

Net Present Value (NPV) test - additional guidance

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Introduction

The **Net Present Value (NPV) test** is detailed within the Entry Capacity Release (ECR) Methodology and is applied where **Funded Incremental Obligated Entry Capacity** release is the solution required to release additional Entry Capacity on the National Transmission System (NTS).

Funded Incremental Obligated Entry Capacity is required where investment is needed in the NTS requiring physical works in order to meet the requested capacity need. It is not expected to be the required where unsold NTS Entry Capacity, Entry Capacity Substitution (from another Entry Point) or Use of existing infrastructure is the utilised as the solution.

This document is provided as additional guidance in response to clarifications sought on the NPV Test in order to address these specific areas. A worked example is included for illustration purposes on how the methodology is applied. This document is a supplementary help document.

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[Capacity methodology statements | National Gas](#)

Contents

This document includes additional guidance in the following areas:

1. NPV Test Overview
2. NPV Test requirements
3. Project Cost Calculation
4. Inflation
5. Discount Rates
6. Capacity Premium
7. Worked Example

The Entry Capacity Release (ECR) methodology relevant paragraphs are referenced throughout.

It is advised to use this document in parallel with the ECR.

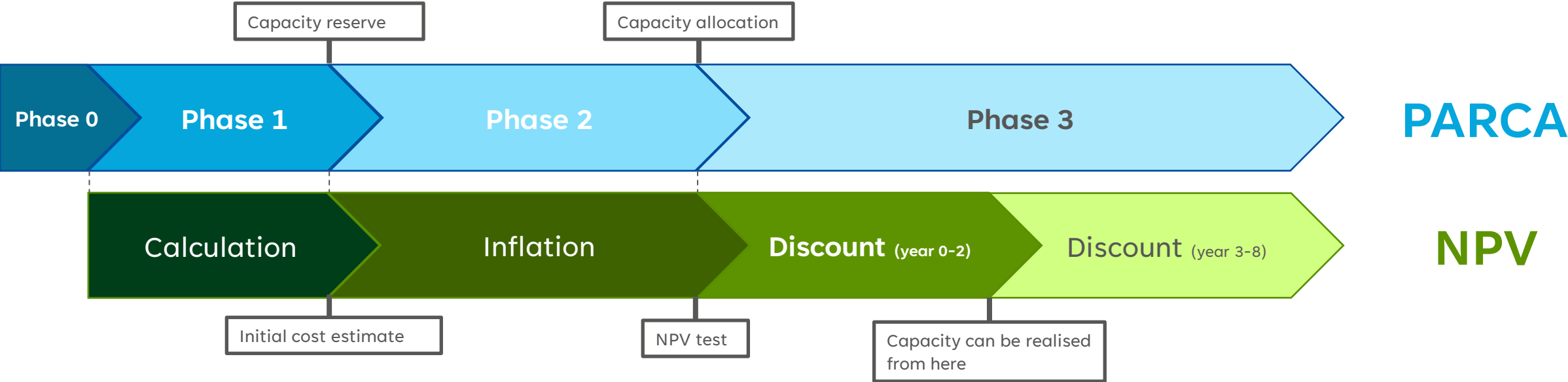
Terms used within this document are defined within the ECR definitions.

NPV test overview

The NPV test is designed such that at least 50% of the estimated project cost, associated with a funded incremental increase in entry capacity, is recovered as part of the allocation process through capacity charges including an additional premium cost where necessary. The 50% project cost figure is also adjusted for inflation and the capacity and premium costs are discounted for time value.

$$\textit{Incremental Revenue} \geq 0.5 * \textit{Project Value}$$

NPV test process overview



NPV test requirements

Key paragraphs from Entry Capacity release methodology statement v8.2 - CHAPTER 6: Net Present Value (NPV) Test :

140. The amount of Incremental Obligated Entry Capacity signalled for release will be the lesser of: (a) the highest common amount requested in excess of the Unsold NTS Entry Capacity in 4 different gas years; and Entry Capacity Release Methodology Statement Page 46 of 88 (b) the highest amount that satisfies a duration equal to the PARCA minimum duration quantity.

141. National Gas Transmission will, for the quarter in question plus the subsequent thirty one quarters (or less where this would be beyond the period for which capacity has been offered) determine the net present value (NPV) of the revenue from the sum of: (a) the requested amount of Incremental Obligated Entry Capacity multiplied by the combined Reserve Price plus premium price (if any); (b) the requested amount of Unsold NTS Entry Capacity multiplied by the premium price (if any). The unsold baseline revenue is not included in the NPV. It is only the premium price applied to the Unsold capacity that is included. For avoidance of doubt, no step pricing is included in the revenue or used for any PARCA calculations.

144. For PARCA applications, the NPV test will be applied, using the capacity quantity information provided by the Shipper User or Reservation Party, at two stages: (a) After Phase 1 PARCA Works, to inform the applicant of the indicative premium payable (if any) before capacity is reserved and the project progresses to phase 2; and Entry Capacity Release Methodology Statement Page 47 of 88 (b) After Phase 2 PAR

148. Where, for the given incremental signal, not enough incremental user revenue is generated at the Reserve price, then a premium can be added. The premium will be the lowest price (to 4 decimal places) that can be added to the Reserve Price to allow 50% of the estimated project cost to be recovered.

In order to calculate what is required for the NPV test we need to determine several factors as per the methodology:

- Project cost
- Inflation rate
- Capacity reserve prices
- Discount rate
- Capacity reserve premium

Each of these are explained in the following pages.

Project cost calculation

Key paragraphs from Entry Capacity release methodology statement v8.2 - CHAPTER 6: Net Present Value (NPV) Test:

133. For the purposes of determining the required commitment from PARCA signatories to trigger the release of Incremental Obligated Entry Capacity, an estimated project cost will be calculated for the requested amount of Incremental Obligated Entry Capacity. For the Incremental Obligated Entry Capacity amount signalled under paragraph 140, an initial estimated project cost will be provided to the applicant prior to the reservation of capacity. The initial estimated project cost shall be calculated in accordance with the methodology in appendix 1 of this statement.

Entry Capacity Release Methodology Statement

Appendix 1 – Estimated project values

Estimated Project Values

For the purposes of determining the required commitment from bidders that would normally trigger the release of incremental capacity an estimated project value is calculated for the incremental capacity level as follows:

$$ProjectValue_{x,EntryPoint} = \frac{(NMkm_{obligated} + Nlkm_{x,EntryPoint}) \times EC}{10^6} \times \frac{39}{CV_{entry}} \times IncCapacity_{x,EntryPoint}$$

Where

$ProjectValue_{x,EntryPoint}$ = Estimated project value for the entry point for the incremental level (£m)

$InitialPrice_{x,EntryPoint}$ = Initial Entry Price for the entry point for the incremental level x (p/kWh/day)

$Nlkm_{x,EntryPoint}$ = Nodal incremental distance for the entry point for incremental level x (km)

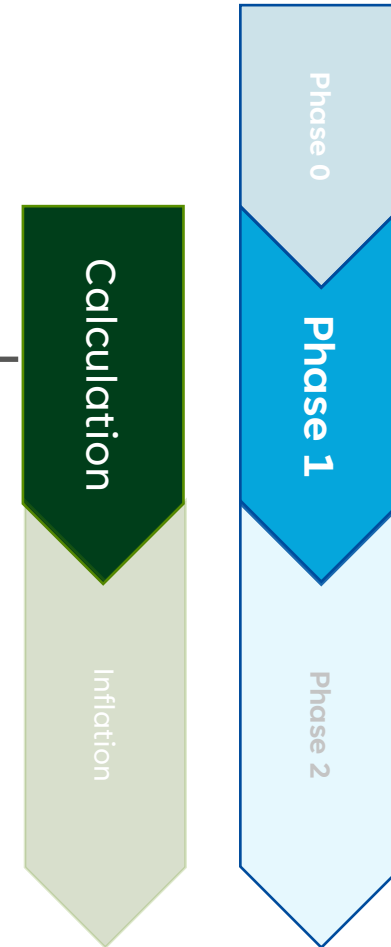
$NMkm_{Obligated}$ = Nodal marginal distance for the entry point at the obligated level (km)

EC = Expansion Constant (£/GWhkm)

$IncCapacity_{x,EntryPoint}$ = Incremental capacity level x for the entry point (GWh)

$EntryPoint$ = The entry point being analysed (a node in the set of supplies)

- Initial cost estimate
- Capacity reserve



The distance gas from the terminal (entry point) will travel on the network at the new obligated level, on a peak demand day, if the network is optimised*

The cost per km of pipe (Assumed to be 85-38bar, averaged between 1200-1050-900mm pipeline and assumed a compressor every 100km) from historical costs, Divided by the capability of said pipeline in GWh. (last calculated in 2006/7, inflated to latest price).

$$ProjectValue_{x,EntryPoint} = \frac{(NMkm_{obligated} + Nlkm_{x,EntryPoint}) \times EC}{10^6} \times \frac{39}{CV_{entry}} \times IncCapacity_{x,EntryPoint}$$

Adjustment to make the figure in £(m)

CV adjustment is assumed entry CV vs refence condition CV (39 MJ/m3)

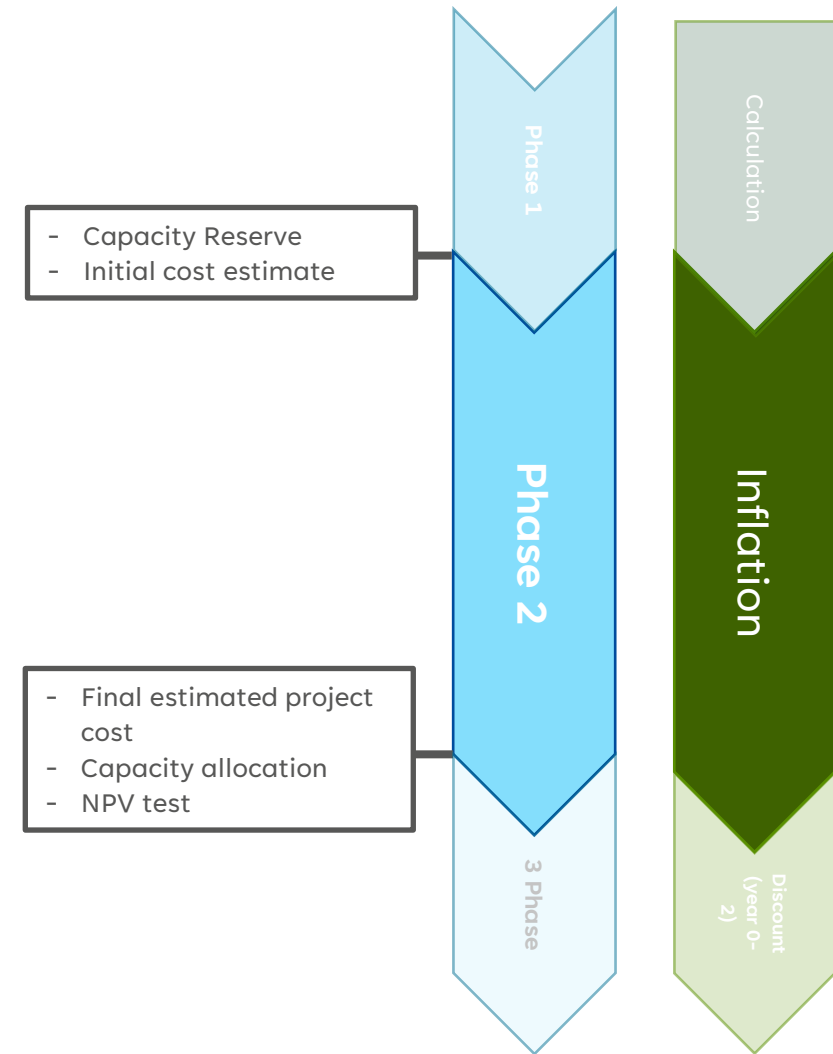
Amount of incremental capacity

*Network is optimised according to Dijkstra algorithm which determines the shortest path between nodes in a weighted network

Inflation

Key paragraphs from Entry Capacity release methodology statement v8.2 - CHAPTER 6: Net Present Value (NPV) Test :

134. The final estimated project cost will be provided to the applicant prior to the allocation of capacity, and shall be calculated by annually **applying inflation**, to the initial estimated project cost, each year that has passed. This applies from the capacity reservation at the end of PARCA phase 1 through to the Allocation date at the end of PARCA phase 2. (Inflation will be taken from Ofgem’s Price Control Financial Model, which is updated annually, hence not referenced here).



Ofgem GT2 PCFM November 2022 <https://www.ofgem.gov.uk/publications/gt2-price-control-financial-model>

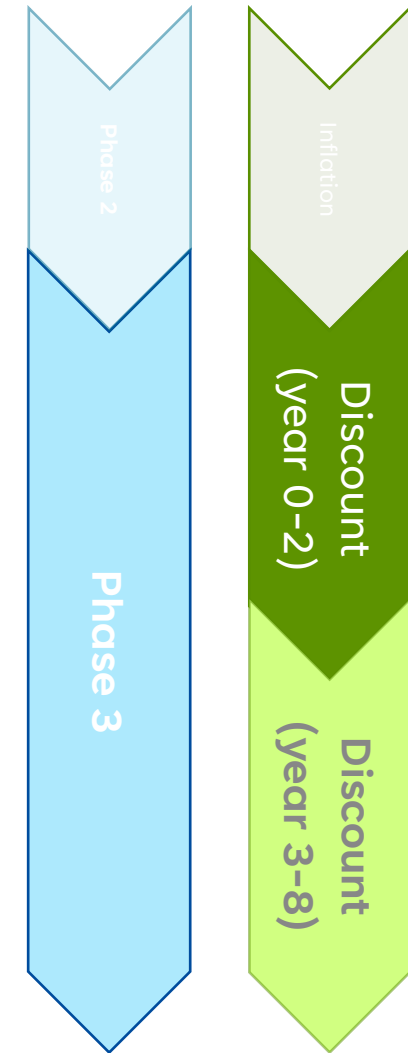
Discount Rate

Key paragraphs from Entry Capacity release methodology statement v8.2 - CHAPTER 6: Net Present Value (NPV) Test:

142. The “quarter in question” will normally be the first quarter following the lead time referred to in paragraph 120 where the aggregate volume of valid bids received and/or capacity quantity/profile requested first exceeds or equals the Unsold NTS Entry Capacity (minus that reserved pursuant to any PARCAs) plus the quantity of Incremental Obligated Entry Capacity that is being considered. However, in respect of the QSEC auction, at any given ASEP more than one quantity of Incremental Obligated Entry Capacity may be considered in which case the quantity duration test in paragraph 140 may be applied from more than one quarter. The test will be applied to each incremental quantity / quarter independently, i.e. to the extent that quantities / quarters overlap, some bids may be considered in more than one test. In all cases, all values will be discounted by the social time preference rate that is published in accordance with “The Green Book: Central Government Guidance on Appraisal and Evaluation” as amended from time to time. The discount will apply from the allocation of capacity (allocation date) at the end of phase 2 PARCA through to the date the capacity is effective from (registration date). The discount will apply to both the value of the capacity and the premium

Year	Discount rate
0	1.000
1	0.966
2	0.934
3	0.902
4	0.871
5	0.842
6	0.814

Discount rates as per “The Green Book: Central Government Guidance on Appraisal and Evaluation [The Green Book](#)



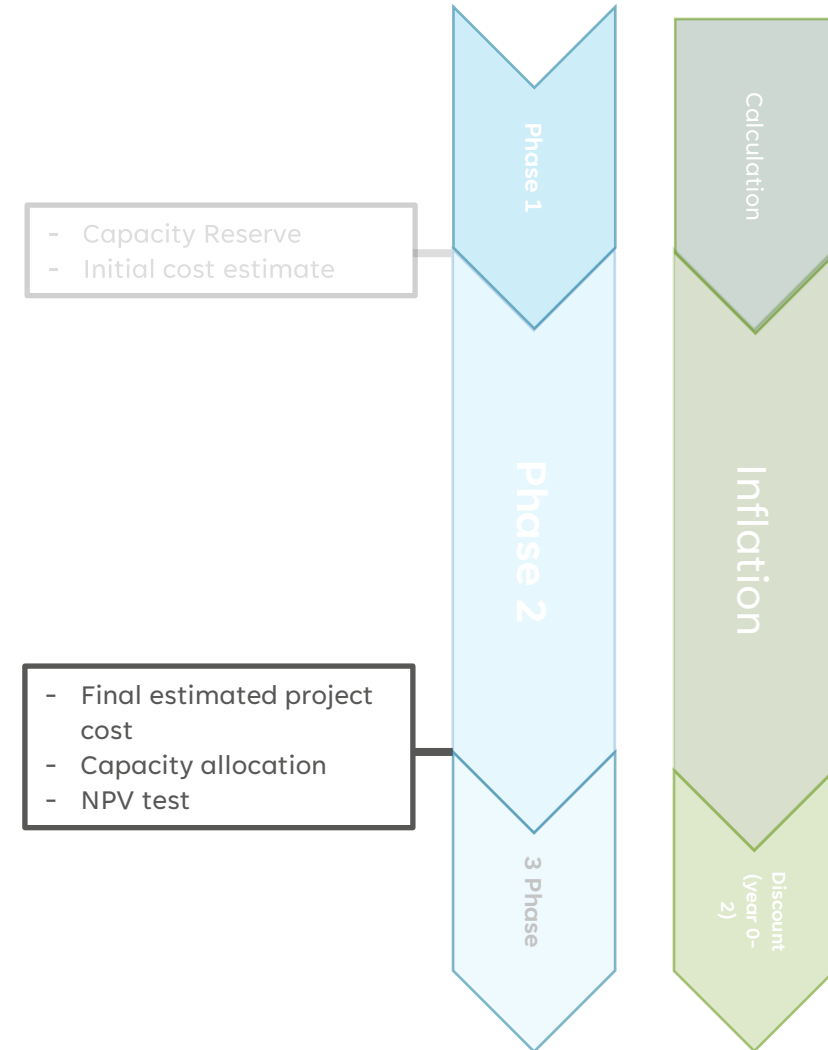
Capacity Premium

Key paragraphs from Entry Capacity release methodology statement v8.2 - CHAPTER 6: Net Present Value (NPV) Test:

141. National Gas Transmission will, for the quarter in question plus the subsequent thirty one quarters (or less where this would be beyond the period for which capacity has been offered) determine the net present value (NPV) of the revenue from the sum of: (a) the requested amount of Incremental Obligated Entry Capacity multiplied by the combined Reserve Price plus premium price (if any); (b) the requested amount of Unsold NTS Entry Capacity multiplied by the premium price (if any).

The unsold baseline revenue is not included in the NPV. It is only the premium price applied to the Unsold capacity that is included. For avoidance of doubt, no step pricing is included in the revenue or used for any PARCA calculations.

148. Where, for the given incremental signal, not enough incremental user revenue is generated at the Reserve price, then a premium can be added. The premium will be the lowest price (to 4 decimal places) that can be added to the Reserve Price to allow 50% of the estimated project cost to be recovered.

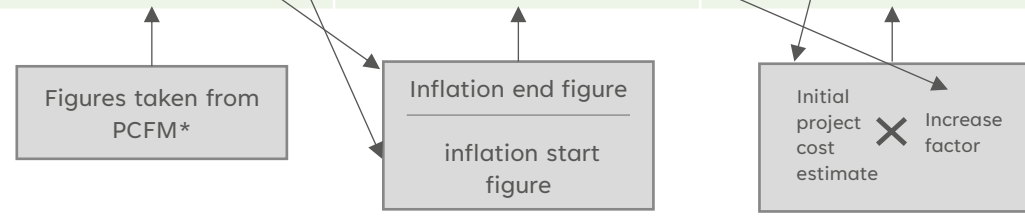


Worked example

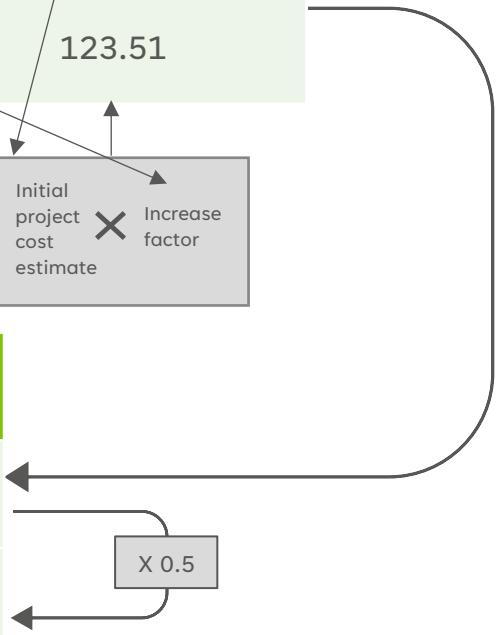
The following pages provide a worded example of the calculations described for illustration purposes.

Worked example – Initial cost and inflation

Inflation				
Milestone	Date	Combined RPI-CPIH price index (financial year average)*	Increase Factor	Cost (£m)
Inflation start (end of Phase 1 / start of phase 2)	01/01/2020	290.600		100.00
Inflation end (NPV test, end of phase 2 / start of phase 3)	01/01/2024	358.920	1.235100487	123.51



	£m	£
Final Estimated Project Cost	123.51	123,510,049
NPV Test requirement (=50%)	61.76	61,755,024



*Ofgem PCFM RIIO-T2 Guidance inflation 2021 (<https://www.ofgem.gov.uk/publications/gt2-price-control-financial-model>)

Worked example - NPV calculation

Indicative capacity prices (p/kWh/d)

Indicative Capacity Price Y+2	0.09
Indicative Capacity Price Y+3	0.11
Indicative Capacity Price Y+4 onwards	0.10

Figures taken from latest gas transportation charges document

Calendar Qtr	Days in relevant quarter	kWh
Q1 Y+2	90	150000000
Q1 Y+3	91	150000000
Q1 Y+4	90	150000000
Q1 Y+5 (below baseline)	90	30000000
Q1 Y+5 (above baseline)	90	150000000

Quarters considered are provided by the requesting party, there must be a minimum of 4 quarters over 4 separate years

The amount of daily incremental capacity increase requested
Note - that if there is unsold baseline this must also be added separately

Note: the first quarter must be at least 24 months from the time of the NPV test

Revenue is calculated as:

$$\text{Days in the quarter} \times \text{Amount requested (kWh)} \times \text{Indicative capacity price for relevant year} \div 100$$

(to convert from p to £)

Note – Whilst below baseline capacity will be allocated and has an associated cost, this revenue is not considered as part of the NPV test

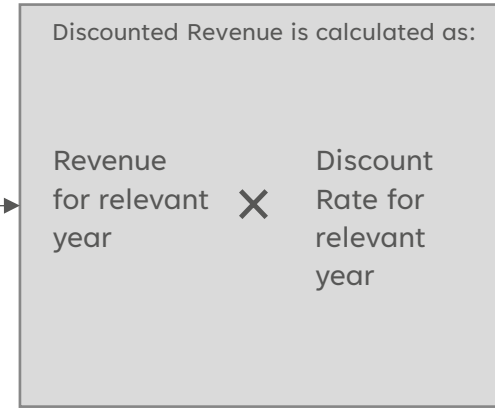
Revenue (£)
12,150,000
15,015,000
13,500,000
13,500,000

Worked example - NPV Discounting

Discount rates	
Discount Rate - year 0	1.000
Discount Rate - year + 1	0.966
Discount Rate - year + 2	0.934
Discount Rate - year + 3	0.902
Discount Rate - year + 4	0.871
Discount Rate - year + 5	0.842
Discount Rate - year + 6	0.814

Discount Figures taken from "The Green Book: Central Government Guidance on Appraisal and Evaluation"

Calendar Qtr	Days in relevant quarter	kWh	Revenue (£)
Q1 Y+2	90	150000000	12,150,000
Q1 Y+3	91	150000000	15,015,000
Q1 Y+4	90	150000000	13,500,000
Q1 Y+5 (below baseline)	90	30000000	
Q1 Y+5 (above baseline)	90	150000000	13,500,000



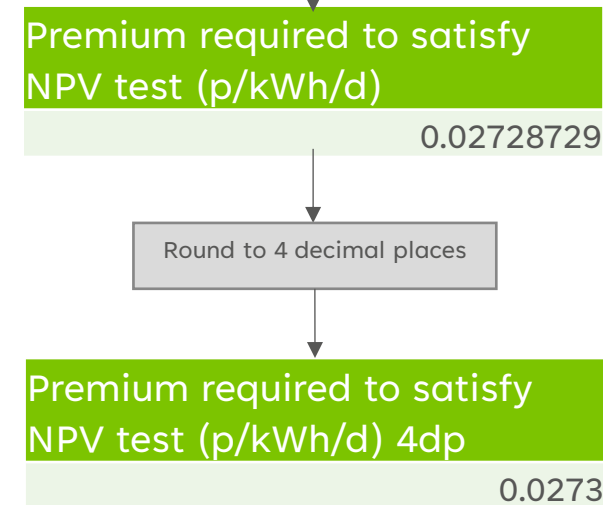
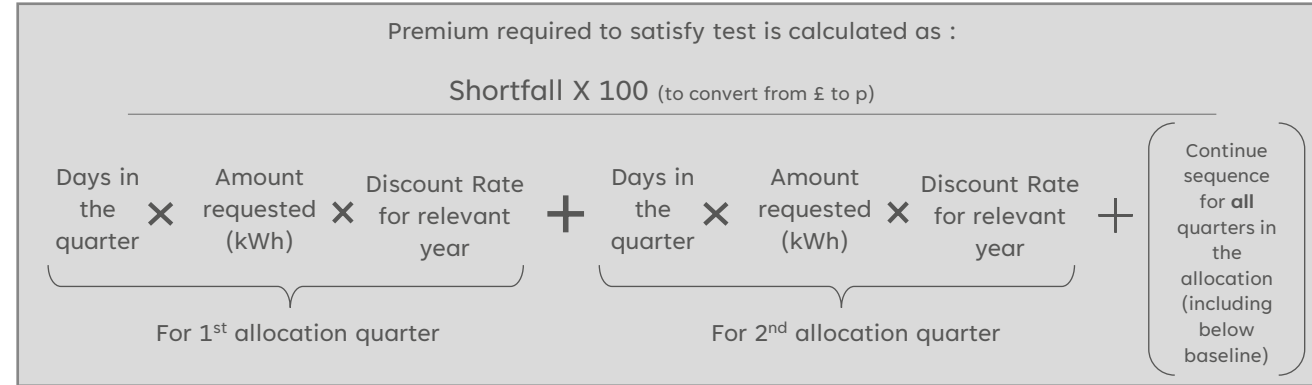
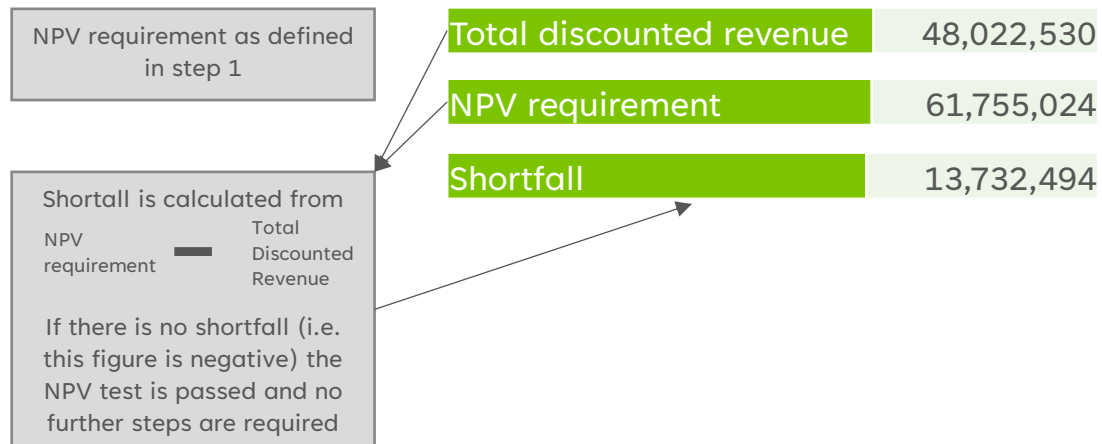
Discounted revenue (£)
11,348,100
13,543,530
11,763,900
11,367,000

Total is the summation of each quarter in the allocation

Total	48,022,530
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Worked example - Calculate Premium price per unit

Calendar Qtr	Days in relevant quarter	kWh	Revenue (£)	Discounted revenue (£)
Q1 Y+2	90	150000000	12,150,000	11,348,100
Q1 Y+3	91	150000000	15,015,000	13,543,530
Q1 Y+4	90	150000000	13,500,000	11,763,900
Q1 Y+5 (below baseline)	90	30000000		
Q1 Y+5 (above baseline)	90	150000000	13,500,000	11,367,000



Worked example - Calculate Premium Value

Calendar Qtr	Days in relevant quarter	kWh	Revenue (£)	Discounted revenue (£)
Q1 Y+2	90	150000000	12,150,000	11,348,100
Q1 Y+3	91	150000000	15,015,000	13,543,530
Q1 Y+4	90	150000000	13,500,000	11,763,900
Q1 Y+5 (below baseline)	90	30000000		
Q1 Y+5 (above baseline)	90	150000000	13,500,000	11,367,000

Premium required to satisfy NPV test (p/kWh/d) 4DP

0.0273

Premium revenue is calculated as:

$$\text{Days in the quarter} \times \text{Amount requested (kWh)} \times \text{Premium required to satisfy NPV test (p/kWh/d) 4dp} \div 100$$

(to convert from p to £)

Premium (£)
3,685,500
3,726,450
3,685,500
737,100
3,685,500

Discount rates	
Discount Rate - year 0	1.000
Discount Rate - year + 1	0.966
Discount Rate - year + 2	0.934
Discount Rate - year + 3	0.902
Discount Rate - year + 4	0.871
Discount Rate - year + 5	0.842
Discount Rate - year + 6	0.814

Discount rate figures taken from "The Green Book: Central Government Guidance on Appraisal and Evaluation" (same figures as used for calculating discount rates for revenue)

Discounted Premium Revenue is calculated as:

$$\text{Premium Revenue for relevant year} \times \text{Discount Rate for relevant year}$$

Discounted Premium (£)
3,442,257
3,361,258
3,211,545
620,638
3,103,191

Worked example - Final checks and charges

Calendar Qtr	Days in relevant quarter	kWh	Revenue (£)	Discounted revenue (£)
Q1 Y+2	90	150000000	12,150,000	11,348,100
Q1 Y+3	91	150000000	15,015,000	13,543,530
Q1 Y+4	90	150000000	13,500,000	11,763,900
Q1 Y+5 (below baseline)	90	300000000		
Q1 Y+5 (above baseline)	90	150000000	13,500,000	11,367,000

Premium (£)	Discounted Premium (£)
3,685,500	3,442,257
3,726,450	3,361,258
3,685,500	3,211,545
737,100	620,638
3,685,500	3,103,191

Total discounted revenue	48,022,530
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Total discounted premium revenue	13,738,889
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NPV requirement	61,755,024
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Total charge (discounted revenue + discounted premium)	61,761,419
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The NPV requirement and the total charge should be approximately the same (they are not exactly the same due to the 4 decimal place rounding of the premium price)

Additional charges:

Whilst not included for the purposes of the NPV test the below baseline bookings will ultimately be charged, they are calculated as:

$$\text{Days in the quarter} \times \text{Amount requested (kWh)} \times \frac{\text{Indicative capacity price for relevant year}}{100} \text{ (to convert from p to £)}$$

In this example:

$$90 \times 300000000 \times 0.1 / 100 = \text{£}2,700,000$$

Further information

If you require any further information on this subject please find below relevant links:

Capacity Methodology Statements: [Capacity methodology statements | National Gas](#)

Capacity webpage: [Capacity | National Gas](#)

Reserving Capacity webpage: [Reserving capacity | National Gas](#)

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Thank you

