

Philippine Onshore Solar Power Plant for 100MW

Description	Values	Unit
Work Start Year	2018	Years
Operating Year	2020	Years
Site and Contry for Project	Philippine	
Power Sales Cost	0.219	USD/kWh =21.9USc/kwh
Total Electric Power Capacity	100	MW (=MWh/h)
Daily Charge Time per day	5	hr/day
Working day per year	365.25	days/Year
Final DC to AC Product Output Capacity Per Annual	127,838	MWh/Annual 70% of 100MW x 5hr/day for annu
Total Electricity Power Sales Cost	27,996,413	USD/year
Solar Panel Acquisition Area	951,824	m ²
Unit Space Acquisiton Cost	20	USD/m ² in Philippine
CAPEX of Area Acquisition Cost	18,655,757	USD
CAPEX for Spur Transmission Line Length	35km	7,998,837 USD -63.3Kv --Single Cir. 1 - Circuit
CAPEX for Bulk Transmission Line is	0km	0 USD 63.3Kv --Single Circuit
CAPEX for Grid Connection(Point Of Inte	1 Sets	11,400,000 USD, Gas=114\$/kw, Goal,Nuclear=227\$/kw, Sola
Type of Solar Power	Photovoltaic-Trac	
Unit CAPEX of Solar Power Plant	1,710	USD/kwh
CAPEX for Solar Power Plant	209,054,594	USD - 이익구백오만사천오백구십사달러
Construction and Fabrication Period	2	Years
Interest FEE during Construction and Fabrication	13,588,549	USD
TOTAL CAPEX AND INTREST FEE DURING CONSTRUCTION	222,643,143	USD - 이익이천이백육십사만삼천일백사십
Fixed and Various OPEX	1,090,108	USD/Year
Fund Intrest	6.5	%
Return rate on investment of Net Profit, r	3	%
Operating Periods	15	Years
Project Design Life	30	Years
Benefit Cost Ratio (B/C)	1.51	≥ 1.1 GOOD For 15Years Operating
IRR(Internal Rate of Return)	3.03%	> 0 GOOD For 15Years Operating
NPV(Net Present Value)	82,736,506	USD with Asset value of Project for 15Years
Electric power Sale	from 2020Years to 2022 Years	0 % from 1Years to 3 Years
Price Inflation to	from 2023Years to 2026 Years	0 % from 4Years to 7 Years
be considered in	from 2027Years to 2031 Years	0 % from 8Years to 12 Years
yearas(Increased	from 2032Years to 2036 Years	0 % from 13Years to 17 Years
Previous Inflation)	from 2037Years to 2034 Years	0 % from 18Years to 15 Years
Income tax rate for government	20	%
Inflation of Space Acquisition	1	%
First Project residual value	109,143,021	USD after 10 Years
Second Project residual value	64,080,117	USD after 20 Years
Final residual value on Design Life	44,185,026	USD after 30 Years
Net Payback Turn Over Periods	12.006	Years

Description	Values	Unit
Annual average solar radiation	3.5	Kwh/m ² .day
Solar Panel Unit Capacity	240	W(Wh/h)/cell
Flat Solar Panel Acquisition Area	915,893	m ² - Consider Loss factor of 0.74
Cell Output	5.84064	W(Wh/h)/cell
Cell Nos/Module	60	Cells/Module
Total Output of Solar Module	0.3504384	Kw(Kwh/h)/module
Solar Pannel Product Capacity	876,600	Mwh/Annual due to Module W/m ²
Solar Radiation Product Capacity	127,838	Mwh/Annual due to Radiation
Nos of Module	562,975	Nos
Cell Size, H=	156	mm
Cell Size, W=	156	mm
Module efficiency	14.75216365	%
Module Size, H=	1640	mm
Module Size, W=	992	mm
Cell Module Area	1.62688	m ²
Total power of the system	135,114	kwp
Total Require Land Acquisition	951,824	m ² (1,000m x 0,952m) 1,000 m x 952 m = 951,824 m ²

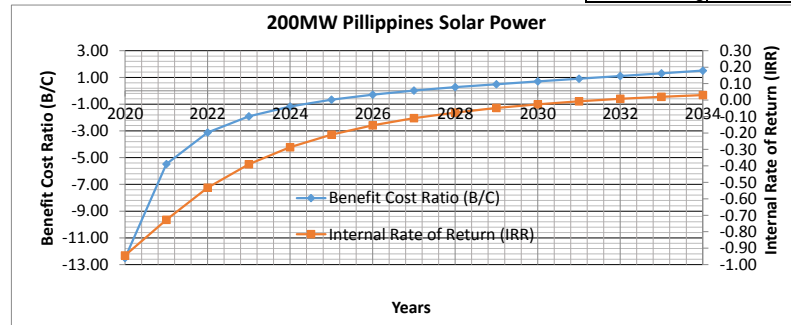
ADD Area = 0m²

Type of Solar Panel	Efficiency Limits(%)
Monocrystalline	15-21
Polycrystalline	13-16
Thin-film	7-13

Solar Panel Slope Angle based on True South

Slope Angle	derate factor
0deg	0.89
15deg	0.97
30deg	1
45deg	0.98
60deg	0.92
90deg	0.68

Select =30deg



Actual Payback turn Over Years	13Years	13Years	해찾기
Initial Value(min 0%, max 7.692%)	4.787%	4.787%	0 Good
Limit of Initial Value	≤ 7.692%	≤ 7.692%	

End of Year	①% of Return of Equity	②% of Return of FUND	③Return of Equity (USD) 20% of Equity	④Return of FUND(USD) 80% of FUND	⑤Remain Cost(USD)	⑥Fund Interest 6.5%(USD)	⑦OPEX(USD)	⑧Yearly Revenue(USD) W/ Inflation	⑨(순이익)Net Profit(USD)	⑩(현재자산가치)Asset value(USD)=Residual Value	⑪(순현재가치)Net Present Value	⑫Benefit Cost Ratio (B/C)	⑬(내부수익률)Internal Rate of Return (IRR)
2020	1	4.79%	2,131,469	8,525,876	222,643,143	14,471,804	1,090,108	27,996,413	1,421,723	195,193,478	-204,437,682	-12.51	-0.94
2021	2	5.27%	2,347,104	9,388,416	211,985,797	13,779,077	1,090,108	27,996,413	1,113,365	182,392,940	-192,424,410	-5.48	-0.73
2022	3	5.76%	2,562,739	10,250,956	200,250,277	13,016,268	1,090,108	27,996,413	861,072	170,588,121	-180,083,293	-3.11	-0.53
2023	4	6.24%	2,778,374	11,113,496	187,436,581	12,183,378	1,090,108	27,996,413	664,845	159,546,800	-167,383,167	-1.91	-0.39
2024	5	6.72%	2,994,009	11,976,036	173,544,711	11,280,406	1,090,108	27,996,413	524,682	149,459,395	-154,296,724	-1.18	-0.29

2025	6	7.21%	7.21%	3,209,644	12,838,576	158,574,665	10,307,353	1,090,108	27,996,413	440,584	140,135,527	-140,800,258	-0.67	-0.21
2026	7	7.69%	7.69%	3,425,279	13,701,116	142,526,445	9,264,219	1,090,108	27,996,413	412,552	131,384,816	-126,873,433	-0.29	-0.15
2027	8	8.18%	8.18%	3,640,914	14,563,656	125,400,049	8,151,003	1,090,108	27,996,413	440,584	123,397,681	-112,499,056	0.01	-0.11
2028	9	8.66%	8.66%	3,856,549	15,426,197	107,195,478	6,967,706	1,090,108	27,996,413	524,682	115,983,743	-97,662,867	0.27	-0.08
2029	10	9.15%	9.15%	4,072,184	16,288,737	87,912,733	5,714,328	1,090,108	27,996,413	664,845	109,143,021	-82,353,332	0.49	-0.05
2030	11	9.63%	9.63%	4,287,819	17,151,277	67,551,812	4,390,868	1,090,108	27,996,413	861,072	102,875,536	-66,561,458	0.70	-0.03
2031	12	10.11%	10.11%	4,503,454	18,013,817	46,112,716	2,997,327	1,090,108	27,996,413	1,113,365	96,990,910	-50,280,600	0.90	-0.01
2032	13	10.60%	10.60%	4,719,089	18,876,357	23,595,446	1,533,704	1,090,108	27,996,413	1,421,723	91,679,562	-33,506,330	1.10	0.01
2033	14	0.00%	0.00%	0	0	0	0	1,090,108	27,996,413	21,525,043	86,751,113	-16,236,198	1.31	0.02
2034	15	0.00%	0.00%	0	0	0	0	1,090,108	27,996,413	21,525,043	82,205,585	530,921	1.51	0.03
2035	16	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2036	17	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2037	18	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2038	19	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2039	20	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2040	21	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2041	22	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2042	23	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2043	24	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2044	25	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2045	26	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2046	27	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2047	28	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2048	29	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2049	30	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2050	Summation	100%	100%	44,528,629	178,114,514	1,754,729,854	114,057,440	16,351,627	419,946,188	53,515,182	82,205,585	82,736,506	1.51	0.03

CAPEX of Power types and Environmental

Select, Solar Panel = Nos of Cell Module and Solar Panel Electric Capacity = 197,288kWh

Power Control Panel Capacity = $\frac{\text{Solar Panel Capacity}}{\text{Control panel Efficiency}}$ = $\frac{197,288\text{kWh}}{85.0\%}$ = 232,104kWh

AC Invert Capacity = $\frac{\text{AC}}{\text{Invert Efficiency}} \times \text{design Factor}$ = $\frac{232,104\text{kWh}}{85.0\%} \times 1.20$ = 327,676kWh --> Overall DC to AC derate factor = 0.602



Component Derate Factors	Acceptable Value Range	
PV module nameplate DC rating	0.80 - 1.05	0.95
Inverter and Transformer	0.88 - 0.96	0.94
Mismatch	0.97 - 0.995	0.99
Diodes and connections	0.99 - 0.997	0.995
DC wiring	0.97 - 0.99	0.98
AC wiring	0.98 - 0.993	0.99
Soiling	0.30 - 0.995	0.95
System availability	0.00 - 0.995	0.99
Shadings (depends of site)	0.60 ~ 1.00	0.97
Sun-tracking(irradiation)	0.93 - 1.00	0.97
due to dust, snow and etc	0.98 ~ 1.00	0.98
Age	0.70 - 1.00	1
Overall DC to AC derate factor		0.740115243

Bangladesh Onshore Solar Power Plant for 200MW

Description	Values	Unit
Work Start Year	2018	Years
Operating Year	2020	Years
Site and Contry for Project	Bangladesh	
Power Sales Cost	0.125	USD/kWh =12.5US¢/kwh
Total Electric Power Capacity	200	MW (=MWh/h)
Daily Charge Time per day	12	hr/day
Working day per year	365.25	days/Year
Final DC to AC Product Output Capacity Per Annual	438,300	MWh/Annual 50% of 200MW x 12hr/day for ann
Total Electricity Power Sales Cost	54,787,500	USD/year
Solar Panel Acquisition Area	1,827,503	m ²
Unit Space Acquisition Cost	2	USD/m ² in Bangladesh
CAPEX of Area Acquisition Cost	3,655,005	USD
CAPEX for Spur Transmission Line Length is	35km	USD -120.8Kv --Single Ci 1 - Circuit
CAPEX for Bulk Transmission Line is	0km	USD 120.8Kv --Single Circuit
CAPEX for Grid Connection(Point Of Intercon	1 Sets	USD, Gas=114\$/kw, Coal,Nuclear=227\$/kw, Solar
Type of Solar Power	Photovoltaic-Tr'g	
Unit CAPEX of Solar Power Plant	1,870	USD/kwh
CAPEX for Solar Power Plant	412,952,466	USD - 사업일전이백구십오만이전사백육십육
Construction and Fabrication Period	2	Years
Interest FEE during Construction and Fabrication	26,841,910	USD
TOTAL CAPEX AND INTREST FEE DURING CONSTRUCTION	439,794,376	USD - 사업삼천구백칠십구만사천삼백칠십육
Fixed and Various OPEX	2,180,217	USD/Year
Fund Intrest	6.5	%
Return rate on investment of Net Profit, r	3	%
Operating Periods	15	Years
Project Design Life	30	Years
Benefit Cost Ratio (B/C)	1.48	≥ 1.1 GOOD For 15Years Operating
IRR(Internal Rate of Return)	2.85%	> 0 GOOD For 15Years Operating
NPV(Net Present Value)	129,171,064	USD with Asset value of Project for 15Years
Electric power Sale	from 2020Years to 2022 Years	0 % from 1Years to 3 Years
Price Inflation to be considered in	from 2023Years to 2026 Years	0 % from 4Years to 7 Years
yeras(Increased	from 2027Years to 2029 Years	0 % from 8Years to 10 Years
Previous Inflation)	from 2030Years to 2034 Years	0 % from 11Years to 15 Years
Income tax rate for government	20	%
Inflation of Space Acquisition	1	%
First Project residual value	194,360,719	USD after 10 Years
Second Project residual value	93,277,350	USD after 20 Years
Final residual value on Design Life	45,856,141	USD after 30 Years
Net Payback Turn Over Periods	12.008	Years

Description	Values	Unit
Annual average solar radiation	6	Kwh/m ² .day
Solar Panel Unit Capacity	250	W/m ² Consider Loss factor of 0.74
Flat Solar Panel Acquisition Area	1,758,515	m ² Consider Loss factor of 0.74
Cell Output	6.084	W(Wh/h)/cell
Cell Nos/Module	60	Cells/Module
Total Output of Solar Module	0.36504	Kw(Kwh/h)/module
Solar Pannel Product Capacity	1,753,200	Mwh/Annual due to Module W/m ²
Solar Radiation Product Capacity	438,300	Mwh/Annual due to Radiation
Nos of Module	1,080,913	Nos
Cell Size, H=	156	mm
Cell Size, W=	156	mm
Module efficiency	15.36683714	%
Module Size, H=	1640	mm
Module Size, W=	992	mm
Cell Module Area	1.62688	m ²
Total power of the system	270,228	kwp
Total Require Land Acquisition	1,827,503	m ² (1,500m x 1,218m) 1,500 m x 1,218 m = 1,827,503 m ²

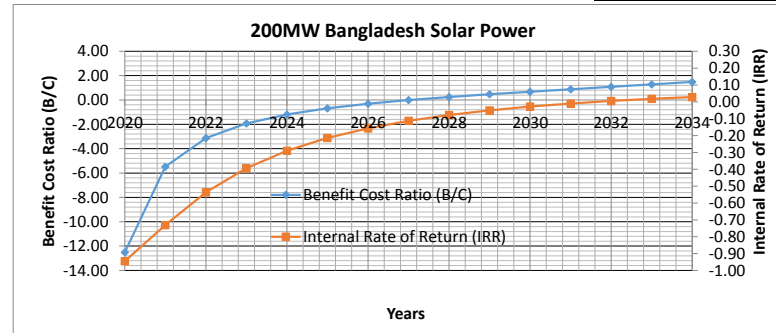
ADD Area = 0m²

Type of Solar Panel	Efficiency Limits(%)
Monocrystalline	15-21
Polycrystalline	13-16
Thin-film	7-13

Solar Panel Slope Angle based on True South

Slope Angle	derate factor
0deg	0.89
15deg	0.97
30deg	1
45deg	0.98
60deg	0.92
90deg	0.68

Select =30deg



Actual Payback turn Over Years	13Years	13Years	해탈기
Initial Value(min 0%, max 7.692%)	4.787%	4.787%	0 Good
Limit of Initial Value	≤ 7.692%	≤ 7.692%	

End of Year	①% of Return of Equity	②% of Return of FUND	③Return of Equity (USD) 20% of Equity	④Return of FUND(USD) 80% of FUND	⑤Remain Cost(USD)	⑥Fund Interest 6.5%(USD)	⑦OPEX(USD)	⑧Yearly Revenue(USD) W/ Inflation	⑨(순이익)Net Profit(USD)	⑩(현재자산가치)Asset value(USD)=Residual Value	⑪(순현재가치)Net Present Value	⑫Benefit Cost Ratio (B/C)	⑬(내부수익률)Internal Rate of Return (IRR)
2020	4.79%	4.79%	4,210,362	16,841,446	439,794,376	28,586,634	2,180,217	54,787,500	2,375,073	382,790,946	-404,343,066	-12.51	-0.95
2021	5.27%	5.27%	4,636,312	18,545,250	418,742,568	27,218,267	2,180,217	54,787,500	1,765,963	354,905,692	-381,108,519	-5.49	-0.73
2022	5.76%	5.76%	5,062,263	20,249,054	395,561,006	25,711,465	2,180,217	54,787,500	1,267,600	329,157,237	-357,211,934	-3.13	-0.54
2023	6.24%	6.24%	5,488,214	21,952,858	370,249,689	24,066,230	2,180,217	54,787,500	879,985	305,046,344	-332,592,170	-1.93	-0.39
2024	6.72%	6.72%	5,914,165	23,656,662	342,808,617	22,282,560	2,180,217	54,787,500	603,117	282,982,315	-307,195,692	-1.20	-0.29
2025	7.21%	7.21%	6,340,116	25,360,465	313,237,790	20,360,456	2,180,217	54,787,500	436,996	262,555,857	-280,976,071	-0.69	-0.21
2026	7.69%	7.69%	6,766,067	27,064,269	281,537,208	18,299,919	2,180,217	54,787,500	381,622	243,357,675	-253,893,521	-0.31	-0.16

2027	8	8.18%	8.18%	7,192,018	28,768,073	247,706,871	16,100,947	2,180,217	54,787,500	436,996	225,797,071	-225,914,453	-0.01	-0.11
2028	9	8.66%	8.66%	7,617,969	30,471,877	211,746,780	13,763,541	2,180,217	54,787,500	603,117	209,464,751	-197,011,061	0.25	-0.08
2029	10	9.15%	9.15%	8,043,920	32,175,681	173,656,934	11,287,701	2,180,217	54,787,500	879,985	194,360,719	-167,160,916	0.47	-0.05
2030	11	9.63%	9.63%	8,469,871	33,879,485	133,437,332	8,673,427	2,180,217	54,787,500	1,267,600	180,484,979	-136,346,593	0.68	-0.03
2031	12	10.11%	10.11%	8,895,822	35,583,289	91,087,977	5,920,718	2,180,217	54,787,500	1,765,963	167,428,238	-104,555,314	0.88	-0.01
2032	13	10.60%	10.60%	9,321,773	37,287,093	46,608,866	3,029,576	2,180,217	54,787,500	2,375,073	155,599,797	-71,778,609	1.07	0.01
2033	14	0.00%	0.00%	0	0	0	0	2,180,217	54,787,500	42,085,826	144,590,363	-38,011,996	1.28	0.02
2034	15	0.00%	0.00%	0	0	0	0	2,180,217	54,787,500	42,085,826	134,399,940	-5,228,876	1.48	0.03
2035	16	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2036	17	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2037	18	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2038	19	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2039	20	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2040	21	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2041	22	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2042	23	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2043	24	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2044	25	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2045	26	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2046	27	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2047	28	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2048	29	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2049	30	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
Summation		100%	100%	87,958,875	351,835,501	3,466,176,012	225,301,441	32,703,253	821,812,500	99,210,744	134,399,940	129,171,064	1.48	0.03

CAPEX of Power types and Environmental Emissions are referred

Select, Solar Panel = Nos of Cell Module and Solar Panel Electric Capacity = 394,576kWh

Power Control Panel Capacity = $\frac{\text{Solar Panel Capacity}}{\text{Control panel Efficiency}}$ = $\frac{394,576\text{kWh}}{85.0\%}$ = 464,208kWh

AC Invert Capacity = $\frac{\text{AC}}{\text{Invert Efficiency}} \times \text{design Factor}$ = $\frac{464,208\text{kWh}}{85.0\%} \times 1.20$ = 655,352kWh --> Overall DC to AC derate factor = 0.602



Component Derate F_r Acceptable Value Range

PV module nameplate DC rating	0.80 - 1.05	0.95
Inverter and Transformer	0.88 - 0.96	0.94
Mismatch	0.97 - 0.995	0.99
Diodes and connections	0.99 - 0.997	0.995
DC wiring	0.97 - 0.99	0.98
AC wiring	0.98 - 0.993	0.99
Soiling	0.30 - 0.995	0.95
System availability	0.00 - 0.995	0.99
Shadings (depends of site)	0.60 ~ 1.00	0.97
Sun-tracking(irradiation)	0.93 - 1.00	0.97
due to dust, snow and etc	0.98 ~ 1.00	0.98
Age	0.70 - 1.00	1
Overall DC to AC derate factor		0.740115243

Nicaragua Onshore Solar Power Plant for 100MW

Description	Values	Unit
Work Start Year	2018	Years
Operating Year	2020	Years
Site and Contry for Project	Nicaragua	
Power Sales Cost	0.15	USD/kWh =15USc/kwh
Total Electric Power Capacity	100	MW (=MWh/h)
Daily Charge Time per day	12	hr/day
Working day per year	365.25	days/Year
Final DC to AC Product Output Capacity Per Annual	192,196	MWh/Annual 43.9% of 100MW x 12hr/day for a
Total Electricity Power Sales Cost	28,829,377	USD/year
Solar Panel Acquisition Area	1,105,818	m ²
Unit Space Acquisiton Cost	2	USD/m ² in Nicaragua
CAPEX of Area Acquisition Cost	2,211,637	USD
CAPEX for Spur Transmission Line Length	35km	7,998,837 USD -63.3Kv --Single Circ 1 - Circuit
CAPEX for Bulk Transmission Line is	0km	0 USD 63.3Kv --Single Circuit
CAPEX for Grid Connection(Point Of Inte:	1 Sets	11,400,000 USD, Gas=114\$/kw, Goal,Nuclear=227\$/kw, Sola
Type of Solar Power	Photovoltaic-Trac	
Unit CAPEX of Solar Power Plant	1,710	USD/kwh
CAPEX for Solar Power Plant	192,610,474	USD - 이익구천이백육십일만사백칠십사달러
Construction and Fabrication Period	2	Years
Interest FEE during Construction and Fabrication	12,519,681	USD
TOTAL CAPEX AND INTREST FEE DURING CONSTRUCTION	205,130,155	USD - 이익오백일십삼만일백오십오달러
Fixed and Various OPEX	1,090,108	USD/Year
Fund Intrest	6.5	%
Return rate on investment of Net Profit, r	3	%
Operating Periods	15	Years
Project Design Life	30	Years
Benefit Cost Ratio (B/C)	2.01	≥ 1.1 GOOD For 15Years Operating
IRR(Internal Rate of Return)	5.37%	> 0 GOOD For 15Years Operating
NPV(Net Present Value)	103,971,752	USD with Asset value of Project for 15Years
Electric power Sale	from 2020Years to 2022 Years	0 % from 1Years to 3 Years
Price Inflation to	from 2023Years to 2026 Years	0 % from 4Years to 7 Years
be considered in	from 2027Years to 2029 Years	0 % from 8Years to 10 Years
years(Increased	from 2030Years to 2034 Years	0 % from 11Years to 15 Years
Previous Inflation)	from 2035Years to 2034 Years	0 % from 16Years to 15 Years
Income tax rate for government	20	%
Inflation of Space Acquisition	1	%
First Project residual value	90,978,482	USD after 10 Years
Second Project residual value	44,015,165	USD after 20 Years
Final residual value on Design Life	22,020,836	USD after 30 Years
Net Payback Turn Over Periods	10.012	Years

Description	Values	Unit
Annual average solar radiation	4.273	Kwh/m ² .day
Solar Panel Unit Capacity	200	W/module and reference value =175W
Flat Solar Panel Acquisition Area	1,064,074	m ² . Consider Loss factor of 0.74
Cell Output	3.552858333	W/(Wh/h)/cell
Cell Nos/Module	72	Cells/Module
Total Output of Solar Module	0.2558058	Kw(Kwh/h)/module
Solar Pannel Product Capacity	1,079,499	Mwh/Annual due to Module W/m ²
Solar Radiation Product Capacity	192,196	Mwh/Annual due to Radiation
Nos of Module	831,939	Nos
Cell Size, H=	132	mm
Cell Size, W=	135	mm
Module efficiency	15.63686203	%
Module Size, H=	1581	mm
Module Size, W=	809	mm
Cell Module Area	1.279029	m ²
Total power of the system	166,388	kwp
Total Require Land Acquisition	1,105,818	m ² (1,000m x 1,106m) 1,000 m x 1,106 m = 1,105,818 m ²

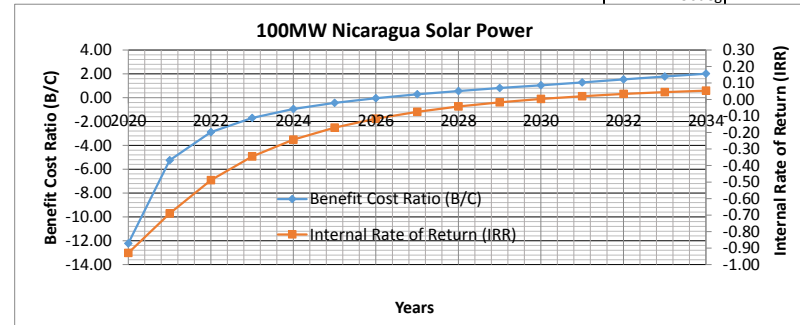
ADD Area = 200,000m²

Type of Solar Panel	Efficiency Limits(%)
Monocrystalline	15-21
Polycrystalline	13-16
Thin-film	7-13

Solar Panel Slope Angle based on True South

Slope Angle	derate factor
0deg	0.89
15deg	0.97
30deg	1
45deg	0.98
60deg	0.92
90deg	0.68

Select =30deg



Actual Payback turn Over Years	12Years	12Years	해 찾기
Initial Value(min 0%, max 8.333%)	5.448%	5.448%	0 Good
Limit of Initial Value	≤ 8.333%	≤ 8.333%	

End of Year	①% of Return of Equity	②% of Return of FUND	③ Return of Equity (USD) 20% of Equity	④ Return of FUND(USD) 80% of FUND	⑤ Remain Cost(USD)	⑥ Fund Interest 6.5%(USD)	⑦ OPEX(USD)	⑧ Yearly Revenue(USD) W/ Inflation	⑨(순이익)Net Profit(USD)	⑩(현재자산가치)Asset value(USD)=Residual Value	⑪(순현재가치)Net Present Value	⑫ Benefit Cost Ratio (B/C)	⑬(내부수익률)Internal Rate of Return (IRR)	
2020	1	5.45%	5.45%	2,235,074	8,940,297	205,130,155	13,333,460	1,090,108	28,829,377	2,584,349	178,584,916	-185,576,634	-12.22	-0.93
2021	2	5.97%	5.97%	2,450,304	9,801,215	193,954,783	12,607,061	1,090,108	28,829,377	2,304,551	165,618,293	-171,728,521	-5.24	-0.69
2022	3	6.50%	6.50%	2,665,533	10,662,132	181,703,264	11,810,712	1,090,108	28,829,377	2,080,712	153,645,727	-157,576,205	-2.89	-0.49
2023	4	7.02%	7.02%	2,880,762	11,523,050	168,375,599	10,944,414	1,090,108	28,829,377	1,912,833	142,434,982	-143,088,817	-1.69	-0.34
2024	5	7.55%	7.55%	3,095,992	12,383,967	153,971,787	10,008,166	1,090,108	28,829,377	1,800,914	132,176,459	-128,239,298	-0.95	-0.24
2025	6	8.07%	8.07%	3,311,221	13,244,885	138,491,827	9,001,969	1,090,108	28,829,377	1,744,955	122,679,762	-113,004,159	-0.43	-0.17

2026	7	8.60%	8.60%	3,526,451	14,105,802	121,935,721	7,925,822	1,090,108	28,829,377	1,744,955	113,754,494	-97,363,242	-0.04	-0.12
2027	8	9.12%	9.12%	3,741,680	14,966,720	104,303,468	6,779,725	1,090,108	28,829,377	1,800,914	105,591,055	-81,299,497	0.28	-0.07
2028	9	9.64%	9.64%	3,956,909	15,827,637	85,595,069	5,563,679	1,090,108	28,829,377	1,912,833	97,999,051	-64,798,777	0.56	-0.04
2029	10	10.17%	10.17%	4,172,139	16,688,555	65,810,522	4,277,684	1,090,108	28,829,377	2,080,712	90,978,482	-47,849,629	0.81	-0.02
2030	11	10.69%	10.69%	4,387,368	17,549,472	44,949,828	2,921,739	1,090,108	28,829,377	2,304,551	84,529,352	-30,443,114	1.05	0.00
2031	12	11.22%	11.22%	4,602,597	18,410,390	23,012,987	1,495,844	1,090,108	28,829,377	2,584,349	78,461,264	-12,572,619	1.28	0.02
2032	13	0.00%	0.00%	0	0	0	0	1,090,108	28,829,377	22,191,414	72,964,619	5,766,305	1.53	0.03
2033	14	0.00%	0.00%	0	0	0	0	1,090,108	28,829,377	22,191,414	67,849,020	23,571,086	1.77	0.04
2034	15	0.00%	0.00%	0	0	0	0	1,090,108	28,829,377	22,191,414	63,114,472	40,857,281	2.01	0.05
2035	16	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2036	17	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2037	18	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2038	19	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2039	20	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2040	21	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2041	22	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2042	23	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2043	24	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2044	25	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2045	26	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2046	27	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2047	28	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2048	29	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2049	30	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
Summation		100%	100%	41,026,031	164,104,124	1,487,235,011	96,670,276	16,351,627	432,440,648	91,430,873	63,114,472	103,971,752	2.01	0.05

CAPEX of Power types and Environmental

Select, Solar Panel = Nos of Cell Module and Solar Panel Electric Capacity

= 212,815kWh

Power Control Panel Capacity = $\frac{\text{Solar Panel Capacity}}{\text{Control panel Efficiency}}$ = $\frac{212,815\text{kWh}}{85.0\%}$ = 250,370kWh

AC Invert Capacity = $\frac{\text{AC}}{\text{Invert Efficiency}} \times \text{design Factor}$ = $\frac{250,370\text{kWh}}{85.0\%} \times 1.20$ = 353,464kWh --> Overall DC to AC derate factor = 0.602



Component Derate Fa Acceptable Value Range

PV module nameplate DC rating	0.80 - 1.05	0.95
Inverter and Transformer	0.88 - 0.96	0.94
Mismatch	0.97 - 0.995	0.99
Diodes and connections	0.99 - 0.997	0.995
DC wiring	0.97 - 0.99	0.98
AC wiring	0.98 - 0.993	0.99
Soiling	0.30 - 0.995	0.95
System availability	0.00 - 0.995	0.99
Shadings (depends of site)	0.60 ~ 1.00	0.97
Sun-tracking(irradiation)	0.93 - 1.00	0.97
due to dust, snow and etc	0.98 ~ 1.00	0.98
Age	0.70 - 1.00	1
Overall DC to AC derate factor		0.740115243

Dominica Onshore Solar Power Plant for 100MW

Description	Values	Unit
Work Start Year	2018	Years
Operating Year	2020	Years
Site and Contry for Project	Dominica	
Power Sales Cost	0.125	USD/kWh =12.5USc/kwh
Total Electric Power Capacity	100	MW (=MWh/h)
Daily Charge Time per day	12	hr/day
Working day per year	365.25	days/Year
Final DC to AC Product Output Capacity Per Annual	219,150	MWh/Annual 50% of 100MW x 12hr/day for anr
Total Electricity Power Sales Cost	27,393,750	USD/year
Solar Panel Acquisition Area	913,751	m ²
Unit Space Acquisiton Cost	3	USD/m ² in Dominica
CAPEX of Area Acquisition Cost	2,741,254	USD
CAPEX for Spur Transmission Line Length is	35km	7,998,837 USD -63.3Kv --Single Cir. 1 - Circuit
CAPEX for Bulk Transmission Line is	1km	620,000 USD 63.3Kv --Single Circuit
CAPEX for Grid Connection(Point Of Intercc	1 Sets	11,400,000 USD, Gas=114\$/kw, Goal,Nuclear=227\$/kw, Sola
Type of Solar Power	Photovoltaic	
Unit CAPEX of Solar Power Plant	1,847	USD/kwh
CAPEX for Solar Power Plant	207,447,155	USD - 이익철백사심사만칠천일백오십오달러
Construction and Fabrication Period	2	Years
Interest FEE during Construction and Fabrication	13,484,065	USD
TOTAL CAPEX AND INTREST FEE DURING CONSTRUCTION	220,931,220	USD - 이익이천구십삼만일천이백이십달러
Fixed and Various OPEX	1,225,213	USD/Year
Fund Intrest	6.5	%
Return rate on investment of Net Profit, r	3	%
Operating Periods	15	Years
Project Design Life	30	Years
Benefit Cost Ratio (B/C)	1.35	≥ 1.1 GOOD For 15Years Operating
IRR(Internal Rate of Return)	2.30%	> 0 GOOD For 15Years Operating
NPV(Net Present Value)	56,016,186	USD with Asset value of Project for 15Years
Electric power Sale	from 2020Years to 2022 Years	0 % from 1Years to 3 Years
Price Inflation to be considered in	from 2023Years to 2026 Years	0 % from 4Years to 7 Years
yeras(Increased	from 2027Years to 2029 Years	0 % from 8Years to 10 Years
Previous Inflation)	from 2030Years to 2034 Years	0 % from 11Years to 15 Years
Income tax rate for government	18	%
Inflation of Space Acquisition	1	%
First Project residual value	98,216,294	USD after 10 Years
Second Project residual value	47,766,032	USD after 20 Years
Final residual value on Design Life	24,165,387	USD after 30 Years
Net Payback Turn Over Periods	13.001	Years

Description	Values	Unit
Annual average solar radiation	6	Kwh/m ² .day
Solar Panel Unit Capacity	250	W/m ² and system solar = 250W
Flat Solar Panel Acquisition Area	879,258	m ² - Consider Loss factor of 0.74
Cell Output	6.084	W(W/h)/cell
Cell Nos/Module	60	Cells/Module
Total Output of Solar Module	0.36504	Kw(Kwh/h)/module
Solar Pannel Product Capacity	876,600	Mwh/Annual due to Module W/m ²
Solar Radiation Product Capacity	219,150	Mwh/Annual due to Radiation
Nos of Module	540,456	Nos
Cell Size, H=	156	mm
Cell Size, W=	156	mm
Module efficiency	15.36683714	%
Module Size, H=	1640	mm
Module Size, W=	992	mm
Cell Module Area	1.62688	m ²
Total power of the system	135,114	kwp
Total Require Land Acquisition	913,751	m ² (1,000m x 0,914m) 1,000 m x 914 m = 913,751 m ²

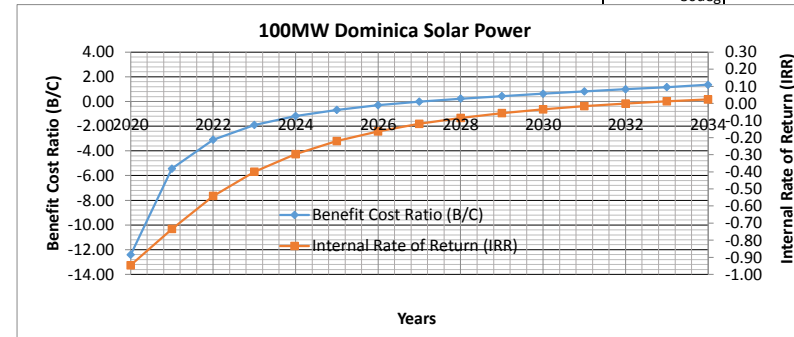
ADD Area = 0m²

Type of Solar Panel	Efficiency Limits(%)
Monocrystalline	15-21
Polycrystalline	13-16
Thin-film	7-13

Solar Panel Slope Angle based on True South

Slope Angle	derate factor
0deg	0.89
15deg	0.97
30deg	1

Select =30deg



Actual Payback turn Over Years	14Years	14Years	해 찾기
Initial Value(min 0%, max 7.143%)	4.220%	4.220%	0 Good
Limit of Initial Value	≤ 7.143%	≤ 7.143%	

End of Year	①% of Return of Equity	②% of Return of FUND	③Return of Equity (USD) 20% of Equity	④Return of FUND(USD) 80% of FUND	⑤Remain Cost(USD)	⑥Fund Interest 6.5%(USD)	⑦OPEX(USD)	⑧Yearly Revenue(USD) W/ Inflation	⑨(순이익)Net Profit(USD)	⑩(현재자산가치)Asset value(USD)=Residual Value	⑪(순현재가치)Net Present Value	⑫Benefit Cost Ratio (B/C)	⑬(내부수익률)Internal Rate of Return (IRR)
2020	1	4.22%	1,864,656	7,458,626	220,931,220	14,360,529	1,225,213	27,393,750	2,037,475	192,371,315	-203,366,151	-12.42	-0.95
2021	2	4.67%	2,063,349	8,253,397	211,607,938	13,754,516	1,225,213	27,393,750	1,719,765	178,434,017	-192,005,563	-5.44	-0.73
2022	3	5.12%	2,262,042	9,048,169	201,291,192	13,083,927	1,225,213	27,393,750	1,455,007	165,565,508	-180,380,057	-3.09	-0.54
2023	4	5.57%	2,460,735	9,842,941	189,980,980	12,348,764	1,225,213	27,393,750	1,243,200	153,516,103	-168,458,999	-1.91	-0.40
2024	5	6.02%	2,659,428	10,637,712	177,677,305	11,549,025	1,225,213	27,393,750	1,084,345	142,490,510	-156,215,388	-1.18	-0.30
2025	6	6.47%	2,858,121	11,432,484	164,380,164	10,684,711	1,225,213	27,393,750	978,442	132,284,026	-143,625,620	-0.68	-0.22

2026	7	6.92%	6.92%	3,056,814	12,227,255	150,089,560	9,755,821	1,225,213	27,393,750	925,490	122,691,948	-130,669,271	-0.31	-0.16
2027	8	7.37%	7.37%	3,255,507	13,022,027	134,805,490	8,762,357	1,225,213	27,393,750	925,490	113,918,984	-117,328,883	-0.02	-0.12
2028	9	7.82%	7.82%	3,454,200	13,816,799	118,527,957	7,704,317	1,225,213	27,393,750	978,442	105,760,432	-103,589,770	0.23	-0.09
2029	10	8.27%	8.27%	3,652,893	14,611,570	101,256,959	6,581,702	1,225,213	27,393,750	1,084,345	98,216,294	-89,439,824	0.44	-0.06
2030	11	8.72%	8.72%	3,851,585	15,406,342	82,992,496	5,394,512	1,225,213	27,393,750	1,243,200	91,286,574	-74,869,341	0.63	-0.03
2031	12	9.17%	9.17%	4,050,278	16,201,113	63,734,569	4,142,747	1,225,213	27,393,750	1,455,007	84,766,568	-59,870,849	0.81	-0.02
2032	13	9.62%	9.62%	4,248,971	16,995,885	43,483,177	2,826,406	1,225,213	27,393,750	1,719,765	78,860,986	-44,438,951	0.99	0.00
2033	14	10.07%	10.07%	4,447,664	17,790,657	22,238,321	1,445,491	1,225,213	27,393,750	2,037,475	73,365,125	-28,570,169	1.17	0.01
2034	15	0.00%	0.00%	0	0	0	0	1,225,213	27,393,750	21,458,200	68,278,988	-12,262,802	1.35	0.02
2035	16	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2036	17	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2037	18	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2038	19	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2039	20	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2040	21	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2041	22	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2042	23	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2043	24	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2044	25	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2045	26	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2046	27	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2047	28	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2048	29	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
2049	30	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0.00	0.00
Summation		100%	100%	44,186,244	176,744,976	1,882,997,327	122,394,826	18,378,195	410,906,250	40,345,647	68,278,988	56,016,186	1.35	0.02

CAPEX of Power types and Environmental Emissions are

Select, Solar Panel = Nos of Cell Module and Solar Panel Electric Capacity = 197,288kWh

Power Control Panel Capacity = $\frac{\text{Solar Panel Capacity}}{\text{Control panel Efficiency}}$ = $\frac{197,288\text{kWh}}{85.0\%}$ = 232,104kWh

AC Invert Capacity = $\frac{\text{AC}}{\text{Invert Efficiency}} \times \text{design Factor}$ = $\frac{232,104\text{kWh}}{85.0\%} \times 1.20$ = 327,676kWh --> Overall DC to AC derate factor = 0.602



Component Derate Fa Acceptable Value Range

PV module nameplate DC rating	0.80 - 1.05	0.95
Inverter and Transformer	0.88 - 0.96	0.94
Mismatch	0.97 - 0.995	0.99
Diodes and connections	0.99 - 0.997	0.995
DC wiring	0.97 - 0.99	0.98
AC wiring	0.98 - 0.993	0.99
Soiling	0.30 - 0.995	0.95
System availability	0.00 - 0.995	0.99
Shadings (depends of site)	0.60 ~ 1.00	0.97
Sun-tracking(irradiation)	0.93 - 1.00	0.97
due to dust, snow and etc	0.98 ~ 1.00	0.98
Age	0.70 - 1.00	1
Overall DC to AC derate factor		0.740115243