



EIGHTH INTERNATIONAL FORUM ON
ENERGY FOR SUSTAINABLE DEVELOPMENT

REGIONAL WORKSHOP ON:

“Developing a Regional Renewable Energy Investment Pipeline”

13 June 2017, Astana - Kazakhstan

Economic And Social Commission For Western Asia / United Nations Economic Commission for Europe



UNITED NATIONS

الاستسوا
ESCWA

PRESENTATION OF ESCWA RENEWABLE ENERGY PROJECT DEVELOPMENT PORTFOLIO

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ESCWA RE Project Development Portfolio

The Technical Assistance Process

- **Call for RE proposals sent to relevant parties in ESCWA Member Countries (MCs)**
- **12 RE project proposals from 6 ESCWA MCs were received with project developers seeking technical assistance**
- **Project developers were invited to attend the training workshop on RE project development** (Rabat, Morocco /May 2016)
- **A guidebook for project developers, outlining the steps for preparing bankable project proposals, was developed, including generic calculation templates per technology.**
- **Material used as a basis for the training & technical assistance**

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Project Reference Number / Title:	RE 2
Name of Project Developer:	Renewable Energies Authority Of Libya
Technology:	PV
Country:	Libya

Assumptions

Macroeconomic data	
Exchange rate (\$/LC)	0,80
Discount rate	5%

Project data	
Installed capacity	14,00 MW
Productivity	1 973 kWh/kW
Annual degradation	0,5%
Net production	27 622 MWh

Investment cost	
CAPEX per MW	1 580 000 \$/MW
Total investment	22 120 000 \$
Depreciation period	25 year

OPEX	
OPEX in % of investment	0,9% % of investment
OPEX per MW	11 376 \$/MW/year
Operation cost per MWh	5,77 \$/MWh

Feed in Tariff	138,3	LC/MWh
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Financing	
Equity	100%
Loan	
Interest rate	7% 7 to 9%
Loan duration	25 Years
reimbursement period per year	4 per year
Grace period	0 Years

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Loan reimbursement

	year 0	year 1	year 2	year 3	year 20
Remaining of loan (LC)	-	-	-	-	-
Reimbursement of the principal (LC)	-	-	-	-	-
Interest (LC)	-	-	-	-	-

Profitability requirements

Equity return requirement	20%
WACC	20,0%

Income statement

in LC

	year 0	year 1	year 2	year 3	year 20	Total
Net electricity generation (MWh)		27 622	27 484	27 346	25 113	526 970
Electricity selling		3 819 294	3 800 197	3 781 196	3 472 335	72 864 123
Expenditure		867 104	867 104	867 104	867 104	17 342 080
<i>Operating expenses</i>		159 264	159 264	159 264	159 264	3 185 280
<i>Depreciation</i>		707 840	707 840	707 840	707 840	14 156 800
Operating income	-	2 952 190	2 933 093	2 914 092	2 605 231	
<i>Financial expenses</i>	-	0	0	0	0	
Total expenditure	-	867 104	867 104	867 104	867 104	17 342 080
Net income before taxes	-	2 952 190	2 933 093	2 914 092	2 605 231	55 522 043

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Profitability indicators

LCOE

Discounted expenditures	10 291 459	LC
Discounted electricity generation	330 993	MWh
LCOE	31	LC/MWh
Depreciation	26,65	LC/MWh
Operating expenses	6,00	LC/MWh
Financing	-	2 LC/MWh

Cash flow	year 0	year 1	year 2	year 3	year 20
Cash flow of the project based on total investment (LC)	-17 696 000	3 660 030	3 640 933	3 621 932	3 313 071
Cash flow of the project based on equity only (LC)	-17 696 000	3 660 030	3 640 933	3 621 932	3 313 071

Net Present Value of cashflow based on tot. Investment	24 843 426	LC
IRR project (based on total investment)	20%	
IRR Investor (based on equity part of investment only)	20%	
Simple Payback period	5	Year
Discounted Payback period	8	Year
Capital Enrichment Ratio	2,47	

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The Technical Assistance Process

- A consultant was engaged by ESCWA to provide individual technical assistance to RE project developers that expressed interest in the process
- Project developers for 9 RE Projects, from 4 ESCWA MCs, confirmed their interest and completed the technical assistance process:
 - Libya : 1 RE Project (REAOL)
 - Mauritania : 2 RE Projects (APAUS)
 - Palestine : 3 RE Projects (Hebron Utility / Hebron Municipality)
1 RE Project (Palestine Red Crescent / Hebron)
 - Sudan : 1 RE Project (HCEURP)
1 RE Project (ATTS)

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Project Name	Country	Project Developer	Project Size // Cost
Hoon Solar PV Grid Connected Power System	Libya	Renewable Energies Authority of Libya (REAOL)	14 MWp // USD 22 M
Use of Productive Green Energy For 10 Landlocked and Isolated Communities	Mauritania	Agency for Universal Access (APAUS)	10 X 100 kW + 50 m3/day desalination // USD 63 M
wide scale electrification program using RE technologies	Mauritania	Agency for Universal Access (APAUS)	Various RE solutions // USD 12 M
1 MW Solar Energy project (distributed)	Palestine	Hebron Municipality/ Hebron Electric Utility	1 MWp // USD 1.5 M
1 MW Solar Energy project – Ground Mounted	Palestine	Hebron Municipality/ Hebron Electric Utility	1 MWp // USD 1.5 M
MSW Gas Generation of 1000 KW (Solid waste plant)	Palestine	Hebron Municipality/ Hebron Electric Utility	1 MW // USD 2.25 M
Al Raja'a center for special education solar energy project.	Palestine	Palestine Red Crescent (PRC) Hebron Branch	80 kWp // USD 82, 000
Khartoum State Waste to Energy Plants (5 Combined Heat & Power plant)	Sudan	Higher Council of Environment and Urban and Rural Promotion	Total= 52 MW // USD 78 M
Production of Biogas from Animal Manure for Rural Areas (1000 digesters)	Sudan	Agricultural Technology Transfer Society	0.2 MW // USD 672,365

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Project Name	Country	Project Description	Summary economic feasibility analysis
Hoon Solar PV Grid Connected Power System	Libya	14 MWp Grid Connected PV system to be installed at Hoon City, Libya	IRR project 20% Payback period: Simple: 5 years Discounted: 8 years
Proposed Use of Productive Green Energy For 10 Landlocked and Isolated Communities	Mauritania	Productive green energy for 10 landlocked and isolated communities (10 X 100 kWp PV systems + storage). Systems installed to be in 10 different rural areas + 50 m3/day desalination plant	IRR project 13% Payback period: Simple: 7 years Discounted: 13 years
wide scale electrification program using various renewable energy technologies	Mauritania	project uses Hybrid (Solar/Thermic) or (Wind/Thermic) mini-plants or multifunctional solar platforms for isolated villages + Interconnection to Grid when feasible	Feasibility study not completed yet

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Project Name	Country	Project Description	Summary economic feasibility analysis
Al Raja'a center for special education solar energy project.	Palestine	80 kWp on-grid PV system to be installed on the roof top of Al Raja'a center for special education building.	IRR project 42% Payback period: Simple: 2 years Discounted: 5 years
1 MW Solar Energy project	Palestine	1 MWp on-grid PV systems distributed on various industrial & commercial facilities and residential buildings.	IRR project 35% Payback period: Simple: 3 years Discounted: 6 years
1 MW Solar Energy project – Ground Mounted	Palestine	1 MWp ground mounted on-grid PV system to be installed South of Hebron	IRR project 24% Payback period: Simple: 4 years Discounted: 7 years

ESCWA RE Project Development Portfolio

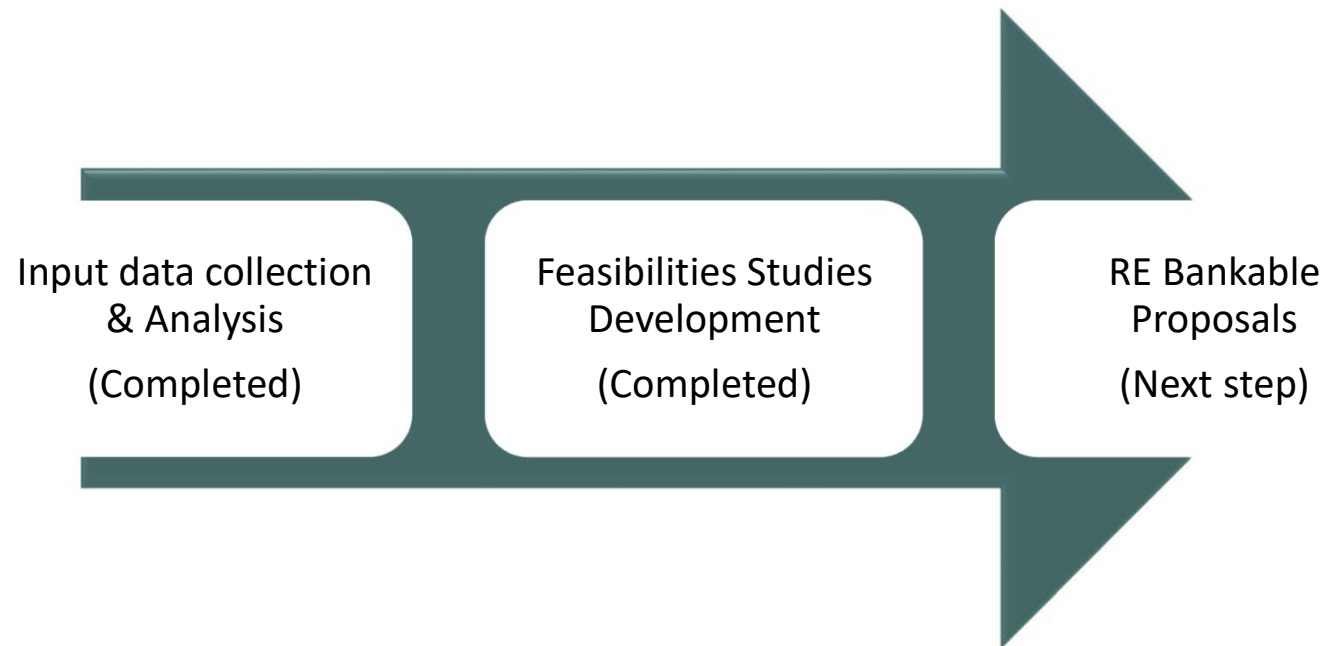
The Technical Assistance Process

Project Name	Country	Project Description	Summary economic feasibility analysis
MSW Gas Generation of 1000 kW	Palestine	1000 kW Municipal Solid Waste plant to be installed in the south of Hebron, Yatta Lanfill. (On-grid gas driven generation unit)	IRR project 55% Payback period: Simple: 2 years Discounted: 3 years
Khartoum State Waste to Energy Plants	Sudan	5 X Combined Heat & Power plants. Biomass, from municipal solid waste (~50% of solid waste). project located within the city of Khartoum.	IRR project 4% Payback period: Simple: 13 years Discounted: 38 years
Production of Biogas from Animal Manure for Rural Areas	Sudan	Install 1000 biogas digester for 1000 different households.	IRR project 3% Payback period: Simple: 15 years Discounted: 25 years

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Process progress ...



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The Technical Assistance Process

In conclusion

- **Specific tools are available to carry out RE economic feasibility studies**
- **Economic pre-feasibility studies for 9 RE projects have been carried out, and can be used to start preparing bankable proposals for projects with promising profitability indicators**
- **For these projects, need to proceed with verification of technical details and confirmation of the economic inputs**
- **The confirmed/verified data would be used in a new evaluation to confirm the conclusions of the pre-feasibility studies and proceed with the preparation of the bankable proposals**

Link to UN DA project: <https://www.unescwa.org/node/94046>

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THANK YOU FOR YOUR ATTENTION



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