

Appendix 表7.1-4 Comparison of Grid Electrification and SHS (72 Village Electrification)

	Specific consump	Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	residual value	Sum of NPV at 0 year	
<b>SHS Electrification</b>																									
No. of Villages	72																								
Households	13,149																								
Capacity	100	Wp																							
Annual consumption	1,919,789	kWh		1,919,789	1,919,789	1,919,789	1,919,789	1,919,789	1,919,789	1,919,789	1,919,789	1,919,789	1,919,789	1,919,789	1,919,789	1,919,789	1,919,789	1,919,789	1,919,789	1,919,789	1,919,789	1,919,789	0	11,899,296	
Distance from Grid	2,230	km																							(i = 0.15)
Investment costs (A)																									158,225,901
System	96.3	P/Wp	126,627,181																						110,110,592
Battery replace	500	P/piece				13,149,240				13,149,240								13,149,240					13,149,240	(4,383,080)	48,115,309
Operation & maintenance																									29,084,293
Village monitor	500	P/village/m		432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	2,677,636
Agent fee	5.00%	% of sales		631,164	631,164	631,164	631,164	631,164	631,164	631,164	631,164	631,164	631,164	631,164	631,164	631,164	631,164	631,164	631,164	631,164	631,164	631,164	631,164	631,164	3,912,097
BPC head office & local	276	P/house/y		3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	22,494,560
Total costs																									187,310,195
Costs/kWh																									15.7
Subsidy	80% of invest	P	101,301,745			10,519,392				10,519,392		10,519,392													108,973,813
<b>Recovery of Costs</b>																									
Tariff (fixed)	40	P/50Wp/m		12,623,270	12,623,270	12,623,270	12,623,270	12,623,270	12,623,270	12,623,270	12,623,270	12,623,270	12,623,270	12,623,270	12,623,270	12,623,270	12,623,270	12,623,270	12,623,270	12,623,270	12,623,270	12,623,270	12,623,270	12,623,270	78,241,948
Tariff (variable)																									0
Total																									78,241,948
% of cost recovery																									41.8%
<b>SHS Electrification</b>																									
No. of Villages	72																								
Households	13,149																								
Capacity	200	Wp																							
Annual consumption	3,839,578	kWh		3,839,578	3,839,578	3,839,578	3,839,578	3,839,578	3,839,578	3,839,578	3,839,578	3,839,578	3,839,578	3,839,578	3,839,578	3,839,578	3,839,578	3,839,578	3,839,578	3,839,578	3,839,578	3,839,578	3,839,578	0	23,798,593
Distance from Grid	2,230	km																							(i = 0.15)
Investment costs (A)																									316,451,803
System	96.3	P/Wp	253,254,362																						220,221,185
Battery replace	500	P/piece				26,298,480				26,298,480								26,298,480					26,298,480	(8,766,160)	96,230,618
Operation & maintenance																									32,996,391
Village monitor	500	P/village/m		432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	432,000	2,677,636
Agent fee	5.00%	% of sales		1,262,327	1,262,327	1,262,327	1,262,327	1,262,327	1,262,327	1,262,327	1,262,327	1,262,327	1,262,327	1,262,327	1,262,327	1,262,327	1,262,327	1,262,327	1,262,327	1,262,327	1,262,327	1,262,327	1,262,327	1,262,327	7,824,195
BPC head office & local	276	P/house/y		3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	3,629,190	22,494,560
Total costs																									349,448,194
Costs/kWh																									14.7
Subsidy	80% of invest	P	202,603,490			21,038,784				21,038,784		21,038,784													217,947,626
<b>Recovery of Costs</b>																									
Tariff (fixed)	40	P/50Wp/m		25,246,541	25,246,541	25,246,541	25,246,541	25,246,541	25,246,541	25,246,541	25,246,541	25,246,541	25,246,541	25,246,541	25,246,541	25,246,541	25,246,541	25,246,541	25,246,541	25,246,541	25,246,541	25,246,541	25,246,541	25,246,541	156,483,897
Tariff (variable)																									0
Total																									156,483,897
% of cost recovery																									44.8%

Appendix 表7.1-4 Comparison of Grid Electrification and SHS (72 Village Electrification)

	Specific consump	Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	residual value	Sum of NPV at 0 year		
<b>Grid Electrification</b>																										
Number of villages	72																									
Households	13,149																									
Annual consumption	12.2	kWh/m		1,925,049	1,925,049	1,925,049	1,925,049	1,925,049	1,925,049	1,925,049	1,925,049	1,925,049	1,925,049	1,925,049	1,925,049	1,925,049	1,925,049	1,925,049	1,925,049	1,925,049	1,925,049	1,925,049	1,925,049	11,931,897		
Distance from Grid	2230	km																						(i = 0.15)		
Investment costs (A)	102816	P/km	229,279,680																					(65,508,480)	149,839,812	
Connection costs	3000	P/House	39,447,720																					(11,270,777)	25,780,038	
Operation & maintenance	2.0%	% of (A)		4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	28,422,569	
Power generation or import cost	0.075	P/kWh		144,379	144,379	144,379	144,379	144,379	144,379	144,379	144,379	144,379	144,379	144,379	144,379	144,379	144,379	144,379	144,379	144,379	144,379	144,379	144,379	144,379	894,892	
Total costs																								204,937,313		
Costs/kWh																								17.2		
Subsidy	100% of invest	P	229,279,680																					199,373,635		
<b>Recovery of Costs</b>																										
Tariff (fixed)	0	P/House/m		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Tariff (variable)	0.2523	P/kWh		485,690	485,690	485,690	485,690	485,690	485,690	485,690	485,690	485,690	485,690	485,690	485,690	485,690	485,690	485,690	485,690	485,690	485,690	485,690	485,690	485,690	3,010,418	
Connection costs (RCS)			39,447,720																						34,302,365	
Total																									37,312,783	
% of cost recovery																									18.2%	
<b>Grid Electrification</b>																										
Number of villages	72																									
Households	13,149																									
Annual consumption	20	kWh/m		3,155,818	3,155,818	3,155,818	3,155,818	3,155,818	3,155,818	3,155,818	3,155,818	3,155,818	3,155,818	3,155,818	3,155,818	3,155,818	3,155,818	3,155,818	3,155,818	3,155,818	3,155,818	3,155,818	3,155,818	3,155,818	19,560,487	
Distance from Grid	2230	km																						(i = 0.15)		
Investment costs (A)	102816	P/km	229,279,680																					(65,508,480)	149,839,812	
Connection costs	3000	P/House	39,447,720																					(11,270,777)	25,780,038	
Operation & maintenance	2.0%	% of (A)		4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	28,422,569	
Power generation or import cost	0.075	P/kWh		236,686	236,686	236,686	236,686	236,686	236,686	236,686	236,686	236,686	236,686	236,686	236,686	236,686	236,686	236,686	236,686	236,686	236,686	236,686	236,686	236,686	1,467,037	
Total costs																									205,509,457	
Costs/kWh																									10.5	
<b>Recovery of Costs</b>																										
Tariff (fixed)	0	P/House/m		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Tariff (variable)	0.2523	P/kWh		796,213	796,213	796,213	796,213	796,213	796,213	796,213	796,213	796,213	796,213	796,213	796,213	796,213	796,213	796,213	796,213	796,213	796,213	796,213	796,213	796,213	796,213	4,935,111
Connection costs (RCS)			39,447,720																						34,302,365	
Total																									39,237,476	
% of cost recovery																									19.1%	
<b>Grid Electrification</b>																										
Number of villages	72																									
Households	13,149																									
Annual consumption	50	kWh/m		7,889,544	7,889,544	7,889,544	7,889,544	7,889,544	7,889,544	7,889,544	7,889,544	7,889,544	7,889,544	7,889,544	7,889,544	7,889,544	7,889,544	7,889,544	7,889,544	7,889,544	7,889,544	7,889,544	7,889,544	7,889,544	48,901,218	
Distance from Grid	2230	km																						(i = 0.15)		
Investment costs (A)	102816	P/km	229,279,680																					(65,508,480)	149,839,812	
Connection costs	3000	P/House	39,447,720																					(11,270,777)	25,780,038	
Operation & maintenance	2.0%	% of (A)		4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	28,422,569	
Power generation or import cost	0.075	P/kWh		591,716	591,716	591,716	591,716	591,716	591,716	591,716	591,716	591,716	591,716	591,716	591,716	591,716	591,716	591,716	591,716	591,716	591,716	591,716	591,716	591,716	3,667,591	
Total costs																									207,710,012	
Costs/kWh																									4.2	
<b>Recovery of Costs</b>																										
Tariff (fixed)	0	P/House/m		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Tariff (variable)	0.2523	P/kWh		1,990,532	1,990,532	1,990,532	1,990,532	1,990,532	1,990,532	1,990,532	1,990,532	1,990,532	1,990,532	1,990,532	1,990,532	1,990,532	1,990,532	1,990,532	1,990,532	1,990,532	1,990,532	1,990,532	1,990,532	1,990,532	12,337,777	
Connection costs (RCS)			39,447,720																						34,302,365	
Total																									46,640,142	
% of cost recovery																									22.5%	
<b>Grid Electrification</b>																										
Number of villages	72																									
Households	13,149																									
Annual consumption	100	kWh/m		15,779,088	15,779,088	15,779,088	15,779,088	15,779,088	15,779,088	15,779,088	15,779,088	15,779,088	15,779,088	15,779,088	15,779,088	15,779,088	15,779,088	15,779,088	15,779,088	15,779,088	15,779,088	15,779,088	15,779,088	15,779,088	97,802,435	
Distance from Grid	2230	km																						(i = 0.15)		
Investment costs (A)	102816	P/km	229,279,680																					(65,508,480)	149,839,812	
Connection costs	3000	P/House	39,447,720																					(11,270,777)	25,780,038	
Operation & maintenance	2.0%	% of (A)		4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	4,585,594	28,422,569	
Power generation or import cost	0.075	P/kWh		1,183,432	1,183,432	1,183,432	1,183,432	1,183,432	1,183,432	1,183,432	1,183,432	1,183,432	1,183,432	1,183,432	1,183,432	1,183,432	1,183,432	1,183,432	1,183,432	1,183,432	1,183,432	1,183,432	1,183,432	1,183,432	7,335,183	
Total costs																									211,377,603	
Costs/kWh																									2.2	
<b>Recovery of Costs</b>																										

Appendix 表7.1-5-1 Comparison of PV Mini-Grid Electrification and SHS

Variable	Units	Unit Cost	Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	residual value	Sum of NPV at 0 year
<b>SHS Electrification</b>																									
Households(H)																									
Capacity	50																								
Annual consumption	0.365	3650	kWp/y		3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650		22,624
Distance from Grid	0		km																						(i = 0.15)
Investment costs (A)		96.3	P/Wp	240,750																					209,348
Battery replace		500	P				25,000						25,000						25,000				25,000		91,479
Operation & maintenance: village		500	P/Village/m		6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000		37,189
Agent fee		0.05	%		1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200		7,438
:Head office	276	276	P/H/y		13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800		85,536
Total																									430,990
<b>Average electricity cost</b>																									
<b>Mini-Grid Electrification</b>																									
Households	50																								
Capacity	50		Wp																						
Annual consumption		3650			3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650		22,624
Distance from Grid																									(i = 0.15)
Investment costs (A)		72.2	P/Wp	180,500																					156,957
Battery replace		375	P				18,750						18,750						18,750				18,750		68,609
Connection costs		4500																							195,652
Operation & maintenance: village		1500	P/Village/m		18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000		111,568
Agent fee		0.05	%		1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200		7,438
:Head office	276	276	P/Wp/y		13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800		85,536
Total																									625,760
<b>Average electricity cost</b>																									
<b>SHS Electrification</b>																									
Households(H)	50																								
Capacity	100		Wp																						
Annual consumption	0.365	7300	kWp/y		7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300		45,247
Distance from Grid	0		km																						(i = 0.15)
Investment costs (A)		96.3	P/Wp	481,500																					418,696
Battery replace		500	P				50,000						50,000						50,000				50,000		182,959
Operation & maintenance: village		500	P/Village/m		6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000		37,189
Agent fee		0.05	%		2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400		14,876
:Head office	276	276	P/H/y		13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800		85,536
Total																									739,255
<b>Average electricity cost</b>																									
<b>Mini-Grid Electrification</b>																									
Households	50																								
Capacity	100		Wp																						
Annual consumption		7300			7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300		45,247
Distance from Grid																									(i = 0.15)
Investment costs (A)		72.2	P/Wp	361,000																					313,913
Battery replace		375	P				37,500						37,500						37,500				37,500		137,219
Connection costs		4500																							195,652
Operation & maintenance: village		1500	P/Village/m		18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000		111,568
Agent fee		0.05	%		2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400		14,876
:Head office	276	276	P/Wp/y		13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800		85,536
Total																									858,764

Appendix 表7.1-5-2 Comparison of PV Mini-Grid Electrification and SHS

	Variable	Units	Unit Cost	Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	residual value	Sum of NPV at 0 year	
SHS Electrification	Households(H)	50																									
	Capacity	200		Wp																							
	Annual consumption	0.365	14600	kWh/y		14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	90,494	
	Distance from Grid	0		km																						(t = 0.15)	
	Investment costs (A)		96.3	P/Wp	963,000																					837,391	
	Battery replace		500	P		6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	37,189	
	Operation & maintenance: village		500	P/Village/m		4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	29,752
	Agent fee		0.05	%		13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	85,536
	:Head office	276		P/H/y																						1,355,785	
	Total																									14,98	
	Average electricity cost																										
Mini-Grid Electrification	Households	50																									
	Capacity	200		Wp																							
	Annual consumption		14600			14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	90,494	
	Distance from Grid																									(t = 0.15)	
	Investment costs (A)		72.2	P/Wp	722,000																					627,826	
	Battery replace		375	P		75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	274,438	
	Connection costs		4500																							195,652	
	Operation & maintenance: village		1500	P/Village/m		18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	111,568	
	Agent fee		0.05	%		4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	29,752
	:Head office		276	P/Wp/y		13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	85,536
	Total																									1,324,771	
	Average electricity cost																									14.64	
SHS Electrification	Households(H)	50																									
	Capacity	300		Wp																							
	Annual consumption	0.365	21900	kWh/y		21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	135,741	
	Distance from Grid	0		km																						(t = 0.15)	
	Investment costs (A)		96.3	P/Wp	1,444,500																					1,256,087	
	Battery replace		500	P		6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	548,876	
	Operation & maintenance: village		500	P/Village/m		7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	44,627	
	Agent fee		0.05	%		13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	85,536
	:Head office	276		P/H/y																						1,972,315	
	Total																									14.53	
	Average electricity cost																										
Mini-Grid Electrification	Households	50																									
	Capacity	300		Wp																							
	Annual consumption		21900			21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	135,741	
	Distance from Grid																									(t = 0.15)	
	Investment costs (A)		72.2	P/Wp	1,083,000																					941,739	
	Battery replace		375	P		112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	411,657	
	Connection costs		4500																							195,652	
	Operation & maintenance: village		1500	P/Village/m		18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	111,568	
	Agent fee		0.05	%		7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	44,627	
	:Head office		276	P/Wp/y		13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	13,800	85,536	
	Total																									1,790,779	
	Average electricity cost																									13.19	

Appendix 表7.1-5-3 Comparison of PV Mini-Grid Electrification and SHS

	Variable	Units	Unit Cost	Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	residual value	Sum of NPV at 0 year		
SHS Electrification	Households(H)	100																										
	Capacity	50		Wp																								
	Annual consumption	0.365	7300	kWh/yr		7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	45,247		
	Distance from Grid	0		km																						(i = 0.15)		
	Investment costs (A)		96.3	P/Wp	481,500																					418,696		
	Battery replace		500	P								50,000															182,959	
	Operation & maintenance: village		500	P/Village/m		6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000		37,189	
	Agent fee		0.05	%		2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400		14,876	
	:Head office	276	276	P/H/y		27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600		171,071	
	Total																										824,790	
Average electricity cost																												
Mini-Grid Electrification																												
SHS Electrification	Households(H)	100																										
	Capacity	50		Wp																								
	Annual consumption	0.365	7300	kWh/yr		7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300			
	Distance from Grid	0		km																								
	Investment costs (A)		72.2	P/Wp	361,000																							
	Battery replace		375	P																								
	Connection costs		4500																									
	Operation & maintenance: village		1500	P/Village/m		18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000		111,568	
	Agent fee		0.05	%		2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400		14,876
	:Head office	276	276	P/Wp/y		27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600		171,071
Total																										1,139,951		
Average electricity cost																												
SHS Electrification																												
SHS Electrification	Households(H)	100																										
	Capacity	100		Wp																								
	Annual consumption	0.365	14600	kWh/yr		14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600			
	Distance from Grid	0		km																								
	Investment costs (A)		96.3	P/Wp	963,000																							
	Battery replace		500	P																								
	Connection costs		33333																									
	Operation & maintenance: village		500	P/Village/m		6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000		37,189	
	Agent fee		0.05	%		4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800		29,752
	:Head office	276	276	P/H/y		27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600		171,071
Total																										1,441,320		
Average electricity cost																												
Mini-Grid Electrification																												
SHS Electrification	Households(H)	100																										
	Capacity	100		Wp																								
	Annual consumption	0.365	14600	kWh/yr		14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600			
	Distance from Grid	0		km																								
	Investment costs (A)		72.2	P/Wp	722,000																							
	Battery replace		375	P																								
	Connection costs		4500																									
	Operation & maintenance: village		1500	P/Village/m		18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000		111,568	
	Agent fee		0.05	%		4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800		29,752
	:Head office	276	276	P/Wp/y		27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600		171,071
Total																										1,605,959		
Average electricity cost																												
SHS Electrification																												
Total																												
17.75																												

Appendix 表 7.1-5-4 Comparison of PV Mini-Grid Electrification and SHS

	Variable	Units	Unit Cost	Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	residual value	Sum of NPV at 0 year			
SHS Electrification	Households(H)	100																											
	Capacity	200	Wp																										
	Annual consumption	0.365	kWh/phy	29200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	180,988		
	Distance from Grid	0	km																								(i = 0.15)		
	Investment costs (A)			96.3	P/Wp	1,926,000																					1,674,783		
	Battery replace			500	P			200,000																200,000				731,834	
	Operation & maintenance: village			500	P/Village/m		6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000		37,189	
	Agent fee			0.05	%		9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600		59,503	
	:Head office	276	P/H/y				27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600		171,071	
	Total																											2,674,380	
Average electricity cost																											14.78		
Mini-Grid Electrification	Households	100																											
	Capacity	200	Wp																										
	Annual consumption			29200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200		180,988	
	Distance from Grid																											(i = 0.15)	
	Investment costs (A)			72.2	P/Wp	1,444,000																						1,255,652	
	Battery replace			375	P			150,000																	150,000			548,876	
	Connection costs			4500																								391,304	
	Operation & maintenance: village			1500	P/Village/m		18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000		111,568	
	Agent fee			0.05	%		9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600		59,503	
	:Head office	276	P/Wp/y				27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600		171,071	
Total																											2,537,974		
Average electricity cost																											14.02		
SHS Electrification	Households(H)	100																											
	Capacity	300	Wp																										
	Annual consumption	0.365	kWh/phy	43800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800		271,483	
	Distance from Grid	0	km																									(i = 0.15)	
	Investment costs (A)			96.3	P/Wp	2,889,000																						2,512,174	
	Battery replace			500	P			300,000																	300,000			1,097,751	
	Operation & maintenance: village			500	P/Village/m		6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000		37,189	
	Agent fee			0.05	%		14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400		89,255	
	:Head office	276	P/H/y				27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600		171,071
	Total																											3,907,440	
Average electricity cost																											14.39		
Mini-Grid Electrification	Households	100																											
	Capacity	300	Wp																										
	Annual consumption			43800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800		271,483	
	Distance from Grid																											(i = 0.15)	
	Investment costs (A)			72.2	P/Wp	2,166,000																						1,883,478	
	Battery replace			375	P			225,000																	225,000			823,313	
	Connection costs			4500																								391,304	
	Operation & maintenance: village			1500	P/Village/m		18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000		111,568	
	Agent fee			0.05	%		14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400		89,255	
	:Head office	276	P/Wp/y				27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600	27,600		171,071
Total																											3,469,990		
Average electricity cost																											12.78		

Appendix 表7.1-5-5 Comparison of PV Mini-Grid Electrification and SHS

	Variable	Units	Unit Cost	Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	residual value	Sum of NPV at 0 year
SHS Electrification	Households(H)	200																								
	Capacity	50	Wp																							
	Annual consumption	0.365	14600	kWph/y		14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	90,494
	Distance from Grid	0	96.3	km																						(i=0.15)
	Investment costs (A)		500	P/Wp	963,000																					837,391
	Battery replace		500	P				100,000																		365,917
	Operation & maintenance: village		0.05	P/Village/m		6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	37,189
	Agent fee		276	%		4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	29,752
	:Head office	276	276	P/H/y		55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	342,142
	Total																									1,612,392
	Average electricity cost																									17.82
Mini-Grid Electrification	Household	200																								
	Capacity	50	Wp																							
	Annual consumption		14600			14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	14,600	90,494
	Distance from Grid	2.9	72.2		722,000																					(i=0.15)
	Investment costs (A)		375	P/Wp																						627,826
	Battery replace		4500	P	900,000																					782,609
	Connection costs		1500	P/Village/m		18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	111,568
	Operation & maintenance: village		0.05	%		4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	29,752
	Agent fee		276	P/Wp/y		55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	342,142
	:Head office																									2,168,335
	Total																									23,96
	Average electricity cost																									
SHS Electrification	Households(H)	200																								
	Capacity	100	Wp																							
	Annual consumption	0.365	29200	kWph/y		29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	180,988
	Distance from Grid		96.3	km																						(i=0.15)
	Investment costs (A)		500	P/Wp	1,926,000																					1,674,783
	Battery replace		500	P				200,000																		731,834
	Operation & maintenance: village		500	P/Village/m		6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	37,189
	Agent fee		276	%		9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	59,503
	:Head office	276	276	P/H/y		55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	342,142
	Total																									2,845,451
	Average electricity cost																									15.72
Mini-Grid Electrification	Household	200																								
	Capacity	100	Wp																							
	Annual consumption		29200			29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	29,200	180,988
	Distance from Grid		72.2		1,444,000																					(i=0.15)
	Investment costs (A)		375	P/Wp																						1,255,652
	Battery replace		4500	P	900,000																					548,676
	Connection costs		1500	P/Village/m		18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	782,609
	Operation & maintenance: village		0.05	%		9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	59,503
	Agent fee		276	P/Wp/y		55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	342,142
	:Head office																									3,100,350
	Total																									17,13
	Average electricity cost																									

Appendix 表7.1-5-6 Comparison of PV Mini-Grid Electrification and SHS

Variable	Units	Unit Cost	Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	residual value	Sum of NPV at 0 year
<b>SHS Electrification</b>																									
Households(H)	200																								
Capacity	Wp																								
Annual consumption	0.365	58400	kWp/ly		58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	361,977
Distance from Grid	0		km																						(t = 0.15)
Investment costs (A)		96.3	P/Wp	3,852,000																					3,349,565
Battery replace		500	P							400,000															1,463,668
Operation & maintenance: village		500	P/Village/m		6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	37,189
Agent fee		0.05	%		19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	119,006
:Head office	276	276	P/Hly		55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	342,142
Total																									5,311,371
Average electricity cost																									14.67
<b>Mini-Grid Electrification</b>																									
Households	200																								
Capacity	200		Wp																						
Annual consumption		58400			58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	361,977
Distance from Grid	2.9																								(t = 0.15)
Investment costs (A)		72.2	P/Wp	2,888,000																					2,511,304
Battery replace		375	P							300,000															1,097,751
Connection costs		4500																							782,609
Operation & maintenance: village		1500	P/Village/m		18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	111,568
Agent fee		0.05	%		19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	19,200	119,006
:Head office	276	276	P/Wp/ly		55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	342,142
Total																									4,964,381
Average electricity cost																									13.71
<b>SHS Electrification</b>																									
Households(H)	200																								
Capacity	300		Wp																						
Annual consumption	0.365	87600	kWp/ly		87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	542,965
Distance from Grid			km																						(t = 0.15)
Investment costs (A)		96.3	P/Wp	5,778,000																					5,024,348
Battery replace		500	P							600,000															2,195,502
Operation & maintenance: village		500	P/Village/m		6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	37,189
Agent fee		0.05	%		28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	178,509
:Head office	276	276	P/Hly		55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	342,142
Total																									7,777,691
Average electricity cost																									14.32
<b>Mini-Grid Electrification</b>																									
Households	200																								
Capacity	300		Wp																						
Annual consumption		87600			87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	542,965
Distance from Grid			km																						(t = 0.15)
Investment costs (A)		72.2	P/Wp	4,332,000																					3,766,957
Battery replace		375	P							450,000															1,646,627
Connection costs		4500																							782,609
Operation & maintenance: village		1500	P/Village/m		18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	111,568
Agent fee		0.05	%		28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	178,509
:Head office	276	276	P/Wp/ly		55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	55,200	342,142
Total																									6,828,411
Average electricity cost																									12.58

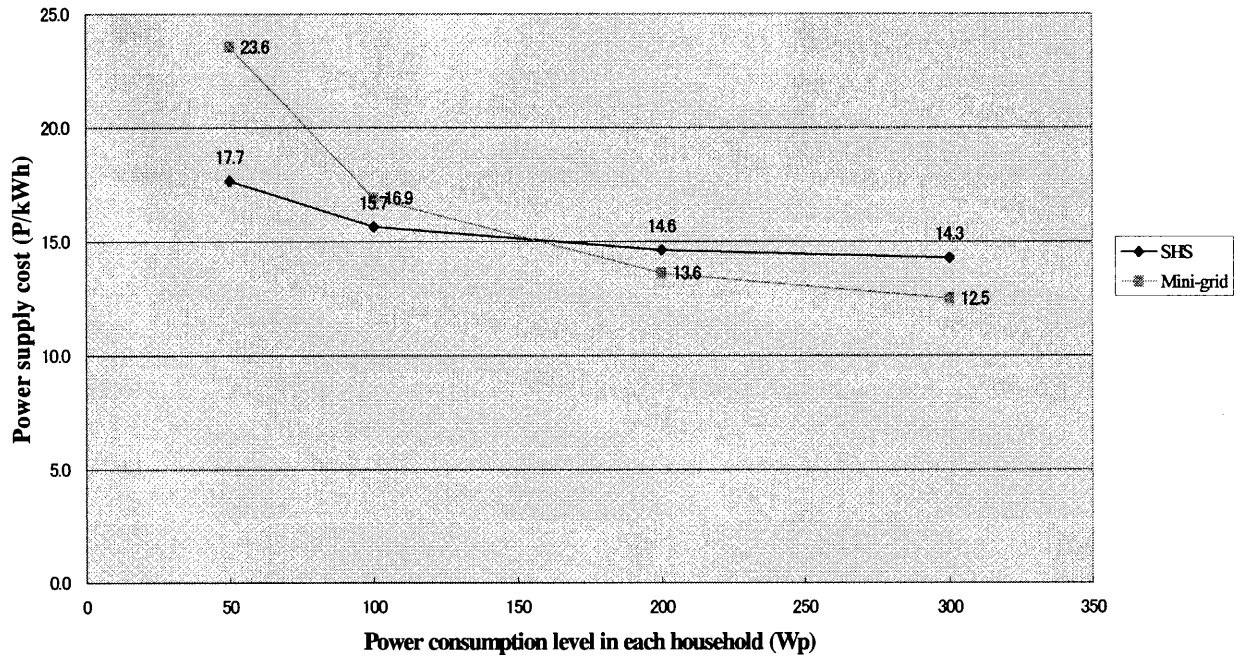


Appendix 表 7.1-5-7 Comparison of PV Mini-Grid Electrification and SHS

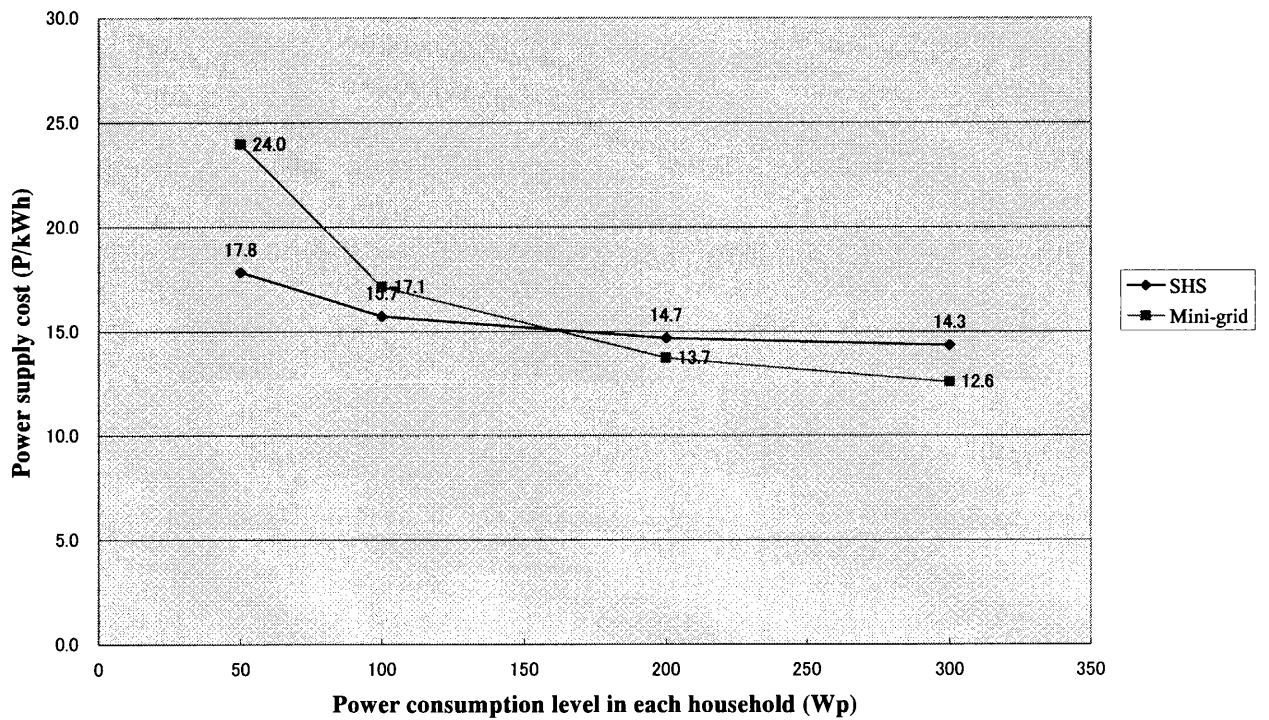
	Variable	Units	Unit Cost	Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	residual value	Sum of NPV at 0 year			
SHS Electrification	Households(H)	300																											
	Capacity	50		Wp																									
	Annual consumption	0.365	21900	kWh/y	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	135,741			
	Distance from Grid			km																									
	Investment costs (A)		96.3	P/Wp	1,444,500																								
	Battery replace		500	P				150,000													150,000				150,000			548,876	
	Operation & maintenance: village		500	P/Village/m		6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000		37,189	
	Agent fee		0.05	%		7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200		44,627	
	:Head office	276	276	P/H/y		82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800		513,214	
	Total																											2,399,992	
Average electricity cost																											17.68		
Mini-Grid Electrification	Households	300																											
	Capacity	50		Wp																									
	Annual consumption	0.365	21900	kWh/y	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	21,900	135,741		
	Distance from Grid			km																									
	Investment costs (A)		72.2	P/Wp	1,083,000																								
	Battery replace		375	P				112,500													112,500				112,500			941,739	
	Connection costs		4500																									1,173,913	
	Operation & maintenance: village		1500	P/Village/m		18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000		111,568	
	Agent fee		0.05	%		7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200		44,627	
	:Head office	276	276	P/Wp/y		82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800		513,214
Total																											3,196,718		
Average electricity cost																											23.58		
SHS Electrification	Households(H)	300																											
	Capacity	100		Wp																									
	Annual consumption	0.365	43800	kWh/y	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	271,483		
	Distance from Grid			km																									
	Investment costs (A)		96.3	P/Wp	2,889,000																								
	Battery replace		500	P				300,000													300,000				300,000			2,512,174	
	Operation & maintenance: village		500	P/Village/m		6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000		1,097,751	
	Agent fee		0.05	%		14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400		89,255	
	:Head office	276	276	P/H/y		82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800		513,214
	Total																											4,249,582	
Average electricity cost																											15.65		
Mini-Grid Electrification	Households	300																											
	Capacity	100		Wp																									
	Annual consumption	0.365	43800	kWh/y	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	271,483		
	Distance from Grid			km																									
	Investment costs (A)		72.2	P/Wp	2,166,000																								
	Battery replace		375	P				225,000													225,000				225,000			1,883,478	
	Operation & maintenance: village		1500	P/Village/m		18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000		1,173,913	
	Agent fee		0.05	%		14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400		89,255	
	:Head office	276	276	P/Wp/y		82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800		513,214
	Total																											4,594,741	
Average electricity cost																											16.92		
Total					2	P/Wp/y																					0		

Appendix 表7.1-5-8 Comparison of PV Mini-Grid Electrification and SHS

	Variable	Units	Unit Cost	Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	residual value	Sum of NPV at 0 year	
SHS Electrification	Households(H)	300																									
	Capacity	200		Wp																							
	Annual consumption	0.365	87600	kWp/ly		87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	542,965	
	Distance from Grid			km																						(i = 0.15)	
	Investment costs (A)		96.3	P/Wp	5,778,000																					5,024,348	
	Battery replace		500	P			600,000				600,000															2,195,502	
	Operation & maintenance: village		500	P/Village/m		6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	37,189	
	Agent fee		0.05	%		28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	178,509	
	:Head office	276		P/H/ly		82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	513,214	
	Total																									7,948,762	
	Average electricity cost																									14.64	
Mini-Grid Electrification	Households	300																									
	Capacity	200		Wp																							
	Annual consumption		87600			87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	542,965	
	Distance from Grid																									(i = 0.15)	
	Investment costs (A)		72.2	P/Wp	4,332,000																					3,766,957	
	Battery replace		375	P			450,000				450,000															1,646,627	
	Connection costs		4500																							1,173,913	
	Operation & maintenance: village		1500	P/Village/m		18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	111,568	
	Agent fee		0.05	%		28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	178,509	
	:Head office	276		P/Wp/ly		82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	513,214
	Total																									7,990,782	
	Average electricity cost																									13.61	
SHS Electrification	Households(H)	300																									
	Capacity	300		Wp																							
	Annual consumption	0.365	131400	kWp/ly		131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	814,448	
	Distance from Grid			km																						(i = 0.15)	
	Investment costs (A)		96.3	P/Wp	8,667,000																					7,536,522	
	Battery replace		500	P			900,000				900,000															3,293,253	
	Operation & maintenance: village		500	P/Village/m		6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	37,189	
	Agent fee		0.05	%		43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	267,764	
	:Head office	276		P/H/ly		82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	513,214
	Total																									11,647,942	
	Average electricity cost																									14.30	
Mini-Grid Electrification	Households	300																									
	Capacity	300		Wp																							
	Annual consumption		131400			131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	814,448	
	Distance from Grid			km																						(i = 0.15)	
	Investment costs (A)		72.2	P/Wp	6,498,000																					5,650,435	
	Battery replace		375	P			675,000				675,000															2,469,940	
	Connection costs		4500																							(225,000)	
	Operation & maintenance: village		1500	P/Village/m		18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	111,568	
	Agent fee		0.05	%		43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	43,200	267,764
	:Head office	276		P/Wp/ly		82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	513,214
	Total																									10,186,833	
	Average electricity cost																									12.51	



Appendix 图 7.1-5 PV-minigrid Versus SHS (300 Households)



Appendix 图 7.1-6 PV-minigrid Versus SHS (200 Households)