UK Government

RAF032/2324: Evaluation of Industrial Energy Transformation Fund (IETF)

Annex A: Interim Impact Research Methodology

Department for Energy Security and Net Zero (2026)

Authors

This report was prepared by Technopolis Group, an independent policy consultancy, and Ricardo, an engineering consultancy, with thanks to government departments, stakeholders, and experts for their insights and contributions throughout the research process.

Views expressed in this report are those of Technopolis Group and Ricardo, and not necessarily those of the UK government.

Contents

Overview of evaluation methodology

The interim impact evaluation methodology was developed as part of a methodological design phase in 2025. This design phase led to the production of an Interim and Final Impact Evaluation Plan (IEP), which built on the IETF M&E Plan originally developed by DESNZ.

In line with the IEP, the interim impact evaluation follows a framework for theory-based evaluation (TBE) using contribution analysis. This theory-based evaluation also incorporates evidence from a quantitative strand of analysis, termed quantitative benefits assessment (QBA).

This document (Annex A) presents the overarching theory-based evaluation methodology. Annex C presents the QBA methodology, including technical assumptions.

The evaluation objectives and questions are presented below.

Evaluation objectives

Objectives, contribution, causation, and attribution

To establish the extent to which the scheme has met its objectives, how, and why, especially the degree to which IETF has ‘contributed to’ or ‘caused’ its identified impacts ‘benefits’ and with reference to additionality.

Primary quantitative benefits of IETF

To robustly estimate the numerical primary quantitative benefits of the IETF to date which have arisen from funded projects.

The primary benefits of the scheme are:

- reduced energy usage associated with the industrial processes of EE (energy efficiency) deployment project beneficiaries
- reduced energy costs associated with the industrial processes of EE deployment project beneficiaries
- reduced carbon intensity associated with the industrial processes of EE deployment project beneficiaries
- reduced carbon intensity associated with the industrial processes of DD (deep decarbonisation) deployment project beneficiaries
- reduction in the perceived risk-adjusted costs of DD technologies

Reduced costs and risks and secondary benefits of IETF

To identify the degree to which, IETF has delivered secondary benefits and, crucially, whether any effects have extended into the wider market such as shifts in perception or behaviour.

The secondary benefits of the scheme are:

- improved air quality impacts from EE and DD deployment project beneficiaries
- improved competitiveness of EE deployment project beneficiaries
- an increased pipeline of EE and DD deployment projects
- reduced energy consumption for UK industry in the long term
- reduced emissions for UK industry in the long term

Evaluation questions

Theory of Change (ToC):

1. Test and refine the causal pathways in the ToC from Barriers Overcome/Capabilities Achieved to End Benefits or Impacts (elements 12-31 of the ToC).

Strategic Objectives, Contribution, Causation, and Attribution:

2. To what extent can it be evidenced that the IETF itself contributed to achieving the benefits delivered by the underlying projects?
3. How additional was IETF funding, in terms of the benefits achieved over and above a non-IETF scenario?
4. To what extent did the EE scheme objectives impact, support or counteract with the DD scheme objectives and vice versa?
5. Have there been any unintended consequences (positive or negative) of the IETF policy and if so, what are they and why did they arise?
6. Were there any material interactions between IETF and other government environmental or economic policies?
7. What lessons, if any, arise from the IETF which could help HMG in determining the pathway to 2050 decarbonisation goals?

Primary Quantitative Benefits of IETF:

8. How has the scheme reduced energy intensity, energy costs and carbon emissions for industry (EE objective)?
9. How has the scheme reduced energy intensity and carbon emissions for industry? (DD objective)
10. What was the overall carbon cost-effectiveness of the IETF (tCO2e/£)?

11. What was the overall BCR of the IETF?
12. To what extent has the IETF contributed to carbon budgets (especially 4 or 5) and the Net Zero 2050 target?

Reduced Costs & Risks and Secondary Benefits of IETF:

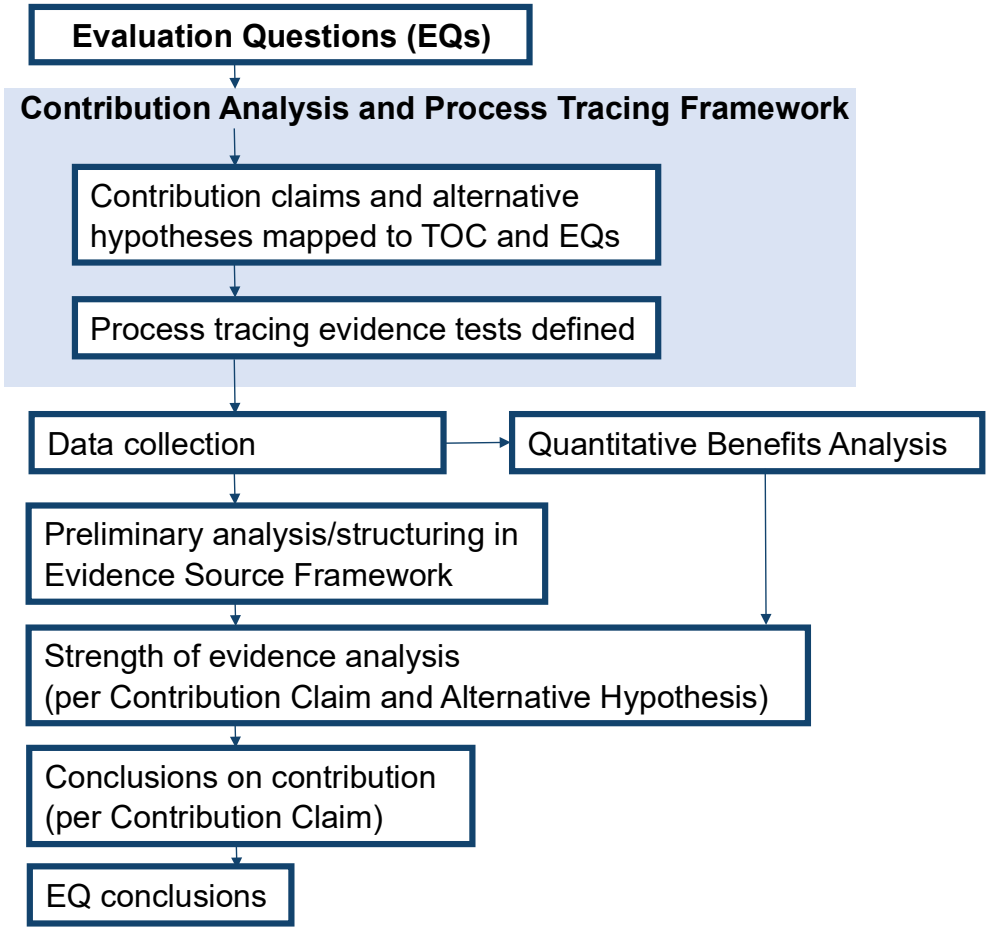
13. How has the scheme brought down the perceived risk-adjusted costs of energy efficiency and deep decarbonisation technologies and the actual risk-adjusted costs for deep decarbonisation technologies for the wider sector beyond beneficiaries?
14. What has been the impact of the IETF on the competitiveness of beneficiaries (e.g. productivity, finances, ability to use new technology) and why?
15. To what extent has progress on secondary benefits enhanced or diminished the scheme's value-for-money, in comparison to progress on primary benefits?
16. How has the IETF impacted jobs?
17. To what extent has the IETF generated evidence on the costs and benefits of EE and DD tech and how has that evidence been shared with, or otherwise influenced wider industry?

Introduction to mixed-method approach

The approach to answering the interim impact evaluation questions is structured around a Contribution Analysis and Process Tracing (CAPT) framework (Annex D). The CAPT framework acts as a map of logical tests and evidence sources required to test the programme ToC, providing a structured and transparent way of arriving at evaluative judgements. Conclusions from the CAPT analysis provided the foundations for answering the evaluation questions.

The CAPT framework draws together qualitative and quantitative sources of evidence which will be triangulated to assess the benefits, contribution and additionality of the programme. The QBA (see Annex C for details) is a distinct modelling process for analysing the programme's primary benefits, which is integrated within the CAPT framework.

Figure 1: Overview flow diagram of interim impact evaluation methodology



Source: Technopolis

Contribution Analysis and Process Tracing (CAPT) framework

Contribution analysis (CA) and process tracing (PT) are two distinct theory-based approaches, which can be combined to strengthen the evaluation of complex programmes, such as the IETF. A combined CA and PT (CAPT) framework was chosen for the evaluation of the IETF because it enables rigorous testing of ToC causal mechanisms and the programme's contribution to a complex mix of qualitative and quantitative benefits. Additionally, CA and PT are non-experimental methods which can be applied in a context where experimental methods are not feasible, as is the case for large and unique interventions like the IETF.

By enabling a rigorous testing of the causal mechanisms within the programme ToC, a CAPT based evaluation supports a deeper analysis of the programme design, and the role the IETF plays in overcoming financial and capability barriers to industrial decarbonisation.

The CAPT framework also provided transparency, in advance of fieldwork, on what criteria would be used to judge whether programme theories hold true or not and how conclusions would be drawn.

Contribution Analysis

CA is a method used to assess the extent and way in which an intervention contributed to observed outcomes, alongside external or alternative explanations, using a structured approach centred on a ToC. It sets out hypotheses or 'contribution claims' and 'alternative hypotheses' describing how a programme intervention is expected to contribute to outcomes, then gathers and synthesises evidence from multiple sources to investigate the plausibility of these hypotheses.

CA acknowledges that (at least for some hypotheses), there may be evidence in support of both the contribution claims and alternative hypotheses to explain the drivers of outcomes. This was anticipated given many of the impacts in the IETF ToC were not expected to be solely attributable to the IETF. For example, it was expected that increased competitiveness of beneficiaries would be difficult to attribute to one single factor given business competitiveness is also shaped by various contextual factors, such as consumer demand and other policies. The aim of the CA was therefore to provide conclusions on the extent to which the programme is a contributing causal factor, whether outcomes would have happened in the absence of the scheme, or whether the programme contributed alongside other factors to either achieve or expand the scale of outcomes.

The concepts of necessity and sufficiency are commonly used by theory-based evaluation practitioners as a means of analysing the causal contribution of different factors (e.g., aspects of an intervention and the wider context) to an outcome of interest. This recognises that the intervention on its own may not be sufficient to cause an outcome, but rather acts together as part of a causal package of factors to contribute to an outcome.

A ‘sufficient’ condition is a causal factor with enough explanatory power to cause the outcome on its own. A necessary condition is one that must be present for the outcome to occur but may be part of a wider causal package of influencing factors that work in combination to produce an outcome. This is known as the “INUS causal field”[1], where contributing factors are: an insufficient (I) but necessary (N) part of a causal package, which is in itself unnecessary (U) but sufficient (S) to produce the observed effects.

CA also enables an assessment of the balance of evidence to conclude whether "on average" (across its many sub-interventions) a programme intervention contributed to an outcome. By disaggregating certain types, such as project types or company/sector types, CA also supports understanding of the variation of outcomes produced by an intervention. Furthermore, by exploring the whole range of outcomes produced by a programme (positive and negative), CA can assess whether the intervention is also contributing to unintended outcomes.

The analysis of evidence in CA is carried out in a descriptive format, to develop a credible ‘contribution story’. CA does not claim to provide definitive proof, but aims to draw well-reasoned and defendable conclusions on what contribution a programme has made to observed outcomes, over and above alternative explanations, and in combination with non-programme factors. This is achieved through an increased understanding of:

- why the observed results have occurred (or not)
- the roles played by the intervention over and above other internal and external factors
- the causal package of factors involved in producing the outcome, including non-programme factors

The HMT Magenta Book describes CA as a useful approach for impact evaluations where experimental or quasi-experimental designs are often not feasible or not practical (as is the case with the IETF programme), but there is still a need to assess whether observed outcomes can confidently be attributed to the intervention[2]. The Magenta Book states that CA relies on the existence of a well-reasoned TOC, which the IETF has (as described below). The Magenta Book also states that the CA is a useful approach for the assessment of programmes with complex TOCs, which again is the case for the IETF which has multiple impact pathways. The Magenta Book includes the following cautions around the use of CA, which this evaluation design has accounted for:

- the quality of CA analysis is dependent on the quality of the thinking which has shaped the attribution problem and TOC. This has been addressed through multiple iterations of the programme TOC and contribution claims

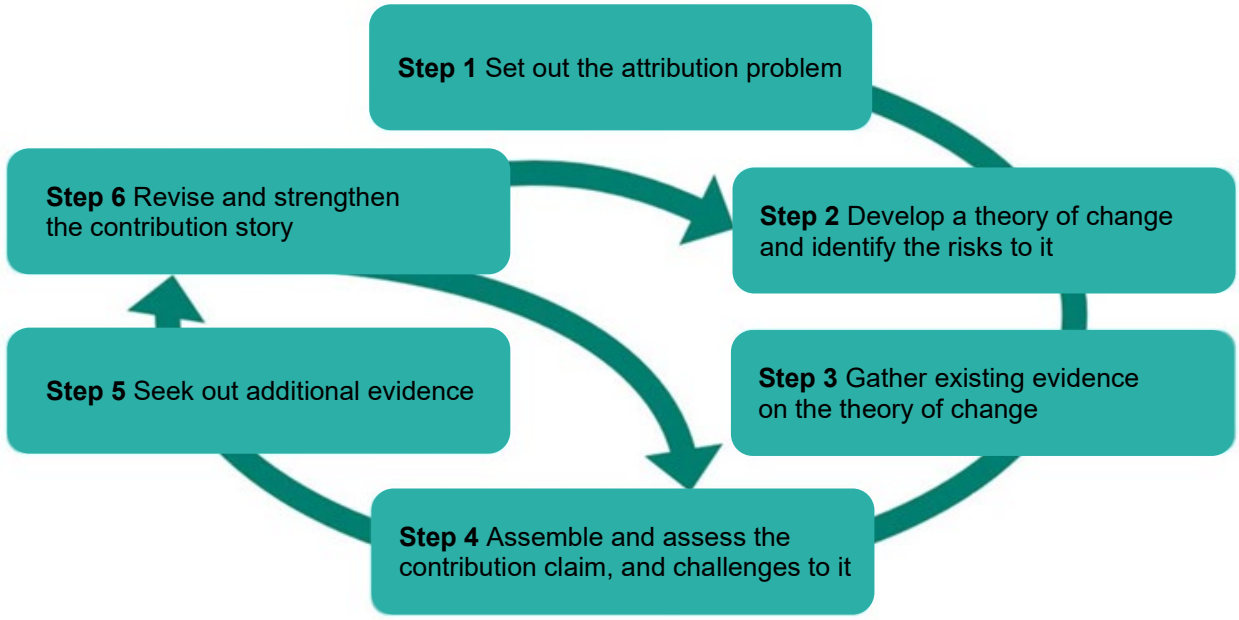
[1] Barbara Befani (2012) ‘Models of Causality and Causal Inference’
[2] HM Treasury (2020) ‘Magenta Book: Annex A analytical methods for use within an evaluation’, page 7

- CA conclusions on programme contribution are based on observed average effects. CA is therefore less suited to interventions with a large degree of variation in implementation or expected outcomes between different groups. The IETF programme is a single intervention and is therefore an appropriate type of intervention for CA. The IETF does have multiple outcome groups (namely study grants vs deployment grants, and EE vs DD grants) – this variation is managed through distinct contribution claims for the different outcome groups, which allows distinct treatment and assessment per group, to characterise the average experience per group as well as range of experiences within the groups.

CA is more commonly used to draw qualitative conclusions around the plausibility of attribution, rather than quantifiable levels of impact (e.g. the size of effect from an intervention). However, it may be used in combination with quantitative techniques to inform assumptions that underpin wider quantitative modelling, as well as draw on quantitative analyses for triangulation.

CA is an iterative approach to developing, testing and refining a TOC, based on evidence of the contribution to outcomes that a programme has made. The CA approach for the IETF interim and final impact evaluations follow the six-step iterative process developed by the originator of CA, John Mayne (2012). These steps are described below, including how they have been applied for the IETF.

Figure 2: Six steps of Contribution Analysis



Source: Marina Apgar and others (2017)

Step 1 – set out the cause-effect issues to be addressed in line with the high-level evaluation questions

The high-level evaluation objectives and questions to be addressed are summarised above, which were developed by DESNZ as part of the original programme M&E Plan.

Step 2 – develop a Theory of Change (ToC) and risks to it, including rival explanations

Outline the expected steps / mechanisms for the programme inputs to meet their intended outcomes and impacts, as well as postulating the role of other potential contributory factors.

The IETF programme ToC (Annex E) and ToC Supplement (Annex B) were developed by DESNZ and refined by external evaluators during earlier evaluation phases. The ToC explicitly outlines a causal narrative explaining how and why the IETF is expected to deliver its objectives from its starting inputs and activities. The ToC Supplement presents specific measurements and evidence sources per element and pathway within the ToC. The ToC and ToC Supplement were reviewed during the impact evaluation design phase and were considered 'fit for purpose', with detailed causal pathways which the evaluation can test through a series of 'contribution claims'.

The Final Process Evaluation (2025) included a review of the ToC from Inputs to Main Tangible Outputs using both primary and secondary data, and found the ToC to be accurate up to this stage, with no need for revision in its causal story. The interim impact evaluation assesses the ToC causal pathways from Barriers Overcome/ Capabilities Achieved to End Benefits or Impacts.

Contribution claims were developed for each of the key ToC impact pathways within scope for the interim impact evaluation. Contribution claims set out hypotheses about how the programme mechanisms were expected to contribute to the programme's primary and secondary benefits. Alternative explanations were formulated alongside the contribution claims, to test for the contribution of non-programme factors to the observed outcomes. Numbered contribution claims and alternative hypotheses are set out in the CAPT Framework (Annex D). It should be emphasised that contribution claims and alternative explanations are not intended to be competing binaries – but together represent a range of programme and non-programme causal factors which may work together as a single causal package. An example contribution claim and alternative hypothesis in provided in Table 1 below.

Table 1: Example contribution claim and alternative hypotheses from the CAPT framework

#	Contribution claim and alternative hypotheses
1	IETF study grants support industry to make decisions on deployment leading to a pipeline of EE and DD projects, or avoided financial loss - because firms would not be able to fund studies otherwise (due to financial barrier) TOC CHAIN: 12>16>26
1A	Non-programme factors (such as other programmes, technology breakthroughs, other sources of learning, other studies) have enabled decision making around deployment, which have led to an increased pipeline of projects (/ avoided financial loss by not pursuing unviable projects)

Step 3 – gather evidence to assess the strengths and weaknesses of the causal links in the ToC

A series of bespoke evidence tests (both qualitative and quantitative) were developed in line with the 'measurement' indicators set out in IETF ToC supplement. These evidence tests set out what evidence was expected to be observed if a contribution claim or alternative hypothesis holds true.

CA does not specify the approach to assessing causal links. Therefore, as described in the PT section below, PT evidence tests were used within Step 3 to strengthen the CA by constructing granular and logical tests on the strength of evidence for each causal pathway. An example of these PT tests, mapped against a contribution claim, is shown in Table 2 below.

Table 2: Example process tracing tests mapped against a contribution claim

#	Contribution claim	Evidence expect to observe if true	Type of test	Rationale
1	IETF study grants contribute to an increased pipeline of EE/DD projects because studies conclude that it is financially viable to deploy EE/DD technologies, enabling beneficiaries to commit to deployment. Firms would not be able to fund studies otherwise (due to financial barrier) CHAIN: 12>16>26	IETF Project database shows that FEED/ feasibility studies have been delivered (of particular interests for impact assessment total number versus planned/ business case to give sense of proportionality/ level of success)	Hoop	Lack of completed IETF funded studies would rule out contribution of the programme
1		Study beneficiaries state that studies enabled decision making on deployment (either to progress, or avoid financial loss), which they wouldn't have been able to do without IETF funding.	Hoop	Interviewees and results from survey support the hypothesis that FEED/feasibility studies have given confidence to commit to technology deployment or avoid financial
1		Case studies produced by beneficiaries (P1 and early P2) show FEED/ feasibility studies successfully leading to project deployment (quantitative) - and this number represents a significant proportion of completed studies.	Straw in the wind	Supportive of CC but likely to be biased and not available for all beneficiaries - so is more a form of supportive evidence
1A	Non-programme factors (such as other programmes, technology breakthroughs, other sources of learning, other studies) have enabled decision making around deployment, which have led to an increased pipeline of projects (avoided financial loss by not pursuing unviable projects)	Study beneficiaries and non applicants point to other factors that have enabled studies or decision making around deployment	Hoop	Stakeholders provide evidence that factors other than IETF, had a major role in improving perceptions, is necessary for the alternative hypothesis to be true, but does not confirm it

These evidence tests described the qualitative and quantitative evidence that the evaluation team then set out to collect, to assess: 1) outcomes/benefits under consideration; 2) the different links in the specific aspect of the impact pathway; and 3) alternative explanations for how change might have happened.

The data collection protocols described further below provide guidance on the data collection approach for each data source identified in the CAPT framework (Annex D).

The CAPT framework covers the interim impact evaluation, as well as a final impact evaluation planned for approximately 2028-2030. Columns AG and AH indicate which tests are included per evaluation phase.

There are 10 contribution claims with accompanying alternative hypotheses, reflecting the key impact pathways within the TOC, which cover both the interim and final impact evaluations. Sat beneath these contribution claims, there are 96 PT tests which are split across the interim and final impact evaluations: 67 PT tests relate to the interim impact evaluation, while 52 PT tests relate to the final impact evaluation. This split reflects the timing, availability and appropriateness of different sources of evidence within the evaluation stages.

Step 4 – assemble and assess evidence on the contribution claims and challenges to it

Evidence collected for each test was assembled and analysed to assess the accuracy of the ToC, and the contribution of the intervention versus other influencing factors.

This required synthesising multiple sources of evidence within the PT tests, to arrive at judgements about the extent to which programme secondary and primary benefits have been achieved, and the role of the programme in achieving these. To assess the role of the programme, this required an assessment of 1) the strength of evidence in support of contribution claims versus alternative hypotheses, followed by 2) a synthesised conclusion on the contribution of the programme intervention versus other factors (represented in the alternative hypothesis) – describing the causal package of factors that achieved the outcomes. The sections below on Synthesising Evidence and Assessing overall contribution and causality cover these steps in detail.

Once each contribution claim had been analysed, an evidence-based and well-reasoned view could be given on the programme's contribution to outcomes, and how different aspects of the programme ToC are functioning.

Reflecting the IETF impact evaluation questions, an assessment of additionality was also made – i.e. identifying the unique, net benefits produced by the programme that would not have happened in its absence. Additionality and contribution are closely linked but distinct concepts. Contribution refers to the role / mechanism by which an intervention led to an outcome, whereas additionality seeks to isolate the unique benefit produced by the intervention over and above what would have happened in the absence of the intervention. Additionality was assessed per contribution claim, by comparing evidence on outputs and outcomes as a result of the programme versus those caused by non-programme factors. The assessment of additionality per contribution claim was summarised in the CAPT Framework (Annex D).

Where possible, additionality has been quantified – such as quantified net CO2 savings (CO2e kg). However, due to the complexity and qualitative nature of some programme benefits, additionality was also described qualitatively, such as its contribution to improved capabilities, which is not easily quantified.

Step 5 – identify and address gaps in evidence

This step was carried out as far as possible, within the limitation of the evaluation timeline. The main way in which this was approached was through preliminary assessment of emerging interview and survey findings, to identify priorities for the remaining interviews. As such, this "live" assessment of evidence helped guide interviewers on key themes and prompts to focus on within interviews.

Step 6 – Revise and strengthen the contribution story

Based on the findings of the CAPT, the Findings Report presents an analysis of the functioning of the programme mechanisms and the extent to which these are functioning as intended.

Process tracing

As described in Step 3 above, whilst the CA approach developed by John Mayne provides a useful overall iterative process for testing and refining contribution claims, it is not prescriptive on the precise methods that may be used to make judgements about the strength of evidence in support of causal claims. PT provides a valuable framework for testing and evidencing causal mechanisms at a granular level. By combining CA with PT strength of evidence tests, this evaluation framework achieves a more rigorous and objective approach to analysis than using either CA or PT alone.

Whereas CA seeks to understand whether an intervention was a necessary contributing factor to an outcome versus non-programme factors, PT focuses on unpacking and testing the strength of evidence for causal mechanisms that link an intervention to its outcomes. This is particularly valuable for evaluating the IETF, as the programme ToC is complex with multiple impact pathways and contextual influences.

PT seeks evidence to evaluate each step in a hypothesised causal chain, and applies logical tests to assess the strength of evidence for causal pathways. PT is typically used for detailed case studies where evaluators aim to explain how and why change occurred, but PT tests can be usefully adapted to programme level analyses in combination with CA to trace and evidence programme mechanisms. As outlined by Befani and Mayne 2014[3], PT is a case-based approach that works well "…within an overarching CA framework; thus shifting the focus of impact evaluation from 'assessing impact' to 'assessing confidence' (about impact)".

[3] Barbara Befani, John Mayne (2014) 'Process Tracing and Contribution Analysis: A Combined Approach to Generative Causal Inference for Impact Evaluation', IDS Bulletin 45.6, pages 17–36

PT makes causal inferences by identifying types of 'clues' that would either support or reject programme hypotheses if observed. In combination with CA, this can be used to develop a series of clues (types of evidence) that confirm or disprove whether observed outcomes (for example, lower perceived risk of DD technologies) may be attributable to aspects of the IETF or other external factors. PT also allows an evaluator to highlight evidence of which features of a programme have positively influenced results, or not as the case may be.

PT takes a probabilistic approach to the interpretation of evidence - by assessing the likelihood of observing different types of evidence if programme theories hold true. It uses tests based on the principles of certainty and uniqueness of evidence; in other words, whether the evidence is necessary and/or sufficient for inferring a conclusion. Tests with high uniqueness help to strengthen a particular hypothesis, by showing that a given piece of evidence was unlikely to be observed without the hypothesis being true – i.e. that the programme was a necessary factor. Tests with high certainty help to rule out alternative explanations, by providing evidence that demonstrates an intervention was necessary for an observed effect to be produced (Befani and Mayne 2014[4]).

PT tests are defined prior to collecting evidence, so that there is a structured and transparent approach to the gathering and assessing the quality of evidence required to prove or disprove hypotheses.

There are four types of causal tests commonly used in process tracing[5]: hoop, straw-in-the-wind, smoking gun and double decisive. Definitions of PT tests are provided below:

- 'Straw-in-the-Wind' (SITW) – evidence that lends support to a causal claim in the hypothesis but is neither necessary nor sufficient in itself to confirm it if observed, or to disprove with certainty if not observed. This type of evidence is slightly more likely to be observed if the hypothesis is true, but might be observed even if it is false.
- 'Hoop tests' – disproves or considerably weakens the hypothesis if not found, but is not sufficient to confirm the hypothesis. These are necessary pieces of evidence that we would 'expect to see' if the given hypothesis is true, such as grant funded projects were completed.
- 'Smoking gun' – evidence that provides a convincing cause-and-effect type contribution story. It strengthens the hypothesis if observed but does not disprove the hypothesis if not observed (although may slightly weaken it). These are pieces of evidence that are likely to be observed if a given hypothesis is true and unlikely to be observed if it is not true.
- 'Double-decisive' – strengthens or confirms the hypothesis and rules out alternative explanations if observed, and if not observed the hypothesis is rejected or significantly weakened. In practice, such definitive evidence may be harder to uncover.

[4] Barbara Befani, John Mayne (2014) 'Process Tracing and Contribution Analysis: A Combined Approach to Generative Causal Inference for Impact Evaluation', IDS Bulletin 45.6, pages 17–36
[5] Stephen Van Evera (1997) 'Guide to Methods for Students of Political Science', New York, Cornell University Press

PT is sometimes combined with Bayesian updating to mathematically estimate the probabilities of hypotheses being true or false based on whether each evidence test has been observed. However, Bayesian updating was not considered appropriate for this evaluation. Bayesian updating involves the specification of prior probabilities for the hypotheses being true according to each evidence test (in advance of fieldwork) and then the updating of these to posterior probabilities based on what evidence is actually observed. This can be well suited to the evaluation of programmes based on a relatively small number of cases and evidence tests. However, in projects with large numbers of cases and multiple strands of data sources and tests, such as the IETF, Bayesian updating may overcomplicate the process given the assigned probability scores for each test are based on subjective judgement. Additionally, when conclusions on a contribution claim are based on multiple tests across different strands of evidence, as in the case of the IETF CAPT Framework (reflecting the complexity of the ToC), the overall scores are more sensitive to errors in judgement of individual tests and risk providing what can seem like arbitrary numbers that are difficult to interpret.

Synthesising evidence

PT tests provide the foundational evidence for the analysis of contribution claims. To arrive at conclusions on contribution claims, multiple sources of evidence from PT tests must be synthesised. This evaluation's approach to synthesising PT tests at the contribution claim level is described in Table 3, below.

In addition to the four PT tests, two additional criteria were included in the synthesis framework to provide an additional filter on strength of evidence: 1) triangulation and 2) authoritative source. These criteria were adapted from a framework developed by Delahais & Toulemonde (2017)[6].

- **Triangulation:** sources that are independent from one another are mutually reinforcing as far as they converge. This could include data of different types, such as interview statements from stakeholders with different interests and biases. For example, converging statements on the role of the programme in reducing perceived risk adjusted costs by various stakeholders such as deployment beneficiaries, IETF delivery officials and wider stakeholders reinforces the claim that risk perception has been reduced by the programme.
- **Authoritative source:** indicates "a piece of evidence which has already passed a thorough test under the responsibility of credible authorities in so far as the point at issue is not in dispute among differing authorities". For this evaluation, we considered the following to be examples of authoritative sources:
  - Programme monitoring data: M&V 'actual' performance data, IETF Delivery Database, IETF Benefits Database.
  - Data on energy consumption and energy intensity by industry based on Energy Consumption in the United Kingdom (ECUK) annual statistical publication and Digest of UK Energy Statistics (DUKES).

[6] Thomas Delahais & Jacques Toulemonde (2017) 'Making rigorous causal claims in a real-life context: Has research contributed to sustainable forest management?' Evaluation, Vol 23, Issue 4, pages 370 – 388

- National Atmospheric Emissions Inventory (NAEI)/ ONS datasets on greenhouse gas emissions disaggregated by industry types.
- Carbon budget progress reports published by Committee on Climate Change (CCC).

While in some instances the same sources of evidence could be classed as passing PT tests and Authoritative and/or Triangulated evidence, in other cases they may not. For example, ECUK data may indicate reduced carbon intensity for UK manufacturing sectors (Authoritative Source), but little else was found to triangulate with to link this evidence to the IETF. In this case, the ECUK data provides a unique form of SITW which possesses a different quality compared to stakeholder perceptions or anecdotal fieldwork evidence.

Table 3: Criteria for assessing the strength of multiple pieces of evidence relating to one contribution claim/alternative explanation

Overall strength of evidence category	Criteria
Strong evidence in support of contribution claim	Criteria met IF: A) Hoop tests and SITW tests passed. AND: B) Based on Authoritative Source PLUS Triangulated evidence. OR: C) Based on Smoking Gun PLUS Triangulated evidence.
Moderate evidence in support	Criteria met IF: A) Hoop tests and SITW passed. AND: B) Authoritative source evidence, OR: C) Triangulated evidence across most sources. However, some inconsistency in findings. Some sources point towards different conclusions - evidence does not Triangulate across all sources.
Limited or weak evidence in support	Criteria met IF: A) Hoop tests and some SITW passed. AND: B) Evidence from Smoking Gun sources is mixed - for example, findings from interviews show some stakeholders' views support claim, with some evidence to refute it. C) Evidence not based on Authoritative Source.
No evidence in support.	Criteria met IF: A) Hoop tests fail. AND/OR: B) No evidence in support of contribution claim across other sources.

The value of this scoring and categorical judgement approach is its simplicity in reporting and its transparency (relative to Bayesian updating), allowing comparison with the conclusions drawn in the CAPT Framework (Annex D). In addition, each conclusion on ‘strength of evidence’ for each contribution claim has been reported in the Findings Report with an accompanying qualitative narrative to demonstrate what findings they are based on.

The analysis of the strength of evidence per contribution claim / alternative hypothesis has been carried out in the analysis fields provided in the CAPT Framework.

Assessing overall contribution and causality

As described earlier, CA aims to understand the extent to which an intervention was a necessary or sufficient factor in producing the observed effects. The final stage in the CAPT analysis was therefore to assess the contribution of the IETF to observed outcomes, analysing the causal package of factors at play as evidenced by the analysis of the contribution claims and alternative hypotheses, as well as any new factors identified throughout the process of the research.

Table 4 sets out a four-point scale used for making conclusions on levels of causality that the intervention of the fund had in contributing to impacts/benefits. Following this scale, the CAPT framework includes an assessment per contribution claim of the relative influence of the programme (as reflected in contribution claim evidence) versus non-programme factors (as reflected in alternative hypothesis evidence).

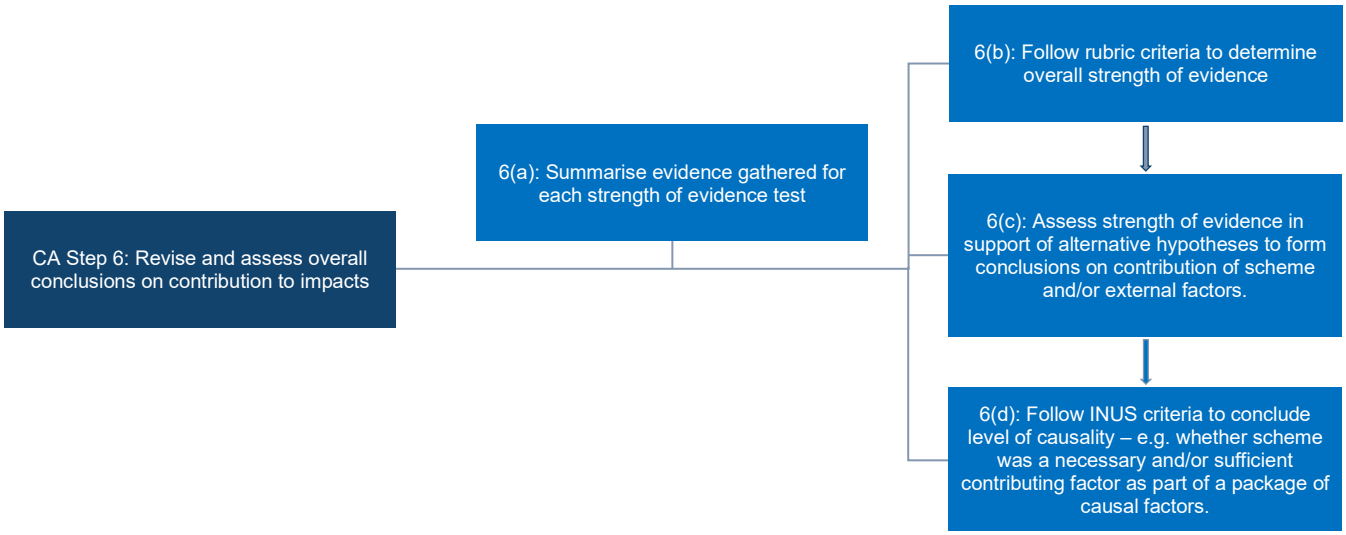
Table 4: Levels of causality to categorise CA conclusions

Level of causality	Description
1	Intervention was sufficient on its own to lead to the intended outputs/ outcomes/ impacts – they would not have happened without the intervention's inputs and resources and no additional inputs were necessary. In this case the intervention alone caused the results.
2	The intervention represented the main contributing factor (highly necessary) but was not sufficient on its own - results would not have been possible without additional support factors – including other resources, such as pre-existing institutional capacities and capabilities, networks, or other contributing programmes etc. In this case the intervention contributed in a necessary but not sufficient way to the results.
3	The intervention was a supplementary factor (somewhat necessary) but not sufficient on its own to produce the observed results - for example it accelerated or increased the scope of an investment that might already have been underway, such as business plans to invest in recruitment. In this case the intervention contributed in a supplementary way to results.
4	Intervention was neither sufficient nor necessary – it was likely that something similar would have happened anyway e.g. EE or DD deployment were planned within an organisation's own decarbonisation strategy or paid for by other means of grant funding. In this case the intervention did not cause the observed results.

The criteria in Table 4 above help determine whether outcomes were primarily driven by programme levers or external factors, or a mix of both. Within each level of causality there could be a scale of the relative contribution of the intervention, therefore alongside the causality rating an assessment has been given describing the rationale for the level given and the interaction of factors within the causal package.

In summary, the final steps of the CAPT were to: i) map out the evidence supporting the contribution claims and alternative explanations, alongside a summary of the strength of evidence; ii) overall conclusions were then developed on the necessity and sufficiency of the programme's contribution to the observed impacts, alongside the contribution of other factors as part of a complete causal package. The sequence of steps taken within this final stage (6) of CA are illustrated in Figure 3 below.

Figure 3: Steps taken to assess evidence and form conclusions



Source: Technopolis

Evaluation question conclusions

The conclusions of the contribution analysis have provided the necessary evidence for answering the high-level evaluation questions. Section 2 of the Findings Report presents the mapping of contribution claims to answering the evaluation questions.

Evidence sources

This section details the approach to data collection for the evidence sources used in addressing the CAPT Framework tests. The following evidence sources were used:

Interviews

Qualitative semi-structured interviews were a key evidence source in the interim impact evaluation. Interim impact evaluation interviews were conducted with a sample of key stakeholders (Table 5 below), selected for their relevant perspective on key ToC tests.

Table 5: Fieldwork sample for interim impact evaluation

Stakeholder group	No. interviews	E-survey
IETF policy / delivery & IUK	3	n/a
Fund beneficiaries – deployment	15	35
Fund beneficiaries - studies	10	26
Unsuccessful / withdrawn applicants	2	3
Wider industry stakeholders (e.g. sector bodies, academia)	6	n/a

Bespoke topic guides were developed for each stakeholder group, populated with questions mapped to the PT tests. The topic guides also include questions addressing evidentiary gaps required for the QBA adjusted economic counterfactual (as discussed in Annex C).

Each interview was transcribed and the data was entered into an Evidence Source Framework, which maps all topic guide questions against the PT tests. This structured framework enabled the filtering of interview data based on stakeholder type, PT test, and topic guide question. This structured approach facilitated the synthesis of responses from different participants as the basis for answering relevant PT tests.

Interviews lasted approximately 60 min and were conducted remotely as an online meeting.

Survey

A survey was used to secure input from a wider sample of beneficiaries and applicants beyond the interviewed population. The survey also enabled the testing of whether themes identified in beneficiary/applicant interviews are prevalent in the wider population. The following survey responses were secured:

- Deployment Beneficiary: 35
- Study Beneficiary: 26
- Unsuccessful / withdrawn applicant: 3

Survey questions per stakeholder group were mapped against the CAPT tests. Similarly to interview data, data from the surveys was analysed in data tables in the Evidence Source Framework, mapped to the CAPT tests, enabling disaggregation of responses to PT tests based on stakeholder type. Evaluators then triangulated the survey data to answer the relevant tests in the CAPT framework.

An engagement strategy has been developed to ensure participation in the survey, acknowledging the risk of low response rates – particularly from unsuccessful applicants. This strategy included: minimising survey length to reduce participant burden, early engagement to the maximum relevant population and DESNZ endorsement in recruitment emails.

Case studies

case studies have been produced by around 40 IETF beneficiaries, including deployment and study grants. The case studies highlight some of the key achievements of the programme, and were mapped as an evidence source for some PT tests, particularly those related to learning / capability development and follow on deployment of study grants.

A sample of 15 case studies was reviewed, chosen to minimise overlap with interview participants, thus maximising overall sample representation. Key insights from the review of case studies were summarised in the Evidence Source Framework, and triangulated as an evidence source to answer relevant PT tests.

Project Completion Forms (PCF)

IETF study and deployment beneficiaries are required to complete a PCF at the end of their projects (i.e. upon completion of studies, and completion of the 5-year post installation monitoring window). PCFs are survey forms that capture information about the benefits and experiences of beneficiary projects, including the performance and results of the project, delivery issues, suppliers, jobs impacts, knowledge and skills development, competitiveness, influence on wider EE/DD implementation, attendance of knowledge events, views on M&V process, as well as additionality and counterfactual characterisation.

PCFs were available for 18 deployment projects and 4 studies.

IETF Delivery Database

This database collates details of all beneficiaries and applicants, and is a key source for analysing the composition of the overall portfolio of grants. The database includes beneficiary and applicant characteristics such as grant size, technology type, company size, and delivery status. This data source is typically mapped as a “hoop” test within the CAPT framework, as it provides confirmation on the quantum and status of projects.

PCFs are mapped as evidence sources for various PT tests. PCF responses were analysed against the relevant PT tests, and summarised in the Evidence Source Framework and triangulated as contributing evidence for PT tests.

Knowledge event databases

DESNZ has recorded data on knowledge event participation including attendee numbers and organisation characteristics. Key figures from the knowledge event database were analysed as evidence for PT tests relating to capability spillovers (namely CC4).

Desk review

Secondary data sources were used to provide evidence of national sector level trends in energy use and decarbonisation, as relevant to CC7 and CC8. This is included ECUK[7] and ONS[8] data. A desk review of these sources provided an indication of national trends, as context for the contribution of the IETF (though were notably only ‘straw-in-the-wind’ due to wide scope for disturbance / non-programme factors).

[7] DESNZ, Energy Consumption in the UK (ECUK)
[8] ONS, UK Environmental Accounts - data on sector greenhouse emissions

Methodological limitations

As also presented in the Findings Report, the qualitative element of the evaluation faced the following limitations:

A high representation of beneficiaries within the overall sample frame introduced bias within the qualitative evidence. This was partly mitigated by triangulation between interview and survey responses of different beneficiary types, as well as inclusion of non-beneficiary perspectives including unsuccessful/ withdrawn applicants (6), wider industry representatives (6) (trade associations, academics and a consultancy), and DESNZ/Innovate UK representatives (3). Where beneficiary accounts are used as a key evidence source for contribution claims, their bias is accounted for in strength of evidence assessments.

The primary fieldwork lacked a representative sample to provide a strong and robust counterfactual group that did not receive funding. This was partly mitigated by targeting the participation of unsuccessful/ withdrawn applicants (6) to understand how they progressed without funding. In addition, consultations with study beneficiaries who have not received deployment grants provided a form of counterfactual on the ability to progress to deployment. Mitigating actions were taken to maximise response rates among this group, by cross referencing study and deployment beneficiaries and targeted survey and interview outreach. In addition, beneficiaries were asked interview and survey questions about alternative scenarios from multiple lines of enquiry (e.g. alternative investment options, likely pace and scale of alternative outcomes). This links to the discussion on QBA counterfactual, as discussed in Annex C.

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