




Natural Resources
Canada



Ressources naturelles
Canada





RETScreen® International

www.etscreen.net

Clean Energy Project Analysis Software

Project information

[See project database](#)

Project name

Micro Hydro Feasibility Analysis Chiapas

Project location

Las Canastas

Prepared for

Humboldt State

Prepared by

Rachel Rivera Matt Allan Jessica Lamb Meghan Heintz

Project type

Power

Technology

Hydro turbine

Grid type

Central-grid

Analysis type

Method 1

Heating value reference

Higher heating value (HHV)

Show settings

☒

Language - Langue

English - Anglais

User manual

English - Anglais

Currency

Mexico

Units

Imperial units

Site reference conditions

[Select climate data location](#)

Climate data location

San Cristóbal de las Casas

Show data

☒

Latitude

Unit

°N

Longitude

Unit

°E

Elevation

Unit

m

Heating design temperature

Unit

°C

Cooling design temperature

Unit

°C





Earth temperature amplitude

Unit

°C

Climate data location	Project location
16.8	16.8
-92.6	-92.6
828	828
13.8	
29.1	
10.9	

Month	Air temperature °C	Relative humidity %	Daily solar radiation - horizontal kWh/m²/d	Atmospheric pressure kPa	Wind speed m/s	Earth temperature °C	Heating degree-days °C-d	Cooling degree-days °C-d
January	19.1	71.0%	4.67	92.4	3.1	19.9	0	281
February	20.5	65.6%	5.42	92.3	2.9	21.8	0	294
March	22.0	61.5%	6.20	92.2	2.7	23.8	0	371
April	23.4	62.6%	6.41	92.1	2.2	25.4	0	402
May	23.5	70.3%	6.05	92.0	2.0	25.1	0	419
June	23.0	78.2%	5.55	92.1	2.0	24.0	0	390
July	22.6	76.6%	5.89	92.2	2.4	23.4	0	390
August	22.8	75.0%	5.70	92.2	2.2	23.8	0	398
September	22.4	79.3%	4.99	92.1	2.0	23.2	0	371
October	21.3	79.3%	4.68	92.1	2.5	22.1	0	351
November	20.4	76.0%	4.67	92.2	2.8	21.1	0	311
December	19.3	74.3%	4.46	92.3	3.2	19.9	0	287
Annual	21.7	72.5%	5.39	92.2	2.5	22.8	0	4,264
Measured at	m				10.0	0.0		



[Complete Energy Model sheet](#)

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NRCan/CanmetENERGY

Micro Hydro Feasibility Analysis Chiapas
Las Canastas

8/4/2010
canastasten.xlsm

General Page 1

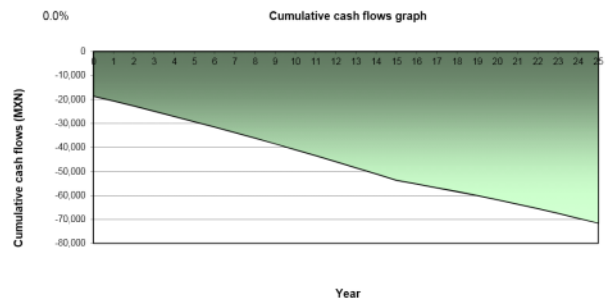
Proposed case power system			Incremental initial costs
Technology	Hydro turbine		
Analysis type	Method 1 Method 2		
Hydro turbine			
Power capacity	kW	0	MXN 17,221
Manufacturer	American Hydro		See product database
Model	Propeller		
Capacity factor	%	60.0%	
Electricity exported to grid	MWh	1	
Electricity export rate	MXN/MWh	629.10	

Emission Analysis

Base case electricity system (Baseline)		GHG emission factor (excl. T&D)	T&D losses	GHG emission factor
Country - region	Fuel type	tCO ₂ /MWh	%	tCO ₂ /MWh
Mexico	All types	0.500		0.500
Electricity exported to grid	MWh	1	T&D losses	10.0%
GHG emission				
Base case	tCO ₂	0.3		
Proposed case	tCO ₂	0.0		
Gross annual GHG emission reduction	tCO ₂	0.2		
GHG credits transaction fee	%	0.0%		
Net annual GHG emission reduction	tCO ₂	0.2	is equivalent to	0.6
				Barrels of crude oil not consumed
GHG reduction income				
GHG reduction credit rate	MXN/tCO ₂	152.00		
GHG reduction credit duration	yr			
GHG reduction credit escalation rate	%			

Financial Analysis

Financial parameters			
Inflation rate	%	3.7%	
Project life	yr	25	
Debt ratio	%	37%	
Debt interest rate	%	7.00%	
Debt term	yr	15	
Initial costs			
Power system	MXN	17,221	58.4%
See Costs Appendix	MXN	12,251	41.6%
Total initial costs	MXN	29,472	100.0%
Incentives and grants	MXN	0	0.0%
Annual costs and debt payments			
O&M (savings) costs	MXN	1,176	
Fuel cost - proposed case	MXN	0	
Debt payments - 15 yrs	MXN	1,197	
	MXN	0	
Total annual costs	MXN	2,373	
Annual savings and income			
Fuel cost - base case	MXN	0	
Electricity export income	MXN	331	
GHG reduction income - 0 yrs	MXN	36	
	MXN		
Total annual savings and income	MXN	367	
Financial viability			
Pre-tax IRR - equity	%	negative	
Pre-tax IRR - assets	%	negative	
Simple payback	yr	-36.4	
Equity payback	yr	> project	



RETScreen Tools - Power project
Settings

- | | | |
|---|--|--|
| <input type="checkbox"/> As fired fuel | <input type="checkbox"/> Ground heat exchanger | <input type="checkbox"/> User-defined fuel - gas |
| <input type="checkbox"/> Biogas | <input type="checkbox"/> Heat rate | <input type="checkbox"/> User-defined fuel - solid |
| <input type="checkbox"/> Building envelope properties | <input type="checkbox"/> Heating value & fuel rate | <input type="checkbox"/> Water & steam |
| <input type="checkbox"/> Appliances & equipment | <input checked="" type="checkbox"/> Hydro formula costing method | <input type="checkbox"/> Water pumping |
| <input type="checkbox"/> Electricity rate - monthly | <input type="checkbox"/> Landfill gas | <input type="checkbox"/> Window properties |
| <input type="checkbox"/> Electricity rate - time of use | <input type="checkbox"/> Unit conversion | <input type="checkbox"/> Custom 1 |
| <input type="checkbox"/> GHG equivalence | <input type="checkbox"/> User-defined fuel | <input type="checkbox"/> Custom 2 |

Hydro formula costing method

Country	Mexico	
Local vs. Canadian equipment cost ratio	0.55	
Local vs. Canadian fuel cost ratio	0.55	
Local vs. Canadian labour cost ratio	0.56	
Equipment manufacture cost coefficient	1.50	
Exchange rate	MXN/CAD	12.26
Cold climate	yes/no	Yes
Frost days at site	day	0
Design flow	ft³/s	2.83
Gross head	ft	15
Number of turbines	turbine	1
Type	Propeller	Kaplan
Flow per turbine	ft³/s	2.83
Turbine runner diameter per unit	ft	0.51
Facility type	Micro	Micro
Existing dam	yes/no	Yes
New dam crest length	ft	10
Maximum hydraulic losses	%	15.0%
Miscellaneous losses	%	10.0%
Road construction		
Canal		
Penstock		
Transmission line		
Grid type	Central-grid	Central-grid
Length	km	1.0
Difficulty of terrain		3.0
Voltage	kV	25.0

[See maps](#)

	Amount MXN	Adjustment factor	Amount MXN	Relative costs
Initial costs (credits)				
Feasibility study	0	1.00	0	0.0%
Development	0	1.00	0	0.0%
Engineering	25,000	1.00	25,000	1.3%
Power system				
Hydro turbine	904,000	1.00	904,000	47.8%
Road construction	0	1.00	0	0.0%
Transmission line	961,000	1.00	961,000	50.8%
Substation	2,000	1.00	2,000	0.1%
Balance of system & miscellaneous				
Penstock	0	1.00	0	0.0%
Canal	0	1.00	0	0.0%
Tunnel	0	1.00	0	0.0%
Other	0	1.00	0	0.0%
Sub-total:	0		0	
Total initial costs	1,892,000		1,892,000	100.0%

Appendix 1	(MXN)
Additonal Initial Costs	
Permit for using federal water	\$2,745.00
Permit for contruction 10 m from federal water	\$1,630.00
AQUW 1.2 meter mounting pole	\$2,635.50
AQUW mounting pole clamps	\$1,115.00
Interrumper Magnetico/Dump Load Controller	\$253.45
AC Breaker Panel/Caja Interrumper	\$92.00
Kilowatt hour meter	\$280.10
Transmission Line/Acometeda per km	\$1,500.00
Power Pole/Mofa	\$2,000.00
Initial Labor	\$1,470.00
Total	\$12,251.05