sanyo	2	10.5%
Total of above	19	100%
Total of all radios/tape players	24	79.2%

Question 13-3d:

Wattage (Nameplate Rating) of Radio or Cassette Player*	Number of Households	Percent of Households
8 Watts	3	13.0%
10 Watts	11	47.8%
15 Watts	2	8.7%
20 Watts	2	8.7%
30 Watts	2	8.7%
32 Watts	2	8.7%
35 Watts	0	0.0%
45 Watts	1	4.3%
TOTAL	23	100%
Average Nameplate Rating	16.2	Watts

*One household reported owning a radio or cassette player, but had loaned it out, so the wattage was not recorded.

Question 13-3e:

Number of Years of Ownership of Radio or Cassette Tape Player	Number of Households	Percent of Households
1 Year	3	13.6%
2 Years	1	4.5%
3 Years	3	13.6%
4 Years	2	9.1%
5 Years	6	27.3%
6 Years	1	4.5%
7 Years	2	9.1%
8 Years	1	4.5%
10 Years	2	9.1%
11 Years	1	4.5%
TOTAL	22	100%
Average Years of Ownership:	5.05	

Question 13-3f:

Hours of use and implied maximum electricity consumption of radio/tape player

Average reported time of use per day:	2.1	Hours
Minimum reported time of use per day:	1	Hours
Maximum reported time of use per day:	12	Hours

Average implied electricity used*:	8.2	W-hr/day
Minimum implied electricity used*:	2.6	W-hr/day
Maximum implied electricity used*:	44	W-hr/day

* Average power consumption by radios and tape players is likely to be much less than the nameplate consumption. The values shown here are calculated assuming that average power consumption is roughly 33% of rated power input.

Question 13-4:
No households in the survey reported owning or using ceiling fans.

Question 13-5a:
A total of 43 Households, or
64.2% of the total sample,
reported owning an electric table fan.

Question 13-5b:
Nearly 15 different brands were represented among the table fans owned among the sample households. The most common brands were:

Radio/Tape Player Brands Present	Number of Households	Percent of Households
Jin Long	17	60.7%
China Light	9	32.1%
Mercury Seagull	2	7.1%
Total of above	28	100%
Total of all table fans	43	65.1%

Question 13-5c:

Size (Rotor Diameter) of Fan*	Number of Households	Percent of Households
20 Centimeters	1	2.3%
21 Centimeters	1	2.3%
27 Centimeters	1	2.3%
29 Centimeters	1	2.3%
30 Centimeters	1	2.3%
35 Centimeters	15	34.9%
40 Centimeters	23	53.5%
TOTAL	43	100%
Average Rotor Diameter:	36.6	cm

Question 13-5d:

Maximum Power Consumption (Wattage Rating) of Fan*	Number of Households	Percent of Households	
30 Watts	1	2.3%	
35 Watts	2	4.7%	
40 Watts	2	4.7%	
42 Watts	10	23.3%	
45 Watts	2	4.7%	
48 Watts	14	32.6%	
50 Watts	6	14.0%	
55 Watts	4	9.3%	
60 Watts	2	4.7%	
TOTAL	43	100%	
Average reported nameplate wattage of fans:		46.6	Watts
Median reported nameplate wattage of fans:		48.0	Watts
Standard Deviation in fan nameplate wattage:		6.1	Watts

Question 13-5e:

Number of Years of Ownership of Fans	Number of Households	Percent of Households
1 Year	1	2.3%
2 Years	1	2.3%
3 Years	8	18.6%
4 Years	10	23.3%
5 Years	12	27.9%
6 Years	5	11.6%
7 Years	2	4.7%
10 Years	2	4.7%
12 Years	2	4.7%
TOTAL	43	100%
Average Years of Ownership:	5.00	Years

Question 13-5f:

Hours of use and implied electricity consumption of table fans

Average reported time of use per day:	4.7	Hours
Minimum reported time of use per day:	2	Hours
Maximum reported time of use per day:	12	Hours

Average implied electricity used*:	137	W-hr/day
Minimum implied electricity used*:	54	W-hr/day
Maximum implied electricity used*:	302	W-hr/day

* Calculations take into account reported or assumed speed setting used on fans.

Question 13-5h:

Months per Year of Fan Use Reported	Number of Households	Percent of Households
2 Months per year	7	16.7%
3 Months per year	31	73.8%
4 Months per year	2	4.8%
More than 4 months	2	4.8%
Total of above	42	100%
Average Months per year fan use:	3.02	

Question 13-5i:

Fan Setting Usually Used	Number of Households	Percent of Households
High Setting	5	11.6%
Medium Setting	37	86.0%
Low Setting	1	2.3%
Total of above	43	100%

Question 13-6a:

A total of 1 Household, or 1.5% of the total sample, reported owning an electric floor fan.

Question 13-6b:

The lone reported floor fan was of the "Seagull" brand.

Question 13-6c:

The rotor diameter of the one floor fan in the sample was 40 cm.

Question 13-6d:

The rated power the one floor fan in the sample was 55 Watts

Question 13-6e:

The floor fan in the sample had been owned for 2 Years

Question 13-6f:

The floor fan in the sample is used for 4 Hours per day, for an implied daily electricity consumption of 220 Watt-hours per day, assuming that average power used is 100% of the fan's rated power.

Question 13-6g:

The floor fan in the sample is used for 3 months per year

Question 13-6i:

The floor fan in the sample is typically used on the "High" setting.

Question 13-7:
No households in the survey sample reported using electric water pumps.

Question 13-8a:
All of the households in the survey reported owning a television set.

Question 13-8b:
Approximately 25 different brands or models were represented among the televisions by households sampled during the survey. Korean, Russian, and Chinese models were the most common TVs found. The most common brands were:

Television Brands Present	Number of Households	Percent of Households
Dae Dong Gang	8	28.6%
Hisense	5	17.9%
Pekopa	5	17.9%
Potoh-225	2	7.1%
So Na Mu	6	21.4%
Juhua	10	35.7%
Hong Mei	4	14.3%
Total of above	40	143%
Total of all televisions	67	59.7%

Question 13-8c:

Size (Diagonal Screen Measure) of TV	Number of Households	Percent of Households
40 to 44 Centimeters	22	32.8%
45 to 49 Centimeters	24	35.8%
50 to 54 Centimeters	13	19.4%
55 to 59 Centimeters	1	1.5%
60 to 64 Centimeters	7	10.4%
TOTAL	67	100%
Average screen size for TVs in sample	47.5	
Median screen size for TVs in sample	48.0	
Most owned screen size in sample	42.0	

Question 13-8d:

Wattage Rating of Televisions	Number of Households	Percent of Households	
30 Watts	16	23.9%	
32 Watts	10	14.9%	
33 Watts	5	7.5%	
40 Watts	4	6.0%	
48 Watts	1	1.5%	
50 Watts	7	10.4%	
60 Watts	5	7.5%	
65 Watts	1	1.5%	
70 Watts	5	7.5%	
75 Watts	1	1.5%	
80 Watts	2	3.0%	
88 Watts	1	1.5%	
90 Watts	8	11.9%	
140 Watts	1	1.5%	
TOTAL	67	100%	
Average reported nameplate wattage of TVs:		51.1	Watts
Median reported nameplate wattage of TVs:		40.0	Watts
Standard Deviation in TV nameplate wattage:		24.3	Watts

Question 13-8e:

Number of Years of Ownership of Television	Number of Households	Percent of Households	
1 Year	4	6.0%	
3 Years	3	4.5%	
4 Years	4	6.0%	
5 Years	10	14.9%	
6 Years	7	10.4%	
7 Years	9	13.4%	
8 Years	7	10.4%	
9 Years	1	1.5%	
10 Years	15	22.4%	
13 Years	1	1.5%	
14 Years	1	1.5%	
15 Years	3	4.5%	
17 Years	1	1.5%	
18 Years	1	1.5%	
TOTAL	67	100%	
Average reported age of TVs:		7.6	Years
Median reported age of TVs:		7.0	Years
Standard Deviation in TV age:		3.7	Years

Question 13-8f:

Hours of use and implied electricity consumption of TVs

Average reported time of use per day:	3.6	Hours
Minimum reported time of use per day:	2.0	Hours
Maximum reported time of use per day:	6.0	Hours
Median reported time of use per day:	3.0	Hours
Standard deviation in time of use/day:	0.9	Hours

Average implied electricity used:	183	W-hr/day
Minimum implied electricity used:	64	W-hr/day
Maximum implied electricity used:	450	W-hr/day
Standard deviation in implied elect. use:	100	W-hr/day

Question 13-8h:

A total of 59 households, or
88.1% of the total sample,
reported owning a black and white television.
The black and white televisions had an average age of 7.8 Years
and an average power consumption of 48.4 Watts

Question 13-8i:

A total of 8 households, or
11.9% of the total sample,
reported owning a color television.
The color televisions had an average age of 5.6 Years
and an average power consumption of 70.8 Watts

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Summary Results: Questionnaire Sheet 14: Electric Cooking Appliances

Question 14-1:
None of the households sampled in the survey used electric rice cookers.

Question 14-2:
All of the households sampled in the survey said that they "never" used electricity for cooking.

Question 14-3:
None of the households sampled in the survey used electric hot plates.

Question 14-4:
None of the households sampled in the survey used an electric oven.

Question 14-5:
All of the households sampled in the survey said that they "never" used electric ovens for cooking.

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Summary Results: Questionnaire Sheet 15: Non-Electric Cooking and Water Heating

Question 15-1:
All of the households sampled in the survey used coal briquette stoves.

Question 15-1a:
All of the households sampled in the survey used coal briquette stoves as the primary cooking device.

Question 15-1b:
None of the households sampled in the survey reported using a secondary cooking device.

Question 15-2a:
All of the households sampled in the survey used coal briquettes as the primary fuel type.

Question 15-2a:
All of the households sampled in the survey used coal briquettes as the primary fuel type.

Question 15-2b:

Number of Briquettes Used per Month	Number of Households	Percent of Households
40 Briquettes	1	1.5%
50 Briquettes	3	4.5%
60 Briquettes	36	54.5%
65 Briquettes	10	15.2%
70 Briquettes	11	16.7%
80 to 90 Briquettes	4	6.1%
120 Briquettes*	1	1.5%
TOTAL	66	100%
Average reported briquettes per month:	64.1	Briquettes
Standard deviation in use of briquettes per month:	10.4	Briquettes

* One household reported consumption of 2 tonnes briquettes, which was doubtless intended as an annual, not monthly, figure.

Question 15-2d:
A total of 11 Households, or 16.4% of the total sample, reported using rice straw as a secondary cooking/heating fuel.

Question 15-2e:

Kilograms of Rice Straw Used Monthly	Number of Households	Percent of Households
30 kg	5	45.5%
40 kg	1	9.1%
60 kg	1	9.1%
90 kg	1	9.1%
100 kg	2	18.2%
150 kg	1	9.1%
TOTAL	11	100%
Average reported kg straw per month:	62.7	kg
Standard deviation in use of briquettes per month:	41.3	kg

Question 15-3:
None of the households sampled in the survey reported heating hot water for bathing.

Question 15-4:

A total of 64 Households, or 95.5% of the total sample, reported boiling pig feed.

Question 15-4a:

A total of 64 Households, or 95.5% of the total sample, reported using coal briquettes to boil pig feed.

Question 15-4b:

Number of Briquettes Used per Month per Household to Boil Pig Feed	Number of Households	Percent of Households
10 Briquettes	1	1.6%
20 Briquettes*	11	17.2%
25 Briquettes	6	9.4%
30 Briquettes	39	60.9%
35 Briquettes	1	1.6%
40 Briquettes	5	7.8%
50 Briquettes	1	1.6%
TOTAL	64	100%
Average reported briquettes per month:	28.7	Briquettes
Standard deviation in use of briquettes per month:		6.3 Briquettes

* One of these households reported also using 30 kg of rice straw monthly to boil pig feed.

Average total use of coal briquettes for cooking and preparing animal feed (briquettes per month): 90.5 per household

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Summary Results: Questionnaire Sheet 16: Electricity and Other Fuels Used to Provide Goods and Services

Question 16-1a:

A total of 52 Households, or 77.6% of the total sample, reported using non-electric (treadle-type) sewing machines

Question 16-1b:

Twelve different brands were represented among the sewing machines owned by the sample households. The most common brands were:

Sewing Machine Brands Owned	Number of Households	Percent of Households
Sang Ma	3	20.0%
Typical	2	13.3%
Lida	2	13.3%
Kum Byol	4	26.7%
Dae Dong Gang	2	13.3%
Bidulgi	2	13.3%
Huahan	2	13.3%
Total of above	15	100%
Total of all sewing machines*	52	28.8%

* In many cases, brand names of sewing machines were not reported.

Question 16-1d:

Number of Years of Ownership of Sewing Machine	Number of Households	Percent of Households
1 Year	1	7.7%
5 Years	1	7.7%
7 Years	2	15.4%
8 Years	3	23.1%
9 Years	1	7.7%
10 Years	2	15.4%
11 Years	1	7.7%
20 Years	1	7.7%
40 Years	1	7.7%
TOTAL	13	100%

* In most cases, ages of sewing machines were not reported.

Question 16-2a:

None of the households sampled in the survey reported using electric-motor driven equipment to provide goods or services for others.

Question 16-3a:

None of the households sampled in the survey reported using other electric equipment to provide goods or services for others.

Question 16-4a:

None of the households sampled in the survey reported using a diesel motor or generator.

Question 16-5a:

None of the households sampled in the survey reported using non-electric heating equipment to provide goods or services to others.

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Summary Results: Questionnaire Sheet 17: Sources of Fossil Fuels and Charcoal

Question 17-1:

Reported Source of Coal	Number of Households	Percent of Households
From "Local Mines or Suppliers"	62	92.5%
From "the Government"	5	7.5%
TOTAL	67	100%

Question 17-1a:
All of the households sampled in the survey reported paying 40 won per tonne for coal.

Question 17-2:
All of the households sampled in the survey reported making coal briquettes from raw coal.

Question 17-3:
None of the households sampled in the survey reported using other electric equipment to provide goods or services for others.

Question 17-4:
None of the households sampled in the survey reported purchasing kerosene.

Question 17-5:
None of the households sampled in the survey reported purchasing LPG.

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Summary Results: Questionnaire Sheet 18: Sources and Time Budgets for Collection of Wood Fuels, and Questionnaire Sheet 19: Sources and Time Budgets for Collection of Non-Wood Biomass Fuels

None of the households in the survey reported collecting wood or non-wood biomass fuels. For those households that use rice straw as a supplementary fuel, the source was apparently the local rice mill, though no data on straw collection activities were recorded.

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Summary Results: Questionnaire Sheet 20: Interviewer Notes and Supplementary Questions

Question 20-2:

Number of Electrical Outlets Present in the Home	Number of Households	Percent of Households
1	9	13.4%
2	47	70.1%
3	9	13.4%
4	2	3.0%
TOTAL Households	67	100%

Question 20-3:

Number of Electrical Outlets Set Up for Use by the Wind Power System	Number of Households	Percent of Households
1	40	59.7%
0 or no record	27	40.3%

Question 20-4:

Average reported daily water use (liters):	165	liters
Minimum reported daily water use (liters):	50	liters
Maximum reported daily water use (liters):	300	liters
Standard Deviation in reported daily water use (ltr):	52	liters

			% of total
Average reported morning water use (liters):	41	liters	25.0%
Minimum reported morning water use (liters):	10	liters	
Maximum reported morning water use (liters):	100	liters	
Standard Deviation, reported morning water use (ltr):	17	liters	

			% of total
Average reported noon water use (liters):	32	liters	19.4%
Minimum reported noon water use (liters):	0	liters	
Maximum reported noon water use (liters):	110	liters	
Standard Deviation, reported noon water use (ltr):	20	liters	

			% of total
Average reported evening water use (liters):	93	liters	56.3%
Minimum reported evening water use (liters):	10	liters	
Maximum reported evening water use (liters):	240	liters	
Standard Deviation, reported evening water use (ltr):	43	liters	

Question 20-5:

Eighteen (18) households reported planning an appliance purchase within the next year. The appliances listed, and costs estimated for those appliances, were:

		Estimated Cost (Won)	
Appliance	Number of Households	High	Low
Refrigerator	1	200	
Tape Recorder (Cassette tape player)	10	140	40
Fan	7	40	35
Iron	1	10	

Question 20-6:

Twenty-six (26) households reported planning an appliance purchase within the next five years. The appliances listed, and costs estimated for those appliances, were:

		Estimated Cost (Won)	
Appliance	Number of Households	High	Low
Refrigerator	16	250	200
Tape Recorder (Cassette tape player)	6	75	60
Fan	3	40	35
Video Set	1		
Iron	1	1.5	

Question 20-7a:

Average reported fraction of budget spent on food:	37%
Minimum reported fraction of budget spent on food:	20%
Maximum reported fraction of budget spent on food:	60%
Standard Deviation in % of budget spent on food:	13%

Question 20-7b:

Average reported fraction of budget spent on clothes:	29%
Minimum reported fraction of budget spent on clothes:	20%
Maximum reported fraction of budget spent on clothes:	50%
Standard Deviation in % of budget spent on clothes:	7%

Question 20-7c:

Average reported fraction of budget spent on other expenses:	35%
Minimum reported fraction of budget spent on other expenses:	10%
Maximum reported fraction of budget spent on other expenses:	60%
Standard Deviation in % of budget spent on other expenses:	14%

Question 20-8:

Average reported grid voltage as measured during interview:	180	Volts
Minimum reported grid voltage as measured during interview:	170	Volts
Maximum reported grid voltage as measured during interview:	198	Volts
Standard Deviation in grid voltage as measured during interview:	5.96	Volts
Number of homes where voltage was measured during interview:	40	
Number of homes where power was out during interview:	11	

D. Presentation of Additional Survey Results and Analysis

LOAD PROFILE ESTIMATES: DEMAND SIDE OF VILLAGE WIND POWER SYSTEM
Equipment, Wattage, and Usage Estimates

Prepared by:	David Von Hippel	
Date last modified:	7-Jun-99	

Clinic Loads

		Present	Future	Fraction	Time of Use						Running
Devices	Number	Wattage	Wattage*	Full Load	On	Off	On	Off	On	Off	Fraction
Hot Plate (dentist)	1	1000	1000	1	9	11					1.000
Grinder (dentist)	1	180	180	0.5	8	9					1.000
Drill (dentist)	1	120	120	0.5	10	11					1.000
Bulbs	5	40	15	1	19	20					0.750
Bulbs--Exam Room	1	100	30	1	19	20					1.000
Bulb--Night Guard	1	40	15	1	0	6	18	24			1.000
Refrigerator	1		100	1	0	24					0.417
Medicine Grinder	1		150	1	9	18					0.111
Pill Maker	1		100	1	9	18					0.111

*Based on replacement of incandescent bulbs with CFLs, and addition of equipment requested by staff.

Kindergarten Loads

		Present	Future	Fraction	Time of Use						Running
Item	Number	Wattage	Wattage*	Full Load	On	Off	On	Off	On	Off	Fraction
Bulb (guard house)	1	40	15	1	0	6	18	24			1.000
Bulbs (other rooms)	11	40	15	1	18	21					1.000
Refrigerator	1	0	130	1	0	24					0.481
Television	1	0	80	1	17	20					1.000
Blower for furnace	0	7500	30	1	6	19					1.000
New Blower	0	0	750	1	0	24					0.056

*Based on replacement of incandescent bulbs with CFLs, and addition of equipment requested by staff.

LOAD PROFILE ESTIMATES: DEMAND SIDE OF VILLAGE WIND POWER SYSTEM
Load Tables by Hour, Location, and Device

Prepared by:
David Von Hippel
Date last modified:
6/7/99

CLINIC

Present Load Curve (average Watts)

	Time (Hour of the Day)																							
Devices	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Hot Plate (dentist)	0	0	0	0	0	0	0	0	0	1000	1000	0	0	0	0	0	0	0	0	0	0	0	0	0
Grinder (dentist)	0	0	0	0	0	0	0	0	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drill (dentist)	0	0	0	0	0	0	0	0	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0
Bulbs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200	0	0	0	0
Bulbs--Exam Room	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0
Bulb--Night Guard	40	40	40	40	40	40	0	0	0	0	0	0	0	0	0	0	0	0	40	40	40	40	40	40
Refrigerator	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medicine Grinder	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pill Maker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL: Present	40	40	40	40	40	40	0	0	90	1000	1060	0	0	0	0	0	0	0	40	340	40	40	40	40

TOTAL Estimated kWh/day **2.93**

Future Load Curve (average Watts)

	Time (Hour of the Day)																							
Item	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Hot Plate (dentist)	0.0	0	0	0	0	0	0	0	0	1000	1000	0	0	0	0	0	0	0	0	0	0	0	0	0
Grinder (dentist)	0.0	0	0	0	0	0	0	0	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drill (dentist)	0.0	0	0	0	0	0	0	0	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0
Bulbs	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	56.25	0	0	0	0
Bulbs--Exam Room	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0
Bulb--Night Guard	15.0	15	15	15	15	15	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	15	15
Refrigerator	41.7	41.7	41.7	41.7	41.7	41.67	41.67	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.67	41.7	41.7	41.7	41.7
Medicine Grinder	0.0	0	0	0	0	0	0	0	0	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	0	0	0	0	0	0
Pill Maker	0.0	0	0	0	0	0	0	0	0	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	0	0	0	0	0	0
TOTAL: FUTURE	56.7	56.7	56.7	56.7	56.7	56.67	41.67	41.7	132	1069	1129	69.4	69.4	69.4	69.4	69.4	69.4	69.4	56.7	142.9	56.7	56.7	56.7	56.7

TOTAL Estimated kWh/day **3.67**

KINDERGARTEN

Present Load Curve (average Watts)

	Time (Hour of the Day)																							
Item	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Bulb (guard house)	40	40	40	40	40	40	0	0	0	0	0	0	0	0	0	0	0	0	40	40	40	40	40	40
Bulbs (other rooms)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	440	440	440	0	0	0
Refrigerator	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Television	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blower for furnace	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Blower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL: Present	40	40	40	40	40	40	0	0	0	0	0	0	0	0	0	0	0	0	480	480	480	40	40	40

TOTAL Estimated kWh/day **1.8**

Future Load Curve (average Watts)

	Time (Hour of the Day)																							
Item	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Bulb (guard house)	15	15	15	15	15	15	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	15	15
Bulbs (other rooms)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	165	165	165	0	0	0
Refrigerator	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5
Television	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	80	80	0	0	0
Blower for furnace	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Blower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL: FUTURE	77.5	77.5	77.5	77.5	77.5	77.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	143	323	322.5	243	77.5	77.5	77.5

TOTAL Estimated kWh/day **2.42**

AVERAGE HOUSEHOLD (SUMMER) LOAD FROM SURVEY DATA

Present Load Curve per Household (average Watts)

	Time (Hour of the Day)																							
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Lighting (all samples)	0	0	0	0	2	50	81	1	0	0	0	0	0	0	0	0	0	0	4	103	110	82	40	0
Lighting (by Bulb only)	0	0	0	0	0	38.25	80	0.7	0	0	0	0	0	0	0	0	0	0	1.4	94.39	98.6	69.5	33.3	0
Appliances	11	11	11	11	11	12	27	12	11	11	11	11	37	29	12	12	14	22	30	120	91	83	42	15
Total Watt Hours per Household, Appliances and Lighting by Bulb:									**1073**										32	215	189	152	75	

Assuming number of connected HH is: **20**

Present Load Curve for 20 Households (Watts)

	Time (Hour of the Day)																							
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Lighting (all samples)	0	0	0	0	47.8	1009	1624	11.9	0	0	0	0	0	0	0	0	0	0	71.6	2060	2191	1648	806	0
Lighting (by Bulb only)	0	0	0	0	0	764.9	1600	14	0	0	0	0	0	0	0	0	0	0	28.1	1888	1972	1389	667	0
Appliances	223.881	224	224	224	224	233.4	533.9	248	224	224	224	224	730	576	245	232	285	435	609	2405	1817	1650	830	293

Assuming that	0%	of	40	Watt bulbs are replaced with	15	Watt CFLs, and
	100%	of	40	Watt bulbs are replaced with	9	Watt CFLs:

Future Load Curve per Household (average Watts)

	Time (Hour of the Day)																							
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Lighting (all samples)	0	0	0	0	1	11	18	0	0	0	0	0	0	0	0	0	0	0	1	23	25	19	9	0
Lighting (by Bulb only)	0	0	0	0	0	9	18	0	0	0	0	0	0	0	0	0	0	0	0	21	22	16	8	0
Appliances	11	11	11	11	11	12	27	12	11	11	11	11	37	29	12	12	14	22	30	120	91	83	42	15
Total Watt-hours per day	Evening Peak Watt Hours (18:00 to 22:00)																		31	141	113	98	49	

Lighting (all samples)	107	Wh	76	Wh
Lighting (by Bulb only)	94	Wh	67	Wh
Appliances	657	Wh	366	Wh
TOTAL (by bulb+appl.)	**751**	**Wh**	**432**	Wh

Future Load Curve for Households (Watts)

	Time (Hour of the Day)																							
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Lighting (all samples)	0	0	0	0	10.7	227	365.4	2.69	0	0	0	0	0	0	0	0	0	0	16.1	463.4	493	371	181	0
Lighting (by Bulb only)	0	0	0	0	0	172.1	360	3.16	0	0	0	0	0	0	0	0	0	0	6.32	424.7	444	313	150	0
Appliances	224	224	224	224	224	233.4	533.9	248	224	224	224	224	730	576	245	232	285	435	609	2405	1817	1650	830	293

Lighting (all samples)	2,130	Wh
Lighting (by Bulb only)	1,873	Wh
Appliances	13,138	Wh

EXAMPLE LOAD CURVE FOR HOUSEHOLD 033:

Estimated Summer Load Curve for Household #033 (Watts)

	Time (Hour of the Day)																							
Load Type	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Lighting	0	0	0	0	0	0	80	0	0	0	0	0	0	0	0	0	0	0	0	120	80	40	0	0
Refrigerator	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63
Clothes Iron	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	57	0
Fan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	29	29	29	29
Television	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70	70	70	70	0
TOTAL	62.5	62.5	62.5	62.5	62.5	62.5	142.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	281.3	241	201	218	91.3
Total Watt-hours/day	2,301																							

AVERAGE OF LOAD CURVES FROM SURVEYED HOUSEHOLDS

	Average of Estimated Summer Load Curves for Households in Survey Sample (Watts)																							
	Time (Hour of the Day)																							
Load Type	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Lighting	0	0	0	0	2	50	81	1	0	0	0	0	0	0	0	0	0	0	4	103	110	82	40	0
Refrigerator	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Clothes Iron	0	0	0	0	0	0	14	1	0	0	0	0	19	12	0	0	2	2	2	45	12	5	1	0
Radio/Cassette	0.0	0.0	0.0	0.0	0.0	0.2	1.1	0.2	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.1	0.3	0.1	0.1	0.0	0.0
Fan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	5.3	1.0	0.4	1.3	2.8	6.7	16.4	18.3	17.3	11.5	3.4
Television	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	10.6	47.9	50.3	49.8	18.7	0.0
TOTAL	11.194	11.2	11.2	11.2	13.6	62.1	108	13	11.2	11.2	11.2	11.2	36.5	28.8	12.2	11.6	14.3	21.8	34	224	201	166	82.6	14.6
Total Watt-hours/day	1,134																							

FOR THE ENTIRE VILLAGE OF 500 HOUSEHOLDS, TOTAL LOAD CURVE IS:

	Estimated Summer Load Curve for Household Sector of Unhari (kW)																							
	Time (Hour of the Day)																							
Load Type	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Lighting	0	0	0	0	1	25	41	0	0	0	0	0	0	0	0	0	0	0	2	51	55	41	20	0
Refrigerator	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Clothes Iron	0	0	0	0	0	0	7	0	0	0	0	0	10	6	0	0	1	1	1	23	6	2	0	0
Radio/Cassette	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fan	0	0	0	0	0	0	0	0	0	0	0	0	3	3	1	0	1	1	3	8	9	9	6	2
Television	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	24	25	25	9	0
TOTAL	5.6	5.6	5.6	5.6	6.8	31.1	53.9	6.5	5.6	5.6	5.6	5.6	18.3	14.4	6.1	5.8	7.1	10.9	17.0	112	101	82.9	41.3	7.3
Total kWh/day	567																							

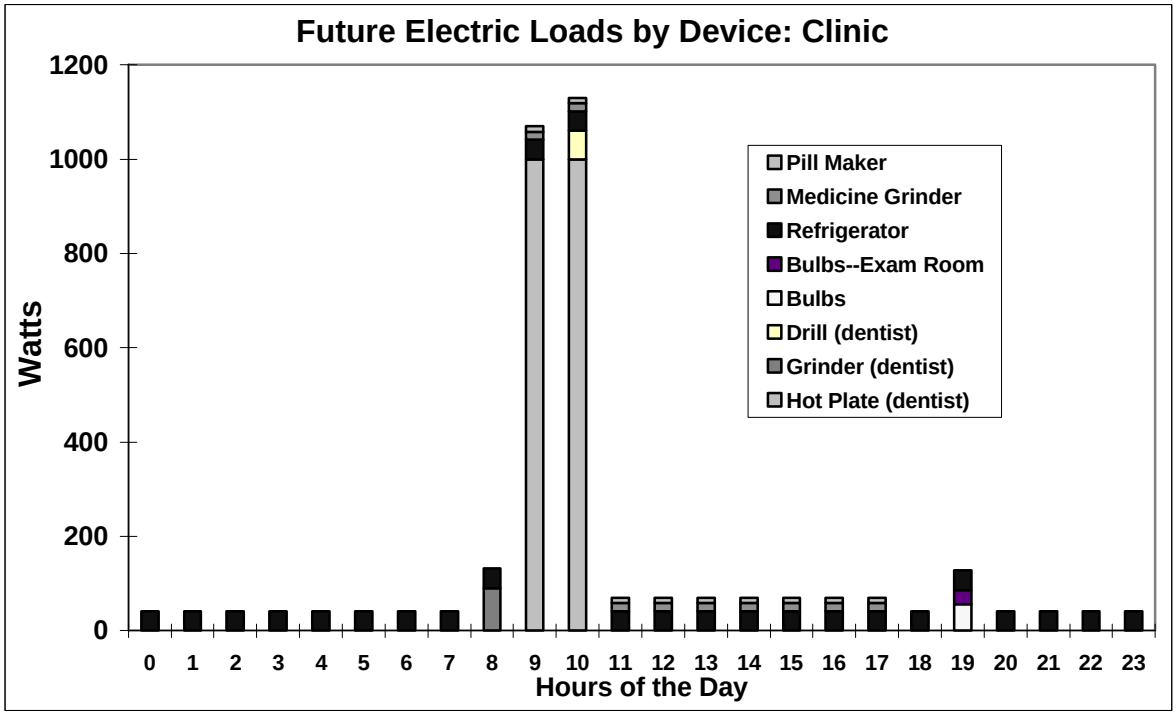
	Estimated Winter Load Curve for Household Sector of Unhari (kW)																							
	Time (Hour of the Day)																							
Load Type	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Lighting	0	0	0	0	1	25	41	41	20	0	0	0	0	0	0	0	0	28	51	51	55	41	20	0
Refrigerator	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Clothes Iron	0	0	0	0	0	0	7	0	0	0	0	0	10	6	0	0	1	1	1	23	6	2	0	0
Radio/Cassette	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Television	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	24	25	25	9	0
TOTAL	5.6	5.6	5.6	5.6	6.8	31.1	53.9	46.8	25.9	5.6	5.6	5.6	15.4	11.8	5.6	5.6	6.5	37.0	63.4	104	91	74.2	35.5	5.6
Total kWh/day	660																							

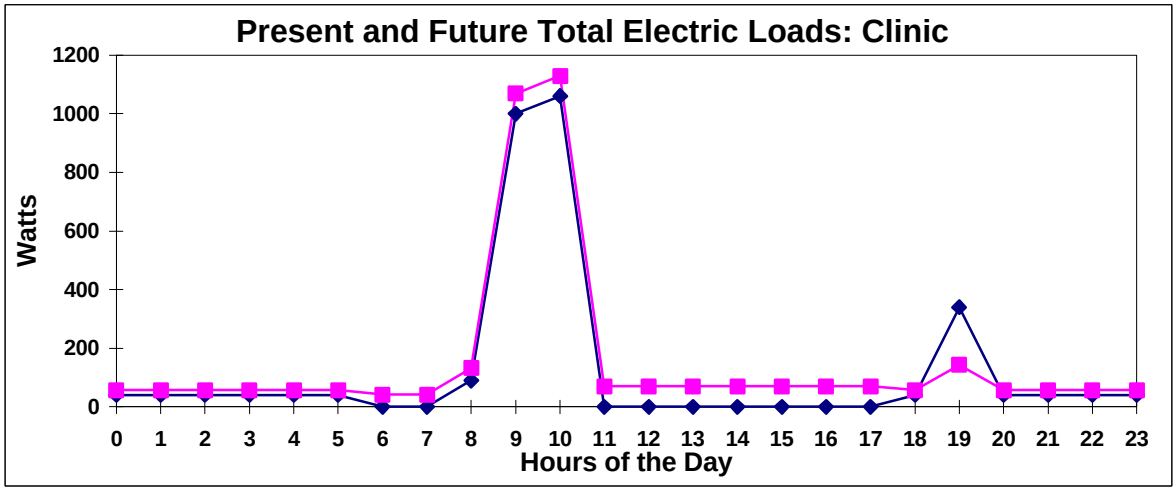
	Estimated Summer Load Curve for Non-Household Sectors of Unhari (kW)																							
	Time (Hour of the Day)																							
Sector/Load	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Medical/Dental Clinic	0.04	0.04	0.04	0.04	0.04	0.04	0	0	0.09	1	1.06	0	0	0	0	0	0	0	0.04	0.34	0.04	0.04	0.04	0.04
Kindergarten	0.04	0.04	0.04	0.04	0.04	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0.48	0.48	0.48	0.04	0.04	0.04
Guest House	0	0	0	0	0	0	0.12	0	0	0	0	0	0	0	0	0	0	0	0.12	0.42	0.42	0.42	0	0
Workshop	0	0	0	0	0	0	0	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	0	0	0	0	0	0	0
Bathing Facilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.48	0.48	0	0	0
Other Services	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	10	10	10	10	10	10.04	0.63	0.63	0.63	0.63
School	0	0	0	0	0	0	0	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	0	0	0	0	0	0	0
Domestic Water	0	0	0	0	0	0	14	14	14	0	0	14	14	14	0	0	0	14	14	14	14	0	0	0
Vegetable Irrigation	0	0	0	0	20	20	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Threshers	367	367	367	367	367	367	367	367	367	367	367	367	367	367	367	367	367	367	367	366.7	367	367	367	367
Rice Mill	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.25	86.3	86.3	86.3	86.3
TOTAL LOAD	454	454	454	454	474	474	488	513	493	480	480	493	493	493	489	489	489	477	478	479	469	454	454	454
Total kWh/day	11,424																							

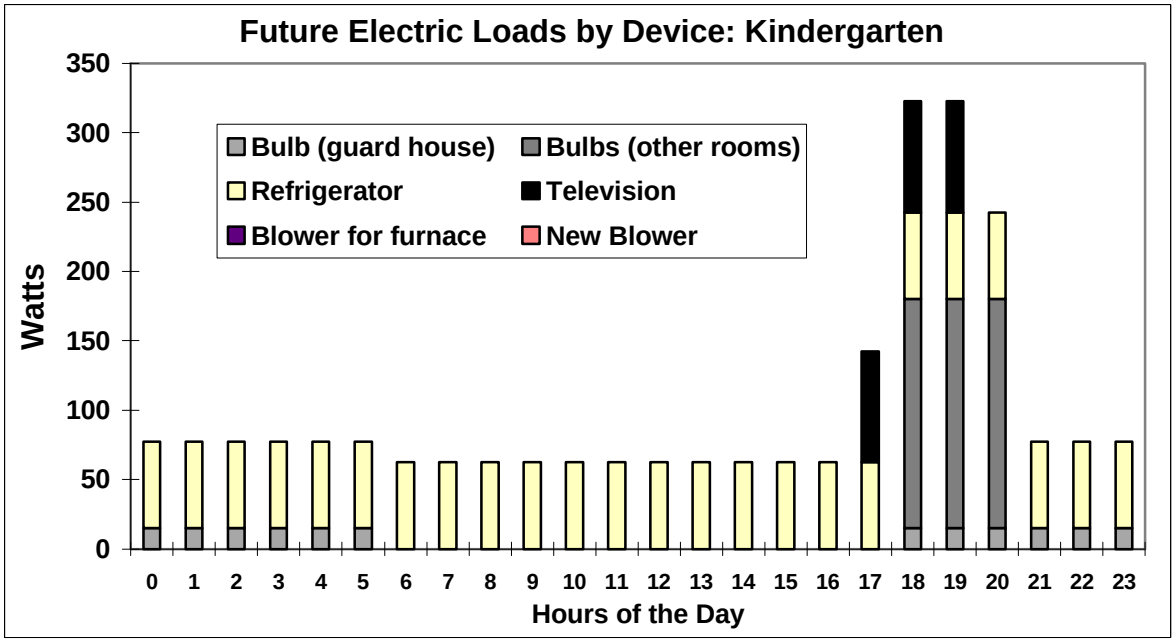
	Estimated Winter Load Curve for Non-Household Sectors of Unhari (kW)																							
	Time (Hour of the Day)																							
Sector/Load	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Medical/Dental Clinic	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.02	0.09	1	1.06	0	0	0	0	0	0.02	0.04	0.04	0.34	0.04	0.04	0.04	0.04
Kindergarten	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.02	0	0	0	0	0	0	0	0	0.24	0.48	0.48	0.48	0.48	0.04	0.04	0.04
Guest House	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.06	0.12	0.12	0.42	0.42	0.42	0	0
Workshop	0	0	0	0	0	0	0	7.34	7.34	7.34	7.34	7.34	7.34	7.34	7.34	7.34	7.34	0	0	0	0	0	0	0
Bathing Facilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.48	0.48	0	0	0
Other Services	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9.41	9.41	9.41	9.41	9.41	9.41	0	0	0	0
School	0	0	0	0	0	0.2	0.4	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	0.4	0.2	0	0	0	0	0
Domestic Water	0	0	0	0	0	0	14	14	14	0	0	14	14	14	0	0	0	14	14	14	14	0	0	0
Vegetable Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Threshers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Mill	86.25	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.25	86.3	86.3	86.3	86.3
TOTAL LOAD	86	86	86	86	86	87	101	109	109	96	96	109	109	109	104	104	104	111	111	111	102	87	86	86
Total kWh/day	2,360																							

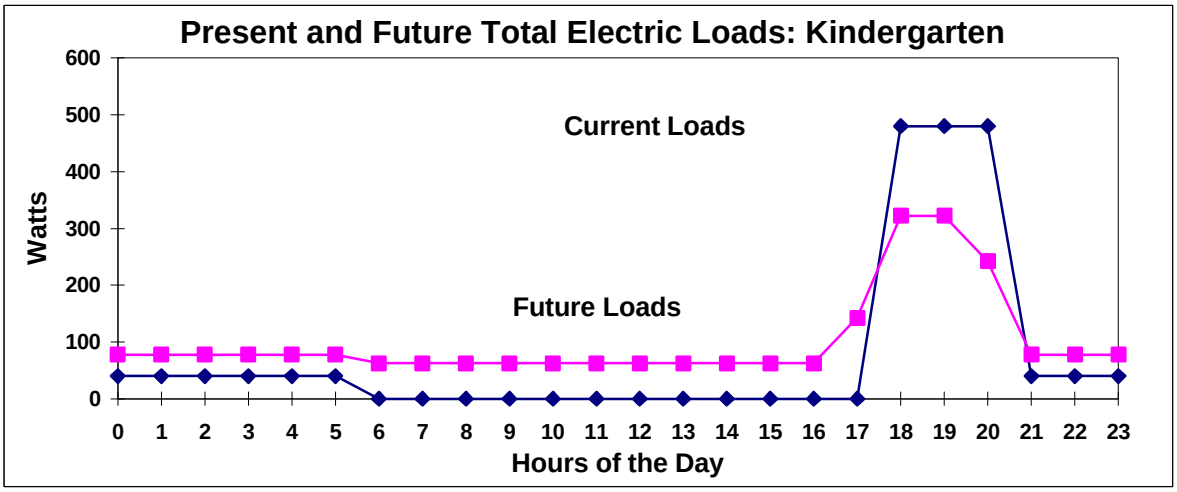
	Summary Estimated Summer Load Curve for Unhari (kW)																							
	Time (Hour of the Day)																							
Sector/Load	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Households	5.6	5.6	5.6	5.6	6.8	31.1	53.9	6.5	5.6	5.6	5.6	5.6	18	14	6.1	5.8	7.1	11	17	112	101	83	41	7.3
Services/School	0.705	0.71	0.71	0.71	0.71	0.71	0.75	1.71	1.8	2.71	2.77	1.71	1.71	1.71	11.1	11.1	11.1	10	10.7	11.76	2.05	1.13	0.71	0.71
Workshop	0	0	0	0	0	0	0	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	0	0	0	0	0	0	0
Domestic Water	0	0	0	0	0	0	14	14	14	0	0	14	14	14	0	0	0	14	14	14	14	0	0	0
Vegetable Irrigation	0	0	0	0	20	20	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Threshers	367	367	367	367	367	367	367	367	367	367	367	367	367	367	367	367	367	367	367	366.7	367	367	367	367
Rice Mill	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.25	86.3	86.3	86.3	86.3
TOTAL LOAD	459	459	459	459	480	505	542	520	499	486	486	499	511	507	495	494	496	488	495	591	570	537	495	461
Total kWh/day	11,991																							
Overall Load Factor	84.6%																							

	Summary Estimated Winter Load Curve for Unhari (kW)																							
	Time (Hour of the Day)																							
Sector/Load	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Households	5.6	5.6	5.6	5.6	6.8	31.1	53.9	47	26	5.6	5.6	5.6	15	12	5.6	5.6	6.5	37	63	104	91	74	36	5.6
Services/School	0.08	0.08	0.08	0.08	0.08	0.28	0.48	1.12	1.17	2.08	2.14	1.08	1.08	1.08	10.5	10.5	10.8	10.5	10.3	11.13	1.42	0.5	0.08	0.08
Workshop	0	0	0	0	0	0	0	7.34	7.34	7.34	7.34	7.34	7.34	7.34	7.34	7.34	7.34	0	0	0	0	0	0	0
Domestic Water	0	0	0	0	0	0	14	14	14	0	0	14	14	14	0	0	0	14	14	14	14	0	0	0
Vegetable Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Threshers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Mill	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.25	86.3	86.3	86.3	86.3
TOTAL LOAD	92	92	92	92	93	118	155	156	135	101	101	114	124	120	110	110	111	148	174	215	193	161	122	92
Total kWh/day	3,020																							
Overall Load Factor	58.5%																							


Future Electric Loads by Device: Clinic
Watts
1200
1000
800
600
400
200
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hours of the Day
Pill Maker
Medicine Grinder
Refrigerator
Bulbs--Exam Room
Bulbs
Drill (dentist)
Grinder (dentist)
Hot Plate (dentist)

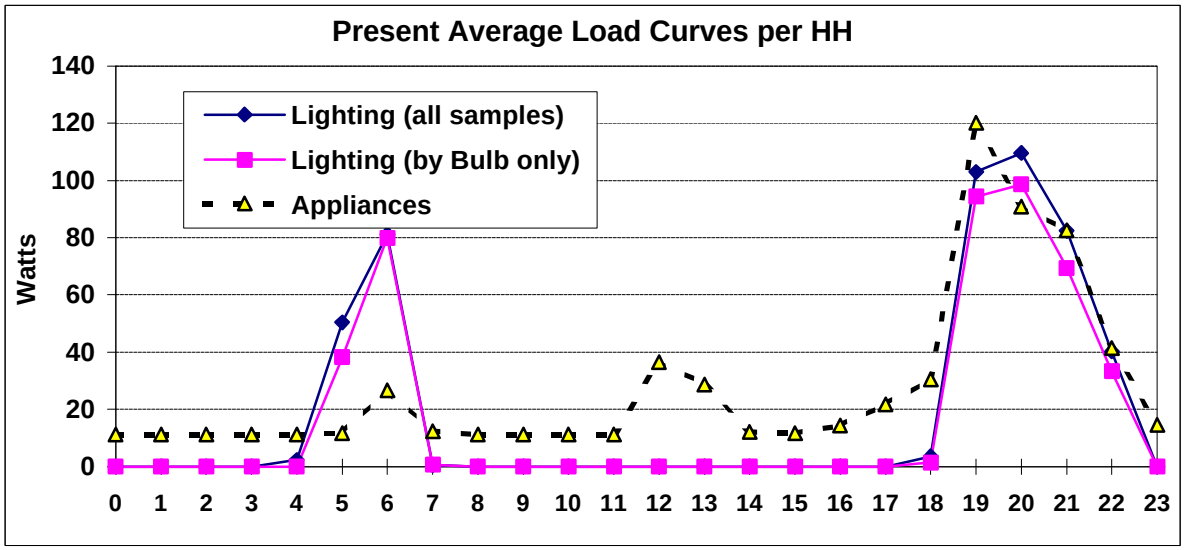

Present and Future Total Electric Loads: Clinic
Watts
1200
1000
800
600
400
200
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hours of the Day

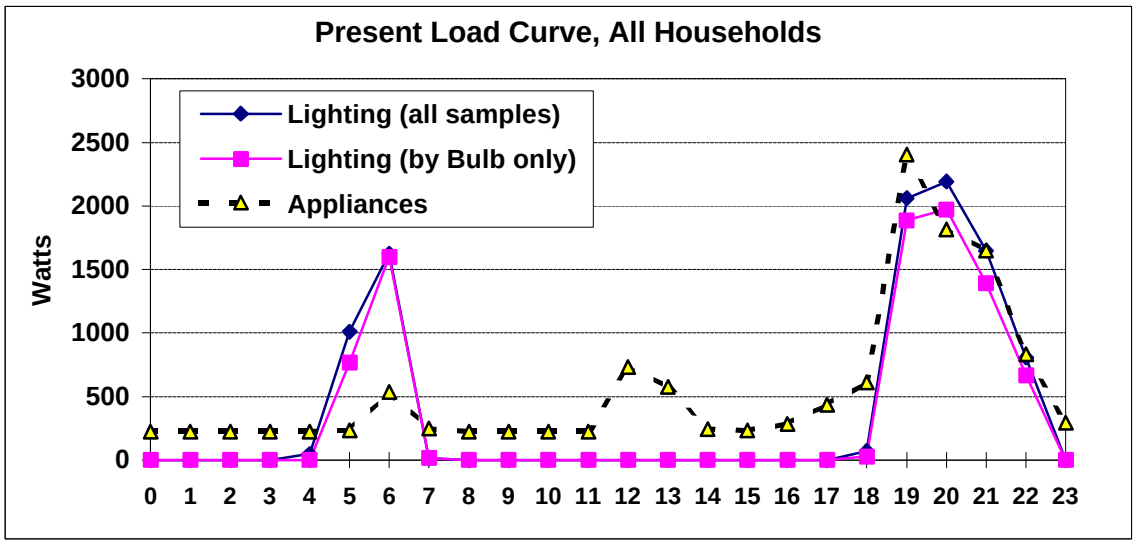

Future Electric Loads by Device: Kindergarten
Watts
350
300
250
200
150
100
50
0
Bulb (guard house)
Bulbs (other rooms)
Refrigerator
Television
Blower for furnace
New Blower
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hours of the Day

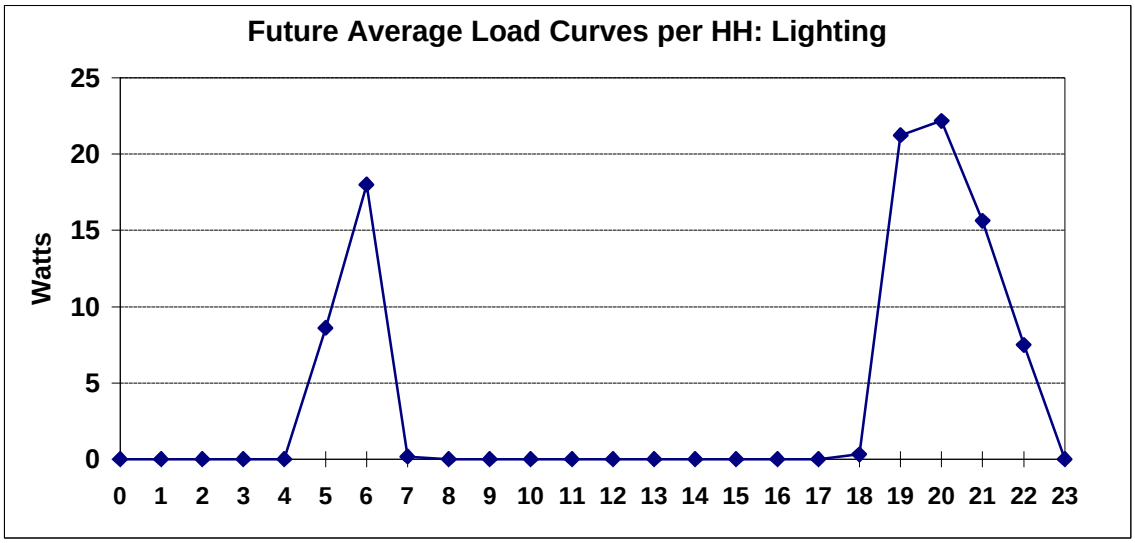

Present and Future Total Electric Loads: Kindergarten
Watts
600
500
400
300
200
100
0
Current Loads
Future Loads
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hours of the Day

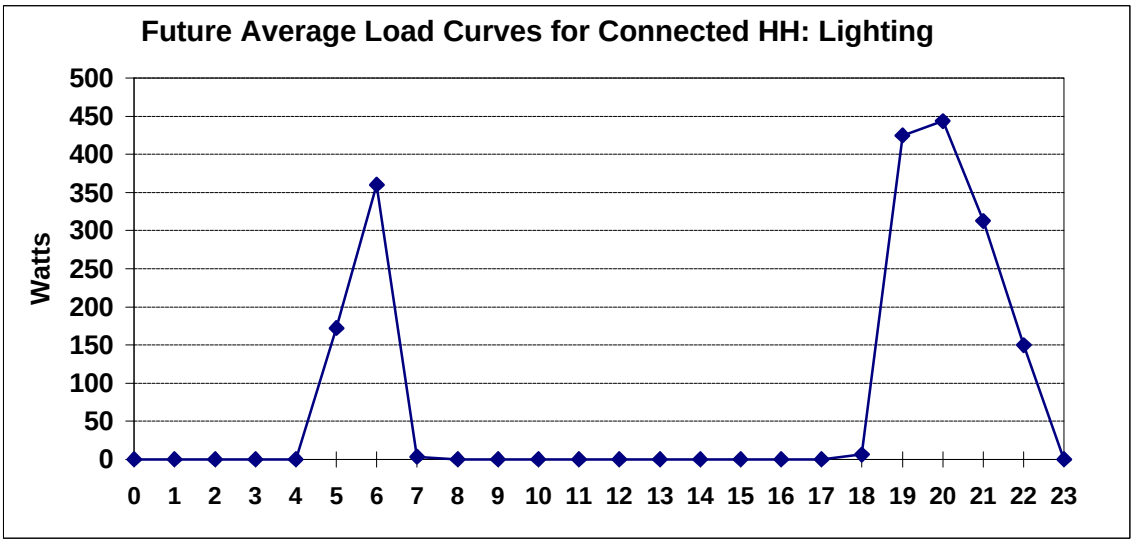
LOAD PROFILE ESTIMATES: DEMAND SIDE OF VILLAGE WIND POWER SYSTEM
Load Curves Based on Survey Data

Prepared by:
David Von Hippel
Date last modified:
6/7/99






Future Average Load Curves per HH: Lighting
Watts
25
20
15
10
5
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

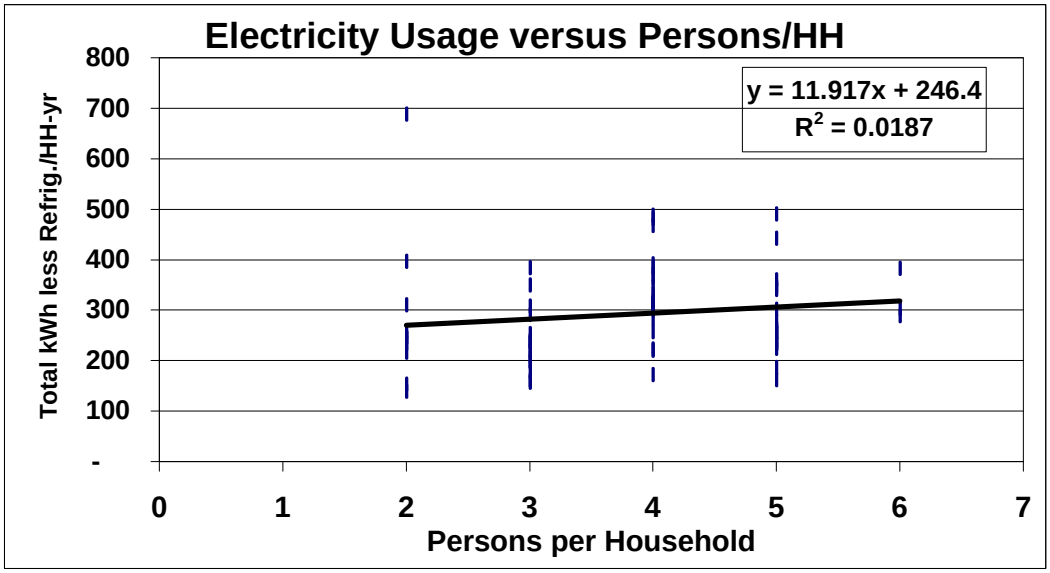

Future Average Load Curves for Connected HH: Lighting
Watts
500
450
400
350
300
250
200
150
100
50
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

ESTIMATES OF ANNUAL ENERGY USE BY FUEL: DEMAND SIDE OF VILLAGE WIND POWER SYSTEM
Household Sector Estimates Based on Survey Data

Prepared by:
David Von Hippel
Date last modified: 4/28/99

	Electricity (kWh per appliance/end-use per year)							Total	Persons
Household Number	Lighting	Refrigerator	Iron	Radio	Fan	TV	Total	w/o refr.	per HH
001	233.6	-	35.20	-	27.38	87.60	384	384	3
002	408.8	-	10.43	-	4.93	43.80	468	468	4
003	292.0	547.50	41.71	-	15.06	36.14	932	385	4
004	438.0	547.50	83.43	-	36.14	131.40	1,236	689	2
005	146.0	-	78.21	-	30.66	109.50	364	364	4
006	248.2	-	52.14	-	-	96.36	397	397	2
007	233.6	-	83.43	-	8.76	164.25	490	490	5
008	233.6	-	41.71	-	-	43.80	319	319	4
009	292.0	-	-	-	-	58.40	350	350	3
010	292.0	-	46.93	-	-	32.85	372	372	4
011	292.0	-	10.43	1.81	3.65	32.85	341	341	5
012	292.0	-	31.29	-	10.95	48.18	382	382	6
013	146.0	-	15.64	-	-	58.40	220	220	4
014	240.9	-	93.86	-	-	153.30	488	488	4
015	189.8	-	54.75	-	11.50	54.75	311	311	2
016	131.4	-	156.43	-	-	58.40	346	346	4
017	204.4	-	-	4.82	27.59	109.50	346	346	5
018	175.2	-	-	-	-	23.36	199	199	3
019	160.6	-	208.57	-	-	73.00	442	442	5
020	197.1	547.50	46.93	5.42	-	142.35	939	392	4
021	102.2	-	31.29	1.20	10.95	98.55	244	244	2
022	146.0	-	62.57	-	8.52	46.72	264	264	5
023	146.0	-	26.07	-	5.48	131.40	309	309	4
024	116.8	-	6.52	1.20	-	32.85	157	157	3
025	87.6	-	17.38	-	-	35.04	140	140	2
026	116.8	-	3.91	-	4.93	98.55	224	224	5
027	131.4	-	5.21	-	21.08	131.40	289	289	6
028	131.4	-	31.29	3.61	13.14	43.80	223	223	4
029	116.8	-	-	-	-	36.50	153	153	2
030	116.8	-	130.36	1.20	19.16	35.04	303	303	6
031	102.2	-	15.64	-	-	54.75	173	173	4
032	131.4	-	41.71	3.61	6.90	73.00	257	257	5
033	116.8	547.50	20.86	-	13.14	102.20	800	253	3
034	219.0	-	-	-	5.26	32.85	257	257	4
035	160.6	-	6.90	14.45	-	35.04	217	217	2
036	116.8	547.50	-	-	13.69	76.65	755	207	3
037	284.7	-	17.24	-	-	58.40	360	360	5
038	160.6	-	29.04	-	15.77	102.20	308	308	3
039	131.4	-	-	-	-	54.75	186	186	5
040	189.8	547.50	30.65	-	7.30	87.60	863	315	4
041	131.4	-	-	1.20	13.69	32.85	179	179	3
042	116.8	-	-	-	-	43.80	161	161	3
043	146.0	-	104.29	-	8.21	32.85	291	291	3
044	131.4	-	31.29	-	-	73.00	236	236	3
045	116.8	-	-	-	12.05	32.85	162	162	5
046	153.3	-	-	-	8.76	36.14	198	198	3
047	116.8	-	41.71	-	-	76.65	235	235	2
048	189.8	730.00	129.05	7.23	28.03	127.75	1,212	482	4
049	146.0	-	59.11	1.93	7.67	43.80	258	258	5
050	146.0	-	40.17	-	6.90	43.80	237	237	3
051	146.0	-	94.79	3.61	10.51	46.72	302	302	5
052	131.4	-	76.62	2.41	10.51	32.85	254	254	5
053	146.0	-	56.58	-	7.88	73.00	283	283	4
054	146.0	-	114.93	3.61	11.50	35.04	311	311	4
055	146.0	547.50	30.65	-	13.14	43.80	781	234	5
056	160.6	-	78.81	1.93	-	36.14	277	277	5
057	146.0	-	45.97	-	10.51	131.40	334	334	4
058	146.0	730.00	35.36	-	11.50	32.85	956	226	3
059	146.0	-	42.44	1.20	13.14	36.14	239	239	5
060	146.0	-	39.41	3.85	11.50	32.85	234	234	5
061	146.0	-	29.04	-	8.76	131.40	315	315	4
062	146.0	-	49.04	0.96	7.88	54.75	259	259	2
063	146.0	547.50	34.48	-	-	65.70	794	246	2
064	146.0	-	52.54	3.85	6.90	98.55	308	308	4
065	146.0	-	29.04	1.20	10.51	32.85	220	220	3
066	146.0	730.00	4.60	-	20.08	70.08	971	241	3
067	175.2	-	66.95	1.81	-	58.40	302	302	4
Total of 67 HH	11,578	6,570	2,855	72	562	4,481	26,118	19,548	255.00
Average of 67 HH	173	98.1	42.6	1.08	8.38	66.9	390	292	3.81

	Coal Briquettes (tonnes)				Probable		
	Reported	From Reported monthly cons.			Raw Coal	Rice Straw	Diesel
Household Number	Cook/Heat	Cook/Heat	Livestock	Total	Use (te)	kg	liters
001	2.50	1.50	1.20	2.70	2	0	0
002	2.00	1.80	0.90	2.70	2	0	6
003	2.50	1.80	0.90	2.70	2	0	3.6
004	1.80	2.45	0.58	3.02	2	0	0
005	2.50	1.15	1.15	2.30	2	0	4.8
006	2.50	2.00	1.20	3.20	2	0	3
007	2.70	1.87	0.94	2.81	2	0	12
008	2.40	2.38	-	2.38	2	0	12
009	2.60	2.26	0.87	3.13	2	0	24
010	2.00	1.80	0.90	2.70	2	0	18
011	2.00	2.30	0.72	3.02	2	0	6
012	4.00	3.60	1.50	5.10	4	0	12
013	2.00	1.68	1.01	2.69	2	0	3
014	2.00	1.83	0.61	2.44	2	1440	12
015	2.00	1.80	0.90	2.70	2	360	6
016	2.00	1.80	0.90	2.70	2	480	3
017	2.50	2.10	0.60	2.70	2	0	12
018	2.00	1.80	0.90	2.70	2	1200	12
019	2.50	2.10	-	2.10	2	0	6
020	2.50	2.02	1.01	3.02	2	0	12
021	2.50	2.59	1.15	3.74	2	0	12
022	2.50	2.02	1.01	3.02	2	0	6
023	2.50	1.80	1.20	3.00	2	1800	18
024	2.00	1.80	0.60	2.40	2	360	24
025	2.00	1.80	0.90	2.70	2	360	12
026	2.00	1.80	0.60	2.40	2	360	12
027	2.00	1.80	0.60	2.40	2	360	18
028	2.50	2.02	1.01	3.02	2	0	6
029	2.00	1.80	0.60	2.40	2	0	12
030	2.00	1.95	0.90	2.85	2	0	12
031	2.50	2.11	0.97	3.08	2	720	6
032	2.50	2.10	0.90	3.00	2	0	12
033	2.50	2.02	0.58	2.59	2	0	0
034	2.50	1.80	0.90	2.70	2	0	4.8
035	2.50	1.80	0.60	2.40	2	0	0
036	2.50	2.10	0.90	3.00	2	0	6
037	2.00	2.09	1.04	3.13	2	0	12
038	2.50	2.10	0.75	2.85	2	0	12
039	2.50	1.73	0.58	2.30	2	0	0
040	2.50	2.10	0.90	3.00	2	0	24
041	2.50	1.95	0.60	2.55	2	0	24
042	2.50	1.95	0.75	2.70	2	0	6
043	2.00	1.73	0.86	2.59	2	0	12
044	2.50	1.80	0.90	2.70	2	0	12
045	2.50	1.95	0.90	2.85	2	0	14.4
046	2.50	1.80	0.30	2.10	2	0	0
047	2.50	2.10	0.90	3.00	2	0	12
048	2.00	2.35	1.01	3.36	2	0	30
049	2.50	2.02	1.01	3.02	2	0	12
050	2.00	1.44	0.72	2.16	2	1200	24
051	2.50	2.02	1.01	3.02	2	0	18
052	2.50	1.95	0.90	2.85	2	0	0
053	2.50	1.95	0.90	2.85	2	0	12
054	2.00	1.95	0.90	2.85	2	0	0
055	2.00	2.18	1.01	3.19	2	0	12
056	2.50	2.02	1.01	3.02	2	0	0
057	2.50	2.10	0.90	3.00	2	0	18
058	2.50	1.80	0.90	2.70	2	0	0
059	2.50	1.80	0.90	2.70	2	0	12
060	2.50	1.80	0.90	2.70	2	0	0
061	2.00	1.80	0.75	2.55	2	0	18
062	2.50	1.80	0.90	2.70	2	0	12
063	2.50	1.80	0.90	2.70	2	0	0
064	2.50	1.80	0.90	2.70	2	0	12
065	2.50	1.73	0.86	2.59	2	0	0
066	2.00	2.10	-	2.10	2	0	0
067	2.00	1.66	0.97	2.62	2	0	12
Total of 67 HH	157.00	130.69	56.02	186.71	136.00	8,640	648.60
Average of 67 HH	2.34	1.95	0.84	2.79	2.03	128.96	9.68


Electricity Usage versus Persons/HH
y = 11.917x + 246.4
R2 = 0.0187
Total kWh less Refrig./HH-yr
800
700
600
500
400
300
200
100
-
0
1
2
3
4
5
6
7
Persons per Household

ESTIMATES OF ANNUAL ENERGY USE BY FUEL: DEMAND SIDE OF VILLAGE WIND POWER SYSTEM
Non-Household Sector Estimates Based on Survey Data and Estimated Parameters

Prepared by:
David Von Hippel
Date last modified: 6/7/99

Estimates of Electricity Use in Non-Household Applications

Medical and Dental Clinic

Lighting	475.2	kWh/yr	*results derived from Load tables in this workbook*
Equipment	784.8	kWh/yr	*results derived from Load tables in this workbook*

Kindergarten

Lighting	961.8	kWh/yr	*results derived from Load tables in this workbook*

Guest House

Lighting: 10 bulbs @ 60 Watts used for 2.5 hours per day on average yields 547.5 kWh/yr

Workshop

Equipment	Number	kW*	Hours/day	Duty %**	days/yr*	kWh/yr
Welding Machines	15	20	2	*30%*	*120*	21,600
Welding Machines (large)	1	60	2	*30%*	*120*	4,320
Air Hammer	1	*5*	2	*30%*	*120*	360
Boring Machine	1	*5*	2	*50%*	*120*	600
Lathes	2	*1.5*	8	*75%*	*120*	2,160
Other Power Tools	3	*1.5*	2	*30%*	*120*	324
TOTAL						29,364

* Figures in italics are rough estimates by Nautilus project team members. Other figures were supplied by farm officials.
** "Duty %" denotes Nautilus rough estimates as to the equivalent of the fraction of time during "in-use" hours that the tools listed are drawing their rated power.

Bathing Facilities

Lighting: 2 facilities each with 4 bulbs at 60 Watts each used for 2 hours each evening yields an estimate of 350.4 kWh/yr

Other Village Services

Figures below that are shown in italics are rough estimates by Nautilus project team members. Other figures were supplied by farm officials.

Lighting: 5 facilities each with 2.5 bulbs at *60* Watts each used for *6* hours each day yields an estimate of 1,643 kWh/yr

Hair Clippers: *2* clippers at *30* Watts used *6* hours per day and *260* days/yr yields an estimate of 93.6 kWh/yr

Hair Dryers: *2* dryers at *1,500* Watts used *6* hours per day and *260* days/yr yields an estimate of 4,680 kWh/yr

Electric Irons: *2* irons at *700* Watts average power usage, used *4* hours per day and *260* days/yr yields an estimate of 1,456 kWh/yr

Ice Cream Freezer: An ice cream freezer with a capacity of 2 cubic meters is reportedly in use. Assume that it consumes about *15* kWh per day, and is in use about *200* days per year yielding an estimate of 3,000 kWh/yr

Noodle Press: Noodle press is rated at 14 kW. Assume that it is used about *2* full-load hours per day and about *260* days per year yielding an estimate of 7,280 kWh/yr

Total Estimated Other Village Services Electricity Use: 18,152 kWh/yr

Primary/Secondary School

Figures below that are shown in italics are rough estimates by Nautilus project team members. Other figures were supplied by farm officials.

Lighting

28 rooms each with 2 60 Watt bulbs, each assumed in use *2.5* hours per day and *260* days per year, plus
10 rooms each with 1 40 Watt fluorescent lamp, each assumed in use *2.5* hours per day and *260* days per year, yields an estimate of 2,444 kWh/yr

Fans

4 fans at *50* Watts, each assumed in use an average of 5 hours per day during *3* months of the year yields an estimate of 91 kWh/yr

Televisions

2 televisions at *80* Watts, each assumed in use an average of 2 hours per day and *260* days per year, yields an estimate of 83 kWh/yr

Radios

4 radios at *10* Watts, each assumed in use an average of 2 hours per day and *260* days per year, yields an estimate of 21 kWh/yr

Water Pumping

Domestic Water Pump

Pump is rated at 14 kW and operates 10 hours per day yielding an estimate of 51,100 kWh/yr

Vegetable Irrigation Pump

Pump is rated at 20 kW and operates 4 hours per day during 3 months of the year yielding an estimate of 7,300 kWh/yr

Rice Irrigation Pump

Estimated on the basis of water applied. Total volume of water applied is 1.2 meters, which over an area of 800 hectares represents a total volume to be pumped of 9,600,000 cubic meters, or 1,200,000 m^3 per work team (with responsibility for 100 ha). As pumping capacity per work team is reportedly 250 liters per second, this implies that pumps are used for 4,800,000 seconds per year, or about 1,333 hours per rice growing season, equivalent to about 1.9 months per year of full-time operation, which is plausible. Assuming an average efficiency of 40% (power in to water transferred) and using the average pumping height of 2.00 meters, the implied electricity requirement to pump irrigation water over the course of the season (800 ha) is 4.70E+08 kJ or about 130,667 kWh, or 130.7 MWh

Rice Processing

Rice Thresher

Each of the 8 threshers are rated at 50 kW and operate 22 hours per day during 30 days of the year yielding an estimate of 264,000 kWh/yr

Rice Mill

Milling machines are rated at 90 kW total and operate 23 hours per day during 200 days of the year yielding an estimate of 414,000 kWh/yr

Coal Mine

Dwellings — There are 5 dwellings or buildings at the coal mine site. Assuming, based roughly on data from the Unhari household survey, that each dwelling uses *400* kWh per year of electricity, this implies electric consumption for lighting, entertainment, and other uses by the miners and support staff of 2,000 kWh/yr

Air Compressor — Air compressor used to operate a jackhammer in the coal mine reportedly is rated at 40 kW. It runs 16 hours/day. Assuming that the coal mine is active about *300* days/year, and that the compressor is on (compressing air) about *50%* of the time that it is in use, the implied use of electricity by the air compressor is about 96,000 kWh/yr

Electric Winch — Winch used to move coal and equipment in the mine reportedly is rated at 14 kW. It runs 16 hours/day. Assuming that the coal mine is active about *300* days/year, and that the winch is in use (as opposed to waiting for a load) about *50%* of the time that it is in use, the implied use of electricity by the winch is about 33,600 kWh/yr

Lighting in the Mine — No data was obtained on lighting in the coal mine, but it is virtually certain that some sort of electric lighting must be used. Assuming that approximately *0.5* kW of lighting is in continuous use during the 16 hours/day and *300* days/year that the mine is in operation, the total electricity use for mine lighting would 2,400 kWh/yr.

Total Electricity for mining operations	132,000	kWh/yr
Total reported coal production by mine	3,000	tonnes
Implied electricity use per tonne coal produced	44	kWh/tonne
Total Electricity for mine, including household use	134,000	kWh/yr

Upland Corn Production

Household Electricity Use — The corn-producing area includes a total of 10 households Assuming per-household use of electricity similar to that in the households surveyed at Unhari, or about *400* kWh/HH-yr, the total household electricity use in the corn-producing area would be 4,000 kWh/yr.

Water Pumping — A water pump rated at 4.5 kW is used for pumping water for use in households in the corn-producing area. Assuming that this pump is used *365* days per year and for about *3* hours per day, the implied electricity use for water pumping would be 4,928 kWh/yr.

Irrigation Water Pumping — A water pumps rated at 40 kW total are used for pumping water for irrigation in the corn-producing area. The pump is used 30 days per year and for about 6 hours per day, implying electricity use for water pumping of 7,200 kWh/yr.

Estimates of Coal Use in Non-Household Applications

Unit: tonnes raw coal (or equivalent in briquettes)

Facility or Area	Coal Use	
Clinic	2.5	(based on 3 te briquettes at an assumed coal/clay ratio of *4:1*)
Kindergarten	20	
Guest House	6	
Public Baths	8	
Primary/Secondary School	50	
Coal Mining Area*	*10*	
Corn Producing Area**	*20*	
Total of above	**116.5**	

* Estimated based on 5 buildings at 2 tonnes coal/yr (as in Unhari) each. Does not include coal losses during mining.

** Estimated based on 10 households at 2 tonnes coal/yr (as in Unhari) each.

Estimates of Petroleum Products Use in Non-Household Applications

Units: kilograms of fuel use

Facility or Area	Diesel	Petrol				
Clinic	50					
Kindergarten	*10*					
Guest House	*20*					
Public Baths	*10*					
Primary/Secondary School	*50*					
Motor Pool--Tractors	64,500		43	Tractors @	1.5	te/yr each
Motor Pool--Others	1,500	20,000				
Coal Transport	27,000		3,000	te coal @	5	te/trip
			with	45	kg diesel used per trip	
Coal Mining Area--HH	*50*					
Corn Producing Area--HH	*100*					
Diesel Generator	1,601		(see calculations below for generator)			
Total of above	**93,290**	**20,000**				

Note: Figures in *italics* are rough guesses based on the use of diesel in households for emergency lighting.

Estimate of use of diesel in diesel generator:

It was reported that a diesel generator with an electrical output of 20 kW is used at times when grid power is unavailable to power the water pump and to power the welding machines.
The diesel generator is reportedly used about 16 hours per month, and that the generator
The reported figures and assumptions above imply annual generation of 3840 kWh.
At an estimated overall efficiency of *20%* for the diesel genset, the total diesel fuel
use would be about 69.12 GJ, which, at 43.18 GJ/tonne
would be about 1,601 kg of diesel per year, about the same as one tractor.

ESTIMATES OF ANNUAL ENERGY USE BY FUEL: DEMAND SIDE OF VILLAGE WIND POWER SYSTEM
Summary Energy Balance for Unhari Village and its Satellite Operations

Prepared by:	
David Von Hippel	
Date last modified:	6/7/99

ASSUMPTIONS

Assumes that the main area of Unhari Village has 500 households

Coal heating value estimate	5250	kcal/kg, or
	22.0	GJ/tonne

Note: Village officials estimated that heat content of the coal usually used at Unhari at 6000 kcal/kg, with "lower quality" coal that is sometimes in use (and comes from the same mine) at about 5000 kcal/kg Coal samples from Unhari provided to the Nautilus project team were evaluated at somewhat under 5000 kcal per kg. The heating value estimate presented above therefore represents the Nautilus team's judgement as to a possible average figure for the coal heat content at Unhari.

Rice Straw Heating Value Estimate:	14	GJ/tonne
Diesel fuel heating value	43.18	GJ/tonne
Diesel fuel density	0.87	kg/liter
Petrol (gasoline) Heating Value	43.93	GJ/tonne

ESTIMATES OF ANNUAL ENERGY USE BY FUEL: DEMAND SIDE OF VILLAGE WIND POWER SYSTEM
Energy Use in Agriculture, Including Human and Animal Labor

Prepared by:
David Von Hippel
Date last modified: 6/2/99

Reconciliation of Tractor Use Estimates:

Total reported use of diesel fuel in tractors for field operations and transport at Unhari was 64.5 tonnes. Based on estimates provided in Annex 1 to the AREP report (See *Note 1*), fuel use for mechanized rice farming (that is, when adequate fuel is available) was estimated at 132 liters per hectare (a combination of diesel and gasoline), which, considering that the Unhari farm cultivates 800 hectares of rice, implies a total petroleum products consumption of 105,600 liters, or about 95.6 tonnes
Under "Crisis situation" conditions, the AREP report (Table 7 of Appendix 1) estimates total fuel use in rice cultivation of 26 liters per hectare, which if applied to the acreage at Unhari would yield a total of 20,800 liters, or 18.824 tonnes of tractor fuel (diesel).
In Table 1 of the AREP report, annual fuel use per tractor (presumably over all crop types) is indicated as a total of 1.6 tonnes per year for about 500 hours of work, including 350 hours as a transport vehicle and 150 hours for field work. This applies to the typical Chollima 28 hp tractor.
Table 5 of the AREP report, presenting a "Possible Allocation of fuel to achieve savings of 80 percent", suggest per-tractor use of a total of 400 hours (250 hours of transport and 150 of field work) for an average of about 1.32 tonnes of fuel per tractor year, although this is meant to apply to a smaller tractor population, and to and average over all crop types cultivated in the DPRK. As rice cultivation seems generally more fuel-intensive than cultivation of other crops, the Unhari report fo 1.5 tonnes per tractor seems plausible.

Given the above, three possiblities come to mind, none of which, it seems, can be ruled out at present:
First, the fuel consumption figures that were obtained from Unhari could have been misunderstood and/or overstated, so that less diesel per hectare was used than 1.5 tonnes per tractor, or some of that diesel was for other purposes, or the actual effective working population of tractors was less than the full complement reported.
Second, the fuel consumption figures for Unhari can be considered accurate, but Unhari receives a better supply of diesel fuel than the average North Korean farm, thus explaining the difference between the Unhari figures and the "crisis situation" AREP estimates.
Third, the AREP estimates could be inaccurate.
The point here is not to figure out the "right" figure for tractor diesel consumption, but to try and estimate from the level of diesel use what a reasonable value for maunal labor and draught animal labor might be for Unhari.

Estimate of Human and Animal Labor in Rice Cultivation:

Using the AREP value of 627 person hours per hectare under "crisis situation" conditions implies a total of 501,600 person hours for rice farming at Unhari, plus 552 person hours for each of the 50 hectares of vegetables (cabbage) cultivated at Unhari, yields a total of 529,200 person hours for farming per year. Assuming an average of 9 working hours per day, this is about 58,800 person days, or approximately 50 person days per worker, counting all workers in the 500 households in the village (with number of wage-earners per household as estimated from NI/KANPC survey results).
Work oxen inputs for rice cultivation are estimated at 30 hours per hectare in Table 7 of Appendix 1 of the AREP report, while work oxen inputs for cabbage farming are 12 hours per hectare annually.
These figures imply total on-farm draft animal use of 24,600 hours per year. Assuming these animals are used for approximately 5 to 8 hours per day, this would imply a total number of animal days of 3,075 to 4,920 Since most of the work to which oxen would be applied seems to be related to ploughing or transport, there are only a relatively few weeks in the season during which the oxen would be used. Making the assumption that the rice cultivation activities that oxen would be used for take place during 40 to 60 days per year, this implies that the village population of draft animals is about 51 to 123 animals. Although no figure for the total number of livestock at Unhari was obtained, it seemed to the NI team members that the stock of oxen was more likely to be at the lower end of this range (or possibly lower) than near the upper end. This could be explained by Unhari being favored, relative to other areas of the country, in diesel fuel supply, by our observations of draft animals populations at Unhari being incomplete, or by the AREP figures not being representative of the situation at Unhari.
Page 8 of Appendix 1 of the AREP report provides the following estimates for the power output of human and animal labor:
Humans: 75 Watts per person
Draft Animals: 500 Watts per animal.
Using these figures, one can calculate total use of human and draft animal energy as:
39,690 kWh of human energy for agriculture (rice and cabbage), and
12,300 kWh of draft animal energy.
These figures translate to:
143 GJ of Human power, and
44 GJ of Draft animal Power:

Human and Animal Labor in the Upland Corn Area:

NI team members were not told whether or not there was a tractor available and used in the upland corn producing area. Assuming that a tractor is in use there, and assuming that fuel shortages put operation of the corn-producing area in a regime similar to the AREP estimates of "crisis situation", the cultivation of the reported 30 hectares of corn would require 22 liters of fuel per hectare, assuming that the areas is "Class 1 or Class 2 land" (AREP designation, Table 7 of Appendix 1). This implies an annual consumption of 660 liters of diesel fuel. The same source lists manual labor requirements of 433 hours per hectare, assuming adequate fertilizer, and 66 hours per hectare of draft animal labor. These figures translate into 12,990 hours of human labor, or, for each of the reported 25 farmers in the upland corn areas, about 520 hours per year. Draft animal use would be 1,980 hours total, which could translate to a total of 248 to 396 animal days per year, or about (using the same work days assumptions as above) 4 to 10 draft animals.

From the AREP conversions of manual and animal labor provided as above, the use of human and draft animal energy in corn farming would be:

974 kWh of human energy for agriculture (rice and cabbage), and
990 kWh of draft animal energy.

These figures translate to: 3.5 GJ of Human power, and
3.6 GJ of Draft animal Power:

Human Labor in Coal Mining:

Based on the reported coal mine staff of 25 miners and supervisors, and assuming that each works about 250 days per year and 10 active hours per shift, the total mining labor would be about 62,500 man-hours, and at 75 Watts per person, this corresponds to 4,688 kWh, or 16.9 GJ.

Sources/Notes:

1 Reference to the "AREP" report are to the Democratic People's Republic of Korea, Agricultural Recovery and Environmental Protection (AREP) Programme, Identification of Investment Opportunities, of which Working Paper 1 is Irrigation and Civil Engineering, and Working Paper 2 is Agricultural Mechaization. The references in the worksheet above correspond to pages and tables in Working Paper 2.