Best Practices

For Catalysing Co-investment and Capacity-Building

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This document provides the following:

- 5 individual best practices, recommendations, tools, and approaches on financing mechanisms to address financial barriers to reducing black carbon SLCP emissions.
- 5 individual financial tools to catalyze finance.

1 BEST PRACTICES

1.1 BEST PRACTICE NO. 1- INTEGRATED MITIGATION REVIEWS

While self-reviews may be done by facilities, it is usually preferable to use a dedicated team, even if it is internal to the company, that is equipped with the necessary tools and resources to do the job. The main advantages of having a dedicated team include:

- Convenient access to the specialized measurement and testing technologies needed to perform the work.
- Fresh views and insight coupled with the expert knowledge and capabilities of the review team.
- Increased probability of identifying significant cost-effective CH_4 emission reduction opportunities through a comprehensive multi-disciplinary facility examination.
- Avoids exceeding available onsite resources.
- Potential synergies between disciplines for improved opportunity identification.
- Maximum utilization of the review team's expertise.
- Independent verification of the facility's performance.

- Transparent third-party determination of the emissions baseline and other data needed for the development of a credible business case suitable for senior management and investor or financier approval.
- Opportunity for technology transfer and training of facility staff.

Additionally, the review provides the means to monitor performance over the long term by comparing system performance against the baseline established at the time of the initial facility surveys. This benchmarking is applicable at the facility level as well as at the individual process unit level.

1.2 BEST PRACTICE NO. 2 – KEY COST FACTORS TO CONSIDER

The key cost factors that affect the potential for viable GHG mitigation opportunities include the following:

- The costs of financing.
- Capital and operating costs of the mitigation option.
- Duties.
- Tax and royalty regimes, and the extent of any concessions.
- Market accessibility and pricing for any produced products.
- The potential to conserve or utilize recovered natural gas.
- The existence of emission fees and a carbon market.
- Production decline rates and the remaining life expectancy of the facility.
- The potential to redeploy the mitigation technology at other facilities at the end of the current facility's life.

1.3 BEST PRACTICE NO. 3 – ALIGNMENT WITH PRIORITY OBJECTIVES

For a project to advance within any organization it must generally satisfy the following criteria:

- Be clearly defined and properly documented (e.g., a credible business case with sufficient detail and accuracy to allow informed decisions by senior management and potential investors or financiers to invest in the project).
- The risks to costs and time to completion are known and acceptable.
- The economics meet or exceed investment hurdle rates expected for the level of risk.
- Alignment with the operator's priority objectives, core competencies, business strategy and available financial resources.

- Alignment with market key performance indicators (e.g., increased reserves, production, revenues and profits).
- Be competitive with other potential investment opportunities.
- Be sufficiently large to justify the due diligence costs.

Regulatory compliance can override these criteria, especially where failure to achieve compliance puts continued operation of the facility at risk.

The existence of material secondary benefits or rewards can improve the attractiveness of the project, but alone, generally are not sufficient for a project to receive approval. These benefits may include strengthened social license, compliance with future legislation, improved work-place safety, sustainable development, improved system reliability, best-in-class recognition, and potential carbon credits or avoided emission fees.

1.4 BEST PRACTICE NO. 4 – MANAGEMENT OF UNCERTAINTIES

Factors that contribute to uncertainties in the practicability and potential viability of an opportunity include the following and need to be address to a level acceptable to management and potential financiers:

- Differences in design standards and operating practices.
- Differences in the extent of market access.
- Remoteness of facilities.
- Potential security issues.
- Age of the facilities coupled with the rate of production and operational-efficiency decline.
- Reduced use of process instrumentation and continuous monitoring systems making it more difficult to identify and evaluate opportunities.
- Rules, regulations, management systems and fiscal policies that may be a disincentive to emissions reduction.
- Low labour costs and the corresponding emphasis on manual versus instrumented or automated solutions.
- Limited access to, and increased costs of, foreign technologies.
- Limited access to the skilled labour or training needed to operate and maintain advanced technologies.
- Potential quality control issues with locally produced products and technologies.
- Protectionist laws and duties aimed at excluding foreign goods and services.

1.5 BEST PRACTICE NO. 5 - STAKEHOLDER BUY-IN

While it is important to engage an operator's environmental department in efforts to develop short-lived climate pollutant (SLCP) mitigation projects, it is essential to engage the engineering and operations departments.

The environmental group can be an effective facilitator to help identify champions in the engineering and operations departments. Additionally, they have an important role in helping to get regulatory approvals, documenting emissions baselines and reporting the reductions achieved.

Engineering will ultimately be the ones to implement a solution, and will have established standards that must be applied. Operations often have the best insight on where high-impact mitigation opportunities likely exist, their support during field measurement programs is critical and they will ultimately be the ones to operate and maintain the solution. It is the vice presidents these two departments report to that will have the authority and resources to approve specific mitigation projects. Without their interest and support, it is very unlikely that a given mitigation project will be advanced. Neglecting to engage these two departments and address their concerns is a critical oversight in trying to develop a SLCP mitigation project.

Most companies place significant value on their social license. If a mitigation project will address local resident concerns in addition to having sound technical and economic merits, this will weigh heavily in its favour.

2 FINANCIAL TOOLS TO CATALYZE FINANCE

2.1 FINANCIAL TOOL NO. 1 – OPPORTUNITY IDENTIFICATION

There is some logic in developing initiatives to target specific climate pollutants such as black carbon, and their sources. However, applying holistic survey methods aimed at high-potential segments of the industry has proven successful in generating consistent environmental benefits with cost-effective implementable solutions. Moreover, this approach takes maximum advantage of the mitigation review team's expertise and measurement equipment while they are on site, and increases the potential amount of cost-effective emissions reduction opportunities identified. A rational and systematic approach to finding practicable high-impact GHG emission reduction opportunities benefits the environment and is profitable for industry.

Efforts to identify significant cost-effective emission reduction opportunities at North American upstream oil and gas facilities indicate that many types of opportunities have a skewed distribution where a few facilities might be performing very poorly with respect to a specific emissions or

efficiency matter, while the rest are performing very well. At the same time, given the broad range of potential opportunities that exist, most facilities have at least some meaningful opportunities for improvements in GHG emissions and energy management.

There are two main reasons why a significant cost-effective opportunity for GHG emissions or energy management improvement may persist at a facility. Either the opportunity does not produce a readily noticeable effect (e.g., the opportunity may develop gradually over time or it is obscured by other factors), or its magnitude is not easy to determine for the purpose of informing or justifying appropriate mitigative action.

The mitigation opportunities occur due to the following reasons:

- Progressive deterioration of facilities.
- Changes in operating conditions from initial design values.
- Use of outdated technologies, designs or operating practices.
- Budget constraints during initial implementation of an energy development project resulting in design bottlenecks, deficiencies and compromises, which contribute to excessive fuel use, increased venting and flaring, and fugitive emissions.
- A lack of instrumentation, process controls, monitoring systems and performance benchmarking to detect and quantify avoidable losses and inefficiencies.
- Internal polices and key performance indicators that create disincentives for optimizing operational performance.

2.2 FINANCIAL TOOL NO. 2 – PREFEASIBILITY ASSESSMENT

A prefeasibility assessment gives an approximate quantitative indication of the economic viability of an identified opportunity, and is a tool for preliminary screening of opportunities. It comprises the basic activities depicted in Figure 1. To advance beyond this assessment, the opportunity needs to show the potential for both favorable economics and a material impact. If the opportunity is too small, then the operator may find the necessary due diligence too costly relative to the potential benefits. Sometimes it may be possible to combine multiple smaller opportunities of the same or related type to achieve sufficient benefit. Conversely, if a project is too large, then it may be challenging to get the necessary financing. A project is normally considered small when it has a capital expenditure (CAPEX) of less than $1 million, and large when the value is greater than about $10 million.

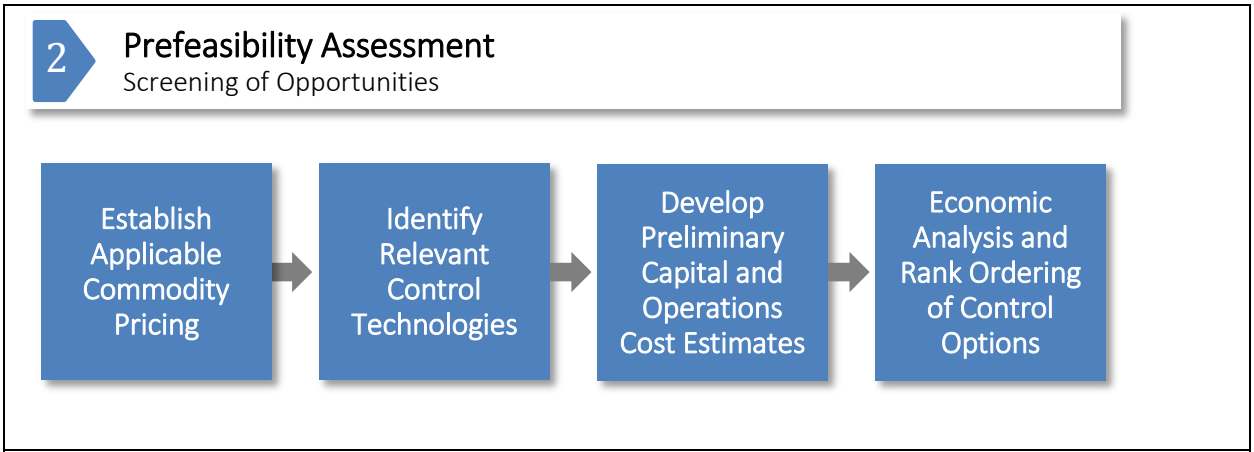

Figure 1: Key elements of a prefeasibility assessment.

Typically, the gross revenue or avoided operating costs achievable by a mitigation measure is estimated based on current commodity prices and data from the limited spot (or point-in-time) measurements performed during the review. A key consideration at oil production facilities (i.e., based on current commodity pricing), is that most of the economic value of any waste associated gas streams rich in non-methane hydrocarbons tends to come from the liquefied petroleum gas (LPG) and natural gas liquids (NGL) fractions rather than the methane. The LPG and NGL value is only realized if the gas is processed on site or at a downstream gas processing plant. Attractive economic opportunities exist to recover the LPG and NGL (even at a small scale), and simply use the methane to power the process with the balance being flared if it cannot be conserved. The recovered liquids can be recombined with the weathered crude oil and sent to market using the existing crude oil transportation system provided the vapour pressure (or volatility) of the blended product is properly managed to comply with the buyer and shipper specifications.

The capital costs used in a prefeasibility assessment are determined using either Class 5 (capacity factored) or Class 4 (equipment factored) cost estimating techniques published by international standard developing organizations ASTM International and AACE International. The results are corrected to present day values and tend to be order-of-magnitude cost estimates. A Class 5 estimate is derived from the available costs of a similar facility or system using a parametric model, judgement or analogy. A Class 4 estimate is derived from similar cost estimates of the major equipment and the use of equipment installation factors.

Operating costs may be estimated using the method published by Chemical Engineering Projects (available at: https://chemicalprojects.wordpress.com/2014/05/11/estimation-of-operating-costs/). Energy and other utilities needs are often the dominant operating costs.

Site-specific constraints and considerations that could materially affect the viability of the project are poorly known at this point. These matters could include, but are not be limited to the following:

- The ability of the existing utility, process and control systems (where applicable) to meet the project needs and the cost implications of satisfying any incremental demands.

- Type of control system required.
- Location and details of existing process and utility tie-in points.
- The amount of piping, electrical and instrumentation work needed to integrate the mitigation measure with the existing process.
- Availability and reliability of current drawings showing structures, underground services, fire protection systems, roads, pipeline corridors, etc.
- Critical environmental and other regulatory requirements.
- The availability of sufficient spacing for the new infrastructure or the ability to satisfy incremental needs at a reasonable cost.
- Access to transportation systems and nearby markets for any new products.
- The remaining life of the existing operation.
- Increased manpower requirements and the need for specialized disciplines that cannot be fully utilized.
- Geotechnical considerations.
- The extent of any opposition from nearby residents.
- Disincentives such as contractual agreements, administrative structure and corporate policies that prevent those responsible for the costs of implementation from sharing in the benefits achieved.
- Lack of practicable on-site opportunities to utilize waste energy.
- The need for any costly safeguarding and monitoring measures.
- Excessive variability or intermittent nature of the source.
- Uncertainties regarding the representativeness of the compiled source data.

In developing countries and countries with economies in transition, additional considerations may include:

- Lack of access to information, contractors, experience and the necessary financial resources needed to complete the front-end engineering assessment.
- Cultural, language, and calendar differences that require more planning and longer response times.
- Differences and difficulties in the local political context in which the companies are operating.
- Slowness of local companies to embrace an international program, for reasons ranging from corporate policy independence, to reticence regarding commitments.

Assuming the above matters can be addressed, the project still has to compete against other potential investment opportunities. Not only must the project be competitive from a financial perspective, but it must also overcome the traditional focus on increasing shareholder value through exploration and development, rather than by reducing wastage or losses and improving efficiency.

2.3 FINANCIAL TOOL NO. 3 – REFINED BUSINESS CASE

The most effective tool to catalyze finance for a project is a credible and compelling refined business case (RBC). The RBC is needed to support decisions by the operator's senior management and potential investors or financiers. The RBC is analogous to a business plan for a specific project. It gives consideration to site-specific conditions and constraints, while drawing on reliable measurement data that adequately characterizes the critical operating parameters, activity levels and stream compositions. The economic analysis is based on accurate cost information (typically Class 3, which comprises current vendor pricing of all major equipment items).

An important element of the RBC is detailing any risks to costs, timely project implementation and reliable ongoing operation of the mitigation measure. The feasibility results are benchmarked against the acceptance criteria of the operator, investor and/or financier. Details are provided to show how the project aligns with the operator's priority objectives and business model.

The key elements of the RBC analysis are presented in Figure 1 below. A front-end engineering design FEED) study is typically conducted to establish how the proposed mitigation technology will be integrated within an existing facility, and to determine equipment needs and sizes to facilitate the solicitation of vendor pricing. The FEED will involve discussions with the operator's operations and engineering personnel, a review of the facility's available design drawings and the application of relevant engineering design standards. Specific matters of concern include how the mitigation measure will be integrated with the existing process operations at the site, where any new equipment will be placed on site, and whether the existing utility services at the site can accommodate any incremental demands that may be placed on them. Additionally, vendor pricing is obtained for the key equipment and materials, the installation costs are assessed in more detail than for a prefeasibility assessment, and the project economics are updated based on this additional information.

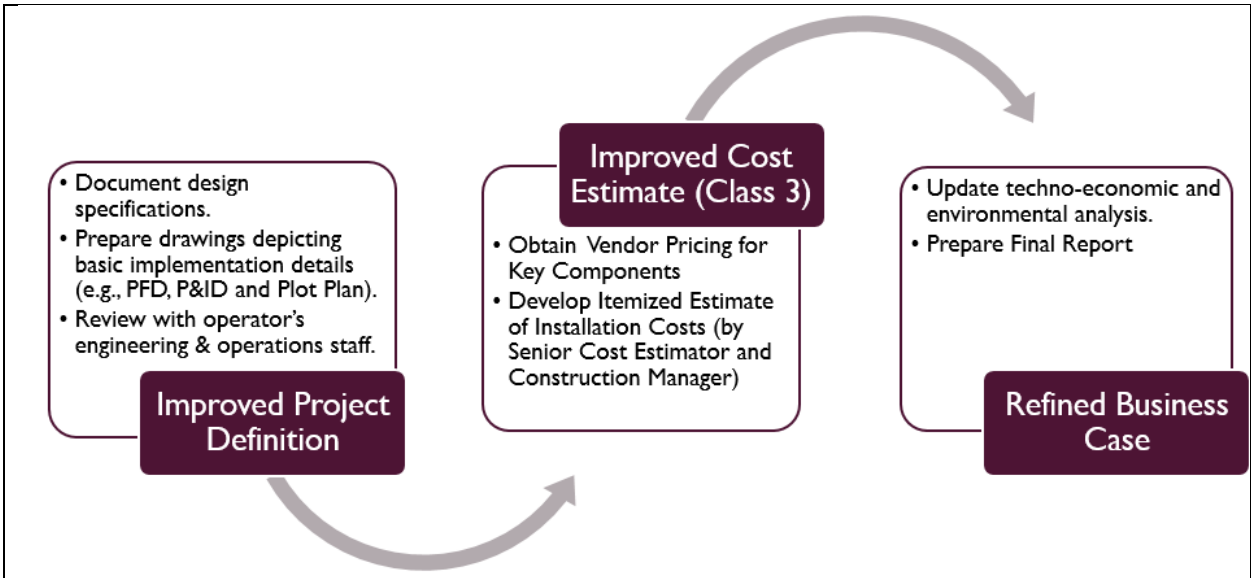

Figure 2: Workflow elements of a refined business case analysis.

2.4 FINANCIAL TOOL NO. 4 – MANAGEMENT APPROVAL AND PROJECT FINANCING

Defining the project and advancing it to the point where senior management and potential investors/financiers can make an informed decision on the matter may require significant time and effort. It is not sufficient that the project is profitable or provides material co-benefits. It must also be competitive against other investment opportunities the operator may have, pose an acceptable level of risk, align with the operator's key performance indicators, and be something that the shareholders, investors and financiers understand and value.

If the project involves a mitigation measure that is familiar to, and commonly implemented by the operator, then its development and approval cycle will be much shorter and less onerous. Projects that are new to the operator or that do not align well with its business model will be much less likely to succeed.

To sell the project to management, it is necessary to show competitive financials, alignment with the company's priority objectives and business model, while also highlighting any quantifiable co-benefits. Co-benefits may include:

- Improved workplace air quality resulting in worker health and safety benefits.
- Improved local air quality resulting in human health and environmental benefits as well as improved public relations.
- Reduced wastage, inefficiencies and system losses resulting in improved profitability (i.e., through conservation of a non-renewable resource, increased product yields, improved system reliability, increased sales and reduced energy consumption).

2.5 FINANCIAL TOOL NO. 5 – FINANCING STRATEGIES

The financing mechanisms for cost-effective GHG mitigation projects include the following and are depicted in Figure 3:

- Self-Financing (i.e., from internal cash flows).
- External Financing.
- Partnerships
- Third-Party Agreements

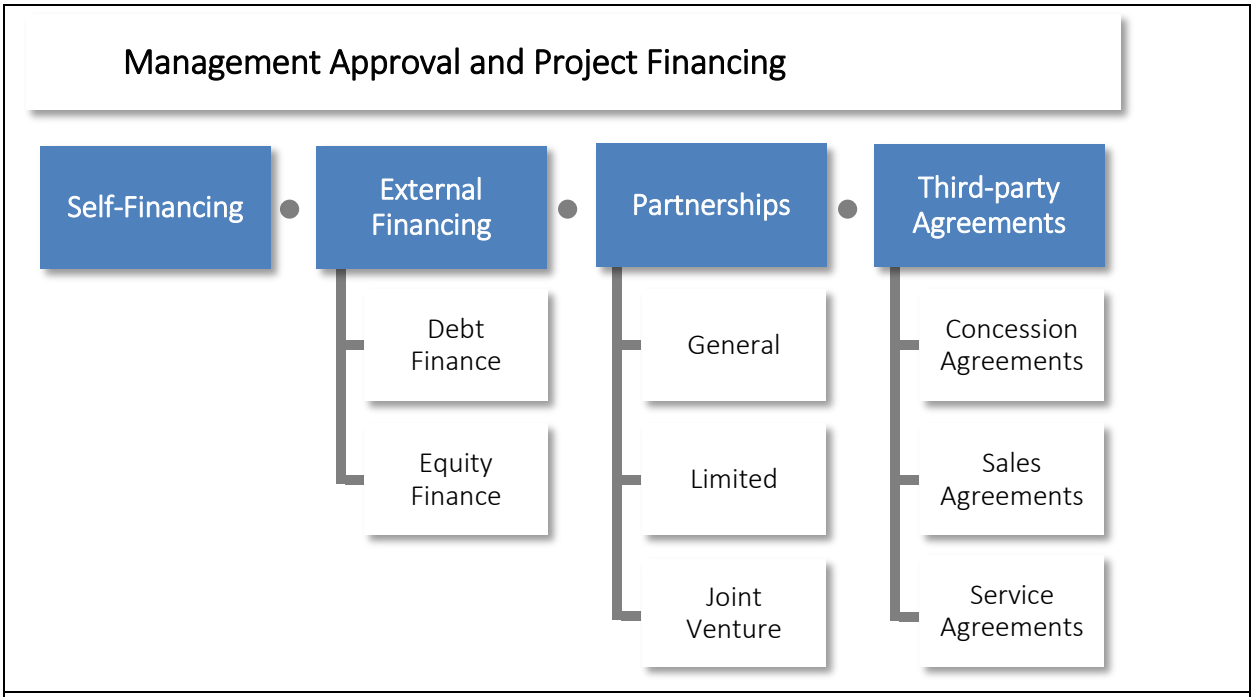

Figure 3: Potential project financing mechanisms.

2.5.1 SELF-FINANCING

If a company is profitable, then it may consider financing GHG mitigation projects out of its own revenues. This approach avoids interest payments and the need to repay any capital, but may only be practical for small to medium sized projects.

In the same way that some companies devote a certain percentage of their revenues to research and development efforts, some companies have given thought to either allocating a certain percentage of their revenues to green projects or establishing an internal green fund that would be used to finance its own green projects. The intent in the latter case would be for the fund to share

in a portion of the revenues generated by the green projects it sponsors so that the fund can grow and continue to support such projects.

2.5.2 EXTERNAL FINANCING

There are two main types of external finance: debt and equity. Debt finance is money borrowed from external lenders, such as a bank, which must be paid back with interest in accordance with an agreed repayment schedule. Equity finance is money received from an investor in exchange for a percentage of the business. Investors or "equity partners" usually do not expect a return on their investment for 3 to 5 years, but often exit after 5 to 7 years.

Some of the key advantages of debt financing are that the interest on loans is usually less than the return on equity investments and is tax deductible; however, the borrower is burdened with making regular principal and interest payments regardless of how well the business is doing. Equity financing avoids the need to repay any capital, but requires giving up some control of the company and imposes an increased reporting burden on the company.

Bonds are another means to finance a project. A bond is a fixed-income instrument in which an investor loans money to an entity (corporate or governmental) that borrows the funds for a defined period of time at a fixed interest rate. Green Bonds are bonds dedicated for qualifying climate and environmental projects. They are typically asset linked and backed by the issuer's balance sheet. According to James Chen at Investopedia (2019), Green Bonds come with tax incentives such as tax exemption and tax credits, making them a more attractive investment compared to a comparable taxable bond. This provides a monetary incentive to tackle prominent social issues such as climate change, and a movement to renewable sources of energy. To qualify for Green status, a proposed bond issue is verified by a third party, such as the Climate Bond Standard Board, which certifies that the bond will fund projects that include benefits to the environment. Unfortunately, Green Bonds generally are not given to fossil fuel producers, and definitely not if the GHG mitigation measure is seen as a means of extending the life of a fossil fuel project. The only oil and gas projects that potentially quality would be those involving conversion to renewables (e.g., using solar panels to power instruments), and those aimed at managing fugitive emissions. Other potential options include Sustainability Bonds and Social Bonds.

Sustainability Bonds are bonds where the proceeds will be exclusively applied to finance or refinance a combination of both green and social projects. The International Capital Market Association (ICMA) has published Sustainability Bond Guidelines (SBG) as well as Green Bond Principles (GBP) and Social Bond Principles (SBP), and these are available at https://www.icmagroup.org/. Social Projects may have environmental co-benefits, and certain Green Projects may have social co-benefits.

2.5.3 PARTNERSHIPS

An operator (or resource owner) may consider participating in a corporation or other entity with third parties for the purpose of implementing and operating a specific GHG mitigation project or group of projects. This approach would potentially avoid any debt burden by the operator. The operator as the owner of the produced hydrocarbons could contribute waste natural gas to a new entity formed with the third party or parties, and receive proceeds from the products produced and sold by that entity. The new entity would assume all financing and operating risks as an independent entity. This avoids the need for the operator to obtain financing directly. Incorporating a new entity also would facilitate the entry of different specialized investors interested in the reduction of GHG emissions by allowing them to participate directly in the created entity.

There are three types of partnerships: general, limited and joint venture. In a general partnership, each partner shares proportionately in the workload, liability and profits generated.

Limited partnerships allow outside investors to buy into a business but maintain limited liability and involvement, based on their contributions. Although a more complicated form of partnership, it offers more flexibility in terms of ownership and decision-making.

Joint ventures are for short-term projects or alliances. If the venture performs well, then it is continued as a general partnership; otherwise, it is dissolved.

Some countries have signed international treaties on foreign investment that provide certainty and protection to foreign investors. As well, some countries offer concessions specifically aimed at advancing certain types of GHG mitigation projects (e.g., royalty holidays, duty waivers on equipment imported for green projects, etc.).

2.5.4 THIRD-PARTY AGREEMENTS

There are three main types of third-party agreements that may be considered as a form of project financing: concession, sales and service.

A concession agreement may take many different forms such as BOT (build-operate-transfer), BOOT (build-own-operate-transfer), BLT (build-lease-transfer), DBOT (design-build-operate-transfer), etc. They all involve a private entity receiving a concession from the operator (resource owner) to finance, design, construct and operate the facilities defined in the agreement in return for the private entity realizing a satisfactory internal rate of return for its investment. At the end of the concession period, the asset is transferred to the operator at no cost. The private entity typically creates a special-purpose entity that enters into the concession agreement, and that entity often obtains debt financing for the project. The special-purpose entity then subcontracts a third party to perform its obligations under the concession agreement. A supply contract is established as part of this agreement to ensure that the project has the necessary access to the waste natural gas stream during the concession period.

Under a sales agreement, the operator transfers the waste natural gas to a third party who is then required to design and install all the equipment needed to capture and commercialize the resource.

This is a form of build-own-operate (BOO) agreement. The operator would sell the raw (unprocessed) natural gas to the third party at the source and allow it to perform, by its own means, any activity required to capture and commercialize the natural gas. Ownership of the natural gas is transferred to the third party after the fiscal point established for the quantification of natural gas for tax and royalty purposes. The operator is responsible for paying those fees but obtains the benefit of the revenues received from sale of the natural gas to the third party. Moreover, the operator does not have to transfer ownership of any of its assets other than the natural gas and does not have to invest any money. The third party assumes the full burden of the project's capital and operating costs, as well as the responsibility for converting the raw natural gas into a marketable product or products and getting them to market. However, it realizes the full benefit from the sale of those products.

Under a service agreement, another type of BOO arrangement, the operator receives an integral service from a third party in exchange for a fee to manage natural gas losses and avoidable system inefficiencies. Examples include, implementing a gas conservation scheme, utilizing waste gas to reduce the operator's purchase of fuel and electricity, installing vapour and waste heat recovery systems, managing fugitive emissions and avoidable system inefficiencies, etc. The operator does not have any liability to other parties for implementation and ongoing operation of the project other than payment of the service fee. The third party has the burden of securing all necessary finance for the project, but in return, obtains a long-term service agreement that allows it to cover its operating costs and make a reasonable rate of return on its investment.