Government leadership

Cost assessment tool user guide

AMMONIA RE

National Direction for Greenhouse Gas Emissions from Industrial Process Heat

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Acknowledgments

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Note

This Cost Assessment Tool User Guidance is advisory only. It has been prepared to provide instructions on how to use the Cost Assessment Tool, and to assist regionals council in interpreting Cost Assessment Tools populated by applicants seeking air discharge consents.

This guidance should be read in conjunction with other relevant official guidance documents released by Ministry for the Environment, Ministry of Business, Innovation & Employment, EECA (the Energy Efficiency & Conservation Authority) and regionally specific guidance. It should also be read in conjunction with standards, recognised industry best practice, and other technical publications.

This guidance will be revised periodically, and readers should ensure they are using the latest version. The publication date of the guidance can be found on the cover page. Comments are welcome via email to <u>technicalenquiries@eeca.govt.nz</u>.

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Contents

1.	Purpo	se	1
	1.1	Purpose of this document	1
	1.2	Purpose of the tool	1
2.	Cost /	Assessment Tool overview	3
	2.1	The Cost Assessment Tool structure	3
	2.2	Input and output tabs	3
	2.2.2	Output tab / Assessment Summary tab	5
	2.2.3	CAT Check Sheet tab	6
	2.3	Cell formatting	6
3.	Step-	by-step guidance for Applicants	7
	3.1	Heat device description	7
	3.2	Fuel Consumption and Energy Output	7
	3.3	Non-Energy related carbon emissions	8
	3.4	CAPEX (Capital Expenditure)	8
	3.5	OPEX (Operating Expenditure)	9
4.	Guida	nce for Councils	.10
	4.1	Analysing the Assessment Summary	10
	4.2	Checks within the tools	11
	4.3	Standardised inputs	12
	4.3.1	Standardised inputs - Template controls	12
	4.3.2	Standardised inputs – Emissions Factors	13
	4.3.3	Standardised inputs – Energy Conversion Factors	13
	4.3.4	Standardised inputs – Energy Unit Prices	14
	4.3.5	Standardised inputs – List of technologies	14
	4.3.6	Standardised inputs - Shadow Carbon Price	14
	4.3.7	Standardised inputs – Units/Labels	15
	4.3.8	Standardised inputs - Variance Threshold	15
	4.4	OPEX Guiderails	16
	4.5	CAPEX and efficiency guiderails	16
	4.6	Other considerations	17
Glo	ossary		.18

1. Purpose

1.1 Purpose of this document

The Cost Assessment Tool User Guide is an accompanying document to the Cost Assessment Tool¹ ("the tool") and is intended to:

- provide instructions for resource consent applicants ("applicants") who are applying for an air discharge consent under the National Direction for Greenhouse Gas Emissions from Industrial Process Heat;
- assist the consenting authority, generally a regional council ("council"), in assessing the air discharge consent application by providing guidance on interpreting the information provided by the applicant in the tool, the results, what to check for, and raising any flags identified by the tool; and
- assist Suitably Qualified Persons (SQPs) with the best practicable option (BPO) assessment and assessment of financial viability of lower-emission heating devices.

1.2 Purpose of the tool

The tool calculates the lifecycle cost of **two heat device options** that could be used to provide industrial process heat for an applicant's facility.

For new heat devices, emissions plans must include an assessment of the technical feasibility and financial viability of lower-emission heating devices. The applicant may use the tool for the assessment of financially viability of lower-emissions heating devices. The tool is also helpful for the BPO assessment for new and existing devices. This means that no other option would present a better balance between costs and greenhouse gas (GHG) emissions for New Zealand.

The consenting authority ("the council") assessing the application can use the tool to check the appropriateness of an applicant's inputs, assess their relevance, and confirm the applicant's assessment that their preferred option is the BPO. The council may use this information when making a decision on the application.

The purpose of the tool is to:

- provide a standardised assessment of the lifecycle cost of potential heat device options.
- provide standard economic inputs for New Zealand-wide inputs such as discount rate, shadow carbon cost and energy prices.
- allow for detailed input of project specific costs by the applicant.
- allow for comparison of the lifecycle cost of different heat device options.
- check that costs for each option are in line with identified market benchmarks.
- check that the different options being assessed provide the same service for the applicant.

The tool has been pre-populated with some example plant options, to assist users in understanding the type and magnitude of input required. These examples and the screenshots included in this guide, are intended to be indicative only, and do not represent a recommended approach.

The tool enables comparisons between options as entered by the users. It does not apply checks against the regulations, for example the maximum length of consents, or whether heat device options are captured by specific aspects of the regulations.

Assessors should note that the tool is not 'locked down'. If they have concerns about the results presented, it is recommended that data be entered into a freshly downloaded copy of the tool to check for any discrepancies in calculations or assumptions.

2. Cost Assessment Tool overview

2.1 The Cost Assessment Tool structure

The tabs used in the tool are colour coded for ease of navigation (Table 1).

Table 1: Tool tab colour-coding

Information purposes only.
User inputs required.
Conducts general checks to ensure the tool is operating as expected or contain stan- dardised inputs which should not generally be changed.
Contains calculations, do not change.
Output and analysis worksheets.

2.2 Input and output tabs

2.2.1 Input tabs

Input tabs are colour-coded yellow and labelled 'Option X Inputs', where 'X' is a heat option number (Figure 1).

Option 1 Inputs Option 2 Inputs

Figure 1: Option inputs tabs and colour

Each heat option has its own input tab (Figure 2), and inputs need to be entered into these tabs.

. A. A	в	С	D		E	F	G H		J	К	L	М	N	0	Р
N	atior	nal G	uidance for Greenho	ouse Gas A	ssessm	ent Cost Assess	ment Template		==0	\wedge					
1									TE TARI TIAKI PÜ						
2	ption	1: LF	PG boiler												
3 <u>B</u>	ick to "	'Start"	page							Ref Type	0 Actual	1 Forecast	Foreca	2 3 at Forecast	4 Forecast
5 6 Cl	neck	ок								Start End	1-Jan-22 31-Dec-22	1-Jan-23 31-Dec-23	1-Jan-2 31-Dec-2	4 1-Jan-25 4 31-Dec-25	1-Jan-26 31-Dec-26
14															
17															
19															
21 22															
23 24			Heat Technology			Boiler	he heat technology is not liste	d, select i	Diher: If you are u	ning a com	bination of technologi	ies, selected Multiple.			
25 • 26 •			Primary Fuel Source Nameplate rating/MCR		kW	LPG 57	ter the main fuel for your heat	equipmer	n.						
27 28	1.1	Fuel	Consumption and Energy	Output											
29 30		1.1.1	Energy Inputs												
31 32		In addi 1	<i>tion to the Primary fuel source abov</i> Primary Fuel Source	e, you can enter up	LPG	kg					-	1.010,000	1,010,000	1,010,000	1,010,000
34		3	Additional Fuel 2 Additional Fuel 2		Fuel OI	kwh kwh									
36		5	Additional Fuel 4		Fuel OI	kwh					-	-	-	-	- 1
38 39			Total Energy consumption from all fo	uel sources	kWh					C	- 1	14,027,778	14,027,778	14,027,778	14,027,778
40 41		1.1.2	Energy End Use (Output)		kWh						12,000,000	12,000,000	12,000,000	12,000,000	12,000,000
42 43		1.1.3 This se	Energy Input and End Use Feat otion calculates some key performa	asibility Checks ance data from you	r input inform.	ation to check that the Energy	gy Input and Energy End Use c	lata provik	ded is leasible.	L.,			05.544		
44 45 46			Annual Average Efficiency Annual Average Load Maximum Exactle Exacts End on a	(D. an. a)	14.46						91.3 %	91.3 %	91.3 %	91.3 %	85.54 % 91.3 %
47	10	Non	Frankrik Related Carbon En	(Bupus)	KWI					L.	13, 140,000	13,140,000	13, 140,000	1 10,140,000	1 15,140,000 1
40	1.2	This se	ction allows you to input other emission	sions from the proje	ot-a.g. proc	ess emissions or relrigerant	s. These should be entered a	s equivale	nt CO z amission.	e					
50	1.3	CAPE	Non-Energy Helated Carbon I	Emissions	(CU2-e					L					II
53 54		This se 1.3.1	ction is for recording the capital cos Heat Technology CAPEX	its of this option in l	NZD over the i	lfespan of the project. All ci	ost information is entered in re.	al terms - c	don twony about in	ellation.					
55 56			Enter information about your heat te	echnology capital c	oosts in this se	ection. If there are renewal.	osts over the lifespan of the p	najeat, yai	u'll need to enter th	ese in the . 	appropriate years.				,
57 58 •			Plant oost Plant useful life		NZD years	25 PA	ase populate the useful life o	(the plant	for this option	L.,	800,000 j	- 1	-	-	l
60 =			Plant usetul lite guideline Commissioning date		years date	25 // 31-Dec-21	is is automatically populated h	rom EELA	guidance.						
62 63		1.3.2	Other CAPEX	zanital izrote hir thi	contina K.e.c	ana dawan'i lit wilain a caba	anu ununan noamma daa Fil	walisha	"nities on manhain wi	14/104/520	rie .				
64 65		1	Balance of plant		NZD					ſ	100,000				I
66 67			Site works Energy supply infrastructure (Conne	ection)	NZD NZD						50,000 20,000				
68 69			Network upgrade costs Diher costs		NZD NZD										
70 71			Placeholder Placeholder		NZD										
73			Placeholder Placeholder		NZD										t
75	1.4	OPEX					6.1 · ·				1				
77		unis se Analia	unun is nor recording me operating a anis ana naanonohla for sourcing me	e iu inaintenance c acation and moiore	usis or mis of nanna norr r	nun mittali over me litespa lata: FFCA has undernion	u u une project. All cost infom nacaanch in idantifu indianti-	14000 IS A	i nered in rear rems i and maintan en so	- aon civa aosta far a	ny avour innailon. Ioma common ha et ter	thanlanias			
79 80		Indicati	te operating and maintenance cos	ts (guiderails) for th	e selected he	sat technology are shown b	elow your inputs. If you select	ed other's	or multiple then no	guiderail d	lata vill be available.				
81 82		These i your da	indicative costs may be used if yo ita will be highlighted in red. In this c.	ou consider they ai ase you may be as	e appropriate kad for furtha	for your development - just information to support the i	copy and paste them into the nost assumptions.	cells abo	ve. If your data diff	ers substar	ntially from the guiders	d values			
83 84		1.4.1	Operating Costs												
85 86			Uperating Costs (without energy, inc Guiderail data	cluding labour)	NZD NZD						17,500 18,000	17,500 18,000	17,500 18,000	17,500 18,000	17,500 18,000
88		1.4.2	Maintenance Costs		NZD					I	17 000	17.000 *	17 000	17 000	17 000
90 91			Guiderail data		NZD						15,750	15,750	15,750	15,750	15,750
92 93			Maintenance Costs (one-offs) Guiderail data		NZD NZD						5,100 5,625	5,100 5,625	5,100 5,625	5,100 5,625	5,100 5,625
<	>		Start Option 1 Input	ts Option	2 Inputs	CAT Check Sheet	Assessment Sumn	hary	Standardise	d inputs	OPEX and	CAPEX Guiderails	Flags	Asset disposal	Cost calculatio

Figure 2: Layout of the user input tabs

The sections or headings within the 'Option X Inputs' tabs, for two options are categorised as:

- 1. Heat Device Description
- 1.1 Fuel/Energy consumption and output
- 1.2 Non-Energy Related Carbon Emissions
- 1.3 CAPEX
- 1.4 OPEX

2.2.2 Output tab / Assessment Summary tab

The output tab or 'Assessment Summary' tab is coloured coded green (Figure 3).

Assessment Summary

Figure 3: Assessment summary tab and colour code

A dashboard, displaying the CAT outputs, has graphs to visualise the costs and emissions over time (Figure 4). The lower part of Figure 4 shows a projects emissions lifecycle profile of the two heat device options (here the example shows a coal boiler vs a heat pump). The option with the lowest cost, emissions, and lowest levelised cost of energy ("LCOE" meaning the average cost of energy produced by the plant over its lifetime) is clearly displayed (see tabs highlighted green).



Figure 4: Layout of assessment summary containing outputs

2.2.3 CAT Check Sheet tab

The 'CAT Check Sheet' (green tab in Figure 4) allows for checks of the data in the tool.

Columns C to H will display an 'OK' value if there are no outstanding alerts indicated within the input tabs. If the value is not 'OK' then the user should investigate the source of the error flag and make appropriate adjustments, or provide an explanation of the discrepancy. For example, the tool is not able to handle all possible plant configurations, or the applicant may have a quoted value for a given cost that overrides the default values included.

The tool is not able to accurately assess the capex for existing plant, so there will likely be errors/ flags raised for the capex value of existing plant, whether entered as an 'existing plant' type or a new plant type.

The inputs that trigger the **energy end use alert, efficiencies/co-efficient of performance (COP) alert** and **consistency of energy end use demand alert**, can all be found within the option inputs tabs. Where column A of an inputs tab shows "Err", the alert has been raised in this row.

2.3 Cell formatting

Table 2 shows how the cells are formatted, including the relevant functions in the tool and how applicants should interact with them.

Table 2: Cell formatting

100	Manual inputs to be entered by the applicant. Some cells may contain defaults which should only be overwritten if the applicant has better information.
100	Parameters to control fixed tool elements (e.g. timeline).Caution: this should not be adjusted by the applicant.
100	Cells containing formulas that 'call-up' data from other parts of the tool. No other operations are performed on this data.
	Cells surrounded by formula or inputs that have been deliberately left blank and where no assumptions should be added.

Applicants should **only enter values into green cells or choose options from the drop-down lists.** Some green cells have been pre-populated with recommended values. Applicants should only override these values if they are confident they have more accurate estimates.

3. Step-by-step guide for applicants

Applicants can follow the steps below to populate the tool using the Inputs tabs.

3.1 Heat device description

- a) Select 'Fuel source', and 'Heat technology' from the drop-down menus provided in cells F24 and F25.
- b) Enter the 'Nameplate rating or maximum continuous rating (MCR)' of the heat option in cell F26. The MCR is specified in kilowatt (kW) units and can usually be found in the manufacturer's specifications.

3.2 Fuel Consumption and Energy Output

Section 1.1. of the options input sheets asks applicants to show fuel consumption and energy output (Figure 5).

11	A B	С	D		E		F		G		н	1	J	К	L	М	N
1 2	Natio Optior	nal n 1: I	Guidance for Greenh LPG boiler	ouse Gas	Assess	smen	t Cost /	Asses	sment	t Tem	plate	- C 1					
3 B 4 5 6 C	ack to "	Start"	r page											Ref Type Start End	Actua 1-Jan-2 31-Dec-2	0 1 Il Forecast 2 1-Jan-23 2 31-Dec-23	2 Forecast 1-Jan-24 31-Dec-24
28	1.1	Fue	Consumption and Energy (Dutnut													
29 30 31 32 33 34 35 36 36	ж	1.1.1 In add 1 2 3 4 5	Energy Inputs dition to the Primary fuel source above, j Primary Fuel Source Additional Fuel 1 Additional Fuel 2 Additional Fuel 3 Additional Fuel 3	you can enter up to	4 other input LPG Fuel Oil Fuel Oil Fuel Oil Fuel Oil	fuels for ti kg kWh kWh kWh kWh	his option									1,010,000 	1,010,000 - - - -
38			Total Energy consumption from all fuel	sources	kWh									[-	14,027,778	14,027,778
39 40 41		1.1.2	Energy End Use (Output)		kWh									F	12,000,000	12,000,000	12,000,000
42		1.1.3	Energy Input and End Use Feasibili	ty Checks						_							
43 44 45		This s	section calculates some key performanc Annual Average Efficiency Annual Average Load	e data from your in	put informatio	on to chec	k that the En	ergy Input	and Energy	y End Use	data provid	led is feasi	ble.	E	0.00 % 91.3 %	85.54 % 91.3 %	85.54 % 91.3 %
40			Maximum Peasible Energy End use (U	uput)	KVID										13,140,000	13,140,000	13,140,000

Figure 5: Fuel Consumption and Energy Output

- a) The selected fuel source (cell F25) will represent the primary fuel source for the heat option. Up to five fuel sources can be included per heat option. If there are additional fuel sources for the same heat option, select the additional fuel sources from the drop-down menus in cells E33-E36.
- b) Enter the 'Fuel consumption' or 'Energy consumption' into the input cells in columns L to AP in rows 32 to 36. For the energy consumption units, select e.g., 'kWh', 'litre' or 'kg' from the drop-down menus in Column F.
- c) Enter the 'Energy end use (Output)' in row 40.
- d) The 'Energy Input and End Use Feasibility Checks' calculate three different metrics to help assess the validity of the input data.
- e) Discrepancies will be shown on the 'CAT check sheet' tab.

3.3 Non-Energy related carbon emissions

Section 1.2 of the options input sheets allows applicants to enter non-energy emissions values. Adding this information is optional, noting that if this information is added, the additional emissions will be included in the 'total lifecycle emissions' of this option in the Assessment Summary tab. Reviewers and approvers should be aware that these emissions are outside the scope of the National Environmental Standards for Greenhouse Gas Emissions from Industrial Process Heat.

Non-energy related carbon emissions could include embedded or embodied emissions related to the purchase, construction, transport etc. of new equipment, or allowances for emissions that might not be captured in the fuel emissions factors, e.g., refrigerant leakage. Applicants should be prepared to explain and provide evidence for any significant values entered in this section.

3.4 CAPEX (Capital Expenditure)

4	AB	С	D	E	F		G	Н		J	K	L	М	Ν
1	Natio Optio	nal (n 2: I	Guidance for Greenhouse G Heat Pump	as Assess	ment Cost	Assess	sment Te	emplate			AO MIT			
2 3 4 5 6	Back to ' Check	<u>'Start"</u> Ok	r <u>page</u>								Ref Type Start End	0 Actual 1-Jan-22 31-Dec-22	1 Forecast 1-Jan-23 31-Dec-23	2 Forecast 1-Jan-24 31-Dec-24
44 45 46 47			Annual Average Efficiency Annual Average Load Maximum Feasible Energy End use (Output)	kWh								0.00 % 92.4 % 12,877,200	297.50 % 92.4 % 12,877,200	297.50 % 92.4 % 12,877,200
48	1.2	Non	-Energy Related Carbon Emissions											
49		This s	ection allows you to input other emissions from the	project - e.g. proces	ss emissions or refri	igerants. Thes	se should be er	ntered as equiva	lent CO , emiss	sions.				
50		1.2.1	Non-Energy Related Carbon Emissions	t CO2-e								l		
51														
52	1.3	CAP	PEX .											
53 54 55 56		This s 1.3.1	ection is for recording the capital costs of this option Heat Technology CAPEX Enter information about your heat technology cap	in NZD over the life tal costs in this sec	espan of the project tion. If there are rea	. All cost infor newal costs ov	rmation is enter ver the lifespan	ed in real terms of the project, yo	- don't worry ab	out inflation. er these in the	appropria	te years.		
57			Plant cost	NZD								960,000	-	-
58	OK		Plant useful life	years	20	Pleas	e populate the	useful life of the	plant for this opt	tion				
59	OK		Plant useful life guideline	years	20	This is	s automatically	populated from	EECA guidance	9.				
60	OK		Commissioning date	date	31-Dec-2	3								
61 62 63 64		1.3.2	Other CAPEX Enter information about your other capital costs fo	r this option. If a co	ost doesn't fit within a	a category, yo	u can overwrite	the 'Placeholde	r' titles to explai	in what the cos	it is.			
65			Balance of plant	NZD								400,000		
66			Site works	NZD								150,000		
67			Energy supply infrastructure (Connection)	NZD								250,000		
68			Network upgrade costs	NZD							ļ	650,000		
69			Other costs	NZD							ļ			
70			Placenoider	NZD							ļ			
71			Placenoider	NZD							·			
72			Placenoider	NZD NZD										
74			macenoider	NZD								l.		II.

Section 1.3 of the options input sheets displays the CAPEX inputs (Figure 6).

Figure 6: CAPEX inputs

- a) Enter the 'Heat technology CAPEX' and 'Other CAPEX' into the input cells in columns L to AP in rows 57 and 65 to 73.
- b) Select the 'Plant commissioning date' of the plant from the drop-down menu in cell F60.
- c) If there are CAPEX categories that have not been covered in the tool, create your own category by replacing 'Placeholder' with appropriate names in cells D70 to D73, and adding the corresponding values in columns L to AP.
- d) The 'Guiderail alert' in the 'CAT Check Sheet' will turn red if the 'Plant cost' inputs in row 57 are outside the allowable deviation range. The allowable deviation range is calculated based on industry norm estimates for the plant in question. If the alert is red, the applicant may want to adjust their inputs or provide evidence to the council that the costs entered are reasonable.
- e) Note that the tool is designed to assess options for new plants. Input data involving an existing plant will likely flag CAPEX discrepancies.
- f) This includes sale of decommissioned existing plant which should be entered as negative CAPEX in the option that enables it to be sold. We recommend entering any sale values in a different year to main plant capex to help preserve transparency.

3.5 **OPEX (Operating Expenditure)**

Section 1.4 of the options input sheets displays the OPEX inputs (Figure 7).

A	B C	D	E F G H	I J K	L	M	N	0	P
1 Na	itional	Guidance for Greenhouse Gas	Assessment Cost Assessment Templa						
2 0	ption 1	LPG boller							
3 Bac 4 5	k to "Star	<mark>" page</mark>		Ref Type Start	0 Actual 1-Jan-22	1 Forecast 1-Jan-23	2 Forecast 1-Jan-24	3 Forecast 1-Jan-25	4 Forecast 1-Jan-26
6 Che	ck (Ж		End	31-Dec-22	31-Dec-23	31-Dec-24	31-Dec-25	31-Dec-26
73		Placeholder	NZD				J		l.
76	14 08	EY							
6	This	section is for recording the operating and maintenance co	sts of this option in NZD over the lifespan of the project. All cost informati	on is entered in real terms - don't worry al	bout inflation.				
7									
8 9	App Indi	licants are responsible for sourcing operating and mainten cative operating and maintenance costs (guiderails) for the	ance cost data. EECA has undertaken research to identify indicative ope selected heat technology are shown below your inputs. If you selected 's	erating and maintenance costs for some c other' or 'multiple' then no guiderail data w	ommon heat technologi ill be available.	88.			
0	The	an indiantina anala mara ka maad if nan analida than ana	and a set of the set o	abarra (franciadata differe archatactic)), f	and the mulder it waters				
2	vou	data will be highlighted in red. In this case you may be as	propriate for your development - just copy and paste ment into the cens ked for further information to support the cost assumptions.	above. Il your data dillers substantially li	on ne guideran values				
3									
4	1.4.1	Operating Costs	170		47.600	47 600	47.600	47.500	47.600
6		Guiderail data	NZD		18,000	18,000	18 000	18 000	18,000
7									
88	1.4.3	2 Maintenance Costs							
9		Annual Maintenance Costs	NZD		17,000	17,000	17,000	17,000	17,000
1		Guiderali data	NZD		15,750	15,750	15,750	10,700	15,750
2		Maintenance Costs (one-offs)	NZD		5,100	5.100	5,100	5,100	5.100
3		Guiderail data	NZD		5,625	5,625	5,625	5,625	5,625
4									
5		Regulatory Costs	NZD		3,200	3,200	3,200	3,200	3,200
7		Guiderali data	NZU		3,500	3,500	3,000	3,500	3,000
86		Condition Assessment Costs	NZD		3.200	3,200	3.200	3.200	3,200
99		Guiderail data	NZD		3,000	3,000	3,000	3,000	3,000
00									
01	1.4.3	3 Other Costs	1/70		00.000	00.000		00.000	
02		Other costs	NZD		20,000	20,000	20,000	20,000	20,000
04		Outer coata	NLD .						i.
05									

Figure 7: OPEX inputs

- a) This technology and nameplate selection serves as the basis for the industry OPEX norm estimates that will be compared against the applicant's inputs.
- b) Enter the 'Operations expenditure', 'Maintenance expenditure' and 'Other expenses' into the input cells in columns L to AP and in rows 85 to 103.
- c) If the 'Other costs' expenditure category is large, you should provide a breakdown of these costs. Inclusion of non-cash costs such as depreciation and tax effects are not recommended. Care should be taken if including administrative and potentially complex or opaque costs such as finance interest.
- d) The cost data entries will turn red to indicate where inputs are outside the allowable deviation range. The allowable deviation range is calculated based on industry norm estimates. If the alert is red, values may be adjusted, or applicants should provide additional evidence that their inputs are reasonable.

4. Guidance for Councils

When reviewing an application (including the completed tool populated by the applicant) councils should pay attention to:

- analysing the assessment summary.
- checks within the tool.
- the standardised inputs.
- OPEX guiderails.
- CAPEX and efficiency guiderails.

These are discussed in more detail below.

4.1 Analysing the Assessment Summary

The applicant should be using the tool as evidence that their preferred fossil fuel source is the BPO, and that a lower emission option is not financially viable.

- a) The option with the lowest 'Total lifecycle cost' will be highlighted in green. This is also visually shown in the graph with a breakdown of costs (Figure 8).
- b) A review of the "CAT check sheet' will highlight any potential data input discrepancies that may warrant further questions or explanation. The council can make a judgement on whether the evidence is sufficient.
- c) Observe if there are any unusual or unexpected data within the graphs for the emissions profiles (Figure 9) of each heat option over its lifetime to observe. Investigate the source of any unusual or unexpected data.
- d) Observe if there are any unusual or unexpected data within the graphs for the CAPEX and OPEX profiles of each heat option, see 'CAPEX vs OPEX' (Figure 10). Investigate the source of any unusual or unexpected data.



Figure 8: Option comparison section



Figure 9: Energy and non-energy related emissions during project lifespan



Figure 10: CAPEX and OPEX costs over lifespan

4.2 Checks within the tools

- a) There are checks within the tool to identify errors in the input data, but not all errors will be captured by these checks.
- b) In most tabs, cell C6 states whether errors have been detected in that tab (Figure 11).

	A B	С	D	E	F	G	Н	I J	K	L	М
1	Natio	nal C	Guidance for Greenhouse Gas /	Assessi	ment Cost As	sessment [·]	Template				
2	Option	ו 1: L	_PG boiler					UNDRY D'HOUNCY & CONSUMATI	ON AUTHORIT		
3 4 5	Back to '	Start"	page						Ref Type Start	0 Actual 1-Jan-22	1 Forecast 1-Jan-23
6	Check	Err							End	31-Dec-22	31-Dec-23
8	1 Hea	t Dev	ice Description								
11	1.1100	Der	Please describe in detail the process heat ontion being	considered .	This should include the t	chnology being use	d and if this is a comb	ination of several tech	nologies or a si	nale technology	
12			rease declarge in declar the proceed near option being	considered.		contrology being dee			lologico ol a oli	ngie teennology.	
13											
15											
16											
18											
19											
21											
22											
23	ок		Heat Technology		Boiler	If the heat technol	ogy is not listed, select	'Other'. If you are usin	g a combinatio	on of technologies, selec	ted 'Multiple'.
25	OK		Primary Fuel Source	1447	LPG	Enter the main fue	l for your heat equipm	ent.			
26	OK		Nameplate rating/MCR	KVV	1500						
28	1.1	Fuel	Consumption and Energy Output								
29			Energy Inpute								
31		1.1.1 In add	ition to the Primary fuel source above, you can enter up t	o 4 other inpu	t fuels for this option						
32	ок	1	Primary Fuel Source	LPG	kg					-	1,010,000
33	OK	2	Additional Fuel 1 Additional Fuel 2	Fuel Oil Fuel Oil	kwh kwh						-
35	ок	4	Additional Fuel 3	Fuel Oil	kWh					-	-
36	Err	5	Additional Fuel 4							-	20
38			Total Energy consumption from all fuel sources	kWh						#N/A	#N/A
20											

Figure 11: Error notifications

4.3 Standardised inputs

The 'Standardised inputs' tab contains the controls for different aspects of the tool and has the following sections:

- Template controls for general information e.g., forecast period, discount rates (Figure 12)
- Emissions factors (per kWh generated by each fuel type (kgCO,e/kWh))
- Energy conversion factors (of fuel to kWh)
- Energy unit prices
- List of technologies
- Shadow carbon prices
- Units/labels
- Other conversion factors
- Variance thresholds
- Tolerance levels

4.3.1 Standardised inputs - Template controls

- a) Start and finish dates can be changed in column F, rows 16 and 17. Any changes to these cells affect the whole tool.
- b) Within the 'Cash flows' tab, the discount rate is used to calculate the lifecycle cost of each heat option. The discount rate can be changed in cell F19 of the 'Standardised inputs' tab. EECA recommends a 5% discount rate as per Treasury guidelines². Higher discount rates e.g. based on the actual borrowing cost faced by applicants, may be acceptable to councils, however councils should be aware that higher discount rates generally favour short-term outcomes which may be inconsistent with the intent of the regulations.

² Discount Rates | The Treasury New Zealand

	A B C D	E	F	G	н	I.	J	К	L	
1	National Guidance for Greenhouse G Standardised inputs	as Ass	essment Co	ost Asses	sment T	emplate				
2 3 4 5 6	Back to "Start" page Workbook Status:							Ref Type Start End	0 Actual 1-Jan-22 31-Dec-22 3	31
8 9 10	1 . Template Controls									
11 12 13 14 15	Template start Number of months per period Number of days in year Number of hours in a day	date # #	1-Jan-22 12 365 24							
16 17 18 19 20	Forecast period start Template end Discounting base date Discount rate	date date %	1-Jan-23 31-Dec-42 31-Dec-22 5 1/							

Figure 12: Template controls

4.3.2 Standardised inputs – Emissions Factors

a) Section 2.1 is the 'Emissions Factors' table containing scientific constants used throughout the tool to convert the volume of each fuel type used (in kWh) into kilograms of CO₂ emitted.

	A B C	D	E	F	G		Н	1 I I	J	K	L	M	N
1	National G Standardise	Buidance for Greenho ed inputs	use Gas Asses	sment C	ost Asses	sment T	ſempl	late					
3 4 5 6 20	Back to "Start" pag Workbook Status:	16								Ref Type Start End	0 Actual 1-Jan-22 31-Dec-22	1 Forecast 1-Jan-23 31-Dec-23	2 Forecast 1-Jan-24 31-Dec-24
21	2. Other Cor	ntrols											
23	2.1 Emiss	sions Factors (Unit of CO2e/kWh)										
24 25		Fuel Type	Unit										
26		Coal	kWh								0.3280	0.3280	0.3280
27		Fuel Oil	kWh								0.2610	0.2610	0.2610
28		Petrol	kWh								0.2490	0.2490	0.2490
29		Diesel	kWh								0.2534	0.2534	0.2534
31		Natural Cas	k/Wb								0.2162	0.2162	0.2162
32		Electricity	kWh								0.083	0.092	0.079
33		Wood	kWh								0.0060	0.0060	0.0060
34		Biogas	kWh								0.0103	0.0103	0.0103
35		Geothermal	kWh								0.0600	0.0600	0.0600
36													



4.3.3 Standardised inputs - Energy Conversion Factors

a) Section 2.2 is the 'Energy Conversion Factors' table with values converting fuel to kWh (Figure 14). These are standard engineering conversions and should not be changed, any changes made will need an explanation to satisfy the council that they are valid.

	A B C	D	1	E F	G	Н		J k	K L
1	National G	Guidance for Gree	enhouse Gas A	ssessment C	ost Assess	sment Ten	nplate		
3 4 5 6	<u>Back to "Start" pa</u> Workbook Status	age :						R Tyj Sta Er	ef 0 pe Actual art 1-Jan-22 nd 31-Dec-22
30	2.2 Energ	av Conversion Factors							
38	2.2 21019	gy conversion ractors							
39		Fuel Type	Unit	kWh per uni	it				
40		Coal	kg	7.1167					
41		Fuel Oil	litre	11.2333					
42		Petrol	litre	9.8280					
43		Diesel	litre	10.6667					
44		LPG	kg	13.8889					
45		Natural Gas	GJ	277.7778					
46		Electricity	kWh	1.0000					
47		Wood	kg	4.8672					
48		Biogas	GJ	277.7778					
49		Geothermal	kWh	1.0000					
50									

Figure 14: Conversion factors of fuel to energy

4.3.4 Standardised inputs – Energy Unit Prices

a) Section 2.3 is the 'Energy Unit Prices' table showing prices used to calculate the cost of fuel each year (Figure 15). These values are net of ETS costs and are a best estimate at the time of publishing the tool. Councils may request different prices (and the underlying calculations) if applicants are using their own prices.

A B	C D	E F G H I	J K	L	М	N	0	Р	Q	R	S
Nation Standa	nal Guidance for Greenhous	e Gas Assessment Cost Assessment Template			2						
Back to "S Workbook	Start" page (Status:		Ref Type Start End	0 Actual 1-Jan-22 31-Dec-22	1 Forecast 1-Jan-23 31-Dec-23	2 Forecast 1-Jan-24 31-Dec-24	3 Forecast 1-Jan-25 31-Dec-25	4 Forecast 1-Jan-26 31-Dec-26	5 Forecast 1-Jan-27 31-Dec-27	6 Forecast 1-Jan-28 31-Dec-28	7 Forecast 1-Jan-29 31-Dec-29
2.3	Energy Unit Prices										
	Puel Type Coal Puel Ol Detel LPG Exertificty Vitool Biochistonemal	System File System System System System System System Stree System Stree System System System System System System System System System System System		0.1900 0.7060 1.7200 1.1110 1.8530 11.1260 0.1440 0.0278 20.8500 0.0330	0 1900 0.7060 1.7200 1.1110 1.8530 11 1260 0.1440 0.0278 20.8500 0.0330	0.1900 0.7060 1.7200 1.1110 1.8530 11.1260 0.1440 0.0278 20.8500 0.0330	0.1900 0.7060 1.7200 1.1110 1.8530 11.1260 0.1440 0.0278 20.8500 0.0330	0.1900 0.7060 1.7200 1.1110 1.8530 11.1260 0.1440 0.0278 20.8500 0.0330	0.1900 0.7060 1.7200 1.1110 1.8530 11.1260 0.1440 0.0278 20.8500 0.0330	0.1900 0.7060 1.7200 1.1110 1.8530 11.1260 0.1440 0.0278 20.8500 0.0330	0.1900 0.7060 1.7200 1.1110 1.8530 11.1260 0.1440 0.0278 20.8500 0.0330
	VZDKWh conversion table Coali Fusi Oli Petrol Desel LPG Hatarai Gas Electricity Vitod Biogas Geothermal			0.027 0.063 0.175 0.104 0.133 0.040 0.144 0.006 0.075 0.033	0.027 0.063 0.175 0.004 0.133 0.040 0.144 0.006 0.075 0.033	0.027 0.063 0.175 0.104 0.133 0.040 0.144 0.006 0.075 0.033	0.027 0.063 0.175 0.104 0.133 0.040 0.144 0.006 0.075 0.033	0.027 0.063 0.175 0.004 0.133 0.040 0.144 0.006 0.075 0.033	0.027 0.063 0.175 0.104 0.133 0.040 0.144 0.006 0.075 0.033	0.027 0.063 0.175 0.004 0.133 0.040 0.144 0.006 0.075 0.033	0.027 0.063 0.175 0.104 0.133 0.040 0.144 0.006 0.075 0.033

Figure 15 : Energy unit prices

4.3.5 Standardised inputs - List of technologies

a) Section 2.4 has the list of technologies. This list of technologies is used as a drop-down list on Option Input tabs and throughout the tool. This technologies list is maintained by EECA and should not be changed.

	A B C D	E	F	G		н	1	J	К	L	М
1	National Guidance for Greenhouse Ga Standardised inputs	is Asse	ssment (Cost Asse	ssment	Templa	ate				
3 4 5 6-	Back to "Start" page Workbook Status:							1	Ref Type Start End	0 Actual 1-Jan-22 31-Dec-22	1 Forecast 1-Jan-23 31-Dec-23
77	2.4 List of technologies										
78 79 80 81 82 83 84 85 86 87	Boiler Burner Furnace Heat pump - ambient source Heat pump - high temperature Kiln/Industrial Oven Existing Plant Resistance Heater Multiple/Other										

Figure 16: List of technologies

4.3.6 Standardised inputs – Shadow Carbon Price

 a) Section 2.5 lists the shadow carbon price used to calculate the cost of carbon emissions for each year going forward (Figure 17). These values are maintained by EECA, sourced from Treasury guidance, and should not be changed.

	A B C D	E	F	G	н	1	J K	L	М	
1	National Guidance for Greenhouse (Gas Asses	sment Cos	t Assessr	nent Temp	late	 	ECV		
2	Standardised inputs						TE T.	ARI TIAKI PÜNGA) Holion Lokalinina Alman	2	
3 4 5 6	Back to "Start" page Workbook Status:						Ret Type Start End	0 Actual 1-Jan-22 31-Dec-22	1 Forecast 1-Jan-23 31-Dec-23	F 1 31
89	2.5 Shadow Carbon Price									
90 91 92	Carbon Price	NZD/t CO2-e						\$ 72	S 81 S	
00	2.C. Unite/Labala									

Figure 17: Shadow carbon price

4.3.7 Standardised inputs - Units/Labels

a) Section 2.6 The 'Units or labels' shown in Figure 18 are used throughout the tool. These values are maintained by EECA and should not be changed.

	A B	С	D	E	F		G	Н	1	J	K	L
1	Nation Standa	al Guidance fo rdised inputs	or Greenhouse	Gas Asse	essment (Cost As	sessm	ent Tem	olate			
3 4 5 6	Back to "Sta Workbook S	art" page Status:									Ref Type Start End	0 Actual 1-Jan-22 31-Dec-22
93	2.6	Units/Labels										
94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112		years months per annum NZD KWh NZD/KWh NZD/GJ t CO2-e kgCO2e/kWh Output/input KW +/- factor 0,1 # date text %										

Figure 18: Units and labels

4.3.8 Standardised inputs - Variance Threshold

a) Section 2.8 Variance Threshold (Figure 19) is used to determine the allowable deviation for every guiderail figure in the tool before an error flag is raised. The variance threshold can be changed in cell E122. Note that any changes made will need an explanation to satisfy the council that they are valid.

	A B C	D	E	F	G	Н	1	J	К	L
1	National Guidan	ce for Greenhoເ	use Gas Asses	sment Cos	st Assessn	nent Temj	olate			$EC \wedge$
2	Standardised inpu	ts							TE TARI ENERGY EFFICIENT	TIAKI PÜNGAO 2Y & CONSERVATION AUTHORITY
3	Back to "Start" page								Ref	0
4	Workbook Status:								Type	Actual
6	WORDOOK Status.								End	31-Dec-22
120	2.8 Variance Thres	hold								
121 122 123	Guiderails v	ariance	10 %							

Figure 19: Variance threshold

4.4 OPEX Guiderails

a) The OPEX guiderail values (Figure 20) are maintained by EECA and should not be changed. These inputs represent expert estimates of various operations and maintenance expenses for a given type of asset. They are used to check and alert if any of the applicant's manual inputs are materially different from observed industry estimates.

A	8 0		D		E	F	G	н	1	J	K	L	M	N	0	Ρ
Na	tional Guida	nce for Gree	enhouse Ga	s Assessment	Cost Assess	ment Template /	<u>۸</u>									
1						EEC/										
2 01	PEX and CAP	EX Guiderails				THE TAKE TUAKE PUNC INCOMPASING AND										
3 Bac	k to "Start" page										Ref	0	1	2	3	4
5											Start	1-Jan-22	1-Jan-23	1-Jan-24	1-Jan-25	1-Jan-26
6 Chee	ck	OK									End	31-Dec-22	31-Dec-23	31-Dec-24	31-Dec-25	31-Dec-26
342	Operation ar	id Maintenance C	osts													
344		1 Coal B	oller: 1000 kW - 5000	XW.		Fuel	Technology	kW lower level	kW higher level							
345	1	Operat	ing Costs (without en-	ergy, including labou N20		Coal	Boiler	1000	5000			60,000	60,000	60,000	60,000	60,000
346	2	Annual	Maintenance Costs	NZO		Coal	Boiler	1000	5000			19,400	19,400	19,400	19,400	19,400
347	3	Mainte	nance Costs (one-offs	NZO		Coal	Boiler	1000	5000							30,000
348	4	Regula	tory Costs	NZO		Coal	Boiler	1000	5000			5,000	5,000	5,000	5,000	5,000
349	5	Condit	on Assessment Cost	IS NZO		Coal	Boiler	1000	5000			5,000	5,000	5,000	5,000	5,000
350	6	Placet	older	NZO		Coal	Boller	1000	5000			1	1	1	1	1
301	1	Placer	order	1420		Coal	Doser	1000	5000					-		
302		Phacen	Or Delta	PAGO		Coa	Bones	1000	5000							
364		2 Coal B		0 KW												
355		< Model	ing Casts (without easi	eray including tabau N20		Cold	Boiler	5000	10000			120.000	120.000	120.000	120.000	120.000
356		Annual	Maintenance Costs	N20		Cold	Boiler	5000	10000			16,800	16,800	16,800	16,800	16,800
357		Mainte	sance Costs (one-offs	0 NZO		Coal	Boiler	5000	10000			-			-	30,000
358		Reput	fory Costs	NZD		Coal	Boller	5000	10000			5.000	5.000	5.000	5,000	5.000
359		Condit	ion Assessment Cost	ts NZO		Coal	Boiler	5000	10000			10.000	10.000	10.000	10.000	10.000
360		Placet	older	NZO		Coal	Boiler	5000	10000			1	1	1	1	1
361		Placet	older	NZO		Coal	Boiler	5000	10000			1	1	1	1	1
362		Placet	older	NZO		Coal	Boiler	5000	10000			1	1	1	1	1
363																
364		3 Coal B	oiler: >10000 kW													
365		Operat	ing Costs (without en	ergy, including labou N20		Coal	Boiler	10000	1000000			180,000	180,000	180,000	180,000	180,000
366		Annual	Maintenance Costs	NZO		Coal	Boiler	10000	1000000			14,200	14,200	14,200	14,200	14,200
367		Mainte	nance Costs (one-off)	N20		Coal	Boder	10000	1000000			-	-		-	30,000
365		Regula	tory Costs	NZO		Coal	Boser	10000	1000000			7,000	7,000	7,000	7,000	7,000
309		Condit	on Assessment Cost	8 1420		Coal	Doser	10000	1000000			15,000	15,000	15,000	15,000	15,000
370		Placer	order	PALL A		Coal	Doner	10000	1000000							
371		Placen	order	1420		Coal	Doller	10000	1000000							
373		Pracer	1111	PhELO		Udai	e-Juse	10000	1000000							
374		4 Bionar	Boiler 1000 kW - 50	20 KW												
375		Operat	ing Costs (without en-	erox including labou N20		Biogas	Boiler	1000.00	5000.00			18,000	18,000	18,000	18,000	18,000
376		Annual	Maintenance Costs	NZO		Biogas	Boller	1000.00	5000.00			10,500	10,500	10,500	10.500	10,500
377		Mainte	sance Costs (one-off)	N20		Riocas	Roller	1000.00	5000.00			3,750	3 750	3 750	3 750	3 750
4	> Start	Ontion 1 Innuts	Ontion 2 Innuts	CAT Chark Sheet	Assessment Summary	Standardised invests	OPEX and CAPEX Guid	derails Flags	Asset disposal Co	et calculatio	+ : •					
	Juan	opoon / nipus	obcours whore	Con Check Singer	a desta	annouraisea impara		riags	Ture unposer to							

Figure 20: OPEX guiderails

4.5 CAPEX and efficiency guiderails

a) The 'CAPEX and efficiency guiderails' (Figure 21) are industry norm estimates of CAPEX (\$/ kW output), efficiency (output/input) and asset lifecycle (years). These can be used by the council to check if any of the applicant's manual inputs differ materially from observed industry values. These values are maintained by EECA and should not be changed.

	X and CAPEX Gu	iderails		TE TARI TIAKI PÜNC INSKY UPDINCE KONSINATION AU	SAO Hority	
ack to	"Start" page					
heck		ок				
2.	CAPEX Guiderails					
	Technology	Fuel	Lifetime (years)	Capex (\$/kW output)	Lower efficiency bound	Upper efficien bound
	Boiler	Coal	30.00	1,218.75	0.70	0.85
	Boiler	Diesel	25.00	458.82	0.80	0.90
	Boiler	Electricity	25.00	328.28	0.88	1.00
	Boiler	Fuel Oil	25.00	458.82	0.80	0.90
	Boiler	LPG	25.00	522.99	0.80	0.90
	Boiler	Natural Gas	25.00	373.56	0.80	0.90
	Boiler	Wood	25.00	1,682.35	0.70	0.85
	Boiler	Petrol	25.00	458.77	0.80	0.90
	Boiler	Biogas	25.00	373.62	0.80	0.90
	Boiler	Geothermal	25.00	No CAPEX guiderail available	0.70	1.00
	Burner	Natural Gas	13.00	509.00	0.80	0.95
	Burner	Coal	30.00	No CAPEX guiderail available	0.70	0.85
	Burner	Diesel	13.00	509.00	0.80	0.95
	Burner	Fuel Oil	13.00	509.00	0.80	0.95
	Burner	LPG	13.00	509.00	0.80	0.95
	Burner	Wood	25.00	No CAPEX guiderail available	0.70	0.85
	Burner	Petrol	13.00	509.00	0.80	0.95
	Burner	Biogas	13.00	509.00	0.80	0.95
	Burner	Geothermal	30.00	No CAPEX guiderail available	0.70	1.00
	Furnace	Electricity	25.00	102.38	0.80	1.00
	Furnace	Coal	25.00	1,218,75	0.70	0.85
	Furnace	Diesel	25.00	508.69	0.80	0.90
	Furnace	Fuel Oil	25.00	508.69	0.80	0.90
	Furnace	IPG	25.00	508.69	0.80	0.90
	Furnace	Natural Gas	25.00	508.69	0.80	0.90
	Furnace	Wood	25.00	1,218,75	0.70	0.85
	Furnace	Petrol	25.00	508.69	0.80	0.90
	Furnace	Biogas	25.00	508.69	0.80	0.90
	Heat pump - ambient sour	ce Electricity	20.00	520.00	2 20	4 10

Figure 21: CAPEX and efficiency guiderail

4.6 Other considerations

To allow flexibility in the tool, the cells have been kept unlocked. If councils are uncertain about the accuracy of the results, councils could copy the applicant's information onto a clean sheet from EECA's website as a comparison

Glossary

Applicant	The person or company that is applying for a resource consent.
Best Practicable Option (BPO)	The best method or option for preventing or minimising the adverse effects on the envi- ronment
CAPEX	Means 'capital expenditure', which are funds used by a company to acquire and upgrade physical assets such as property, plants, buildings, technology, or equipment.
Condition assessment cost	The cost associated with condition assessment inspections, which help plan preventa- tive maintenance or remedial work to preserve an object's value and extend its useful life
Consent Authority	The council considering applications for Air Discharge Permits under section 87 of the Resource Management Act 1991 (RMA).
Coefficient of Performance (COP)	A ratio of useful heating or cooling energy provided (energy output) relative to energy input.
End-use energy demand	The output energy required for the end use process.
Energy supply infrastructure (Connection)	Dedicated connection equipment from the heat plant to the fuel source.
Energy input	The amount of energy consumed by the heat technology.
Fuel source	A substance that is used by the heat plant to provide heat (e.g. coal, gas, electricity)
Heat Device Type	Type of equipment designed, used, and intended to be used to supply heat for a struc- ture.
LCOE	Means 'Levelised cost of energy' meaning the average cost of energy produced by the plant over its lifetime.
Lifecycle cost	Economic cost to New Zealand for an option over the lifespan of the consent.
Maximum Continuous Rating (MCR)	The maximum output (MW) that a heat technology can produce continuously under normal conditions. Under ideal conditions, the actual output could be higher than the MCR.
Nameplate rating	The manufacturer's output rating of the heat technology. See MCR.
Network upgrade costs	A modification or addition to transmission-related facilities that are integrated with and support the transmission system for general benefit of all applicants.
Network charges	The network tariff is what networks charge for you to use their infrastructure (e.g. pipe- lines, poles, and wires) to get you the energy your heat plant consumes.
Non-energy related carbon emissions	Carbon emissions from processes (e.g. chemical processes in manufacturing) that are not from energy use.
OPEX	Means 'operational expenditure', which are funds spent for ongoing costs of running a business including maintenance expenses e.g., rent, marketing, payroll, insurance.
Regulatory compliance costs	The costs incurred by business to meet regulatory obligations.
Seasonal adjustment factors	A factor to account for the change in energy usage due to seasonal changes. i.e. more energy would be required to produce heat in winter than in summer months.
Site works	The process in which the construction site is prepared for the construction job.
tool	The Cost Assessment tool that calculates present cost values and highlights the option with least present cost.