Feasibility studies for first of a kind commercial sustainable biofuel projects: Detailed instructions for financial analysis model

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1 Introduction

The intended purpose of the financial analysis template is to support project teams that are considering or involved in a feasibility study for an advanced biofuel plant project by providing a ready-made framework with which to conduct the financial analysis of their project.

Neither the methodology chosen in the template nor any aspect of the documentation is intended to be prescriptive. Rather both are intended simply as resources that project teams can draw on.

The template could not be designed in a manner that would cover all project eventualities and so it is likely that project teams will need to adapt the template to exactly match their needs. The same applies to the level of detail of the analysis: for early evaluations of the potential financial performance of a biofuel production process the template may be more detailed than customary. For a bankable project however, financial institutions may request even greater detail in the financial aspects. Nonetheless, much of the mechanics of the financial analysis function transparently to the user so those details that are not of interest can simply be ignored.

The workbook has been setup with assumptions about which way the calculations proceed. It is unfortunately not possible to set up the workbook in a way that will robustly cover all the eventualities. Because of this it is likely that certain formulas will need to be adapted by the users; some values that are now calculated may need to be switched to be inputs, and conversely, some current inputs may need to be switched to be calculated values. A simple example of this from the "Project description" worksheet is that the workbook is set up for the actual annual fuel output (cell C16) and operating hours (cell C15) to be provided as inputs. The worksheet then calculates the plant name plate capacity (cell C6) and utilisation factor (cell C14). There are clearly a number of different ways that these parameters can be specified and the user will need to adapt the equations to suit their specific circumstances.

Since it is likely that some level of modification of the spreadsheet will be required, it is recommended that this be done by users with some degree of familiarity with Microsoft Excel. Specifically, the workbook uses named variables and ranges, data tables, and lookup functions such as INDEX and MATCH, so familiarity with these is necessary to be able to make changes effectively.

2 List of worksheets

The financial analysis workbook is made up of the following worksheets:

Name	**Description**
Instructions	Description of formatting used in workbook and of the individual worksheets
Dashboard	Summary of key financial outputs such as levelised fuel cost, NPV, IRR and DSCR
Levelised cost	Detailed levelised cost breakdown in €/t[fuel] and €/l[fuel]
Sensitivity	Data tables that calculate sensitivity to variations in feedstock supply

	scenario, fuel price scenario, capex, feedstock cost, green electricity price premium. This worksheet includes the switch to select central feedstock blend and fuel price scenarios
Project description	Key plant performance inputs and process inputs and outputs (and conversion into units needed for later calculations)
Capex breakdown	Breakdown of the project capex
Financial inputs	Key financial inputs such as discount and interest rates and amortization periods
Price inputs	Price inputs for process inputs and products and calculation of escalated prices
Indices	Input tables of price inflation indices
Fuel prices	Fuel price scenario input table
Feedstock calculations	Calculation of feedstock blends and blended prices for different feedstock supply scenarios
Calculations	Financial calculations needed to put together cashflow analysis
Cashflow	Cashflow, income statement, balance sheet
Reference data	Reference data and unit conversions.

Where relevant, a more detailed description and instructions for individual worksheets are given below.

3 Workbook formatting

Standardized formatting has been used throughout the workbook to facilitate use of the workbook and in particular, to make the formulas in the workbook easier to interpret.

The standardized formatting template is shown below:

Cell formatting description	
Free entry input	Cell in which user input is expected
Listed input	Cell which has pull down allowing user to choose between pre-defined options
Formula 1	Contiguous blocks with the same formula formatting all have the same equation that can be dragged
Formula 2	Contiguous blocks with the same formula formatting all have the same equation that can be dragged
Formula 3	Contiguous blocks with the same formula formatting all have the same equation that can be dragged

The three “Formula” formatting (various shades of light blue) are of particular importance. Contiguous blocks with the same “Formula” colour all contain the same, draggable formula.

4 Named variables

Named variables are used extensively in the workbook for any data that is used on a different worksheet than where it is calculated.

The general template of named variables is “VariableName_unit”. Where both ‘VariableName’ and ‘unit’ are replaced by the relevant values.

Where a named variable refers to a range that is used in a lookup, the variable will generally follow the template: “VariableName_Table_Data_unit”. Such named ranges may also have adjacent ranges that are used in conjunction with the data named range that may use the following general templates: “VariableName_Table_Names” or “VariableNames_Table_Units”.

In a number of instances the name of a named range or variable is shown in a cell adjacent to the cell or range in small grey font as shown in the example below from the **Financial inputs** worksheet:

Gross plant capital expenditure	39,000	32,500	32,500	26,000	0	GrossPlantCapexDrawArray_k€
Building capital exp	6,000	5,000	5,000	4,000	0	BldgCapexDrawArray_k€
Equipment capital exp	33,000	27,500	27,500	22,000	0	EquipCapexDrawArray_k€
Debt capitalised interest	975	2,860	4,771	6,711	0	InterestCapexDrawArray_k€
Total capital investment	39,975	35,360	37,271	32,711	0	TotalCapexDrawArray_k€
Grant contributions	0	0	0	0	0	GrantDrawArray_k€
Post grant capital draw	39,975	35,360	37,271	32,711	0	
Loan draw	20,475	19,110	21,021	19,711	0	LoanDrawArray_k€
Equity contributions	19,500	16,250	16,250	13,000	0	EquityDrawArray_k€

5 Using the template

The high level process for using the template is to provide values for all the cells formatted as “Free entry input” on the **Project description**, **Capex breakdown**, **Financial inputs**, **Price inputs**, **Indices**, **Fuel prices** and **Feedstock calculations** worksheets.

In addition, on the **Project description** worksheet, the formulas to calculate the annual process inputs and outputs need to be verified and/or adapted. Additional discussion of this is included in Section 6.2.

The detailed results of the financial analysis are given on the **Cashflow** worksheet.

The **Levelised cost** worksheet provides a detailed breakdown of the fuel levelised cost by tonne and litre of fuel. The levelised cost is particularly useful for comparing different routes or different technology providers’ processes where the relative split between capital and operational costs may be different.

The **Dashboard** worksheet provides a high level summary of the key outputs of the financial analysis.

The **Sensitivity** worksheet provides some sensitivity analysis for certain key financial parameters to variations in capital costs, feedstock blend scenario, fuel price scenario, feedstock price and coproduct price.

6 Project description worksheet

6.1 Input block: General project parameters

General project parameters

Parameter	Value	Units	Reference	Note
Plant capacity	54.8	kt[fuel]/yr		
Total project capex	130,000	k€		See Capex breakdown worksheet
Plant lifetime	30	yrs		
Construction start year	2015	-		
Construction duration	4	yrs		Max 5 years

In this block, the expected plant lifetime, the year of the start of construction (see also the reference year on the **Financial inputs** worksheet) and the duration of the construction period should be inputted. Note that the workbook is set up to allow for up to 5 years of construction period. If a longer construction period is necessary, sections of the **Financial inputs** worksheet that deal with the capital spend profile and commercial loan interest will need to be adapted.

The total project capex data is carried over from the **Capex breakdown** worksheet.

The plant nameplate capacity is calculated from the annual output and annual hours that are inputs in the 'Plant operational parameters' block directly below.

6.2 Input block: Plant operational parameters

Plant operational parameters

Parameter	Value	Units	Reference	Note
Plant utilisation factor	91%	-		
Annual hours	8,000	h		
Annual output	50	kt[fuel]		
	1.34E+06	GJ[fuel]		

In this block, the plant actual annual output in kilo-tonnes and actual operational hours should be inputted. The plant utilisation factor and nameplate capacity are calculated from this data.

6.3 Input block: Plant commissioning ramp-up profile

Plant commissioning ramp-up profile

Year	1	2	3	4	5
% of capacity	67%	80%	100%	100%	100%
Ramp up profile			5 yrs		

In this block, the plant utilisation factor during the plant commissioning phase should be inputted. Allowance has been made for up to 5 years of commissioning. This utilisation factor is used to scale the plant actual output, process inputs and outputs and variable costs on the **Calculations** worksheet. Note that labour is not scaled as this is assumed to be fixed.

6.4 Display block: Feedstock supply case

Feedstock supply case

	Supply case		Blend 1		
	As received basis	Value	Units	Reference	Note
1	Feedstock 1	161,223	t[AR]		
2	Feedstock 2	133,375	t[AR]		
3	Feedstock 3	0	t[AR]		
	Total	294,598	t[AR]		
	Average price	53.0	€/t[AR]		
	Dry basis	Value	Units	Reference	Note
	Total	266,750	odt		
	Average process yield	5.34	t[AR]/t[fuel]		

This block displays the data on the feedstock blend that is being used for the specific calculation and the quantities of the various feedstocks that make up the blend. These quantities are carried over from the **Feedstock blend** worksheet. The feedstock blend is selected by a pull down menu in the **Sensitivity** worksheet.

6.5 Input block: Process specific inputs

Process specific inputs

Parameter	Value	Units	Reference	Note
Electricity	0.00	MWh[e]/t[fuel]		
Natural gas	0.000	MWh[ng]/t[fuel]		
Steam	0.00	t[steam]/t[fuel]		
Water	4.00	m3[water]/t[fuel]		
Input 5	1.00	unit/t[fuel]		
Input 6	1.00	unit/t[fuel]		
Input 7	1.00	unit/t[fuel]		
Input 8	1.00	unit/t[fuel]		

In this block, the process inputs in relevant unit of input per relevant unit of fuel output should be inputted. The relevant plant output unit could be tonne of fuel as shown above or, for instance, MJ of fuel. The name, value and units must be inputted. Allowance has been made for up to 8 process input streams. Additional input streams can be added but this change will need to be reflected in the 'Annual inputs' block below and also in the **Price inputs** and **Calculations** worksheets.

6.6 Input block: Process specific outputs

Process specific outputs

Parameter	Value	Units	Reference	Note
Fuel	0.187	t[fuel]/t[feedstock AR]		
Output 2	0.00	t/t[fuel]		
Ash	0.06	t[ash]/odt[feedstock]		
Waste water	4.00	m3[water]/t[fuel]		
Biogas	0.000	MWh[biogas]/t[fuel]		
Electricity	2.50	MWh[e]/t[fuel]		
Output 7	0.00	t/t[fuel]		
Output 8	0.00	t/t[fuel]		

In this block, the process outputs in relevant unit of output per relevant unit of fuel output should be inputted. The fuel output value and unit is calculated from the yield value in the 'Feedstock supply case' block above. The name, value and unit for the other output streams need to be inputted. Allowance has been made for up to 7 user-defined process output streams. Additional output streams can be added but this change will need to be reflected in the 'Annual outputs' block below and also in the **Price inputs** and **Calculations** worksheets.

6.7 Calculation block: Annual inputs

Annual inputs

Parameter	Value	Units	Reference	Note
Feedstock AR	294,598	t[AR]		
Feedstock dry	266,750	odt[feedstock]		
Electricity	0	MWh[e]		
Natural gas	0	MWh[ng]		
Steam	0	t[steam]		
Water	200,000	m3[water]		
Input 5	50,000	unit		
Input 6	50,000	unit		
Input 7	50,000	unit		
Input 8	50,000	unit		

ProcInputs_Names ProcInputs_Units

ProcAnnualInputs_Data

In this block, the process specific inputs are converted into annual total quantities. The feedstock values are automatically carried over from the 'Feedstock supply case' block above. The equations for the values must be checked to ensure that the conversion from specific values is correct. Similarly, the unit values need to be checked and inputted for each stream.

6.8 Calculation block: Annual outputs

Annual outputs

Parameter	Value	Units	Reference	Note
Fuel	50,000	t[fuel]		
Output 2	0	t		
Ash	16,005	t[ash]		
Waste water	200,000	m3[water]		
Biogas	0	MWh[biogas]		
Electricity	125,000	MWh[e]		
Output 7	0	t		
Output 8	0	t		

ProcOutputs_Names ProcOutput_Units

ProcAnnualOutputs_Data

In this block, the process specific outputs are converted into annual total quantities. The fuel value are automatically carried over from the 'Plant operational parameters' block above. The equations for the values must be checked to ensure that the conversion from specific values is correct. Similarly, the unit values need to be checked and inputted for each stream.

7 Capex breakdown worksheet

7.1 Input blocks: Direct cost, Indirect cost, Contingency and fee

Direct cost

Parameter	Value	Units	Reference	Note
Land		k€		
ISBL equipment		k€		
ISBL equipment installation		k€		
BOP equipment		k€		
BOP equipment installation		k€		
Buildings		k€		
Service facilities		k€		
Offsite buildings		k€		Feedstock collection points
Site preparation		k€		

Indirect cost

Parameter	Value	Units	Reference	Note
Engineering and supervision		k€		
Construction overhead		k€		
Freight, insurance and taxes		k€		

Contingency and fee

Parameter	Value	Units	Reference	Note
EPC fee		k€		
Contingency		k€		

These input blocks represent a typical capital cost breakdown and are provided to assist in putting together the total plant capital cost estimate. The individual line items in these input blocks are not specifically needed by the model so can certainly adapted to fit the specificities of the project. The model only uses the total building, plant and equipment capital costs in the calculation block below.

7.2 Calculation block: Capex

Nominal building capex	20,000	k€	
Nominal plant and equipment capex	110,000	k€	
Adjusted building capex	20,000	k€	Includes multiplier for
Adjusted plant and equipment capex	110,000	k€	sensitivity analysis
Total capex	**130,000**	**k€**	

In this block, the building and plant and equipment capital costs from the blocks above are summed up. The equations need to be adapted to match the project specific capex breakdown. The building and plant and equipment categories are treated separately as the **Financial description** worksheet allows for separate depreciation periods for these two categories of capital goods. The adjusted capex amounts at the bottom of the block include a multiplier that is used in the sensitivity analysis.

8 Financial inputs worksheet

8.1 Input blocks: General, financing, grant and commercial loan

General inputs

Parameter	Value	Units	Note
Reference year	2015	-	
Discount rate	10.0%	-	
Corporate tax rate	20%	-	

Financing

Parameter	Value	Units	Note
Total plant capex	130,000	k€	
Grant as % of total	0%	-	Excludes capitalized interest
Equity as % of total	50%	-	Post grant, excluding capitalized interest

Grant

Parameter	Value	Units	Note
Grant amount	0	k€	
Amortization life	30	yrs	

Commercial loan

Parameter	Value	Units	Note
Grace period	4	yrs	Interest capitalized during construction
Loan maturity	15	yrs	Includes grace period
Interest rate	10%	-	
Capitalized interest	15,317	k€	
Loan principal	80,317	k€	
Annual payment	12,366	k€	

Equity

Parameter	Value	Units	Note
Total equity contribution	72,658	k€	

These blocks are used to provide the high level project finance inputs. Most of these parameters are self-explanatory. These include the following:

- Reference year: The year to which quantities are discounted. This is particularly useful if the start of construction is planned for a future year. The reference year must be before or equal to the construction start year.
- Grant: If the project finance includes a grant amount, the grant amount is calculated based on a percentage of the total project cost. The grant amount is then subtracted from the total project cost and the debt and equity fractions are calculated on the remaining balance. The grant also has its own amortization life that should be inputted.
- Financing: The percentage of equity financing for the project should be inputted. The equity fraction is calculated on the remaining balance after subtraction of the grant amount, excluding capitalized interest.
- Commercial loan: The loan maturity and interest rate should be inputted. The loan maturity is defined including the grace period. The model assumes that no loan payments are made during

the construction phase. Any interest incurred during the construction phase is capitalized and added to the commercial loan amount.

8.2 Input block: Depreciation

Depreciation

Parameter	Value	Units	Note
Capex split buildings	15%	-	
Capex split equipment	85%	-	
Lifetime buildings	30	yrs	
Lifetime equipment	30	yrs	
Lifetime capitalized interest	30	yrs	

In this block the split of the capex between buildings and equipment is carried over from the **Capex breakdown** worksheet. The depreciation periods for buildings, equipment (which includes the plant) and the capitalized interest should be inputted in accordance with the accounting practices of the project team.

8.3 Input block: Accounting

Accounting

Parameter	Value	Units	Note
Days revenue in Receivables	30	days	
Days costs in Payables	30	days	
Days costs of materials in Inventory	30	days	
% of year in Receivables	8%	-	
% of year in Payables	8%	-	
% of year in Inventory	8%	-	

Reference year discount point	Start
Discount Period correction factor	0.953
Start	0.953
Mid	1.000
End	1.049

Note: For NPVs, all cashflows are counted as occurring mid-period

In this block parameters relevant to the cashflow should be inputted, namely the number of days of commercial activity that are held as receivables, accounts payables and inventory.

For the NPV calculations, all cashflows are counted as occurring mid-period. The 'Reference year discount point' can be used to adjust whether quantities are discounted to the start, mid or end of the reference year.

8.4 Input block: Gross plant capital spend profile

Gross plant capital spend profile					
Year	1	2	3	4	5
Construction	TRUE	TRUE	TRUE	TRUE	FALSE
Spend profile	39,000	32,500	32,500	26,000	
Total correct?	TRUE				

In this block the overall plant capital spend profile during the construction period should be inputted. If the total inputted in the 'Spend profile' row does not match the project total capex, the 'Total correct?' flag will indicate FALSE.

8.5 Calculation block: Interest capitalization during grace period

Interest capitilization during grace period						
Year	1	2	3	4	5	
Capitalize	TRUE	TRUE	TRUE	TRUE	FALSE	
Balance b/f	0	20,475	39,585	60,606	80,317	
Gross debt drawn	19,500	16,250	16,250	13,000	0	
Interest	975	2,860	4,771	6,711	0	
Balance c/f	20,475	39,585	60,606	80,317	80,317	
Gross plant capital expenditure	39,000	32,500	32,500	26,000	0	GrossPlantCapexDrawArray_k€
Building capital exp	6,000	5,000	5,000	4,000	0	BldgCapexDrawArray_k€
Equipment capital exp	33,000	27,500	27,500	22,000	0	EquipCapexDrawArray_k€
Debt capitalised interest	975	2,860	4,771	6,711	0	InterestCapexDrawArray_k€
Total capital investment	39,975	35,360	37,271	32,711	0	TotalCapexDrawArray_k€
Grant contributions	0	0	0	0	0	GrantDrawArray_k€
Post grant capital draw	39,975	35,360	37,271	32,711	0	
Loan draw	20,475	19,110	21,021	19,711	0	LoanDrawArray_k€
Equity contributions	19,500	16,250	16,250	13,000	0	EquityDrawArray_k€

In this block the details of the grant, equity and loan capital draws during the construction period are calculated, as well as the interest on the commercial loan. The interest during the construction period is assumed to be capitalized so this block is used to calculate the actual loan principal. Please note that since the equity percentage is calculated excluding capitalized interest, the equity percentage of the total project cost including capitalized interest will be slightly lower.

9 Price inputs worksheet

This worksheet is used to input the prices for process inputs, operational costs and products and also to calculate escalated prices for these in future years.

9.1 Input block: Process inputs

Process inputs

	Parameter	Value	Units	Reference	Note
1	Feedstock AR	52.95	€/t[AR]		
3	Electricity	90	€/MWh[e]		
4	Natural gas	0	€/MWh[ng]		
5	Steam	35	€/t[steam]		
6	Water	0.1	€/m3[water]		
7	Input 5	130	€/unit		
8	Input 6	24	€/unit		
9	Input 7	35	€/unit		
10	Input 8	15	€/unit		

MatCostsTable_Names MatCostsTable_Units

In this block the prices for each of the process inputs and the relevant units should be inputted. The price for the feedstock is carried over from the **Feedstock blend** worksheet. The names of the process input streams are carried over from the **Project description** worksheet.

9.2 Input block: Operational costs

Operational costs

Parameter	Value	Units	Reference	Note
Labour	2,200	k€/yr		
Maintenance	1,500	k€/yr		
Solid waste disposal	16	k€/yr		
Other opex	400	k€/yr		

OpexCostsTable_Names

In this block the annual cost of the various operational cost items should be inputted. The cost for solid waste disposal in the example is carried over from the **Project description** worksheet as solid waste is a process output. The model assumes that operational costs are in k€/yr but these units can be adjusted if necessary. Additional operational cost items can be added to this block but the change would need to be reflected in the **Calculations** worksheet too.

9.3 Input block: Product prices

Product prices

	Parameter	Value	Units	Reference	Note
	Fuel		€/t[fuel]	Scenario 2	Scenario
2	Output 2	20.0	€/t		
3	Ash	0.0	€/t		
4	Waste water	0.0	€/m3[water]		
5	Biogas	0	€/MWh[biogas]		
6	Electricity	94.5	€/MWh[e]	Premium:	5.0%
7	Output 7	11.0	€/unit		
8	Output 8	0	€/unit		

ProdPriceTable_Names ProdPriceTable_Units

In this block the price of process outputs that generate revenue should be inputted. The fuel price is automatically carried over from the **Fuel prices** worksheet based on the fuel price scenario that is selected on the **Sensitivity** worksheet. The price for electricity in the example is calculated from the

electricity price in the ‘Process inputs’ block above and the green electricity price premium that is carried over from the **Sensitivity** worksheet.

9.4 Calculation block: Escalated costs and prices

Escalated process input prices

Index	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Feedstock	52.95	53.74	54.55	55.37	56.20	57.04	57.90	58.77	59.65	60.54	61.45	62.37	63.31	64.26	65.22	66.20
Electricity	90	91	93	94	96	97	98	100	101	103	104	106	108	109	111	113
Local PPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Local PPI	35	36	36	37	37	38	38	39	39	40	41	41	42	42	43	44
Local PPI	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.13
None	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00
None	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
None	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Local PPI	15.00	15.23	15.45	15.69	15.92	16.16	16.40	16.65	16.90	17.15	17.41	17.67	17.93	18.20	18.48	18.75

MatCostsTable_Data

Escalated operational costs

Index	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Wage	2,200	2,233	2,266	2,300	2,335	2,370	2,406	2,442	2,478	2,515	2,553	2,591	2,630	2,670	2,710	2,751
Local PPI	1,500	1,523	1,545	1,569	1,592	1,616	1,640	1,665	1,690	1,715	1,741	1,767	1,793	1,820	1,848	1,875
Local PPI	16	16	16	17	17	17	18	18	18	18	19	19	19	19	20	20
Local PPI	400	406	412	418	425	431	437	444	451	457	464	471	478	485	493	500

OpexCostsTable_Data

Escalated product prices

Index	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	620	634	648	662	676	691	705	719	733	747	761	775	789	803	818	832
Local PPI	20.00	20.30	20.60	20.91	21.23	21.55	21.87	22.20	22.53	22.87	23.21	23.56	23.91	24.27	24.64	25.00
Local PPI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Local PPI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Local PPI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Electricity	94.50	95.92	97.36	98.82	100.30	101.80	103.33	104.88	106.45	108.05	109.67	111.32	112.99	114.68	116.40	118.15
Local PPI	11.00	11.17	11.33	11.50	11.67	11.85	12.03	12.21	12.39	12.58	12.77	12.96	13.15	13.35	13.55	13.75
Local PPI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ProdPriceTable_Data

In this block, the escalated costs or prices are calculated for each of the process inputs, operational costs and products for future years. The index that is used for each price should be selected using the pull-down menu at the beginning of the respective row. The values of the indices are carried over automatically from the **Indices** worksheet. No escalation is done for the fuel prices as these are carried over from the **Fuel prices** worksheet.

10 Indices worksheet

This worksheet is used to input inflation rates for various categories of prices and calculate the price indices used to escalate prices in the **Price inputs** worksheet.

10.1 Input block: Inflation rate input table

Inflation rate input table

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Local CPI		2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Local PPI		1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Feedstock inflation rate		1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
LCU wage growth		1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Electricity price inflation rate		1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Fuel price inflation rate		1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%

In this block the inflation rates for different product categories and their names should be inputted. In the example, the block is set up so that the inflation rates are constant. However, if preferred, values for individual years can also be inputted.

10.2 Calculation block: Index table

Index table	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Local CPI	1.00	1.02	1.04	1.06	1.08	1.10	1.13	1.15	1.17	1.20	1.22
Local PPI	1.00	1.02	1.03	1.05	1.06	1.08	1.09	1.11	1.13	1.14	1.16
Feedstock inflation rate	1.00	1.02	1.03	1.05	1.06	1.08	1.09	1.11	1.13	1.14	1.16
LCU wage growth	1.00	1.02	1.03	1.05	1.06	1.08	1.09	1.11	1.13	1.14	1.16
Electricity price inflation rate	1.00	1.02	1.03	1.05	1.06	1.08	1.09	1.11	1.13	1.14	1.16
Fuel price inflation rate	1.00	1.02	1.03	1.05	1.06	1.08	1.09	1.11	1.13	1.14	1.16
None	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

IndexTable_Names IndexTable_Data

In this block, price indices are calculated from the inflation rates inputted in the 'Inflation rate input table' block above. In addition, a 'None' row with a constant index of 1 is also included. The price indices are used in the **Price inputs** worksheet to calculate escalated prices.

11 Fuel prices worksheet

11.1 Input block: Escalated fuel prices

Escalated prices	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Scenario 1	540.0	554.6	569.1	583.7	598.3	612.9	627.4	642.0	656.6	671.1	685.7
Scenario 2	620.0	634.1	648.2	662.3	676.5	690.6	704.7	718.8	732.9	747.0	761.1
Scenario 3	700.0	713.7	727.3	741.0	754.6	768.3	781.9	795.6	809.3	822.9	836.6
Scenario 4	780.0	793.2	806.4	819.6	832.8	846.0	859.2	872.4	885.6	898.8	912.0
Scenario 5	860.0	872.7	885.5	898.2	911.0	923.7	936.5	949.2	961.9	974.7	987.4
Scenario 6	945.0	957.1	969.3	981.4	993.6	1,005.7	1,017.9	1,030.0	1,042.1	1,054.3	1,066.4

FuelPriceCaseList

In this block, the fuel price scenarios should be inputted and named. The fuel prices in this table should be escalated. Approaches that can be used to estimate advanced biofuel prices are discussed in the main guidance document.

12 Feedstock blend worksheet

This worksheet is designed to assist in evaluating the relative merits of different feedstock supply options for the project. The model assumes that:

- The project will need to draw on more than one kind of feedstock to put together its feedstock supply
- The total annual plant output is fixed and the amount of feedstock is adjusted to match this output level
- Up to three different feedstock types can be included in each supply cases

Feedstock prices are most often available on an as-received basis (meaning at the typical moisture content) whereas process yields are most often described in terms of dry feedstock. The model therefore calculates the feedstock quantities on both bases.

The worksheet has been set up to allow for up to three different feedstock blends to be evaluated. Additional blends can be added but the data tables in the **Sensitivity** worksheet would need to be recreated if these new blends are to be included in the sensitivity analysis.

12.1 Input block: Feedstock blends and characteristics

Case list

Blend 1
Blend 2
Blend 3

As received basis		Moisture content (%)	Deliverved Price €/t[AR]	Yield odt/t[Fuel]	Blend 1 (% dry basis)	Blend 2 (% dry basis)	Blend 3 (% dry basis)	
Feedstock 1	t[AR]	9.0%	57.0	5.20	55%	20%	0%	**Note: percentages are defined on a dry basis**
Feedstock 2	t[AR]	10.0%	48.0	5.50	45%	30%	0%	
Feedstock 3	t[AR]	24.0%	51.0	5.00	0%	50%	100%	
Weighted average price	€/t[AR]				53.0	51.3	51.0	Feedstock_AveragePrice_€`tAR
Effective yield - dry	odt/t[Fuel]				5.34	5.19	5.00	
Total feedstock - dry	odt				266,750	259,500	250,000	

In this block the following information should be inputted:

- Names of the feedstock blends
- Names, moisture contents, price (AR basis) and process yield (dry basis) for each feedstock type
- Percentages of each feedstock in each blend (dry basis)

12.2 Calculation block: Feedstock quantities

Dry basis		Blend 1	Blend 2	Blend 3	
Feedstock 1	odt	146,713	51,900	0	
Feedstock 2	odt	120,038	77,850	0	
Feedstock 3	odt	0	129,750	250,000	
Total	odt	266,750	259,500	250,000	Feedstock_TotalDry_odt
Effective yield - AR	t[AR]/t[fuel]	5.335	6.285	6.579	Proc_AvgYieldTable_Data_tAR`tFuel
Unit cost	€/l[fuel]	0.224	0.211	0.202	

As received basis		Blend 1	Blend 2	Blend 3	
Feedstock 1	t[AR]	161,223	57,033	0	
Feedstock 2	t[AR]	133,375	86,500	0	
Feedstock 3	t[AR]	0	170,724	328,947	Feedstock_AsReceivedTable_Data_tAR
Total	t[AR]	294,598	314,257	328,947	Feedstock_TotalAsReceived_tAR

In this block, the amounts of dry feedstock needed to allow the plant to produce its intended annual output are calculated. These dry feedstock quantities are then also converted into as received feedstock quantities.

13 Reference data worksheet

This worksheet is used for external reference data such as fuel thermo-physical characteristics and any unit conversion coefficients that are needed in the model.

13.1 Input block: Reference data

Reference data

Fuel characteristics

Parameter	Value	Units	Reference	Note
LHV	26.81	MJ/kg	Biograce Standard Values	At 0% water
Density	794	kg/m3	Biograce Standard Values	
Litres per tonne	1259.4	l/t		

Conversion coefficients

Parameter	Value	Units	Reference	Note
MJ per kcal	0.0042	MJ/kcal		

In this block, the following fuel characteristics should be inputted:

- Lower heating value: used to calculate the energy content of the annual plant fuel output
- Density: Used to calculate the fuel specific volume
- Specific volume: Used to calculate the fuel levelised cost on a per litre basis

Any unit conversion factors that are needed by the model should be inputted in the lower table.

14 Calculations worksheet

This worksheet is used to calculate all the data needed to populate the **Cashflow** worksheet.

Plant operation is assumed to cease once the plant life has been reached (i.e., the model does not account for plant refurbishment).

14.1 Display block: Logic flags

	01Jul15	01Jul16	01Jul17	01Jul18	01Jul19	01Jul20	01Jul21	01Jul22	01Jul23	01Jul24	01Jul25
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Construction flag	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Operation flag	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
Ramp up flag	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE
Loan flag	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
Building depreciation flag	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
Equipment depreciation flag	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
Capitalized interested depreciation flag	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
Grant amortization flag	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
	0	0	0	0	1	2	3	4	5	5	5
Plant ramp up factor	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%

This block displays a series of logic flags that indicate when in time different phases of the project such as construction, ramp-up, operation etc., are taking place. These Boolean flags are used in the calculations in the blocks below.

This block also includes the ramp-up factor that is carried over from the **Project description** worksheet.

14.2 Calculation block: Operating costs

Operating costs

Parameter	Units	NPV	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Labour	k€	17,916	0	0	0	0	2,335	2,370	2,406	2,442	2,478	2,515	2,553
Maintenance	k€	12,215	0	0	0	0	1,592	1,616	1,640	1,665	1,690	1,715	1,741
Solid waste disposal	k€	130	0	0	0	0	17	17	18	18	18	18	19
Other opex	k€	3,257	0	0	0	0	425	431	437	444	451	457	464
Subtotal	**k€**	**33,519**	**0**	**0**	**0**	**0**	**4,369**	**4,434**	**4,501**	**4,568**	**4,637**	**4,706**	**4,777**

	Materials		Base price (2015)		Annual quantity												
	Parameter	Units	Value	Units	Value	Units	NPV	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
1	Feedstock AR	k€	52.95	€/t[AR]	294,598	t[AR]	127,031	0	0	0	0	16,556	16,804	17,057	17,312	17,572	17,836	18,103
3	Electricity	k€	90	€/MWh[e]	0	MWh[e]	0	0	0	0	0	0	0	0	0	0	0	0
4	Natural gas	k€	0	€/MWh[ng]	0	MWh[ng]	0	0	0	0	0	0	0	0	0	0	0	0
5	Steam	k€	35	€/t[steam]	0	t[steam]	0	0	0	0	0	0	0	0	0	0	0	0
6	Water	k€	0.1	€/m3[water]	200,000	m3[water]	163	0	0	0	0	21	22	22	22	23	23	23
7	Input 5	k€	130	€/unit	50,000	unit	43,894	0	0	0	0	6,500	6,500	6,500	6,500	6,500	6,500	6,500
8	Input 6	k€	24	€/unit	50,000	unit	8,104	0	0	0	0	1,200	1,200	1,200	1,200	1,200	1,200	1,200
9	Input 7	k€	35	€/unit	50,000	unit	11,818	0	0	0	0	1,750	1,750	1,750	1,750	1,750	1,750	1,750
10	Input 8	k€	15	€/unit	50,000	unit	6,108	0	0	0	0	796	808	820	832	845	858	870
	Total materials	**k€**					**197,117**					**26,823**	**27,084**	**27,349**	**27,617**	**27,889**	**28,166**	**28,447**
	Total operating costs	**k€**					**230,636**	0	0	0	0	**31,192**	**31,518**	**31,849**	**32,185**	**32,526**	**32,872**	**33,224**
	Inventory	k€						0	0	0	0	2,205	2,226	2,248	2,270	2,292	2,315	2,338
	Accounts Payable	k€						0	0	0	0	2,564	2,591	2,618	2,645	2,673	2,702	2,731

In this block the various operating costs are calculated for each year of plant operation. The price and annual quantity of each process input material in the reference year is displayed in this block to allow users to verify that the units for the price and quantity are self consistent.

NPVs of each quantity are also calculated as these are used in the calculation of the levelised cost in the **Levelised cost** worksheet.

14.3 Calculation block: Revenues

	Revenues		Base price (2015)		Annual quantity												
	Parameter	Units	Value	Units	Value	Units	NPV	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
	Fuel	k€	620	€/t[fuel]	50,000	t[fuel]	267,370	0	0	0	0	33,823	34,529	35,234	35,940	36,646	37,351	38,057
2	Output 2	k€	20.0	€/t	0	t	0	0	0	0	0	0	0	0	0	0	0	0
3	Ash	k€	0	€/t	16,005	t[ash]	0	0	0	0	0	0	0	0	0	0	0	0
4	Waste water	k€	0	€/m3[water]	200,000	m3[water]	0	0	0	0	0	0	0	0	0	0	0	0
5	Biogas	k€	0.0	€/MWh[biogas]	0	MWh[biogas]	0	0	0	0	0	0	0	0	0	0	0	0
6	Electricity	k€	94.5	€/MWh[e]	125,000	MWh[e]	96,196	0	0	0	0	12,537	12,725	12,916	13,110	13,307	13,506	13,709
7	Output 7	k€	11.0	€/unit	0	t	0	0	0	0	0	0	0	0	0	0	0	0
8	Output 8	k€	0.0	€/unit	0	t	0	0	0	0	0	0	0	0	0	0	0	0
	Total revenues	**k€**					**363,566**					**46,360**	**47,254**	**48,151**	**49,050**	**49,952**	**50,858**	**51,766**
	Accounts Receivable	k€						0	0	0	0	3,810	3,884	3,958	4,032	4,106	4,180	4,255

In this block the revenues from each process output are calculated for each year of plant operation. The prices and annual quantity of each process output in the reference year is displayed in this block to allow users to verify that the units for the price and quantity are self consistent.

14.4 Calculation block: Commercial loan

Commercial loan

Parameter	Units	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Beginning balance	k€	0	20,475	39,585	60,606	80,317	75,982	71,215	65,971	60,202	53,856	46,876
Loan draw	k€	20,475	19,110	21,021	19,711	0	0	0				
Interest	k€	0	0	0	0	8,032	7,598	7,121	6,597	6,020	5,386	4,688
Repayment	k€	0	0	0	0	4,334	4,768	5,244	5,769	6,346	6,980	7,678
Debt servicing	k€	0	0	0	0	12,366	12,366	12,366	12,366	12,366	12,366	12,366
Ending balance	k€	20,475	39,585	60,606	80,317	75,982	71,215	65,971	60,202	53,856	46,876	39,198

In this block, the balance and payments for the commercial loan are calculated.

14.5 Calculation block: Depreciation

Depreciation

Buildings	Units	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Beginning depreciable balance	k€	0	6,000	11,000	16,000	20,000	19,333	18,667	18,000	17,333	16,667	16,000
Capital expenditure	k€	6,000	5,000	5,000	4,000	0	0	0				
Book depreciation	k€	0	0	0	0	667	667	667	667	667	667	667
Ending depreciable balance	k€	6,000	11,000	16,000	20,000	19,333	18,667	18,000	17,333	16,667	16,000	15,333

Equipment	Units	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Beginning depreciable balance	k€	0	33,000	60,500	88,000	110,000	106,333	102,667	99,000	95,333	91,667	88,000
Capital expenditure	k€	33,000	27,500	27,500	22,000	0	0	0				
Book depreciation	k€	0	0	0	0	3,667	3,667	3,667	3,667	3,667	3,667	3,667
Ending depreciable balance	k€	33,000	60,500	88,000	110,000	106,333	102,667	99,000	95,333	91,667	88,000	84,333

Capitalized interest	Units	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Beginning depreciable balance	k€	0	975	3,835	8,606	15,317	14,806	14,295	13,785	13,274	12,764	12,253
Capital expenditure	k€	975	2,860	4,771	6,711	0	0	0				
Book depreciation	k€	0	0	0	0	511	511	511	511	511	511	511
Ending depreciable balance	k€	975	3,835	8,606	15,317	14,806	14,295	13,785	13,274	12,764	12,253	11,743

Total depreciation	**k€**	0	0	0	0	**4,844**	**4,844**	**4,844**	**4,844**	**4,844**	**4,844**	**4,844**
Gross plant accumulated depreciation	k€	0	0	0	0	4,333	8,667	13,000	17,333	21,667	26,000	30,333

In this block, the capital expenditures and depreciation of buildings, equipment and interest are calculated.

14.6 Calculation block: Grant

Grant	Units	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Beginning balance		0										
Grant draw		0	0	0	0	0	0	0				
Amortisation		0	0	0	0	0	0	0	0	0	0	0
Ending balance		0	0	0	0	0	0	0	0	0	0	0
Total amortization	**k€**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

In this block, the balance, draws and amortization of the project grant are calculated.

14.7 Calculation block: Working capital

Working capital	Units	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Accounts receivable	k€	0	0	0	0	3,810	3,884	3,958	4,032	4,106	4,180	4,255
Inventory	k€	0	0	0	0	2,205	2,226	2,248	2,270	2,292	2,315	2,338
Accounts payable	k€	0	0	0	0	2,564	2,591	2,618	2,645	2,673	2,702	2,731
Total working capital	k€	0	0	0	0	3,451	3,519	3,588	3,656	3,725	3,793	3,862
Working capital addition	k€	0	0	0	0	3,451	68	68	68	69	69	69

		NPV	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total capital investment	k€	121,565	39,975	35,360	37,271	32,711	0	0	0	0	0	0	0
Equity contributions	k€		19,500	16,250	16,250	13,000	0	0	0	0	0	0	0
Grant contributions	k€		0	0	0	0	0	0	0	0	0	0	0
External borrowing/(Repayments)	k€		20,475	19,110	21,021	19,711	-4,334	-4,768	-5,244	-5,769	-6,346	-6,980	-7,678
Gross plant capital expenditure	k€		39,000	32,500	32,500	26,000	0	0	0	0	0	0	0
Gross plant asset	k€		39,000	71,500	104,000	130,000	130,000	130,000	130,000	130,000	130,000	130,000	130,000

In this block the project working capital and other capital flows are calculated.

14.8 Calculation block: Production

Production	Units	NPV	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Fuel production	t[fuel]	337,649	0	0	0	0	50,000	50,000	50,000	50,000	50,000	50,000	50,000

Unit production costs		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total production costs	k€	0	0	0	0	31,192	31,518	31,849	32,185	32,526	32,872	33,224
Coproduct revenues	k€	0	0	0	0	12,537	12,725	12,916	13,110	13,307	13,506	13,709
Total depreciation & amortization	k€	0	0	0	0	4,844	4,844	4,844	4,844	4,844	4,844	4,844
Gross unit production cost	€/t[fuel]					720.72	727.24	733.86	740.58	747.40	754.32	761.35
Net unit production cost	€/t[fuel]					469.97	472.73	475.53	478.38	481.27	484.20	487.17
Fuel price: Blend 1	€/t[fuel]	620	634	648	662	676	691	705	719	733	747	761

In this block annual production, costs and revenues are calculated.

14.9 Display block: Revenues, margin and cash flow

		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total revenue	k€	0	0	0	0	46,360	47,254	48,151	49,050	49,952	50,858	51,766
Total operating costs	k€	0	0	0	0	-31,192	-31,518	-31,849	-32,185	-32,526	-32,872	-33,224
Operating margin	k€	0	0	0	0	15,168	15,736	16,301	16,865	17,426	17,985	18,542
Post-tax free cash flow	k€	-39,000	-32,500	-32,500	-26,000	9,652	13,489	13,942	14,392	14,841	15,288	15,734

In this block, data on revenues, operating costs, operating margin and free cash flow are pulled together to be used in one of the plots on the **Dashboard** worksheet.

15 Cashflow worksheet

This worksheet presents the project cashflow summary, income statement and balance sheet in a standard format. Project NPV and IRR are also calculated on this sheet on both a pre- and post-tax basis. Payback periods are calculated on both free and discounted cashflows.

15.1 Display block: Cashflow summary

Cashflow summary

Parameter	Units	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total revenue	k€	0	0	0	0	46,360	47,254	48,151	49,050	49,952	50,858	51,766
Total costs	k€	0	0	0	0	31,192	31,518	31,849	32,185	32,526	32,872	33,224
Operating margin	**k€**	**0**	**0**	**0**	**0**	**15,168**	**15,736**	**16,301**	**16,865**	**17,426**	**17,985**	**18,542**
Interest	k€	0	0	0	0	8,032	7,598	7,121	6,597	6,020	5,386	4,688
Depreciation and amortization	k€	0	0	0	0	4,844	4,844	4,844	4,844	4,844	4,844	4,844
Income before taxes	**k€**	**0**	**0**	**0**	**0**	**2,293**	**3,294**	**4,336**	**5,424**	**6,562**	**7,756**	**9,011**
Taxes paid	k€	0	0	0	0	459	659	867	1,085	1,312	1,551	1,802
Net income	k€	0	0	0	0	1,834	2,635	3,469	4,339	5,250	6,205	7,209
Depreciation and amortization	k€	0	0	0	0	4,844	4,844	4,844	4,844	4,844	4,844	4,844
Operating cash flow	**k€**	**0**	**0**	**0**	**0**	**6,678**	**7,479**	**8,313**	**9,183**	**10,094**	**11,049**	**12,053**
Capital investment	k€	-39,975	-35,360	-37,271	-32,711	0	0	0	0	0	0	0
Working capital additions	k€	0	0	0	0	-3,451	-68	-68	-68	-69	-69	-69
Cashflow before financing	**k€**	**-39,975**	**-35,360**	**-37,271**	**-32,711**	**3,227**	**7,411**	**8,245**	**9,115**	**10,025**	**10,980**	**11,984**
External borrowing/(Repayments)	k€	20,475	19,110	21,021	19,711	-4,334	-4,768	-5,244	-5,769	-6,346	-6,980	-7,678
Equity contributions	k€	19,500	16,250	16,250	13,000	0	0	0	0	0	0	0
Grant contributions	k€	0	0	0	0	0	0	0	0	0	0	0
Available cashflow	**k€**	**0**	**0**	**0**	**0**	**-1,107**	**2,643**	**3,000**	**3,346**	**3,679**	**4,000**	**4,306**
Opening cash balance	k€	0	0	0	0	0	-1,107	1,536	4,536	7,882	11,561	15,561
Available cashflow	k€	0	0	0	0	-1,107	2,643	3,000	3,346	3,679	4,000	4,306
Closing cash balance	**k€**	**0**	**0**	**0**	**0**	**-1,107**	**1,536**	**4,536**	**7,882**	**11,561**	**15,561**	**19,867**

This blocks displays a standard project cashflow summary.

15.2 Display block: Income statement

Income statement

Parameter	Units	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Revenues		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Fuel	k€	0	0	0	0	33,823	34,529	35,234	35,940	36,646	37,351	38,057
Output 2	k€	0	0	0	0	0	0	0	0	0	0	0
Ash	k€	0	0	0	0	0	0	0	0	0	0	0
Waste water	k€	0	0	0	0	0	0	0	0	0	0	0
Biogas	k€	0	0	0	0	0	0	0	0	0	0	0
Electricity	k€	0	0	0	0	12,537	12,725	12,916	13,110	13,307	13,506	13,709
Output 7	k€	0	0	0	0	0	0	0	0	0	0	0
Output 8	k€	0	0	0	0	0	0	0	0	0	0	0
Total revenues	**k€**	**0**	**0**	**0**	**0**	**46,360**	**47,254**	**48,151**	**49,050**	**49,952**	**50,858**	**51,766**
Operating costs		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
O&M costs	k€	0	0	0	0	4,369	4,434	4,501	4,568	4,637	4,706	4,777
Materials	k€	0	0	0	0	26,823	27,084	27,349	27,617	27,889	28,166	28,447
Total operating costs	**k€**	**0**	**0**	**0**	**0**	**31,192**	**31,518**	**31,849**	**32,185**	**32,526**	**32,872**	**33,224**
Depreciation and amortization	k€	0	0	0	0	4,844	4,844	4,844	4,844	4,844	4,844	4,844
Operating margin	**k€**	**0**	**0**	**0**	**0**	**10,324**	**10,892**	**11,458**	**12,021**	**12,582**	**13,142**	**13,699**
Interest expenses	k€	0	0	0	0	8,032	7,598	7,121	6,597	6,020	5,386	4,688
Earnings before tax	**k€**	**0**	**0**	**0**	**0**	**2,293**	**3,294**	**4,336**	**5,424**	**6,562**	**7,756**	**9,011**
Taxes	k€	0	0	0	0	459	659	867	1,085	1,312	1,551	1,802
Net income	**k€**	**0**	**0**	**0**	**0**	**1,834**	**2,635**	**3,469**	**4,339**	**5,250**	**6,205**	**7,209**

This block presents a standard project income statement.

15.3 Display block: Balance sheet

Balance sheet

Parameter	Units	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Assets												
Current assets		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Cash	k€	0	0	0	0	-1,107	1,536	4,536	7,882	11,561	15,561	19,867
Accounts receivable	k€	0	0	0	0	3,810	3,884	3,958	4,032	4,106	4,180	4,255
Inventory	k€	0	0	0	0	2,205	2,226	2,248	2,270	2,292	2,315	2,338
Fixed assets												
Initial expenses	k€	975	3,835	8,606	15,317	14,806	14,295	13,785	13,274	12,764	12,253	11,743
Gross plant	k€	39,000	71,500	104,000	130,000	130,000	130,000	130,000	130,000	130,000	130,000	130,000
Accum. depr on plant & bldgs	k€	0	0	0	0	4,333	8,667	13,000	17,333	21,667	26,000	30,333
Net book value	k€	39,975	75,335	112,606	145,317	140,473	135,629	130,785	125,941	121,097	116,253	111,409
Total assets	**k€**	**39,975**	**75,335**	**112,606**	**145,317**	**145,380**	**143,275**	**141,526**	**140,124**	**139,057**	**138,310**	**137,869**
Liabilities and shareholder's equity												
Current liabilities												
Accounts payable	k€	0	0	0	0	2,564	2,591	2,618	2,645	2,673	2,702	2,731
Long-term liabilities												
External debt	k€	20,475	39,585	60,606	80,317	75,982	71,215	65,971	60,202	53,856	46,876	39,198
Shareholder's equity												
Capital paid in	k€	19,500	35,750	52,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000
Grant	k€	0	0	0	0	0	0	0	0	0	0	0
Retained earnings	k€	0	0	0	0	1,834	4,469	7,938	12,277	17,527	23,732	30,940
Total equity	k€	19,500	35,750	52,000	65,000	66,834	69,469	72,938	77,277	82,527	88,732	95,940
Total liabilities and equity	**k€**	**39,975**	**75,335**	**112,606**	**145,317**	**145,380**	**143,275**	**141,526**	**140,124**	**139,057**	**138,310**	**137,869**
Bank debt to total capital		51%	53%	54%	55%	52%	50%	47%	43%	39%	34%	28%
Balance check		0	0	0	0	0	0	0	0	0	0	0

This block displays a standard project balance sheet.

15.4 Calculation block: Financial performance metrics

Project IRR

Parameter	Units		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Revenues	k€		0	0	0	0	46,360	47,254	48,151	49,050	49,952	50,858	51,766
Operating costs	k€		0	0	0	0	-31,192	-31,518	-31,849	-32,185	-32,526	-32,872	-33,224
Depreciation and amortization	k€		0	0	0	0	-4,844	-4,844	-4,844	-4,844	-4,844	-4,844	-4,844
EBIT	**k€**		**0**	**0**	**0**	**0**	**10,324**	**10,892**	**11,458**	**12,021**	**12,582**	**13,142**	**13,699**
Taxes on EBIT	k€		0	0	0	0	-2,065	-2,178	-2,292	-2,404	-2,516	-2,628	-2,740
NOPLAT	**k€**		**0**	**0**	**0**	**0**	**8,259**	**8,714**	**9,166**	**9,617**	**10,066**	**10,513**	**10,959**
Add depreciation and amortization			0	0	0	0	4,844	4,844	4,844	4,844	4,844	4,844	4,844
Gross cashflow	**k€**		**0**	**0**	**0**	**0**	**13,103**	**13,557**	**14,010**	**14,461**	**14,910**	**15,357**	**15,803**
Gross capital expenditure	k€		-39,000	-32,500	-32,500	-26,000	0	0	0	0	0	0	0
Grant	k€		0	0	0	0	0	0	0	0	0	0	0
Change in working capital	k€		0	0	0	0	-3,451	-68	-68	-68	-69	-69	-69
Pre-tax project IRR													
Free cash flow (FCF)	k€		-39,000	-32,500	-32,500	-26,000	11,717	15,668	16,233	16,797	17,358	17,917	18,474
Cumulative FCF	k€		-39,000	-71,500	-104,000	-130,000	-118,283	-102,615	-86,382	-69,586	-52,228	-34,311	-15,837
FCF payback													
Discount factor	-		0.953	0.867	0.788	0.716	0.651	0.592	0.538	0.489	0.445	0.404	0.368
Discounted cash flow (DCF)			-37,185	-28,170	-25,610	-18,625	7,630	9,276	8,737	8,218	7,721	7,245	6,791
Cumulative DCF			-37,185	-65,356	-90,965	-109,590	-101,960	-92,684	-83,947	-75,729	-68,008	-60,764	-53,973
DCF payback													
Pre-tax FCF IRR	%	11.58%											
Pre-tax FCF NPV	k€	20,874											
Pre-tax FCF payback	yrs	11.8											
Pre-tax DCF payback	yrs	23.1											
Post-tax project IRR													
Free cash flow	k€		-39,000	-32,500	-32,500	-26,000	9,652	13,489	13,942	14,392	14,841	15,288	15,734
Cumulative FCF	k€		-39,000	-71,500	-104,000	-130,000	-120,348	-106,859	-92,917	-78,525	-63,683	-48,395	-32,661
FCF payback													
Discounted cash flow (DCF)			-37,185	-28,170	-25,610	-18,625	6,286	7,986	7,503	7,042	6,601	6,182	5,784
Cumulative DCF			-37,185	-65,356	-90,965	-109,590	-103,305	-95,318	-87,815	-80,773	-74,172	-67,990	-62,206
DCF payback													
IRR	%	10.06%											
NPV	k€	830											
Post-tax FCF payback	yrs	13.0											
Post-tax DCF payback	yrs	33.4											
Debt Service Coverage ratio													
Debt servicing			0	0	0	0	12,366	12,366	12,366	12,366	12,366	12,366	12,366
DSCR							1.19	1.22	1.25	1.28	1.30	1.33	1.35
			#N/A	#N/A	#N/A	#N/A	1.19	1.22	1.25	1.28	1.30	1.33	1.35

In this block standard financial performance metrics are calculated these include:

- Free cashflow (FCF)
- Discounted cashflow (DCF)
- Payback (on both free and discounted cashflows)
- Net present value (NPV)
- Internal rate of return (IRR)
- Debt service coverage ratio (DSCR)

The financial performance metrics are calculated on both a pre- and a post-tax basis.

16 Dashboard worksheet

This worksheet displays a summary of the model analysis. This includes:

- The central feedstock and fuel price scenarios being used

- Total plant capex
- Pre- and post-tax NPV, IRR, FCF payback and DCF payback
- The minimum debt service coverage ratio (DSCR) of the project

The worksheet also includes graphs of:

- Levelised fuel cost breakdown as a waterfall chart
- Evolution of the DSCR during the loan maturity period
- Project revenues, costs, margin and free cashflow

17 Levelised cost worksheet

This worksheet presents a detailed levelised cost breakdown for the fuel per tonne and litre of fuel. The levelised fuel cost is calculated using the same approach that is used in levelised cost of energy calculations: namely both the product and cost data are discounted.

The levelised cost data is particularly useful for comparing different processes that may have a different split between capital and operating costs.

18 Sensitivity worksheet

The sensitivity worksheet allows the robustness of the project financial performance to a range of key parameters to be assessed. The parameters that are included in the sensitivity analysis in the example are:

- Project capital cost
- Feedstock cost
- Co-product price (electricity in the example)
- Fuel price scenario
- Feedstock supply case

The financial performance metrics that are included in the example sensitivity analysis are:

- Pre-tax NPV
- Pre-tax IRR
- Pre-tax discounted cashflow (DCF) payback period

The sensitivity analysis calculates a total of 96 unique results for each financial performance metric

The worksheet uses Excel data tables to calculate multiple sets of results with a single model. The advantage of this approach is that it ensures that all the results are calculated with an identical model. The disadvantage of the approach is that if one wishes to change the list or number of parameters, the data tables must be recreated.

Excel's calculation options can be used to set whether the full data tables are recalculated every time there is a change in the workbook or not. As recalculating the data tables can take a few seconds, it can be useful to set Excel's calculation option to 'Automatic Except for Data Tables' while working on the model. The data tables can then be updated once the inputs to the model have been finalized either by changing the calculation option or instructing Excel to 'Calculate now' (F9).

In addition to the data tables, this worksheet includes a set of graphs that illustrate the change in financial performance in response to changes in:

- Feedstock supply case
- Feedstock price
- Fuel price
- Capex
- Co-product price

18.1 Input block: Sensitivity analysis multipliers

Row Inputs	Base	Values				
Capex multiplier	100%	90%	100%	110%	120%	130%
Feedstock price multiplier	100%	100%	110%	120%	150%	170%
Green e price premium	5%	0%	5%	10%	20%	

Column Inputs		
Feedstock supply case	Blend 1	1
Fuel price scenario	Scenario 2	2

In this block, the values of multipliers for capex, feedstock and co-product price should be inputted. The example has been set up to allow for 5 values of capex and feedstock price multipliers and 4 values of co-product price multiplier.

The pull-down menus for feedstock supply case and fuel price scenario allow the central scenarios for each to be selected. Due to a limitation in how Excel data tables work these pull-down menus must unfortunately be located on the **Sensitivity** worksheet to allow these parameters to be varied in the data tables.

18.2 Display block: Sensitivity analysis data tables

Pre-tax NPV	Capex multiplier						Feedstock price multiplier						Green e price premium			
	20,874	90%	100%	110%	120%	130%	20,874	100%	110%	120%	150%	170%	20,874	0%	5%	10%	20%
Blend 1		31,833	20,874	9,915	-1,044	-12,003	Blend 1	20,874	8,171	-4,532	-42,642	-68,048	Blend 1	16,327	20,874	25,420	34,513
Blend 2		27,582	16,623	5,664	-5,295	-16,254	Blend 2	16,623	3,494	-9,634	-49,020	-75,277	Blend 2	12,076	16,623	21,169	30,262
Blend 3		22,253	11,294	335	-10,624	-21,583	Blend 3	11,294	-2,368	-16,030	-57,015	-84,339	Blend 3	6,747	11,294	15,840	24,933
	20,874	90%	100%	110%	120%	130%	20,874	100%	110%	120%	150%	170%	20,874	0%	5%	10%	20%
Scenario 1		6,888	-4,071	-15,030	-25,989	-36,948	Scenario	-4,071	-16,774	-29,477	-67,586	-92,992	Scenario	-8,617	-4,071	476	9,569
Scenario 2		31,833	20,874	9,915	-1,044	-12,003	Scenario	20,874	8,171	-4,532	-42,642	-68,048	Scenario	16,327	20,874	25,420	34,513
Scenario 3		56,777	45,818	34,859	23,900	12,941	Scenario	45,818	33,115	20,412	-17,697	-43,103	Scenario	41,272	45,818	50,365	59,458
Scenario 4		81,722	70,763	59,804	48,845	37,886	Scenario	70,763	58,060	45,357	7,248	-18,158	Scenario	66,217	70,763	75,310	84,403
Scenario 5		106,667	95,708	84,749	73,790	62,831	Scenario	95,708	83,005	70,302	32,192	6,786	Scenario	91,161	95,708	100,254	109,347
Scenario 6		132,704	121,745	110,786	99,827	88,868	Scenario	121,745	109,042	96,339	58,230	32,824	Scenario	117,199	121,745	126,292	135,385

Pre-tax IRR	Capex multiplier						Feedstock price multiplier						Green e price premium			
	11.6%	90%	100%	110%	120%	130%	11.6%	100%	110%	120%	150%	170%	11.6%	0%	5%	10%	20%
Blend 1		12.6%	11.6%	10.7%	9.9%	9.2%	Blend 1	11.6%	10.6%	9.6%	6.3%	3.6%	Blend 1	11.2%	11.6%	11.9%	12.6%
Blend 2		12.3%	11.3%	10.4%	9.6%	9.0%	Blend 2	11.3%	10.3%	9.2%	5.7%	2.7%	Blend 2	10.9%	11.3%	11.6%	12.3%
Blend 3		11.8%	10.9%	10.0%	9.3%	8.6%	Blend 3	10.9%	9.8%	8.7%	4.8%	1.5%	Blend 3	10.5%	10.9%	11.2%	11.9%
	11.6%	90%	100%	110%	120%	130%	11.6%	100%	110%	120%	150%	170%	11.6%	0%	5%	10%	20%
Scenario 1		10.6%	9.7%	8.9%	8.2%	7.6%	Scenario	9.7%	8.7%	7.6%	3.9%	0.6%	Scenario	9.3%	9.7%	10.0%	10.7%
Scenario 2		12.6%	11.6%	10.7%	9.9%	9.2%	Scenario	11.6%	10.6%	9.6%	6.3%	3.6%	Scenario	11.2%	11.6%	11.9%	12.6%
Scenario 3		14.5%	13.4%	12.4%	11.5%	10.8%	Scenario	13.4%	12.5%	11.6%	8.5%	6.2%	Scenario	13.1%	13.4%	13.7%	14.3%
Scenario 4		16.4%	15.1%	14.1%	13.1%	12.3%	Scenario	15.1%	14.3%	13.4%	10.6%	8.4%	Scenario	14.8%	15.1%	15.4%	16.0%
Scenario 5		18.2%	16.8%	15.6%	14.6%	13.7%	Scenario	16.8%	16.0%	15.2%	12.5%	10.6%	Scenario	16.5%	16.8%	17.1%	17.7%
Scenario 6		20.0%	18.5%	17.2%	16.1%	15.1%	Scenario	18.5%	17.7%	16.9%	14.4%	12.6%	Scenario	18.2%	18.5%	18.8%	19.3%

Payback period	Capex multiplier						Feedstock price multiplier						Green e price premium			
	23.1	90%	100%	110%	120%	130%	23.1	100%	110%	120%	150%	170%	23.1	0%	5%	10%	20%
Blend 1		19.7	23.1	27.8	0.0	0.0	Blend 1	23.1	28.3	0.0	0.0	0.0	Blend 1	24.7	23.1	21.8	19.7
Blend 2		20.7	24.5	30.0	0.0	0.0	Blend 2	24.5	31.3	0.0	0.0	0.0	Blend 2	26.4	24.5	23.0	20.6
Blend 3		22.1	26.7	33.9	0.0	0.0	Blend 3	26.7	0.0	0.0	0.0	0.0	Blend 3	29.1	26.7	24.8	22.0
	23.1	90%	100%	110%	120%	130%	23.1	100%	110%	120%	150%	170%	23.1	0%	5%	10%	20%
Scenario 1		28.9	0.0	0.0	0.0	0.0	Scenario	0.0	0.0	0.0	0.0	0.0	Scenario	0.0	0.0	33.8	27.8
Scenario 2		19.7	23.1	27.8	0.0	0.0	Scenario	23.1	28.3	0.0	0.0	0.0	Scenario	24.7	23.1	21.8	19.7
Scenario 3		15.4	17.5	19.9	23.0	26.9	Scenario	17.5	19.7	22.9	0.0	0.0	Scenario	18.2	17.5	16.8	15.7
Scenario 4		12.9	14.4	16.0	17.9	20.2	Scenario	14.4	15.7	17.3	28.3	0.0	Scenario	14.8	14.4	14.0	13.3
Scenario 5		11.3	12.4	13.7	15.0	16.6	Scenario	12.4	13.3	14.2	19.3	28.3	Scenario	12.7	12.4	12.2	11.7
Scenario 6		10.1	11.0	12.0	13.0	14.2	Scenario	11.0	11.6	12.2	15.1	18.8	Scenario	11.2	11.0	10.9	10.5

This block holds the 18 data tables that are used to calculate all the different results for the sensitivity analysis.