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Project title:
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Instrument : Integrated project
Thematic priority : 6.1.3.2.4
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Identification of Base Conditions for Debt Finance

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Abstract

This deliverable reviews the essential set of technical and commercial contracts around the power station project in order to determine the areas where the realistic ability to obtain debt finance will have an influence or impact on the choices or structures.

In particular it explores, from a banking perspective, the issues associated with a HYPOGEN power plant being able to attract the three principal sources of finance, namely grant funding, debt and equity.

It concludes that such a plant, if the project company is appropriately structured, could be capable of achieving debt finance. However, it also points out that support from a number of key contractual counterparties may be required and, most importantly, the risk associated with the construction of the project would need to be mitigated.

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1 INTRODUCTION

This deliverable reviews the essential set of technical and commercial contracts around the power station project in order to determine the areas where the realistic ability to obtain debt finance will have an influence or impact on the choices or structures.

As with any major financing, there are three principal sources of finance, namely grant funding, debt and equity.

1.1 Grant Funding

Though generally considered to be "free", in fact grant funding almost always has a cost, whether in terms of influence over decisions / selections made, restrictions upon certain actions and implications upon other forms of finance (eg where grant funding can be rescinded or is highly conditional, it may result in less scope for debt to be raised). Therefore, whilst it may clearly be beneficial from the perspective of project returns or in terms of actually allowing a development to progress, nevertheless the implications surrounding grant funding have to be carefully considered.

1.2 Debt Finance

The overall cost of debt is a function of the underlying interest rate of the respective currency (eg Euribor, or the European Inter-bank Offer Rate, currently 3.25%), as adjusted from time to time by the relevant monetary authority (eg the European Central bank ("ECB")), plus a credit margin. The credit margin is reflective of the underlying risk associated with the project such that the greater the risk, the more expensive the cost of debt. Thus, if one were to assume a margin of 2.25%, the overall cost of debt would be 5.5% (this figure is for illustrative purposes only and in no way should be seen as a prediction of what might be achievable were the project to be financed). In addition, lenders will require security against the provision of debt. This may take the form of guarantees (that is, debt with recourse to the owners of the company / project) which would result in the cost of the debt being based on the credit risk of the guarantor, or over the physical assets and shares of the company (ie having no recourse to assets outside of the company, which would be typical for a non-recourse transaction). These factors are considered in greater detail in Section 2 below. As a result of the limited risk and limited return, debt should always demand a lower return (credit margin) than equity.

1.3 Equity

The equity return reflects the portion of value remaining after all of the other obligations have been discharged. As the last to be paid, it therefore obviously is the most "at risk" portion of the funding and consequently requires the highest return. The "cost" of equity in the utilities sector (including power generation) has been assumed (again for illustrative purposes) at 7 - 8% "real" (ie adjusted for inflation) or, assuming 2% constant inflation, 9% - 10% "nominal". However, for a project involving new technology such as this, a premium might be required. Thus, based on such illustrative figures, an overall equity return of 10% "real" and 12% "nominal" would result.

1.4 Weighted Average Cost of Capital

The optimal capital structure for a project would be that which minimized the Weighted Average Cost of Capital ("WACC"), that is, the overall cost of the debt and the equity required for the funding of the project. This is determined through the "gearing", that is the ratio of debt to equity. The following example establishes the overall WACC:

Cost of Funding
Using the illustrations indicated above, the cost of debt would be 5.5% and the cost of equity would be 12%

Assuming debt of 70% and equity of 30%, the WACC would be ((0.7x5.5) + (0.3x12)) = 3.85 + 3.6 = 7.45%. Therefore the WACC would be 7.45%

By contrast, where debt was 80% and equity was 20%, other assumptions remaining consistent, the WACC would reduce to ((0.8x5.5) + (0.2x12)) = 4.4 + 2.4 = 6.8%.

Similarly, where debt was 60% and equity was 40%, other assumptions remaining consistent, the WACC would increase to ((0.6x5.5) + (0.4x12)) = 3.3 + 4.8 = 8.1%.

As the WACC is generally used for discounting purposes, it is therefore of considerable significance to the overall value of the project. In addition, many corporations have strict "Return on Equity" criteria which, for projects where the level of gearing is lower, mean that the overall of return of the project has to be higher in order to provide the same ROE. Again, this is a material consideration in the investment decision for a new project. Consequently, the overall capital structure is of critical importance.

More significantly, as indicated below, the capital structure to be employed will have a material impact on the contractual structure of the project.

2 OUTLINE OF PRINCIPAL FINANCING OPTIONS

In reviewing the options for financing a hydrogen and electricity production facility that also includes carbon capture and storage, three broad options exist. These are:

- Corporate funding for the development
- Non- or Limited-recourse Financing; and
- A hybrid structure that would involve elements of both

Each of these options is examined in greater detail below.

2.1. Approach to Corporate-based Financing

The provision of finance on a corporate basis consists of the sponsor or sponsors providing or accessing debt either from their internal cashflow or, more likely, from financial institutions on the basis of a corporate guarantee. Consequently, the risk of the project is borne directly by the sponsor (s), whilst the primary risk to lenders is the underlying credit quality of those sponsors. This contrasts sharply with non –recourse financing whereby, as outlined in detail below, the lenders will take direct risk on the success of the project.

The cost of debt, under a corporate scenario, will reflect the credit quality of the sponsors, rather than the purpose for which the funds are being utilised. This approach can be adopted either for a single sponsor or a group of sponsors, with the key contractual issue being the form and structure of the guarantee provided to lenders. The preference of sponsors would always be to provide "several" guarantees covering only their portion of responsibility, whereas the lenders would always like to see "joint and several" guarantees, whereby each sponsor guarantees both its own individual portion and the overall amount of debt, with the relationship between each of the Shareholders being established through a Shareholders Agreement (or Joint Venture Agreement). The Shareholders Agreement would cover certain other areas, including equity contribution, the nature and scope of guarantees and a clear mechanism for dispute resolution between the parties. For the lenders, the joint and several guarantee would ensure that they are insulated from any areas of dispute between shareholders and have the assurance that under any scenario they are likely to be repaid.

It should be clearly noted that the underlying contractual framework for the project agreements would be of less significance in the scenario where corporate lending is utilised, given that the primary risk of lenders is that of the credit risk of the sponsors. Consequently, the project structure would be more flexible and the underlying project agreements (discussed below) would certainly not be required to be so rigorous and, in many instances, may not be required at all from a lending perspective. Therefore, it is anticipated that the time required for execution of project and financing agreements would be reduced.

2.2. Approach to Non-recourse Financing ("Project Financing")

In contrast to corporate lending, a non-recourse financing (or "Project Financing") would result in substantially in lenders taking full underlying risk of the project. Consequently, the approach is considerably more structured, with the key element of a project finance structure being the allocation of risks, which allows for various risks to be borne by parties most capable of mitigating them. From this perspective, some sponsors choose to follow a project financing approach even when they raise financing with a corporate guarantee.

Since in a project financing, lenders generally do not have access to financial support from sponsors, lenders pay significantly more attention to due diligence of all aspects of the project in order to confirm that the project will be able to meet its performance and debt service obligations.

A typical project structure is presented below. Although the number of project parties and various agreements may differ from project to project, it is important to determine that each project party has:

- The ability to perform;
- The incentive to perform; and
- The obligation to perform.

Only the presence of all three of these elements will ensure that the counterparty will be able to perform under its contract. Consequently, in approaching any project a key requirement is to analyse performance obligations of various counterparties involved in the Project with a view of developing the most optimal risk allocation structure.

Risk Profile Overview

While structuring a limited recourse financing for the Project, substantial attention will focus on analysing and becoming comfortable with the following aspects of the Project:

- Ability and incentive of the Sponsors to drive the Project to completion and to monitor its performance.
- Adequacy and reliability of the proposed technical solution;
- Ability of the proposed EPC/EPCM contractors to perform and / or Sponsor completion guarantee
- Definition of the completion tests upon which the recourse to the Sponsors can be released (if applicable).
- Availability of long-term fuel supplier;
- Ability of the O&M contractor to achieve production performance;
- Condition, technical suitability, capacity and operating capability of all infrastructure assets which are not part of the Project, but on which the successful operation of the Project will depend (pipelines, water and electricity grid etc.), including availability of any alternative and back-up solutions;
- Ability, incentive and obligation of the offtaker(s) to take delivery of / pay for the electricity generation / hydrogen / CO2;
- Compliance of all underlying agreements for logistic, infrastructure and off-take with volume and specifications of the production;
- Degree of political risk (including public enquiries) in the country and potential for its mitigation;
- General condition of the hydrogen and electricity market in the region;
- Potential for CO2 transportation and utilisation;
- Any transit risks;
- Structuring for project expansion (and potential intercreditor issues); and
- Other risks.

2.3. Hybrid Structure

An alternative to each of the corporate lending and non-recourse options would be a hybrid structure, under which the lenders would assume project risk save for certain clearly identifiable areas where such risk would require sponsor support. Examples of this would be the provision of a guarantee covering both completion and the initial [5] years of operation, where concerns existed relating to a particular item of equipment or a process. In the event of any failure during the guarantee period, the guarantee would have to be extended. IN this way, lenders would take comfort from the guarantee until such time as the item or process was considered proven.

Similarly, where it was desirable to allocate value on a basis other than pure commercial rationale, for example where a defined volume of hydrogen was requested to be used for commercial sales to try and "kick start" the more widespread development of its utilization, rather than using it for power generation, again lenders would be likely to request that the sponsors guarantee the value of such hydrogen, whether or not it is sold.

In either instance, effectively sponsors are providing the requisite additional guarantees against specific risks or to allow themselves commercial flexibility. IN turn, it would facilitate the scenario whereby lenders would assume the risk against the remainder of the project.

2.4. Key Project Agreements

The optimal risk allocation in any project is achieved by structuring key project agreements to ensure their financeability. This is recommended as a prudent approach for sponsors under a corporate lending structure. However, it is essential for a non-recourse transaction, where Lenders will analyse each individual contract and take a view on responsibilities allocated to various counterparties, their creditworthiness and whether these counterparties are properly incentivised and obligated to perform. It is therefore important to receive timely advice on general contractual risk allocation. The exact list of contracts will depend on the specific characteristics of the project, but it is anticipated that lenders will require to review from a financing stand point the following contracts:

- Joint venture / shareholders agreements;
- EPC/EPCM contracts
- Offtake agreements, for Electricity, Hydrogen and CO2
- Hydrogen and CO2 transportation agreement;
- Feedstock / Fuel supply agreements;
- O&M contracts;
- Long Term Services Agreements;
- Insurance.

In addition to these contracts, there will be a number of other agreements which will form the financing documentation package and which are discussed further below.

2.5. Joint Venture / Shareholders Agreements

As indicated in Section 2.1 above, the Shareholder Agreement provides the framework for the management of the relationship between each of the sponsors. These contracts are obviously not necessary when there is a single project sponsor. In situations when there is more than one equity investor, these agreements define the split of economic and voting interests of the board of the project company, outline the purpose of the project and describe in detail responsibilities and obligations of each individual partner. Although these agreements are more important to the sponsors than to prospective lenders to the project, lenders usually analyse the following areas of the shareholders agreements:

- Definition of the project and its scope;
- Completion guarantee obligations or any cross guarantees between the sponsors;
- Description of the involvement of any of the sponsors or their affiliated companies as other counterparties of the project company (offtaker, supplier);
- Agreement on the budget;
- Equity interest division between the sponsors and relevant equity funding obligations, including timing of equity injections and whether any of the sponsors is to be carried;
- Procedures following non fulfilment of a cash call by a shareholder, including equity buy-out rights of the remaining shareholders;
- Dividend policy;
- Financing strategy
- Description of any royalty fees, specific tax exemption provisions or other economic features which determine the project;
- Composition of governing bodies of the project company and deadlock resolution mechanisms;
- Representations and warranties given by each of the shareholders and other legal matters, like the choice of law, court jurisdiction and arbitration provisions.

Based on this agreement, lenders will be able to start developing a financial model for the project and to start analysing the financial viability of the project. In addition, they should be able to assess whether the construction arrangements require a completion guarantee and whether such guarantee envisaged by the sponsors would be acceptable or needs to be enhanced further to support financeability of the project.

2.6. Financing Documents

The exact number and structure of finance documents will depend to a large extent on the legal structure which is implemented to achieve the best terms of the financing. These documents establish the relationship between the sponsors and the lenders, the obligations that are to be undertaken by the project company and / or the sponsors. Finally, in a distress situation, they would indicate the events that would give rise to lenders being able to exercise their security.

There are several possible structures which will enable the limited recourse finance for the Project, but which will have different legal structures. However, we would anticipate that the following agreements would constitute the financing documentation for such a transaction:

- Commercial bank loan agreement;
- Multilateral agency loan agreements (eg if European Investment Bank involvement);
- Intercreditor agreement;
- Security documents, including assignment of key contracts and pledge of assets and shares;
- Trust deed over the offtake contract;
- Account deed;
- Direct agreements;
- Completion guarantee; and
- Insurance assignments.

2.7. Financing Summary

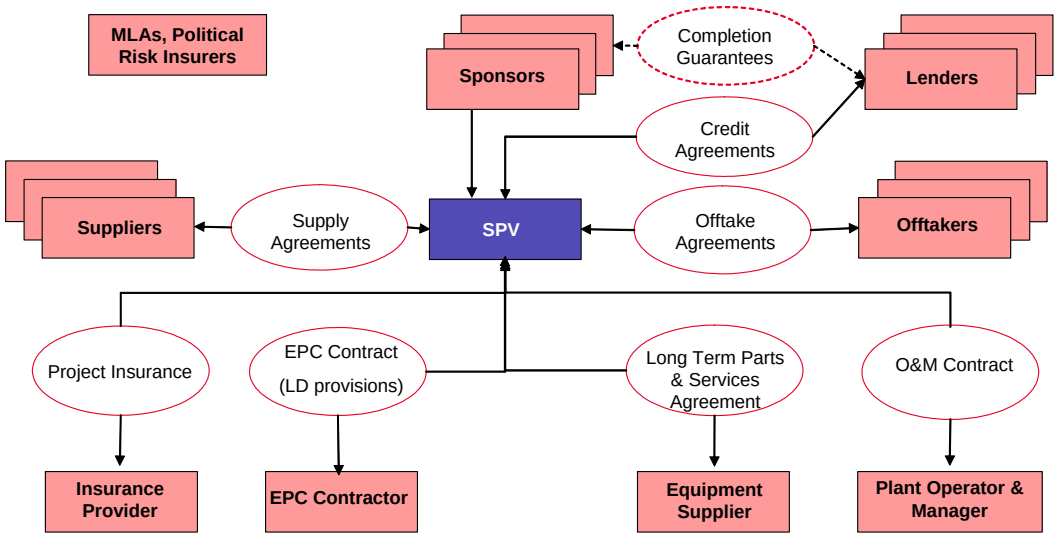
The selection of financing approach will be based on a wide variety of factors, including the nature and identity of both the sponsors and the key contractual counterparties. The choice may also be determined by structural impediments that cannot be overcome (eg where a key technology supplier is not of sufficient credit strength, some form of financial support may be required from a sponsor). The key issues for consideration will therefore generally be as follows:

- to determine the ownership structure for the shareholders
- this in turn may be influenced by and will certainly influence the return thresholds required (and whether the key determinant will be the Project Return or the return on Equity
- These returns will be a function of whether the debt is with recourse to the project or with recourse to the shareholders.

Whilst a non-recourse financing structure will both limit the quantum of equity required to be injected by sponsors and also require a lower overall project return in order to meet the equity hurdle rate, nevertheless a more disciplined structure with an apportionment of risk to all of the principal project counterparties will be required, as discussed in detail in Section 3 below. Whilst this mitigation of risk is clearly of benefit to the shareholders, nevertheless consideration should be given to the likely impact on the overall timetable for project development.

3 CONTRACTUAL STRUCTURE

Provided below is an illustration of the range of contracts and the overall contractual structure for the development of a complex project, particularly where there is the strong desire to develop the project on a non-recourse basis.



3.1. Construction Risk

EPC/EPCM Contracts

The construction arrangements represent perhaps the single most important project agreement(s), on the basis that until the project has successfully completed this phase and is operational, it is unable to generate the underlying product and thus produce cashflow to service debt and release dividends. Consequently, the construction period is of particular significance, in terms of the due diligence exercise for lenders.

Subject to the identity and credit strength of the counterparty or counterparties to the construction contract(s) and the complexity of the technology to be implemented, lenders may be able to get comfortable with a single point EPC Contract and a single counterparty (or joint venture arrangement) assuming the full construction risk. Where this is not the case, as indicated below, a comprehensive completion guarantee from the sponsors will be required.

One of the key aspects of the EPC contracts from the financing point of view is the allocation of liabilities and liquidated damages payable by the contractor in the event of delay or construction defect. Lenders therefore expect that the sponsors will strive to negotiate the most optimal mitigation of these risks while controlling the cost of the EPC contract.

Lenders will also analyse financial strengths and performance history of the proposed contractors. In addition, lenders will need to take a view on the viability of the proposed

technological solution and will rely on opinion and conclusions of a credible third-party consultancy firm (please refer to the technical risk section below).

Completion Guarantee

As part of the project financing structure, lenders may require that a comprehensive first-demand guarantee is provided as a protection if the project fails to compete by a certain date.

Generally, in projects of this nature, the release criteria for the completion guarantee would include some of the following provisions:

- The production and export of electricity / hydrogen / CO2 at a pre-determined daily rate for an agreed period (90 - 120 days will probably be sufficient). This will be necessary to demonstrate the sustainability of production, the reliability of the production equipment and the surrounding infrastructure, including pipelines;
- The funding of a debt service reserve. This will usually be equivalent to 6 months of debt service;
- Confirmation that all authorisations are valid and current, all necessary permits and approvals have been obtained and there are no material proceedings ongoing;
- The delivery of an updated technical report and certificate of technical completion, which will confirm that the project has been completed to specifications, in accordance with the development plan and there are no outstanding quality issues which may endanger the future operation of the project. The technical consultant may also need to perform various tests on the key equipment blocks;
- The delivery of an updated environmental report, which confirms that the project has been completed to specifications and in accordance with the development plan;
- Given that the successful operations of the project may rely on the completion of a number of gas transportation pipelines, a certification of completion of relevant pipeline routes may also be required.
- Satisfaction of economic criteria, which will include presenting a revised economic model for the project demonstrating that the pre-agreed minimum and average cover ratios (e.g. Debt Service Cover Ratio, Loan Life Cover Ratio, Project Life Cover Ratio) have been met.

Therefore, in defining completion, lenders will rely on a number of physical, financial and technical tests in order to release the completion guarantee. Also, passing some of these tests will need to be certified and confirmed by relevant consultants. While most of the tests appear straight forward, the number of tests and their nature may make the release of the guarantee difficult and onerous process.

In relation to the completion guarantee that may be required we have made the following assumptions:

- The Completion Guarantee will be an irrevocable and unconditional on-demand payment guarantee, with back stop payment latest 12 or 18 months after the scheduled Completion Date;
- It will include certain financial covenants and ownership clauses yet to be determined and

- It will not be subject to any exclusion or limitation related to an event of political risk during the Pre-Completion period.

There may also be a potential for structuring of a staged release of the Completion Guarantee. Instead of considering one single set of completion tests, it is possible to envisage a staged completion with step by step reduction of the amount of the completion guarantee according to certain clearly defined milestones, to be achieved during the pre-completion period. This will only be possible if the capacity introduced is independent of the capacity still under construction and is capable of reliably functioning on its own.

Summary

For corporate lending, no completion guarantee is required (as the overall guarantee of the sponsor(s) is implicit in the structure). However, under the non-recourse alternative either a highly robust EPC Contract with a strong credit entity will be required, or it will be necessary to provide completion guarantees. Under the hybrid structure, it is anticipated that a completion guarantee would be included but, following the achievement of the completion tests, the lenders would accept project on substantially all areas of the project.

Technical Guarantees

In addition to considering the overall EPC or alternative construction arrangements, a hydrogen –fuelled power generation facility will also have a number of identifiable processes, each of which will be critical to the overall operation of the project. From the Deliverables so far available from SP2 (D2.1.1 & D2.2.1), there is a range of potential technology suppliers for the proposed plant.

Coal / Lignite Gasification:

- Royal Dutch Shell (”Shell”);
- General Electric; and
- Siemens
- BGL
- HTW

Methane Reforming (ATR):

- Haldor Topsøe A/S
- Lurgi AG

Methane Reforming (SMR):

- Haldor Topsøe A/S
- KTI (Kinetic Technology International)
- Uhde GmbH

Gas Turbines:

- Siemens
- Alstom

With regard to the coal gasification and gas turbine areas, the principal options and / or counterparty are well known and are considered below. All of these entities have high (or adequate) credit ratings and therefore we expect they will be acceptable to prospective lenders. Since in most instances the individual contracts will not be signed with the parent companies of these groups who are the actual credit rating carriers, lenders will need to understand the relationship between the contracting subsidiary and the parent, the contracting subsidiary's creditworthiness and whether any of its obligations under the EPC/EPCM contract need to be supported by the parent company or another member of the group with a stronger credit rating.

In the section below we provide a brief overview of credit rating position of each of the contemplated providers of technology.

Shell

Royal Dutch Shell is rated AA / Aa1 by Standard and Poor's and Moody's respectively. The ratings reflect the new unified corporate structure (following the restructuring which took place in June 2005). The ratings on Royal Dutch Shell PLC reflect the group's strong business portfolio, notably in downstream activities; its position as the third-largest global private integrated oil company; and its very conservative financial profile and policies. The ratings are constrained by a below-average production profile, and continued difficulty in replacing proven reserves.

General Electric ("GE")

GE is rated AAA / Aaa by Standard and Poor's and Moody's respectively. The ratings reflect the company's excellent business risk profile, the minimally leveraged balance sheet for its industrial operations, its significant liquidity, its strong corporate governance, as well as management's commitment to the highest level of credit quality. GE has strong leadership positions across its array of global business platforms. It enjoys unparalleled diversity, customer concentration is negligible, sales are geographically dispersed, and its end markets run the gamut of economic activity. Its operations are exposed to varying degrees of cyclicality and price pressures. However, a large amount of high-margined service (around 20% of industrial revenues) and aftermarket sales provides significant earnings support throughout the business cycle.

Siemens

Siemens is rated AA- / Aa3 by Standard and Poor's and Moody's respectively. The ratings reflect the company's leading global market positions in numerous segments of the fragmented electrical engineering and electronics industry, as well as the group's conservative financial profile. Siemens' strong business profile is supported by the vast business and geographical diversity of the group's industrial activities, which helps balance the cyclicality to which most of the individual industry segments are exposed. The benefits of this diversification have been particularly visible in recent years. The group's size also allows for efficient portfolio management, which represents an important source of strategic flexibility to better allocate investments in line with long-term business prospects.

A rating downgrade would be considered should Siemens fail to demonstrate material progress towards improved profitability and cash from operations, or if management does

not maintain spending discipline during the next few quarters of restructuring. In order to stabilize the outlook, Siemens would have to (i) demonstrate an ability to turn around its underperforming businesses, most importantly Siemens Business Services; (ii) make material progress over the next few quarters towards its margin targets for those business segments that are not already on track; and (iii) maintain discipline on investment opportunities in order to avoid further material increases in net debt.

Alstom

Though not rated by either of S&P or Moody's, Alstom is well known to financial institutions that cover the power generation sector, particular for non-recourse financing transactions, as the company has core expertise in this area, covering both coal- and gas-fired power generation amongst other disciplines.

The company has recovered strongly from financial difficulties in 2002 – 2003, as demonstrated by the financial year end figures for 2004/2005, which indicated a strong increase in orders (up 15% from 2003 / 2004), substantial improvements in operating income and a reduction in Net Debt from €3.7bn to €1.4bn. This was bolstered by the acquisition of 21% of the company by Bouygues of France, from the French state, in April 2006.

With regard to the Lignite Gasifier and Methane Reforming technology, of whom BGL, HTW. Lurgi AG, Haldor Topsøe A/S, KTI (Kinetic Technology International) and Uhde are the principal providers, these entities are well known by financing institutions as providers of material components or processes, but are less well known as counterparties to a full EPC contract. It is anticipated that additional technical due diligence, together with credit analysis, would be required (though we recognise that most of the entities has a strong group of core relationship banks).

Summary

Whilst most of the component parts and processes that would be used are well known and proven, their actual configuration and implementation for a hydrogen-fuelled power generation facility is not proven. Consequently, in order to develop a project such as that envisaged by DYNAMIS, there will be the absolute requirement either of very strong EPC Contract arrangements with the counterparties taking full risk for completion of the construction phase, or the sponsors will need to provide support in the form of a comprehensive completion guarantee, in order to secure bank finance.

3.2. Offtake Contracts

Lenders will look to the Offtake Contracts as the principal source of revenue and therefore the means of debt repayment and equity return. It is vital therefore to have a robust offtake contract (or contracts) and, assuming that non-recourse financing or a hybrid structure is a desirable option, to structure them from the outset with this in mind. Lenders will analyse these contracts to understand the impact of various aspects of the offtake agreements on the ability of the project to raise limited recourse debt, allocation of risk between the parties and any pass through elements between the offtake contracts and other project agreements.

Standard features of an offtake contract would include:

- Take-or-pay provision for a minimum volume, that is viewed as sufficient by the Lenders to meet cover ratio requirements;
- The committed volume will be sufficient to absorb the production assumed under the base case projections as well as significant incremental production if the real output exceeds the plan;
- The specifications of the hydrogen and CO2 will be in line with the processing and consumption requirements of the offtakers and the specifications of the pipelines;
- Adequate provisions for remedies and cure period in the event of deliveries not meeting either volume or specification requirements;
- Price definition fixed or subject to a price formula with international and clearly assessable benchmarks for the duration of the offtake contract;
- The terms of payments based on the irrevocable obligation of the buyer to make payment to an account pledged in favour of the lenders;
- The tenor of the contract will exceed the tenor of the financing with a number of years which is sufficient to cover for potential delays in construction or production;
- The consequence of a Force Majeure event will not release offtakers from their off-take and payment obligations indefinitely;
- Contract counterparties will be either creditworthy entities or their contractual obligations will be supported by creditworthy entities;
- The main terms of the offtake contract shall not be amended without the lenders' prior consent; and
- The borrower's rights under the offtake contract will be assigned in favour of the lenders and no further assignment or transfer or any kind of security in favour of any other third party will be possible without prior consent of the lenders

Economic features of the offtake agreements will be considered by the lenders extremely carefully as these (together with the supply contracts) will determine the viability of the project and its ability to service the debt. Contractual volumes and price formula will be included in the economic model of the project.

3.3. Supply Agreements

Another of the more critical project agreements is the Supply agreement. Without a long term supply contract with a creditworthy counterparty, lenders will find it difficult to consider financing a project on a stand alone basis. The supply contract determines the ability of the project to operate, as without appropriate sources of feedstock, both in terms of quantity and quality, it will not be possible to generate the end-product, in this case electricity generation, hydrogen and CO2. Lenders pay particular attention to supply contracts and will look to analyse the following areas:

- Identity of the supply counterparties;
- Supply counterparties' ability to source the contractual amount of feedstock of the necessary quality over the term of the contract;
- Supply counterparties' ability to deliver feedstock;

- Supply counterparties' financial strength to meet its financial obligations in the event of non performance (i.e. failure to deliver or delivery of not sufficient quantity/quality);
- Contract economics and feedstock price formula.

Economic features of the supply agreements will be considered by the lenders extremely carefully as these (together with the offtake contracts) will determine the viability of the project and its ability to service the debt. Contractual volumes and price formula will be included in the economic model of the project.

3.4. Hydrogen and CO2 Transportation Contracts

One of the important aspects of the project of this type will be the availability of the relevant infrastructure to evacuate and transport produced hydrogen and CO2 from the site to the end consumer or distributor. Lenders will need to analyse the technical aspects of pipelines (available throughput capacity, technical specifications, existing connections, availability of substitute arrangements) but also contracts governing the utilisation of these pipelines.

In addition to a review of transportation charges, lenders will also need to understand the proposed allocation of risk between the provider of transportation services and the project. Lenders would normally expect the transportation service providers to be liable to pay penalties to the project when they are unable to fulfil their obligations. These penalties may be significant, but will be driven by the value of the transportation services provided and not necessarily the value of the product which was not delivered due to the unavailability of the transport infrastructure. In many instances the total exposure of the transport service provider is limited and may not cover the full extent of the project's losses. The penalties may therefore be estimated by evaluating the cost of procuring alternative transportation on a short notice, e.g. cost of hiring specialised reinforced canisters and trucks to transport hydrogen. Therefore lenders would require significantly more information for the delivery arrangements and specifically about the transportation service providers.

3.5. O&M and LTSA Contracts

Another important set of contracts includes contracts for the operations and maintenance ("O&M") and long term service agreements ("LTSA"). These contracts will provide for regular maintenance, operation and supply of spare parts for the key equipment blocks of the project. Lenders will expect that both the O&M contractor and the LTSA counterparty are experienced and creditworthy entities and that the contracts are structured in a way to incentive their performance.

It is reasonable to expect that the LTSA counterparty will be the one of the EPC/EPCM contractors and a key equipment block supplier. The contract will be structured to incentivise the counterparty for the specific aspects of the performance of the key equipment blocks and will specify penalties if certain performance tests are missed. Please note that total liability of the LTSA contractor will be capped and therefore may not necessarily be equivalent to the total loss suffered by the project as a result of sub-optimal performance of the equipment. The project is therefore potentially exposed to incur losses due to poor performance of the LTSA contractor and therefore lenders analyse in detail the proposed potential counterparty in terms of their experience, reliability and financial strength.

The same also applies to O&M contracts. Lenders will expect the O&M contractor to be an experienced operator with a history of operating and maintaining similar equipment. The contract will provide a framework under which the contractor will be incentivised or penalised for meeting or failing (respectively) various performance guidelines (e.g. outage duration).

In projects of this type where maintenance requirements are based on operating cycles for different equipment blocks, we could also expect that lenders might require an O&M reserve account. The project will therefore need to allocate a certain amount of cash into the account over time so that by the time of the most expensive maintenance outage (e.g. turbine overhaul) there are sufficient funds in the reserve account to cover the relevant cost.

4 BANKABLE REVENUE STREAMS

A hydrogen-based power plant will have three principal sources of revenue, arising from sales of electricity, hydrogen and the value associated with carbon storage. This section focuses on each of these sources from a contractual and commercial stance, reviews the sustainability of each and comments on the extent to which the revenue source is "bankable" ie can it be used to raise debt.

4.1. Sale of Electricity

The sale of electricity could be taken on a "merchant" risk basis (ie selling to the market) or, where non-recourse financing is anticipated, more generally on the basis of a long-term offtake agreement. Such offtake arrangements, as indicated in Section 3.2, have been relatively standardised in the form of a "Power Purchase Agreement". Essentially this would establish a stable and reliable revenue stream, on the basis of a minimum "availability" for any contract year. That is, the project would not necessarily have to generate, but would receive payment for being able to do so. The actual dispatch of the plant would be at the instruction of the counterparty, though again there could be obligations to actually generate for certain minimum periods. Assuming Carbon Capture and Storage ("CCS"), it is anticipated that on a marginal cost basis, the project would have an intrinsic cost advantage in having to provide limited, if any, carbon certificates whilst operating. Consequently, it is anticipated that it would be run as a "base load" generator.

4.2. Sale of Hydrogen

The hydrogen market is in its infancy and therefore it is difficult to speculate as to whether a long-term offtake for significant volumes could be agreed. At this stage, the more likely assumption is that volumes of hydrogen sold would initially be modest, but as the "hydrogen economy" develops, then assuming that the value is equal to or greater than electricity generation, then there would be some substitution between power generation and sales of hydrogen. Such flexibility would have to be incorporated into the plant design and any Power Purchase Agreement.

From the perspective of financing the project and given that the market is relatively small, hydrogen sales would not be accepted at this stage as a robust revenue stream, save where the offtaker was an extremely credible and major player in the chemical or energy sectors.

4.3. Sale of Carbon Value arising from CCS

Currently, the EU Emissions Trading Scheme ("ETS") establishes a form of tax on those parties who emit carbon beyond their "free emission" level, through the requirement to provide a carbon certificate for every incremental tonne of carbon emitted. As such certificates are tradable, their intrinsic value is variable, depending upon supply and demand below any penal threshold. As has been seen in recent years, such value may be extremely volatile, given that the value is linked to the cost of gas (with cost increases potentially seeing displacement of gas-fired generation with coal-fired generation), together with mild winters (less gas and coal generation required) and heavier rainfall (increasing hydro generation). Demand is also highly dependent upon allocation issues and hence upon political decisions.

It is anticipated that a new hydrogen generation facility that benefited from CCS would receive the appropriate allocation of free allowance of carbon certificates under the Emissions Trading Scheme. Given the presence of CCS and thus limited carbon emissions, this should act as a substantial grant or subsidy for the project, as the allowances could be monetised on an annual basis. This relies on CCS being a recognised mechanism under the ETS, which is yet to be finalised by the EU; hence there remains a risk, but this can be expected to be resolved by 2008.

However, in order for CCS to be effective, there is likely to be the requirement for significant additional infrastructure and thus additional cost, associated with the capture and transportation of the carbon to the end storage facility. Thus, the volatility in the value of carbon certificates is of concern, in as much as the investment requirements of the infrastructure, particularly in transporting carbon for any material distance (which will require pipelines), will be repaid through an uncertain revenue stream.

Consequently, the critical issue relating to such infrastructure is the determination initially of what assumption should be used for the value of each carbon certificate over a long-term timeframe (such infrastructure assets as pipelines are often financed on a 20 year basis); and secondly, the extent to which the monetisation of the carbon allowances will offset the cost of such infrastructure.

A final issue is the extent to which, in addition to the carbon allowances, which are part of the International Emissions Trading (and the Emissions Trading Scheme ("ETS")) established under the Kyoto Protocol, a generation project with CCS might also qualify under the related Joint Implementation mechanism. This would allow the generation of carbon certificates to arise as a result of the capture and storage of the carbon, in addition to the free allowances. However, it is anticipated that only one of these alternatives will be permissible, in which case, to the extent that the volume of carbon captured and stored exceeds the free allocation, the project would benefit from seeking the ability to generate carbon certificates. However, again the principal risk is that the value of the certificates diminishes.

4.4. Summary

The financing of major infrastructural development has generally been extremely successful and has allowed extremely aggressive terms (both term and cost of debt) where a stable and long-term revenue stream is discernible. Whilst it is anticipated that this should be possible through the sale of electricity through a long-term Power Purchase Agreement, any sales of hydrogen are likely to be initially for substantially lower volumes and are not anticipated to be under a long term arrangement.

With regard to the value of carbon storage, the major impediment of the ETS is that Phase 1 was for a relatively short (3 year) period, whilst Phase 2 will not be materially longer from a financing perspective (2008-2012). Thus there is residual uncertainty as regards the long-term evolution of the ETS. This is compounded by the price volatility seen in the cost of carbon certificates in recent years. Hence if any ETS revenues are to be bankable for the timeframe required by the project, there will have to be progress in firming up the future ETS framework.

5 LOCATIONAL ISSUES

From a financing and commercial stance, the location will be driven by the following factors:

- Maximising Revenue;
- Minimising Costs; and
- Minimising Risk

5.1 Maximising Revenue

The main revenue streams are from power and hydrogen sales. Hence they are maximised by selling these products into markets where they have the highest expected lifetime value and by ensuring unimpeded access to these markets at least cost during the lifetime of the plant. Although energy markets are being liberalised throughout the EU, unit value and the ability to obtain long-term offtake agreements will not necessarily be uniform across the region. This is being studied further by WP6.1 (D6.1.4, August 2007)

Currently, the only discernible revenue stream available from CCS is through its potential utilisation for enhanced oil recovery ("EOR"). The commercially beneficial revenue would be a function of the sales price of long term carbon as against the investment cost of the pipeline. However, the pipeline could clearly be developed as a separate project, allowing for a revenue stream from the sale of the carbon at the plant gate with no additional expenditure. This would be the preferred position from the perspective of lenders to the power generation facility.

5.2 Minimising Cost

Minimising the operating cost of the HYPOGEN plant would suggest that the location is determined by the continuing cost base for in-flows and out-flows. This would imply benefits from close proximity to (i) the underlying fuel source; (ii) major demand centres for either power or hydrogen; and (iii) the storage area for CCS.

Practically, the optimum location will be strong in all three categories thus minimising the overall operating cost profile of the project. Capital costs and the service costs associated with them are likely to largely location-independent across western Europe.

5.3 Minimising Risk

Risk can be considered in two respects. Initially, there is the intrinsic operating risk that has to be considered in relation to location. That is, factors such as proximity to areas of dense population, risk of pipeline leakage (and thus hydrogen / carbon / gas leakage). However, for a new industrial development, the other key factor will be the associated political risk relating to storage of carbon, which may be seen as undesirable, notwithstanding the geological safeguards of the selected environment. Such concerns, and the potential for public enquiries that result in project delays, would be a further element of consideration.

It is anticipated that whilst the location for any project will be determined in large part by technical characteristics, the commercial, political and societal elements should not be overlooked. In an environment of extremely high construction costs associated with any major infrastructure development, optimising the location on either revenue or cost grounds is of the utmost importance, whilst the mitigation of political risk through avoiding "NIMBY" (not in my back yard) syndrome could be extremely beneficial in terms of the time required for development of the project and its ability to generate unencumbered revenues.

6 ADDITIONAL FACTORS FOR CONSIDERATION (AND DUE DILIGENCE)

In addition to the review of financing and project documents, the two additional key areas of due diligence relate to the insurance and technical review.

6.1. Insurance

Lenders will require that the project is sufficiently insured to provide protection in certain a specific risk event, including Construction All Risk ("CAR"), Delay in Start Up ("DSU"), Business Interruption ("BI") and a range of other specific policies to protect the value of the development. A third party insurance consultant would be retained by the lenders to analyse the proposed insurance arrangements and whether confirm their adequacy or propose an alternative insurance programme.

6.2. Technical and Environmental Due Diligence

Lenders will need to become comfortable with all technical aspects of the project. Since the ability of the Project to generate cash depends on its ability to export electricity, CO2 and hydrogen, lenders will not only scrutinise the technical ability of the project to produce these products in the necessary amount and of the required quality, but also will look at all transportation and processing infrastructure which, even though not integral to the project, will impact the ability of the project to monetise the produced gas. Some banks with sufficient in-house expertise will be able to analyse this technical aspects and form a view, but most banks will need to rely on a review and conclusions conducted by third party consultants.

Complementing the Technical Review, an environmental performance of the project will also be undertaken. Many banks have internal environmental standards and will require that the project complies with these before any final financing decision is made. Many banks are also members of the Equator Principles group, which requires that projects financed by these banks comply with the IFC environmental standards. Furthermore, all Export Credit Agencies (ECAs) and Multilateral agencies (MLAs) have very strict environmental due diligence requirements, since their actions and financing decisions are scrutinised by a wider public. Therefore, any ECA involvement will bring further requirements for environmental due diligence and these will need to be specified in the scope of work of the environmental consultant

7 CONCLUSIONS AND SUMMARY

The development of a hydrogen-based power station, capable of delivering both power generation and hydrogen for commercial sale, together with the utilisation of CCS, if appropriately structured, could be capable of achieving debt finance. However, as indicated, in order to do so, support from a number of key contractual counterparties would be required and, most importantly, the risk associated with the construction of the project would need to be mitigated. As outlined in Section 3, this may be achieved either through a comprehensive Engineering, Procurement and Construction ("EPC") Contract with an appropriate counterparty, or through the provision of corporate guarantees until completion of this construction phase, as demonstrated by appropriate tests, has been achieved.

Once operational, the risk associated with such a project will diminish substantially, not only because of the generation of cashflow, but also because it is anticipated that the due diligence undertaken will confirm that most of the processes associated with the project, whilst not proven as an overall package, are individually well established and therefore should operate reliably.

The financing, especially if on a non-recourse basis, whilst challenging, will comprise of a number of technical processes that are individually proven and brings together such processes from the power generation, pipeline and petro-chemical sectors, all of which have a substantial and well documented heritage in achieving non-recourse financing.

APPENDIX 1: DEPENDENCIES AND DYNAMIS LINKS

The diagram on the following page picks up the main areas of dependency of a Power Station Project Company, expanding on the discussion in the main body of this report.

In doing so, it attempts to identify those issues which may have a geographic variance and hence may impact directly or indirectly on choice of plant location. These are marked in green.

It also attempts to highlight the links to work within the DYNAMIS programme structure and shows where some of the issues arsing in each of the key areas are being picked up in a particular workstream.

Diagram of Power Station Project Company Dependencies