Department for
Business, Energy
& Industrial Strategy

Combined Heat and Power – Finance

A detailed guide for CHP developers – Part 5

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1 Introduction

There are several approaches to costing and financing a CHP development. However the benefits of investing in CHP can only be realised by the appropriate operation of the plant. Combining this understanding of operations and capital investment makes financing CHP unique and has led to CHP financing solutions only seen in the CHP sector.

The CHP Finance guide reviews methods for establishing the capital, fuel and maintenance costs. The impact of financing CHP on a company's balance sheet is reviewed. This guide also looks at the common methods of financing the investment of CHP and shows how to compare the projected performance of CHP against conventional methods of heat and electrical generation.

The economic benefit of installing a CHP unit on any particular site arises out of the relationship between annual operating cost savings and capital outlay. The annual cost savings must be sufficient to meet the requirements for return on the capital invested by the owners of the plant.

A number of financial appraisal techniques are available and this guide looks at the following in the context of both custom and packaged CHP:

- Financial Appraisal
- Financing Options

2 Custom CHP Finance

2.1 Appraisal

A large-scale CHP project cannot be evaluated financially as an isolated project because its capital cost is likely to be sufficiently large to affect the company's overall financial profile. The effects of the project on the company's finances, and its impact on the profit/loss account and balance sheet, should therefore be considered in some detail. CHP projects will also be competing with other projects for (usually) limited capital resources.

Financial appraisal is a rational method of comparing the costs and benefits of a proposed project so as to choose the best investment for the future of the company. Furthermore, where capital funding is limited, it is a means of ranking competing calls on that funding. The aims of financial appraisal can be summarised as follows:

- To determine which investments make best use of the company's money.
- To guide the optimisation of benefits from each investment opportunity.
- To guide the company's risk management strategies.
- To provide a basis for the subsequent analysis of investment performance.

2.1.1 CHP Choice & Costs

The capital cost of any CHP plant depends on its size and type. However, there are a number of issues that should be taken into account in relation to costs:

- A CHP plant is more efficient than a simple power plant when the heat output is used effectively. Where CHP power generation produces heat that subsequently remains unused, the plant is effectively operating in the open cycle mode and therefore, probably, at a lower efficiency than the competing external power station.
- The plant will operate at its greatest energy efficiency, thereby maximising savings, when it is maintained as close as possible to its maximum load – as long as all the output is used.
- Economies of scale do exist. As the size of a CHP plant increases, capital and installation costs, expressed as £/kW, both fall. Operating and maintenance costs are also significant factors, especially for reciprocating engine-based systems.
- Although a plant sized to meet maximum electrical demand will produce the greatest savings in purchased electricity, it may end up operating at part load – and thus less efficiently and economically – for a greater part of the time.
- Although electricity can be exported to the national grid during periods of surplus, these surpluses are most likely to arise at night when selling prices are at their lowest.

The first step in most financial appraisals is to assemble information on the capital costs and the annual cost benefits of the project and then to calculate the cash flow.

2.1.2 Capital Costs

Calculating the capital cost is unlikely to be as straightforward for a CHP plant as for lesser capital expenditure projects such as replacing an item of machinery. A replacement machine is likely to be bought through the capital budgeting process: the project engineer will have little interest in the financing method and may regard it as a problem solely for the finance department. A CHP plant, on the other hand, will need special consideration because the scale of its cost and the long-term nature of the commitment required may mean that its inclusion in the normal capital budget is inappropriate. A CHP project is not directly process related, so confidence in the capital cost estimate is more difficult to achieve than with more familiar, core-business investments.

2.1.3 Benefits

The first step in determining the annual cost benefits of a project is to evaluate its profit/loss and cash flow benefits. These are rarely the same.

For CHP, the annual cash benefits consist of the difference between the annual costs of the two options:

- Possessing a CHP plant.
- Not possessing a CHP plant.

It is important to use common assumptions regarding, for example, potential fuel price increases, when evaluating the costs of each option.

2.1.4 Overall Cost Savings

The first step is to determine the site’s base-load energy demands and non-CHP energy costs over several time bands. This also indicates the heat to power ratio of the site during each time band. The second step is to calculate the costs of meeting the same energy demands using the CHP plant selected. The energy cost savings associated with the CHP plant can then be determined.

The third component incorporates a cost estimate for maintaining the CHP plant. This is deducted from the energy cost savings to give the net annual cost saving potentially achievable by the plant. This potential saving is then assessed against the installed cost of the plant.

2.1.5 Installed Cost

The installed cost of the CHP plant also needs to be estimated as part of the initial feasibility study. In the case of smaller and simpler CHP plants, it is relatively easy to obtain a ‘budget’ estimate from the supplier of the selected prime mover/electrical generator. Most suppliers

offer ‘total CHP packages’ as part of their business. The graph opposite shows the typical variation in cost with installed capacity.

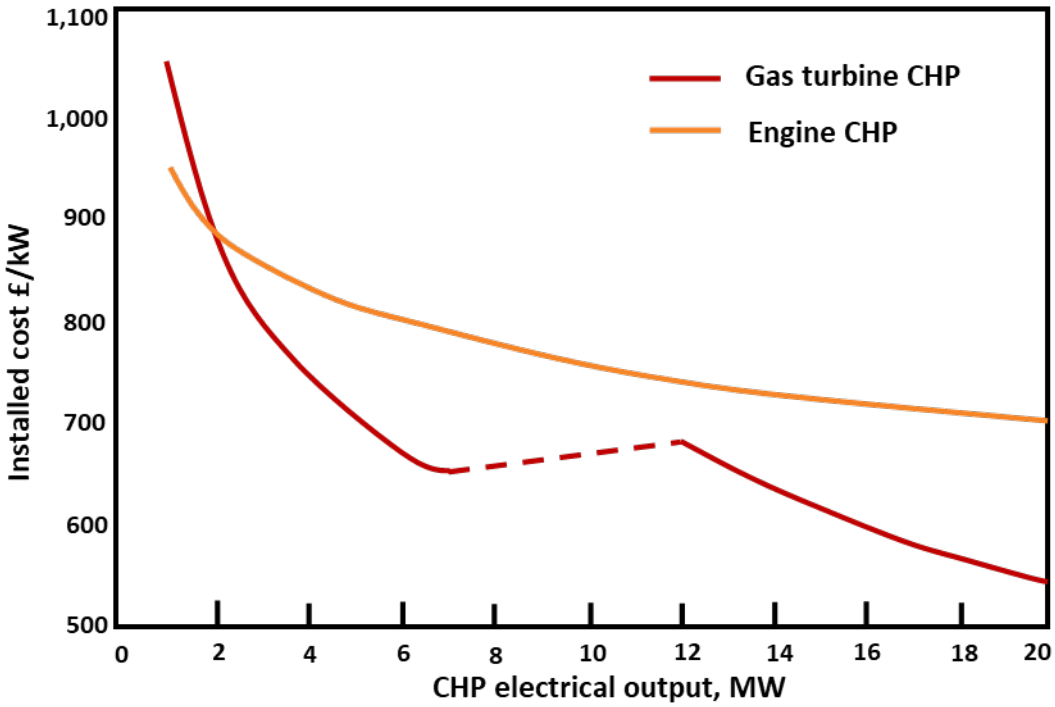

Figure 1: Installed cost of CHP with increasing electrical capacity

2.1.6 Maintenance Costs

A company considering the installation of a CHP plant must take account of the costs of maintaining the prime mover/electrical generator and associated equipment. The following table provides indicative maintenance costs expressed in p/kWh of electricity generated for two scenarios: 4,500 operating hours/year and 8,000 operating hours/year.

Table 1: Maintenance costs for different power generation devices

Technology/ cost (£/kWh)	4500 Operating hours/ year	8000 Operating hours/ year
Gas turbines	0.4	0.35
Gas engines	0.7	3.6
Dual-fuel compression ignition engines	0.8	0.7
Steam turbines	Less than 0.05	Less than 0.05

Costs will vary where operating hours are significantly different from those in the table. The figures given include all maintenance of the prime mover/electrical generator (including major refurbishment/replacement at the end of its useful life), maintenance of auxiliary equipment (gas compressor, generator etc.), consumables, and insurance. Excluded is the (relatively small) cost of maintaining the heat recovery boiler. This is likely to be balanced by reduced maintenance costs on any boilers that have been fully or partially replaced by the heat recovery boiler. An exception arises in the case of steam turbine or combined cycle CHP, when a high-pressure heat recovery boiler is installed where no high-pressure boilers previously existed.

2.2 Custom CHP Financing Options

Financing options can be divided into two key groups, i.e. those that appear on a company's balance sheet and those that do not. The table below shows both groups.

Table 2: Possible financing methods for CHP projects

Capital purchase or 'on-balance-sheet' financing	Operating lease or 'off-balance-sheet financing
Financed by: • Internal funding • Debt finance • Leasing • Capital purchase or 'on-balance-sheet' financing	Financed by: • Equipment supplier • Energy services company • Other sources of funding • Operating lease or 'off-balance-sheet financing

2.2.1 Choosing between On/Off Balance-sheet Financing

Choosing an appropriate method of financing will depend on the state of the company's profit/loss account and balance sheet, and also on the degree of risk and benefit associated with the project.

If a company opts for a capital purchase, i.e. an on-balance-sheet approach to funding, it may obtain the maximum benefits but it will also carry all the risk. A capital purchase may produce the highest NPV, but the initial cash flow will be negative.

As already discussed, many companies will not, or cannot, provide the funds for the capital purchase of a CHP plant. There are several reasons for this:

- The return on investment for such a project may be lower than – and would, therefore, have an adverse impact on – the company's return on capital employed.

- Even if the return on investment is satisfactory, there may be other, more attractive claims on the company's cash resources.
- A capital purchase may increase the company's gearing or reduce liquidity to unacceptable levels.

Such a company may, therefore, prefer an off-balance-sheet financing option. Where a scheme is financed under an operating lease arrangement, the overall NPV will be lower than for the capital purchase option but the cash flow will always be positive – unless the project is only marginally viable or the lender's charges for money borrowed are high.

Much ingenuity has been expended by ESCOs in devising schemes that combine the off-balance sheet advantages of operating leases with retention of the benefits of capital purchase. However, in recent years, accounting standards have become increasingly strict, and any such scheme is now subject to the provisions of Financial Reporting Standard FRS 5 – Reporting the Substance of Transactions.

It is possible to involve an ESCO contractor with a project, regardless of the financing method chosen. Such a company may well have a valuable role to play in managing and lessening the risks to the end-user.

When choosing a financing option, remember that:

- All potential financing options should be evaluated with equal care.
- The commitment from the end-user will be the same, i.e. high, whichever route is chosen.
- The choice of funding route should generally be secondary to the decision to proceed with the project.

Whichever method of financing is chosen, the decision to invest in large-scale CHP involves a long-term commitment.

Joint Ventures

A number of large-scale CHP schemes have recently been funded as joint ventures between the end-user and an ESCO contractor. Joint ventures are a highly specific form of legal entity and are normally only warranted for large, complex schemes which can justify the high set-up costs. In such cases, the joint venture serves to 'ring fence' the operation and limit the financial liabilities of the partners.

2.2.2 On balance sheet

The capital purchase of a CHP plant will appear on the company's balance sheet as a fixed asset. A capital purchase is generally funded using internal sources, external (debt) finance or a mixture of both. Another option is to lease a CHP rather than purchase it.

Internal Funding

With internal funding, the company provides the capital for the CHP installation. In so doing, it retains full ownership of the project and should reap the maximum potential benefits. At the same time, the company bears a considerable element of technical and financial risk, although the degree of this risk can vary with the installation option chosen. For instance, where a company places the work with a turnkey contractor, the contract terms may reduce the risk the company has to bear by placing more of it on the contractor. Similarly, the terms of contracts with consultants, equipment suppliers and subcontractors can be designed to minimise the investment risk.

Debt Finance

A large capital purchase is often funded by a new debt plus some internal funding. As with full internal financing, the residual technical and financial risks remain with the investing company, apart from those that lie with suppliers and contractors. At the same time, the company retains the full benefits of the installation.

With new debt, it is possible to match an appropriate source of capital to a specific project. In particular, the borrowing timescale can be matched to the timescale of requirements, i.e. short-term finance should be obtained for short-term cash needs and long-term finance for long-term needs such as a CHP plant.

For example, if a company investing in a CHP plant intends to generate a flow of savings/income over a period of 15 years, that company should attempt to finance the plant over the same period. If this is not possible, then the borrowing timescale should, at least, be as long as the payback period for the project plus the period required for recovering the ‘cost of money’. In this way, the repayment schedule can be financed out of the savings/income generated by the CHP system.

The Prospective Lender's Viewpoint

When a company obtains finance, it should bear in mind that the lender regards the loan as an investment.

For every investment, there is a trade-off between risk and return: the higher the risk associated with an investment, the higher the return required on that investment.

Factors influencing the perceived risk and return include:

- The company's current level of borrowings.
- The credibility of the company's projections of project benefits.
- The confidence of the lender in the company.
- The confidence of the lender in the technology to be employed

- The level of security that can be offered by the company - the lender normally requires security so that the amount of the loan can be recovered if the company fails.
- The confidence of the lender in the general economic situation.

Leasing

Leasing is a financial arrangement that allows a company to use an asset over a fixed period. There are three main types of arrangement:

- Hire purchase.
- Finance lease (also known as ‘lease’ or ‘full pay-out lease’).
- Operating lease (also known as ‘off-balance-sheet’ lease).

Under a hire purchase agreement, the purchasing company becomes the legal owner of the equipment once all the agreed payments have been made. For tax purposes, the company is the owner of the equipment from the start of the agreement. The basis of the finance lease arrangement is the payment by the company of regular rentals to the leasing organisation over the primary period of the lease. This allows the leasing organisation to recover the full cost – plus charges – of the equipment. Although the company does not own the equipment, it appears on the balance sheet as a capital item and the company is responsible for maintenance and insurance.

At the end of the primary lease period, either a secondary lease – with much reduced payments – is taken out, or the equipment is sold second-hand to a third party, with the leasing organisation retaining most of the proceeds of the sale.

Internal financing is not necessarily an easy option. Although CHP is a long-term investment, it will often have to compete with other potential business projects that are closer to the company’s core area activities. Furthermore, it may have to compete within a short-term appraisal environment. So obtaining approval for CHP as a self-financed project may prove to be a problem.

Although a company normally pools all of its existing sources of finance so that it is not possible to state which one has been used to fund which new project, each form of capital nevertheless has a cost associated with it. It is therefore usual to calculate a composite rate that represents the average cost of capital weighted according to the various sources of finance. This rate is known as the weighted average cost of capital (WACC).

With finance leasing, the leasing organisation obtains the tax benefits, and these are passed back, in part, to the company in the form of reduced rentals. In principle, the rental can be paid out of the energy savings, thereby assisting cash flow. Finance leasing may have tax advantages over internal and debt financing if the company has insufficient taxable profits to benefit from the tax allowances available on capital expenditure.

With this route, the level of financial and technical risk taken on by the company is similar to that of a self-financed project.

2.2.3 Off-balance-sheet

Two types of organisation can arrange or supply off-balance-sheet financing for CHP plant:

Equipment Supply Organisations

An equipment supplier may, as an alternative to outright purchase, offer a leasing package to the company. The equipment supplier will normally design, install, maintain and, sometimes, operate the CHP system. A common commercial arrangement is for the energy to be supplied at prices that incorporate agreed discounts on the open market price.

The company pays for the fuel and agrees to buy the electricity and/or heat generated at the agreed price. To assure the equipment supplier of a continued income from the sale of utilities to the company throughout the 5-10 year contract period, the company may be required to make a commitment in the form of a substantial standing charge, a lease payment or a high ‘take or pay’ volume of the energy supplied.

This arrangement transfers most of the technical risk from the company to the equipment supplier. However, the company’s savings are also significantly lower than under a capital purchase arrangement. The company also retains the risks relating to fuel price fluctuations.

This form of financing arrangement has commonly been used to finance small, ‘packaged’ engine-based CHP systems.

Energy Services Company (ESCO) Contractors

An ESCO arrangement can vary widely. In some instances, the ESCO contractor will design, install, finance, operate and maintain a CHP plant on the company’s site. In other cases, the company subcontracts only the operation and maintenance of CHP plant that has been installed by other contractors under a design and manage or turnkey arrangement. In both cases, the ESCO contractor supplies heat and power to the company at agreed rates. The ESCO contractor may also take responsibility for fuel purchase and for other on-site energy plant.

From a financing point of view, the basis of an agreement of this type is the transfer of CHP plant capital and operating costs, together with all the technical and operating risks of CHP, from the end-user to the ESCO contractor.

The company’s savings when funding a CHP plant through an ESCO arrangement would normally be less than under a capital purchase arrangement because the ESCO contractor needs to recover the cost of the capital investment and cover operating costs, overheads and profit. However, under certain circumstances, the savings can be greater than with a capital purchase arrangement. For example, the ESCO contractor may be able to size a CHP plant to meet the heat requirement of the company and produce surplus electricity that can be exported and sold. The company will still receive only part of the value of the energy savings but,

because the energy savings are greater, the company's share may have a value greater than the savings that would have been achieved under a smaller capital purchase scheme. The ESCO contractor will also be able to increase the benefits compared with an in-house solution by avoiding the learning curve costs.

Different ESCO contractors may produce widely differing proposals, depending on the company's requirements and the ESCO contractor's objectives. Among the many variables to be resolved will be:

- Who will operate the plant on a day-to-day basis and, therefore, bear the performance risk?
- Who will maintain the plant?
- Who will own the plant at the end of the initial agreement period of 10-15 years and at what ongoing cost?

Any transaction with an ESCO contractor still involves a long-term commitment by the company. The company's audited accounts should contain a summary of this commitment. Evidence will also be needed to satisfy the company's auditors that the arrangement is an operating lease and not a finance lease. If ownership transfer to the company is implied or stated in the contract, the arrangement must appear on the company's balance sheet. It should also be noted that an ESCO contract and finance are not intrinsically linked. It is possible to enjoy the core benefits of an ESCO arrangement – cost reduction and operational risk transfer – irrespective of the finance route chosen.

3 Packaged CHP Finance

3.1 Appraisal

A packaged CHP project cannot always be evaluated financially as an isolated project, because its capital cost may be sufficiently large to affect the organisation's overall financial profile. In such cases, the effects of the project on the organisation's finances and its impact on the profit and loss account and on the balance sheet should be considered in some detail. A CHP project might also be competing with other projects for (usually limited) capital resources.

Financial appraisal is a rational method of comparing the costs and benefits of a proposed project so as to choose the best investment for the future of the organisation. Furthermore, where capital funding is limited, it is a means of ranking competing calls on that funding. The aims of financial appraisal can be summarised as follows:

- To determine which investments make best use of the organisation's money.
- To guide the optimisation of benefits from each investment opportunity.
- To guide the organisation's risk management strategies.
- To provide a basis for the subsequent analysis of investment performance.

Further information on those elements of financial appraisal that need particular attention in relation to a packaged CHP project can be found in:

- CHP Costs.
- Capital expenditure, operating expenditure and fiscal benefits.
- Appraisal methods.

3.1.1 Costs

The capital cost elements of a CHP installation will include some or all of the following:

- Packaged CHP – engine, alternator and controls.
- Site clearance, enabling works.
- Foundation preparation.
- Chimney/flue.
- Provision of gas supply.
- Electrical interconnection.
- Interconnection to site heat systems, including control.
- Engineering, Health and Safety and management costs.

- Applications and consents.

Most small-scale CHP projects are offered as turnkey projects with a single price for equipment supply, installation and commissioning.

Irrespective of whether the project is funded in-house, by an energy supply contract or through an energy services company (ESCO) scheme, the cost elements must be met by someone.

Under an ESCO/energy supply contract scheme, the capital cost elements borne by the supplier will be passed on to the site user in the form of:

- Annual fixed charges.
- Tariff rates for the electricity and/or heat supplied.
- In an ESCO scheme, the user normally pays by the unit for the gas consumed.

For an initial scheme appraisal, capital cost estimates may be obtained from equipment suppliers, although it is important to check carefully to establish what assumptions have been made and what has been included and/or omitted. While it may be possible, through the supplier, to make a capital cost estimate for packaged CHP on the basis of engine rating, n reality, the overall project cost needs to consider fully all those factors likely to increase the total cost, including:

- Upgrading gas supplies.
- Long and tortuous flue runs.
- Difficult access to plant room.
- Complete connection to the electrical distribution system.
- The inclusion of an absorption chiller.

Detailed site design and survey work is expensive. Whilst it is reasonable for a supplier to base an initial estimate on basic assumptions about installation costs, this is only to check basic project viability. It is important to make sure that, when making a detailed assessment and comparing vendors, a full site survey and design has been done.

The capital cost of any CHP plant depends on its size and type. However, there are a number of issues that should be taken into account in relation to costs:

- Small-scale CHP plants seldom produce electricity more cheaply than purchasing it from the mains supply. However, the additional benefit of using the ‘free’ heat makes it economically worthwhile. The introduction of the CCL and exemption for Good Quality CHP improved the economic case for CHP.

- A CHP plant is more cost-effective than other forms of energy supply when the heat output is used effectively. However, where CHP power generation produces heat that subsequently remains unused, the financial benefit falls.

The plant will operate at its greatest energy efficiency, thereby maximising savings, when it is maintained as close as possible to its maximum load – as long as all the output is used.

Economies of scale do exist. As the size of a CHP plant increases, capital and installation costs, expressed as £/kW, both fall. Maintenance costs per unit of electricity generated also decrease with increasing unit size.

Although a plant sized to meet maximum electrical demand will produce the greatest savings in purchased electricity, it may end up operating at part load for a greater part of the time. Although reciprocating engine units operate efficiently at part load, other types of unit operate less efficiently and less economically under these conditions.

Although electricity can be exported to the national grid during periods of surplus, these surpluses are most likely to arise at night when selling prices are at their lowest. In small-scale CHP, the economic case for exporting is seldom justified.

Analysis should be carried to establish the base case costs and then the costs of the CHP cost model.

CHP Model

The next step is to model the operating costs for the chosen CHP option. Modelling factors will include:

- Heat and power demand – as in the base case.
- Energy tariffs.
- Plant rating for heat and power at 100% output.
- Hours of CHP operation.
- CHP electrical efficiency.
- CHP plant availability.
- CHP operation and maintenance charges.

Ideally the calculation would consider each hour of the year and ask the following questions:

- Is there a minimum heat and power demand that will justify the installation of a CHP unit?
- How much heat and power can the CHP unit supply?
- What are the costs of fuel and maintenance to operate the CHP unit?

- How much power must be imported and at what cost?
- How much additional heat is required and at what cost?

In practice, the calculation is simplified by using a single calculation for periods with similar heat or power loads. For example, where there are steady loads overnight, it is acceptable to make the calculation for one hour and then multiply the result by the total number of night hours.

The fully aggregated CHP operating costs may be compared with the base case costs to determine the operating cost savings that can be achieved by installing and operating a CHP system.

Base Case

Base case operating costs (i.e. operating costs without CHP) should be drawn up for comparison with predicted operating costs after CHP plant installation.

Base case costs will be derived from:

- Heat and power demand data.
- Energy tariffs (existing or projected) for gas, oil and electricity.
- Costs of plant maintenance and other consumables, e.g. water treatment for boilers.

The base case calculation is best performed using a spreadsheet. As a reality check, make sure that the costs calculated from the base case model for your situation are comparable with actual recorded energy costs.

3.1.2 Capex, Opex & Benefits

The first step in most financial appraisals is to assemble information on the capital cost and the annual cost benefits of the project and then to calculate the cash flow.

Capital Cost of CHP

Calculating the capital cost may not be as straightforward for a CHP plant as for lesser capital expenditure projects such as replacing an item of machinery. The scale of the cost and the long-term nature of the commitment required may make it inappropriate to include a CHP plant in the normal capital budget. Furthermore, because a CHP project is not directly process or business related, it is more difficult for organisations to be confident in the capital cost estimate than when they are dealing with more familiar, core-business investments.

However, CHP plant and machinery benefit from Enhanced Capital Allowances (ECAs) that gives 100% allowance in the year that the CHP plant is acquired. Even though the programme is tax neutral overall, there is a valuable cash flow benefit for the purchaser of CHP plant over and above the other savings that can be made. Further details are available on the CHPQA website.

Annual Benefits

The first step in determining the annual cost benefits of a project is to evaluate its profit/loss and cash flow benefits. These are rarely the same.

For CHP, the annual cash benefits consist of the difference between the annual costs of not possessing a CHP unit and those incurred either by installing a CHP unit as a capital purchase or by arranging the installation of a CHP unit as part of an energy supply contract or under an equipment supplier finance arrangement.

- Where the unit comprises a capital purchase, the site owner provides the investment and makes the greatest savings, but must allow for the cost of finance.
- In the case of an energy supply contract or equipment supplier finance arrangement, the unit's supplier provides the investment and owns the asset. The site owner pays for energy supplied, and the price paid will incorporate a component to pay for the capital investment. The savings/benefits that accrue to the site owner are less than with capital purchase but the site owner's investment capital requirement is minimised, eliminated or, where existing plant needs replacing, can be reduced.

It is important to use common assumptions regarding, for example, potential fuel price increases, when evaluating the costs of each option considered. As well as comparing capital purchase/energy supply/equipment supplier finance options for a given plant output, it is also beneficial to consider different outputs to see which CHP unit size is the best economic proposition.

3.1.3 Appraisal Techniques & Balance Sheet Effects

A project's financial viability is determined using some common appraisal techniques, and similarly some of the effects investments have on the balance sheet are highlighted in the balance sheet effects.

Appraisal techniques

It is worth remembering that no method of financial appraisal is perfect. A simple method with which the organisation is familiar may be more useful than a more sophisticated but unfamiliar one. The following sections outline the main criteria used in financial appraisal and highlight their advantages/disadvantages.

Balance sheet effects

All commercial sector organisations have to consider the 'shape' of their balance sheet. In the case of public companies, city analysts will assess the company's performance and issue reports to existing shareholders and prospective investors. Naturally, the company will wish these reports to be as favourable as possible. In addition, lending institutions that have lent the company money will monitor its financial performance.

The main performance benchmarks are ratio analyses. However, the value of a single ratio is extremely limited, and it is usually more important to determine trends and relationships than to rely on absolute values.

Common ratios with the greatest influence on the choice of a financing method for packaged CHP are liquidity, gearing and return on capital employed (ROCE). However, their relevance will vary with the type and nature of the organisation concerned – in the case of public sector bodies, for instance, they are likely to be of limited interest.

3.2 Packaged CHP Financing Options

Financing options can be divided into two key groups, i.e. capital purchase options that appear on an organisation's balance sheet and operating lease options that do not. These options are summarised in the table below.

Table 3: Finance options for CHP

Capital purchase or 'on-balance-sheet' financing	Operating lease or 'off-balance-sheet' financing
Financed by:	Financed by:
Internal funding	Equipment supplier
Debt finance	Energy services company
Leasing	Other sources of funding

In the case of packaged CHP installations, the main financing options are:

- Energy supply contract.
- Capital purchase.
- As part of a site's energy services company contract.
- Balance sheet Financing.
- Enhanced Capital Allowances.

3.2.1 Energy Supply Contract

One approach to financing a packaged CHP unit is for an equipment supplier to offer an energy supply package to the organisation wishing to install the plant. This is an 'off-balance-sheet' arrangement. The equipment supplier will normally design, install, maintain and operate the CHP system.

The organisation pays for the fuel and agrees to buy the electricity and/or heat generated at the agreed price. To assure the equipment supplier of a continued income from the sale of utilities to the organisation throughout the 5-15 year contract period, the organisation may be required to make a commitment in the form of a substantial standing charge, a lease payment or a high ‘take or pay’ volume of the energy supplied.

This arrangement transfers most of the technical risk from the organisation to the equipment supplier. However, the organisation’s savings are significantly lower than under a capital purchase arrangement. The organisation also retains the risks relating to fuel price fluctuations and changes in site energy requirements.

3.2.2 Capital Purchase

The capital purchase of a packaged CHP plant will appear on the organisation’s balance sheet as a fixed asset. A capital purchase is generally funded using internal sources, external (debt) finance or a mixture of both. Another option is to lease a CHP rather than purchase it.

Internal Funding

With internal funding, the organisation provides the capital for the CHP package. In so doing, it retains full ownership of the project and should reap the maximum potential benefits. At the same time, the organisation bears a considerable element of technical and financial risk, although the degree of this risk can vary with the installation option chosen. For instance, where an organisation places the work with a turnkey contractor, the contract terms may reduce the risk the company has to bear by placing more risk management with the contractor. Similarly, the terms of contracts with consultants, equipment suppliers and subcontractors can be designed to minimise the investment risk.

Internal financing is not necessarily an easy option. Although CHP is a long-term investment, it will often have to compete with other potential business projects that are closer to the organisation’s core area activities. Furthermore, it may have to compete within a short-term appraisal environment. So obtaining approval for CHP as a self-financed project may prove to be difficult.

Although an organisation normally pools all of its existing sources of finance so that it is not possible to state which one has been used to fund which new project, each form of capital, nevertheless, has a cost associated with it. It is, therefore, usual to calculate a composite rate that represents the average cost of capital weighted according to the various sources of finance. This rate is known as the weighted average cost of capital (WACC).

Debt Finance

A substantial capital purchase is often funded by a new debt plus some internal funding. As with full internal financing, the residual technical and financial risks remain with the investing organisation, apart from those that lie with suppliers and contractors. At the same time, the organisation retains the full benefits of the installation.

With new debt, it is possible to match an appropriate source of capital to a specific project. In particular, the borrowing timescale can be matched to the timescale of requirements, i.e. short-term finance should be obtained for short-term cash needs and long-term finance for long-term needs such as a CHP plant.

For example, if an organisation investing in a CHP plant intends to generate a flow of savings/income over a period of 15 years, that organisation should attempt to finance the plant over the same period. If this is not possible, then the borrowing timescale should, at least, be as long as the payback period for the project plus the period required for recovering the 'cost of money'. In this way, the repayment schedule can be financed out of the savings/income generated by the CHP system.

The Prospective Lender's Viewpoint

When an organisation obtains finance, it should bear in mind that the lender regards the loan as an investment.

For every investment, there is a trade-off between risk and return: the higher the risk associated with an investment, the higher the return required on that investment.

Factors influencing the perceived risk and return include:

- The organisation's current level of borrowings.
- The credibility of the organisation's projections of project benefits.
- The confidence of the lender in the organisation.
- The confidence of the lender in the technology to be employed.
- The level of security that can be offered by the organisation – the lender normally requires security so that the amount of the loan can be recovered if the organisation fails.
- The confidence of the lender in the general economic situation.

Leasing

Leasing is a financial arrangement that allows an organisation to use an asset over a fixed period. There are three main types of arrangement:

- Hire purchase.
- Finance lease (also known as 'lease' or 'full pay-out lease').
- Operating lease (also known as 'off-balance-sheet' lease).

Under a hire purchase agreement, the purchasing organisation becomes the legal owner of the equipment once all the agreed payments have been made. For tax purposes, the organisation is the owner of the equipment from the start of the agreement.

The basis of the finance lease arrangement is the payment by the organisation of regular rentals to the leasing company over the primary period of the lease. This allows the leasing company to recover the full cost – plus charges – of the equipment. Although the organisation does not own the equipment, it appears on the balance sheet as a capital item and the organisation is responsible for maintenance and insurance.

At the end of the primary lease period, either a secondary lease – with much reduced payments – is taken out, or the equipment is sold second-hand to a third party, with the leasing company retaining most of the proceeds of the sale.

With finance leasing, the leasing company obtains the tax benefits, and these are passed back, in part, to the organisation in the form of reduced rentals. In principle, the rental can be paid out of the energy savings, thereby assisting cash flow. Finance leasing may have tax advantages over internal funding and debt financing if the organisation has insufficient taxable profits to benefit from the tax allowances available on capital expenditure.

With this route, the level of financial and technical risk taken on by the company is similar to that of a self-financed project.

Leasing is not common in small-scale CHP.

3.2.3 Energy Services Contracts

Energy services company (ESCO) contracts can vary widely. They are more common in some sectors where the organisation effectively ‘contracts out’ its entire energy facilities. An example of this would be the provision of energy services to a hospital under a Public Private Partnership (PPP) contract.

In some instances, the ESCO contractor will design, install, finance, operate and maintain a CHP plant on the organisation’s site. In other cases, the organisation subcontracts only the operation and maintenance of CHP plant that has been installed by other contractors under a capital purchase arrangement. In both cases, the ESCO contractor supplies heat and power to the organisation at agreed rates. The ESCO contractor will also normally take responsibility for fuel purchase, for other on-site energy plant and for the purchase of conventional energy.

From a financing point of view, the basis of an agreement of this type is the transfer of CHP plant capital and operating costs, together with all the technical and operating risks of CHP, from the end user to the ESCO contractor.

The organisation’s savings when funding a CHP plant within an ESCO arrangement would normally be less than under a capital purchase arrangement because the ESCO contractor needs to recover the cost of the capital investment and cover operating costs, overheads and profit. However, under certain circumstances, the savings can be greater than with a capital purchase arrangement. For example, the ESCO contractor may be able to size a CHP plant to meet the heat requirement of the organisation and produce surplus electricity that can be exported and sold. The organisation will still receive only part of the value of the energy savings but, because the energy savings are greater, the organisation’s share may have a

value greater than the savings that would have been achieved under a smaller capital purchase scheme. The ESCO contractor will also be able to increase the benefits compared with an in-house solution by avoiding the ‘learning curve’ costs.

Different ESCO contractors may produce widely differing proposals, depending on the organisation’s requirements and the ESCO contractor’s objectives. Among the many variables to be resolved will be:

- Who will operate the plant on a day-to-day basis and, therefore, bear the performance risk?
- Who will maintain the plant?
- Who will own the plant at the end of the initial agreement period of 10-15 years and at what ongoing cost?

Any transaction with an ESCO contractor involves a long-term commitment by the organisation. The organisation’s audited accounts should contain a summary of this commitment. Evidence will also be needed to satisfy the organisation’s auditors that the arrangement is an operating lease and not a finance lease. If ownership transfer to the organisation is implied or stated in the contract, the arrangement must appear on the organisation’s balance sheet.

It should also be noted that an ESCO contract and finance are not intrinsically linked. It is possible to enjoy the core benefits of an ESCO arrangement – cost reduction and operational risk transfer – irrespective of the finance route chosen.

3.2.4 Balance Sheet Financing

Whichever method of financing is chosen, the decision to invest in packaged CHP involves a long-term commitment.

Choosing an appropriate method of financing will depend on the state of the organisation’s profit/loss account and balance sheet, and also on the degree of risk and benefit associated with the project.

If an organisation opts for a capital purchase, i.e. an on-balance-sheet approach to funding, it may obtain the maximum benefits but it will also carry all the risk. A capital purchase may produce the highest NPV, but the initial cash flow will be negative. As already discussed, many organisations will not, or cannot, provide the funds for the capital purchase of a CHP plant. There are several reasons for this:

- The return on investment for such a project may be lower than – and would, therefore, have an adverse impact on – the organisation’s return on capital employed.
- Even if the return on investment is satisfactory, there may be other, more attractive claims on the organisation’s cash resources.
- A capital purchase may increase the organisation’s gearing or reduce liquidity to unacceptable levels.

Such an organisation may, therefore, prefer an off-balance-sheet financing option. Where a scheme is financed under an energy supply contract, the overall NPV will be lower than for the capital purchase option but the cash flow will always be positive – unless the project is only marginally viable or the lender's charges for money borrowed are high.

When choosing a financing option, remember that:

- All potential financing options should be evaluated with equal care.
- The commitment from the end-user must be the same, i.e. high, whichever route is chosen.
- The choice of funding route should generally be secondary to the decision to proceed with the project.

4 Combined Heat & Power Incentives

The UK Government has introduced a number of fiscal and financial support mechanisms designed to improve the economics of developing and operating CHP plants certified, either fully or partly, as “Good Quality” by the CHPQA programme. The following sections describe existing relevant government policies and measures that exist to support and incentivise Good Quality CHP deployment.

4.1 Climate Change Levy Exemption

The Climate Change Levy was introduced by the UK Government in 2001 and is charged on most non-domestic supplies of energy used as fuel for lighting, heating and power.

CHP schemes that are fully or partially certified as Good Quality CHP under CHPQA and have obtained a Secretary of State (CHP) Exemption Certificate are exempt from the main rates of CCL on:

- The fuel they utilise (assuming they meet a power efficiency threshold of 20% otherwise this exemption is scaled back).
- The direct and self-supplies of the power output generated (assuming the QI is met, otherwise the qualifying power output (QPO) is scaled back).

Indirect supplies (that is, supplies to the final consumer made by electricity utilities) of QPO electricity are only exempt from the main rates of CCL where the electricity was generated before 1 April 2013 (as evidenced by CHP LECs). Following closure of the CHP LEC scheme, March 2013 was the last month of generation eligible for CHP LECs.

4.2 Carbon Price Support Tax Exemption

In April 2013, a Carbon Price Floor (CPF) was introduced on fossil fuels used to generate electricity. The CPF is made up of the EU ETS carbon price and a UK-only tax known as the Carbon Price Support. Operators of CHP schemes above 2MWe were initially liable to account for the CPS rates of CCL on the proportion of coal, gas or LPG they used to generate electricity. However, with effect from the 1 April 2015, the Government introduced an exemption from the CPF for fuels that are used in CHPs to generate Good Quality electricity for self-supply or use ‘on site’.

4.3 Business Rating Exemption

The business rating exemption applies to specified plant and machinery contained within CHP Schemes that are fully or partially certified as “Good Quality CHP” under the CHPQA scheme and have obtained a Secretary of State (CHP) Exemption Certificate. The exemption extends

to accessories associated with the power generating plant and machinery (these items may be rateable in their own right elsewhere in the P & M Schedule) but not to heat recovery plants and machinery.

4.4 Renewable Heat Incentive

The Renewable Heat Incentive (RHI), launched in November 2011, is a DECC initiative designed to provide support to renewable heat technologies in order to increase deployment and aid market development with the ultimate aim of reducing cost of installation. The RHI supports heat where that heat is used in a building for 'eligible purposes': heating a space, heating water, or for carrying out a process where the heat is used.

- Solid biomass CHP installations (excluding solid biomass contained in waste) are eligible for the solid biomass CHP tariff on their eligible heat output if:
- The installation/relevant combustion unit(s)/conversion from power only generation was commissioned on or after 4 December 2013.
- The relevant combustion unit(s) are new at the time of installation.
- The installation is certified under the CHPQA scheme. Applicants will have to provide evidence of current CHPQA certification as part of the accreditation process in order to be awarded this tariff.
- The relevant combustion unit(s) are designed and installed to burn solid biomass only (not including solid biomass contained in waste).
- The relevant combustion unit(s) comply with the air quality requirements Thus to qualify for the RHI tariff, the scheme has to have a CHPQA certificate but does not have to fully qualify as Good Quality CHP. However, the CHP tariff will be eligible only for heat generated by the engine or extracted from the turbine, and Ofgem will require that heat so generated is separately metered.

4.5 Contracts for Difference

The Contracts for Difference (CfD) regulations came into force in Great Britain on 1 August 2014. CfDs will replace the RO for new projects targeting commissioning from 1 April 2017. A generator party to a CfD is paid the difference between the 'strike price' (a price for electricity reflecting the cost of investing in a particular low carbon technology), and the 'reference price' (a measure of the average market price for electricity).

Biomass CHP and energy from waste (but not bio liquid fuelled) CHP are eligible to compete for support in CfD allocation rounds, but biomass and energy from waste power-only projects are not eligible for CfD support. Support under the CfD will be paid only on the proportion of metered electrical output assessed by CHPQA scheme to be "Good Quality".

4.6 Feed-in Tariff

The Feed-in Tariff (FiT) was introduced by the UK Government in order to support renewable electricity generating technologies installed up to 5 MWe in capacity. Currently, the only renewable fuel CHP technology supported by the FiT scheme is anaerobic digestion (excluding sewage gas).

In order to qualify for the FiT scheme, qualifying CHP generators must be connected to the grid via an import / export meter. FiTs are payable for each unit of electricity generated whether used on-site or exported to the grid. In addition to the generation tariff, any power exported to the grid is also eligible for the export tariff. The tariff rates are adjusted annually by the percentage increase or decrease in the Retail Price Index over the 12 month period ending on 31 December of the previous year.

4.7 Hydrocarbon Oil Duty Relief

CHP schemes that are fully or partially certified as “Good Quality CHP” under the CHPQA programme and have obtained a Secretary of State (CHP) Exemption Certificate are able to claim a refund of Hydrocarbon Oils duty on oil used to generate electricity in respect of an annual operation (assuming they meet a power efficiency threshold of 20% otherwise this exemption is scaled back to the same relevant fraction as entitlement to relief from CCL).

This publication is available from: https://www.gov.uk/government/collections/combined-heat-and-power-chp-developers-guides

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