User Guide

Green hydrogen cost assessment tool

Date: June 2025

Acknowledgements

Project Team: (ISA-ADB TA) Dr Mridula Bharadwaj. (ISA) Ramesh Kumar Kuruppath (Chief of Unit - PPIC), S Gautham.

Technical Reviewers: Ashish Khanna (Director General, ISA), Dr Pradeep Tharakan (Director, Energy Transition, ADB), Tron Andre Svanes (Energy Specialist, ADB)

The International Solar Alliance extends its gratitude to Emanuele Bianco, Energy Specialist, ADB for his valuable feedback during the course of the project.

Disclaimer

This tool is currently in draft/beta testing and we appreciate your feedback. This tool is intended to provide indicative output based on information submitted by you, which should be used solely for reference purpose only. The results of this tool are not intended for any commercial usage or reproduction and does not carry any right of publication or disclosure to any other party. Users need to provide assumptions that align with envisaged countries/ projects. A few assumptions have been pre-fixed to facilitate ease of use only. The resulting output and its content do not constitute investment advice, financial advice or any form of recommendation or management decision making. The output provided do not imply any endorsement, assurance, audit or validation by us of any existing or proposed green hydrogen project of any kind or the cost involved therein. These outputs and related content are not binding and should not be relied upon for making any business, investment, or financial decisions of any manner whatsoever. You must exercise your own due diligence and verify the information before making any decisions based on the output. No liability is accepted for its use or for any inaccuracies it may contain. This tool and the resultant output is not a replacement for detailed techno-commercial feasibility and project modelling.

Brief description

Key inputs considered for the LCOH calculation

Project Assumptions

- Plant Economic Life
- Construction Period
- Phasing of CAPEX

Financial Assumptions

- Capital structure (whether foreign debt needs to be considered)
- Debt Equity ratio
- Return on Equity
- Interest rate
- Hedging cost (for foreign debt)
- Corporate tax rate
- Target GH selling price

Renewable Energy Assumptions

- Mode of RE procurement (PPA/CAPEX)
- Source of RE (Solar/Wind/Hybrid/Other)
- Cost of RE
- Transmission cost and losses
- Wheeling cost and losses
- Electricity duties and other regulatory costs
- % procurement from balancing power source
- Balancing power cost
- Cost of RE certificate/Green premium
- RE availability (Load Factor / Electrolyser Utilisation)

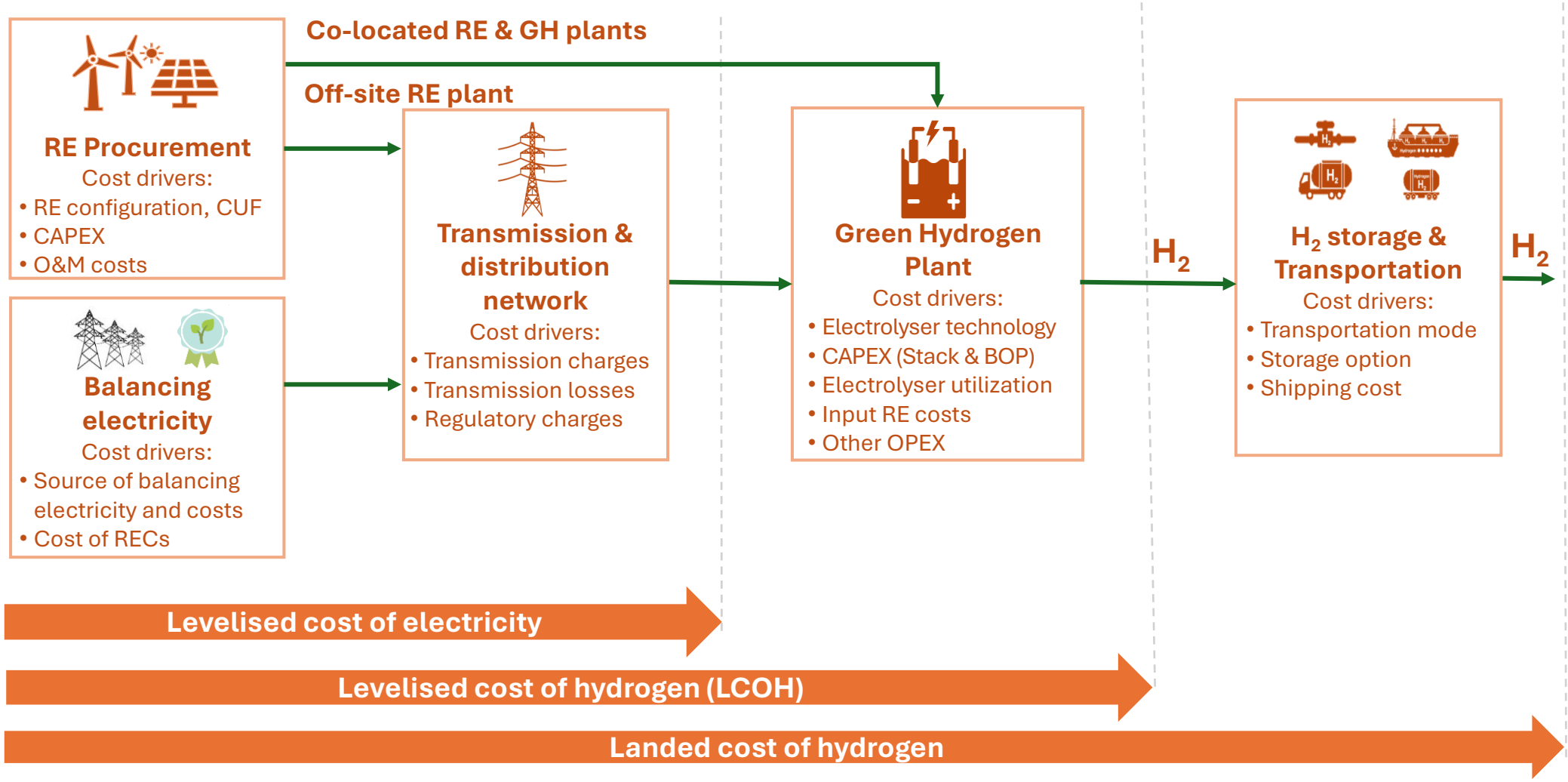
Other Assumptions

- Cost escalation factor
- Subsidy/incentives on Electricity cost/GH plant Opex
- CAPEX for GH storage
- Days of GH storage
- Land distance from GH facility to point of consumption/port
- Cost of GH transport within country
- GH Shipping charges

Electrolysis unit Assumptions

- Ownership type (CAPEX/Lease)
- Electrolyser Technology (Alkaline/PEM/SOEC)
- Source of Water for Electrolysis (Raw water/Sea Water)
- Installed Electrolyser Capacity
- System CAPEX
- Tax and Duties
- Upfront CAPEX subsidy
- Proportion of BOP in the capital cost
- GH plant Opex
- Land cost
- Specific Energy Consumption (System)
- Stack Lifetime
- Electrolyser Stack degradation
- Stack Replacement Cost
- Water cost
- Water quantity for Electrolysis
- CAPEX for Desalination+Demineralization plant and pipelines (in case sea water is used)

The model will allow for various options (E.g. RE configuration) and inputs along the value chain to calculate and optimize LCOH



User instructions

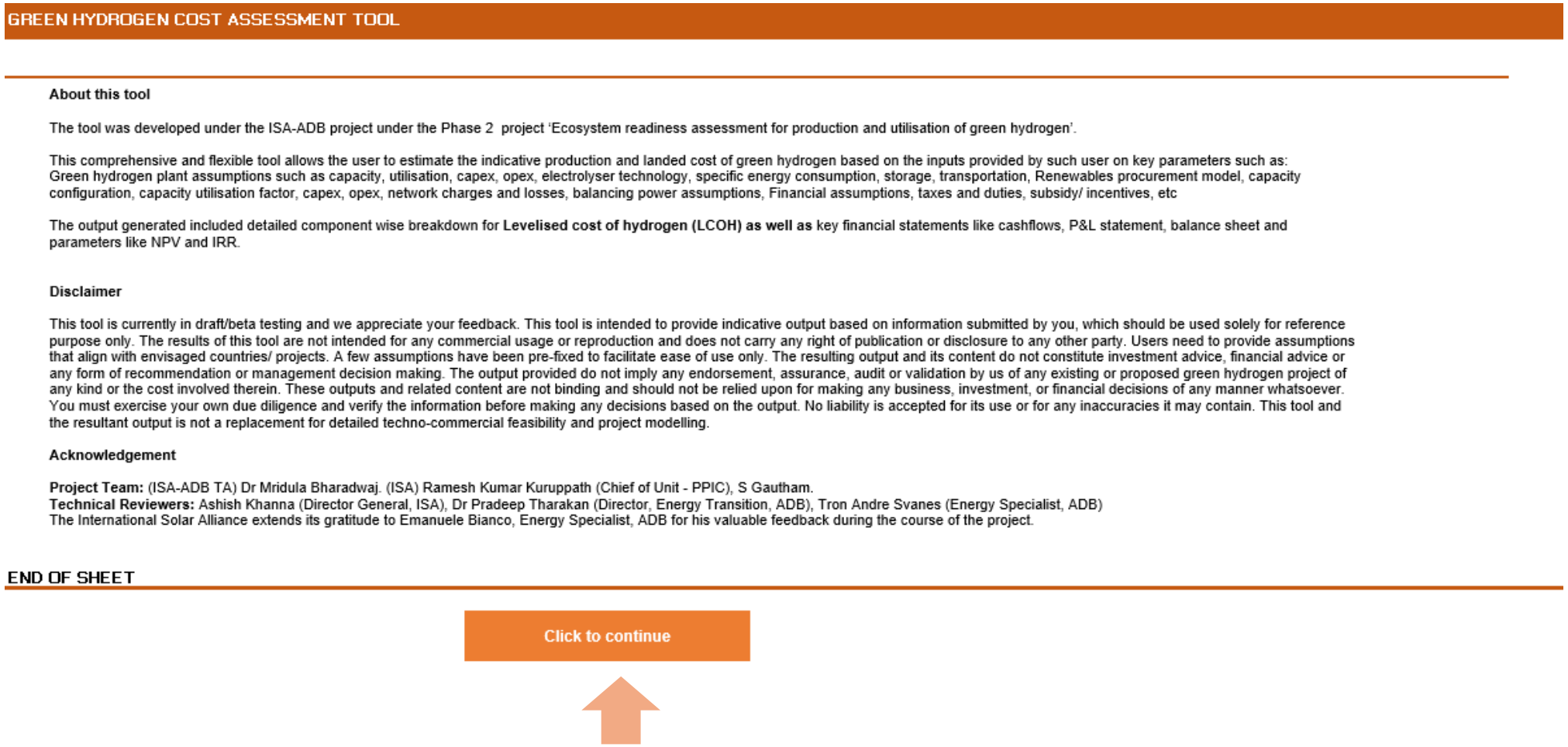
Navigating through the GH Feasibility assessment tool

Inputs		Calculations		Outputs	
Dashboard	Key user inputs regarding financing, RE, GH plant needs to be updated/validated	RE- Renewable Energy Cost (for GH production)	Calculations to estimate the levelised cost of electricity	Dashboard	Key outputs including GH cost, GH productions, cost components, project financial parameters are displayed on the Dashboard
		GH - Green Hydrogen cost	Calculations to estimate the levelised cost and yearly cost of Green Hydrogen	Financial statements	Balance sheet, Cash flow, P&L and financial parameters may be analysed in financial statements sheet

Key steps to navigate through the cost tool model (1/4)

Step 1:

Read the disclaimer and click on “Click to Begin” button to begin operating the tool



GREEN HYDROGEN COST ASSESSMENT TOOL

About this tool

The tool was developed under the ISA-ADB project under the Phase 2 project ‘Ecosystem readiness assessment for production and utilisation of green hydrogen’.

This comprehensive and flexible tool allows the user to estimate the indicative production and landed cost of green hydrogen based on the inputs provided by such user on key parameters such as:
Green hydrogen plant assumptions such as capacity, utilisation, capex, opex, electrolyser technology, specific energy consumption, storage, transportation, Renewables procurement model, capacity configuration, capacity utilisation factor, capex, opex, network charges and losses, balancing power assumptions, Financial assumptions, taxes and duties, subsidy/ incentives, etc

The output generated included detailed component wise breakdown for **Levelised cost of hydrogen (LCOH) as well as** key financial statements like cashflows, P&L statement, balance sheet and parameters like NPV and IRR.

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END OF SHEET

Click to continue

Key steps to navigate through the cost tool model (2/4)

Step 2:

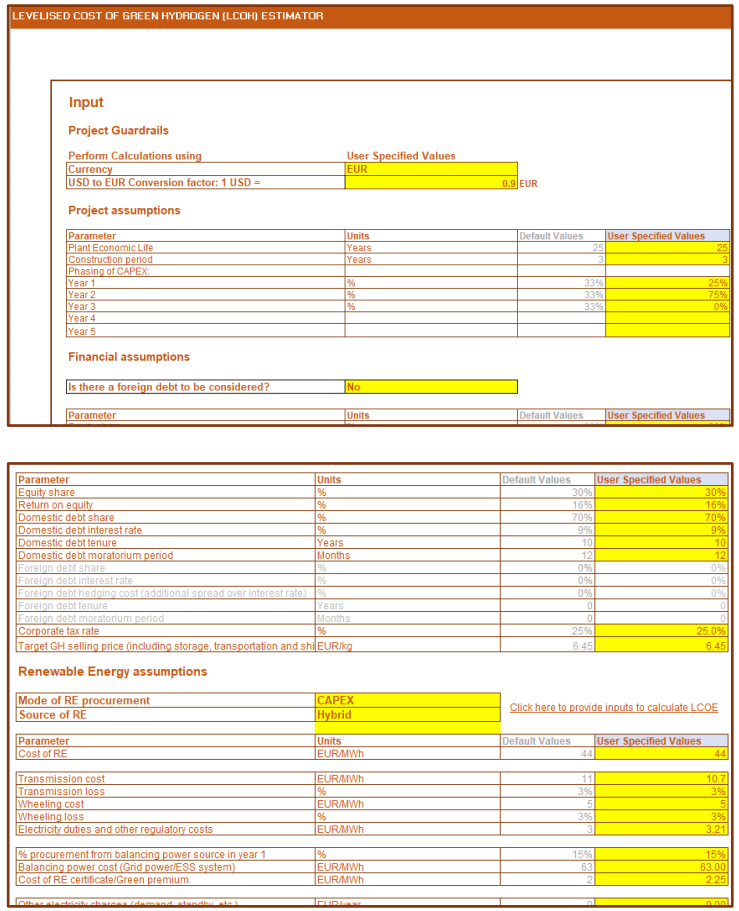
Input key parameters on financing, RE, GH plants on the Dashboard

Step 3:

Check cost & key financial outputs on the Dashboard

Step 4:

(In case of RE procurement under CAPEX mode) → validate/update the assumptions on LCOE Dashboard sheet



LEVELISED COST OF GREEN HYDROGEN (LCOH) ESTIMATOR

Input

Project Guardrails

Perform Calculations using	User Specified Values
Currency	EUR
USD to EUR Conversion factor: 1 USD =	0.9 EUR

Project assumptions

Parameter	Units	Default Values	User Specified Values
Plant Economic Life	Years	25	25
Construction period	Years	3	3
Phasing of CAPEX:			
Year 1	%	33%	25%
Year 2	%	33%	75%
Year 3	%	33%	0%
Year 4			
Year 5			

Financial assumptions

Is there a foreign debt to be considered?	No

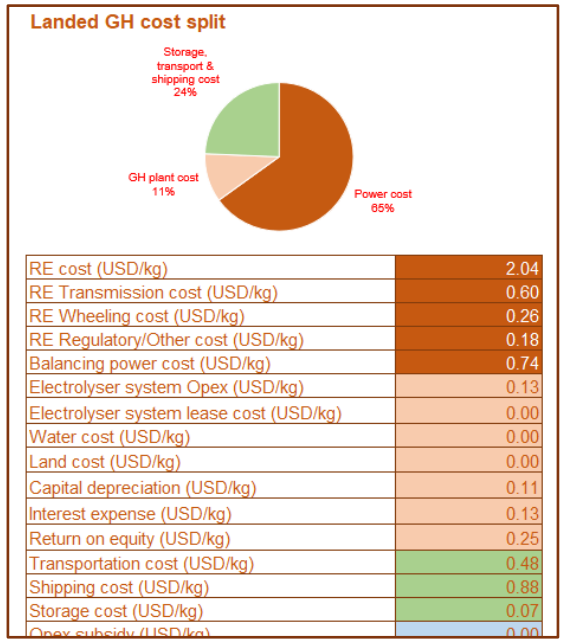
Parameter	Units	Default Values	User Specified Values
Equity share	%	30%	30%
Return on equity	%	16%	16%
Domestic debt share	%	70%	70%
Domestic debt interest rate	%	9%	9%
Domestic debt tenure	Years	10	10
Domestic debt moratorium period	Months	12	12
Foreign debt share	%	0%	0%
Foreign debt interest rate	%	0%	0%
Foreign debt hedging cost (additional spread over interest rate)	%	0%	0%
Foreign debt tenure	Years	0	0
Foreign debt moratorium period	Months	0	0
Corporate tax rate	%	25%	25.0%
Target GH selling price (including storage, transportation and shi	EUR/kg	6.45	6.45

Renewable Energy assumptions

Mode of RE procurement	CAPEX
Source of RE	Hybrid

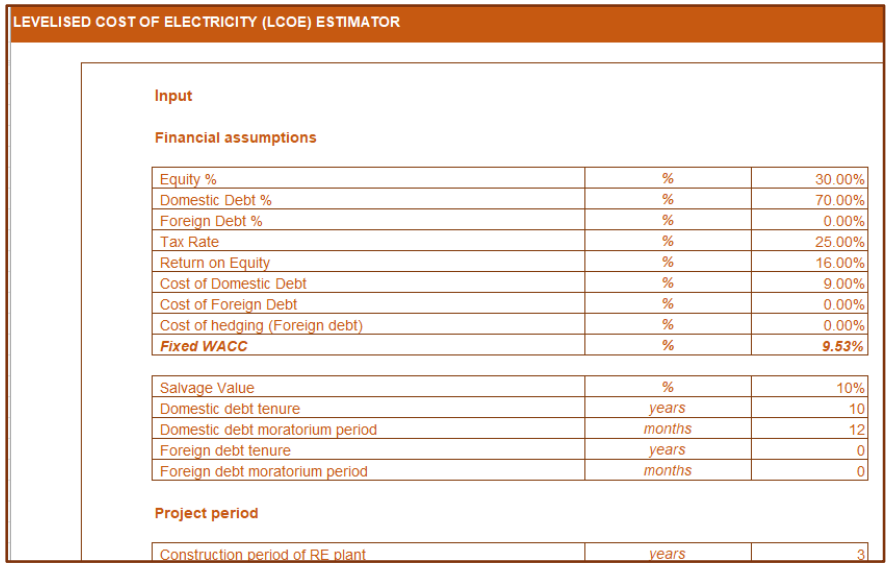
Click here to provide inputs to calculate LCOE

Parameter	Units	Default Values	User Specified Values
Cost of RE	EUR/MWh	44	44
Transmission cost	EUR/MWh	11	10.7
Transmission loss	%	3%	3%
Wheeling cost	EUR/MWh	5	5
Wheeling loss	%	3%	3%
Electricity duties and other regulatory costs	EUR/MWh	3	3.21
% procurement from balancing power source in year 1	%	15%	15%
Balancing power cost (Grid power/ESS system)	EUR/MWh	63	63.00
Cost of RE certificate/Green premium	EUR/MWh	2	2.25
Other electricity charges (demand, standby, etc.)	EUR/year	0	0.00



Landed GH cost split

RE cost (USD/kg)	2.04
RE Transmission cost (USD/kg)	0.60
RE Wheeling cost (USD/kg)	0.26
RE Regulatory/Other cost (USD/kg)	0.18
Balancing power cost (USD/kg)	0.74
Electrolyser system Opex (USD/kg)	0.13
Electrolyser system lease cost (USD/kg)	0.00
Water cost (USD/kg)	0.00
Land cost (USD/kg)	0.00
Capital depreciation (USD/kg)	0.11
Interest expense (USD/kg)	0.13
Return on equity (USD/kg)	0.25
Transportation cost (USD/kg)	0.48
Shipping cost (USD/kg)	0.88
Storage cost (USD/kg)	0.07
Opex subsidy (USD/kg)	0.00



LEVELISED COST OF ELECTRICITY (LCOE) ESTIMATOR

Input

Financial assumptions

Equity %	%	30.00%
Domestic Debt %	%	70.00%
Foreign Debt %	%	0.00%
Tax Rate	%	25.00%
Return on Equity	%	16.00%
Cost of Domestic Debt	%	9.00%
Cost of Foreign Debt	%	0.00%
Cost of hedging (Foreign debt)	%	0.00%
Fixed WACC	%	***9.53%***

Salvage Value	%	10%
Domestic debt tenure	*years*	10
Domestic debt moratorium period	*months*	12
Foreign debt tenure	*years*	0
Foreign debt moratorium period	*months*	0

Project period

Construction period of RE plant	*years*	3

Key steps to navigate through the cost tool model (3/4)

Step 5:

Access Financial Statements pertaining to the GH project

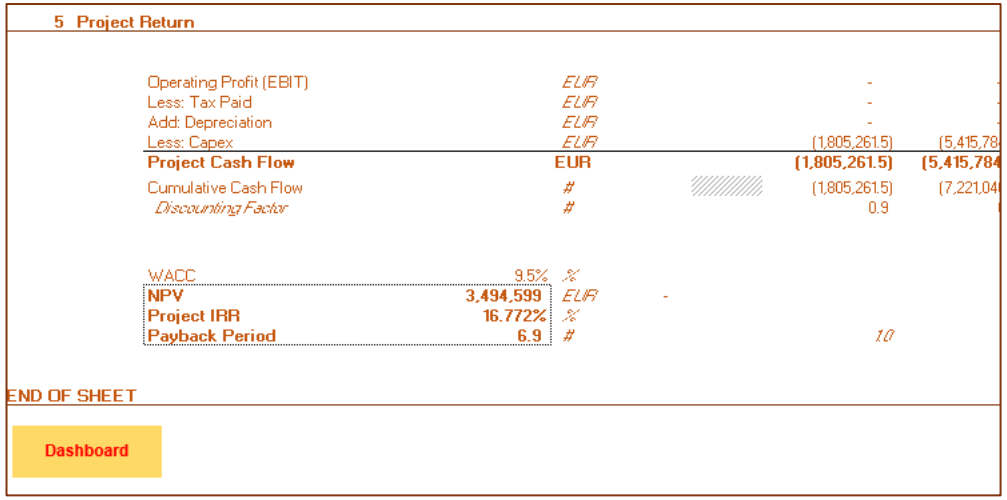
FINANCIAL STATEMENTS

		Period no	1	2	3	4	5	6	7	8	9	10	11
		Days in period	365	365	365	365	365	365	365	365	365	365	365
1 PROFIT & LOSS													
Revenue	EUR		-	-	-	9,238,839	9,238,839	9,238,839	9,238,839	9,238,839	9,238,839	9,238,839	9,238,839
Operating Cost	EUR		-	-	-	6,820,510	6,940,423	7,064,230	7,192,055	7,324,025	7,460,271	7,600,928	7,746,134
EBITDA	EUR		-	-	-	**2,418,329**	**2,298,416**	**2,174,609**	**2,046,784**	**1,914,814**	**1,778,568**	**1,637,911**	**1,492,705**
Depreciation	EUR		-	-	-	259,958	259,958	259,958	259,958	259,958	259,958	259,958	259,958
Operating Profit (EBIT)	EUR		-	-	-	**2,158,371**	**2,038,458**	**1,914,651**	**1,786,826**	**1,654,856**	**1,518,610**	**1,377,954**	**1,232,747**
Interest + Hedging cost	EUR		-	-	-	454,926	429,652	379,105	328,558	278,010	227,463	176,916	126,368
Earnings Before Tax (EBT)	EUR		-	-	-	**1,703,445**	**1,608,806**	**1,535,546**	**1,458,268**	**1,376,846**	**1,291,147**	**1,201,038**	**1,106,379**
Corp. Tax Payable	EUR		-	-	-	425,861	402,202	383,887	364,567	344,211	322,787	300,260	276,595
Profit After Tax (PAT)	EUR		-	-	-	**1,277,584**	**1,206,605**	**1,151,660**	**1,093,701**	**1,032,634**	**968,360**	**900,779**	**829,784**
Effective Tax Rate	%		**0%**	**0%**	**0%**	**25%**	**25%**	**25%**	**25%**	**25%**	**25%**	**25%**	**25%**
2 Balance Sheet													
ASSETS													
Gross Non Current Assets (Property, Plant, Equipment)	EUR		1,805,262	7,221,046	7,221,046	6,961,088	6,701,131	6,441,173	6,181,216	5,921,258	5,661,300	5,401,343	5,141,385
Sale of Asset	EUR		-	-	-	-	-	-	-	-	-	-	-
Net Non Current Assets	EUR		**1,805,262**	**7,221,046**	**7,221,046**	**6,961,088**	**6,701,131**	**6,441,173**	**6,181,216**	**5,921,258**	**5,661,300**	**5,401,343**	**5,141,385**
Cash and Bank Deposits	EUR		-	-	-	1,537,541.4	2,442,466.8	3,292,447.3	4,084,469.4	4,815,424.4	5,482,105.6	6,081,204.8	6,609,309.9
Total Current Assets	EUR		-	-	-	**1,537,541.4**	**2,442,466.8**	**3,292,447.3**	**4,084,469.4**	**4,815,424.4**	**5,482,105.6**	**6,081,204.8**	**6,609,309.9**

Key steps to navigate through the cost tool model (4/4)

Step 6:

To change the values, use the “Dashboard” button provided at the bottom of the sheets on LCOE and Financial Statements to reach the Dashboard sheet and update the values.



5 Project Return

Operating Profit (EBIT)		EUR	-	-
Less: Tax Paid		EUR	-	-
Add: Depreciation		EUR	-	-
Less: Capex		EUR	(1,805,261.5)	(5,415,78
Project Cash Flow		**EUR**	**(1,805,261.5)**	**(5,415,784**
Cumulative Cash Flow		#	(1,805,261.5)	(7,221,04
Discounting Factor		#	0.9	
WACC	9.5%	%		
NPV	**3,494,599**	EUR	-	
Project IRR	**16.772%**	%		
Payback Period	**6.9**	#	*10*	

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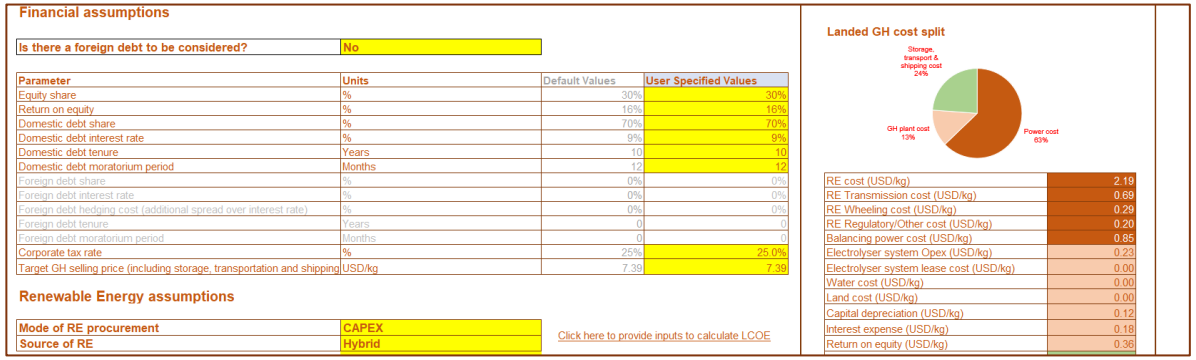
Dashboard



Financial assumptions

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Return on equity	%	16%	16%
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Domestic debt interest rate	%	9%	9%
Domestic debt tenure	Years	10	10
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Foreign debt share	%	0%	0%
Foreign debt interest rate	%	0%	0%
Foreign debt hedging cost (additional spread over interest rate)	%	0%	0%
Foreign debt tenure	Years	0	0
Foreign debt moratorium period	Months	0	0
Corporate tax rate	%	25%	25.0%
Target GH selling price (including storage, transportation and shipping)	USD/kg	7.39	7.39

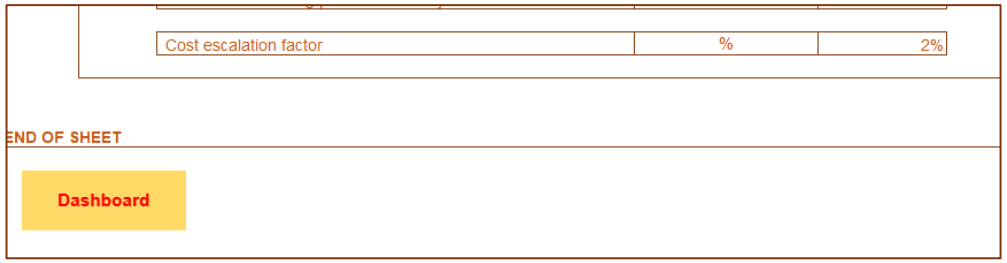
Renewable Energy assumptions

Mode of RE procurement	CAPEX
Source of RE	Hybrid

Click here to provide inputs to calculate LCOE

Landed GH cost split

RE cost (USD/kg)	2.19
RE Transmission cost (USD/kg)	0.69
RE Wheeling cost (USD/kg)	0.29
RE Regulatory/Other cost (USD/kg)	0.20
Balancing power cost (USD/kg)	0.85
Electrolyser system Opex (USD/kg)	0.23
Electrolyser system lease cost (USD/kg)	0.00
Water cost (USD/kg)	0.00
Land cost (USD/kg)	0.00
Capital depreciation (USD/kg)	0.12
Interest expense (USD/kg)	0.18
Return on equity (USD/kg)	0.36



Cost escalation factor	%	2%

END OF SHEET

Dashboard

THANK YOU

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