FINANCIAL ASSURANCE SYSTEM IN THE OIL INDUSTRY: A DECISION MODEL FOR AN ENVIRONMENTAL BOND SCENARIO

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Abstract. *In several countries financial assurance requirements are not part of a hypothetical scenario. In fact, this regulatory regime has been adopted to guarantee that sufficient financial resources are available for the closure and/or remediation of an oil field in the event that the owners or operators become insolvent. These conditions must be complied with (certain financial guarantee steps) before a permit is issued. Furthermore before any person engaging in the business of drilling for a producing well or before an operator drills, deepens, or otherwise permanently alters the casing of a well, a bond must be drawn to cover all drilling, operations, plugging, abandonment, and decommissioning environmental responsibilities. Such requirements assure that the environment and the public will be protected during exploration and production and that the producing area will be restored for other uses after the oil related activity ceases. Considering a hypothetical regulatory scenario in Brazil this paper shows an oil-producing project, which faces the problem of selecting the best alternative form of environmental bond in order to minimize its financial impact. Based upon a discount cash flow analysis this present work proposes a decision model that estimates for each environmental bond the option which offers the least economic impact in the project and, at same time, provides the best financial guarantee for all stakeholders involved in the process.*

Key words: *Financial Assurance, Environmental Bonds, Decommissioning, and Decision Model.*

1. INTRODUCTION

The world depends on fossil fuels for more than 60 percent of its total energy needs (ODCP, 1998). Offshore exploration became a very important energy source since it was launched in 1947 in the Gulf of Mexico and latter followed by the discovery of expressive reserves in the North Sea during the 1960's. Of great significance for South American economy, was the discovery of the offshore reserves at Campos basin in Brazil.

Today over 6,500 offshore installations are in place around the world. From this figure, 4,000 are in Gulf of Mexico, 950 in Asia, 700 in the Middle East, and 400 in Europe (ODCP, 1998). Although retaining the record for deep-water exploration, Brazil has approximately 60 offshore platforms (Brasil Energia, 1999).

Offshore platforms can be designed for a variety of needs (i.e. platforms for drilling, storage, processing, and accommodations), environments and purposes. Parameters such as water depth, distance from shore, environment setting (rough seas, harsh climate, etc.), will prescribe the type of installation to be built (i.e. steel jacked platform/shallow waters; concrete gravity structure; steel gravity structure; floating production system; steel jacked platform/deep waters; and tension leg platform).

Usually offshore installations have a life span of approximately 20 years. Although most platforms were not designed to be removed (and recycled), at the end of this period unless the platform is re-used (relocated), it must be decommissioned. Consequently in the next 30 years (between 2000 and 2025) approximately 6,500 installations will have to be decommissioned at an estimated cost of $20-$40 billion (Coleman, 1997).

Issues such as decommissioning and abandonment of offshore installations had indeed been ignored until recently. The present growing interest in the subject originated recently during the development of the public and consequently political outcry over the decommissioning the Brent Spar installation in the Northeast Atlantic in 1995. From this point on the International Maritime Organization (IMO) set the standards and guidelines for the removal of offshore installations which became the foundation of most national and regional legislation governing such processes. Fortunately most governments admit that there are a variety of approaches to specific offshore situations. A particular rule enforced to all installations involving a variety of scenarios (available technology, environmental impact, safety and cost) will not furnish the best result. Therefore each case has been examined on a case by case basis. Often there is no optimum solution and the best that can be achieved is the "least worst solution" (Coleman, 1997).

This issue has a great economic impact on the industry, governments and public in general. Presently there are several mechanisms being used to guarantee the availability of financial resources (from the industry) for the decommissioning of offshore installations. Mechanisms such as financial assurances (bonds) may have a significant impact on the investment since the cost for decommissioning has to be secured before an exploration permit is issued. Through the traditional point of view of the industry, any financial resource applied in this process is considered a lost investment. Companies usually look for low cost solution, but on the other hand the industry acknowledges that its public image has a great value in today's economy. Governments, which are responsible for creating and implementing the regulations, must come up with financial mechanisms to guarantee the availability of resources in case of environmental accidents and/or insolvency; on the contrary they will cope with the bill. Independent contractors see this as a great financial opportunity. Tougher regulations would bring more contracts and consequently more money.

Under the public standpoint, decommissioning costs may be allowable against tax. Consequently, the taxpayer will be paying for part of the process. A recently survey shows that if the total removal of offshore facilities in the Northern Seas (the study suggests 435 platforms) becomes an obligation, the taxpayer may have to pay an additional US $400 million to $2,200 million for decommissioning up to the year 2020 (Scheelhaase, 1997).

This paper does not intend to discuss the technical aspects of the decommissioning process neither to discuss the extent of financial impact on the different stakeholders, but rather emphasizes the financial impact brought upon an investor by a specific financial assurance (bond) regime.

1.1 Decommissioning

According to ODCP(1998), the term *decommissioning* is used to describe all stages of the process initiated when an installation approaches the end of its useful life. Such process involves the detailed planning and approval procedures, sealing the well and making it safe, removal and re-use, recycling or disposal of all, or part, of the installation. Besides all the logistic and technical analysis, large facilities require long term planing which involve environmental impact assessment, safety studies, economic evaluations, etc.

The term "decommissioning" can also be used for onshore processes. In spite of the fact that the terms "decommissioning" and "abandonment" are often used interchangeably for onshore applications, they embodied different meanings. Abandonment usually designates the plugging and capping of a specific well (or purging and capping of a pipeline). Decommissioning commonly refers to the facility itself, and is in general a process consisting of three phases: (1) dismantling, (2) decontamination, and (3) reclamation. Dismantling involves the removal of all surface equipment, buildings, and the abandonment of any well bores and pipelines. It also involves the removal of all salvageable material, including gravel, pipe in the ground, and any liquids in its pits or tanks. Decontamination, involves clean-up, removal, neutralization, or any other action which would render any surface or subsurface contamination harmless, or of very low risk to the environment. Reclamation involves returning the disturbed site to the land, soil and vegetation standards established by regulatory agencies (Alberta, 1998).

1.2 Decommissioning Guidelines

The London Convention, a treaty signed by some 50 countries, governs the disposal of waste and material at sea and it specifically addresses offshore platforms. Since no "International Law" can be in fact enforced, a framework of international conventions, treaties, guidelines, regional agreements, and national legislation, regulates the decommissioning of such installations. The IMO sets the standards and guidelines for removal of offshore installations (an interpretation for the 1982 United Nations Law of the Sea Convention – LOS): (1) installations weighting less than 4,000 tons, located at places where the water depth is less than 75 meters, must be completely removed from the site; and (2) installations located at water depths greater than 75 meters must be removed to a depth of 55 meters below the surface avoiding navigation hazards.

1.3 Decommissioning Process

Basically in most cases the decommissioning process will involve two parts: dealing with the "topside" and the "structure" or "jacket". The topside is usually taken to shore for recycling but they could also be disposed of in deep waters, re-used, used as artificial reefs, or toppled on site. The steel sub-structure is the cause of the main controversies since it could be left in place, partially removed, or totally removed.

Consequently, due to the complexity of the different combinations of installations and settings, finding a single and unified solution for all cases may not be possible. The elaboration of the decommissioning plan must take into account environmental and non-environmental factors, including technical and financial considerations (ODCP,1998). Besides, there is a lack of an adequate methodology to estimate the tradeoffs, and help the decision-maker find the best available alternative.

2. THE MODEL

This paper deals only with regulations for decommissioning of offshore oil and gas installations and does not involve the environmental regulatory regime as a whole (i.e. oil spills, accidents, fires, etc.). Nevertheless, there are regimes presently adopting financial assurance instruments to ensure environmental sound performances in the oil industry.

2.1 – A Proposed Brazilian Regulatory Framework

Considering that the present Brazilian legal framework does not require any form of financial assurance instrument (bonds) for decommissioning purposes, several assumptions are adopted in order to make the application of the proposed decision model possible as describe in Fig. 1.

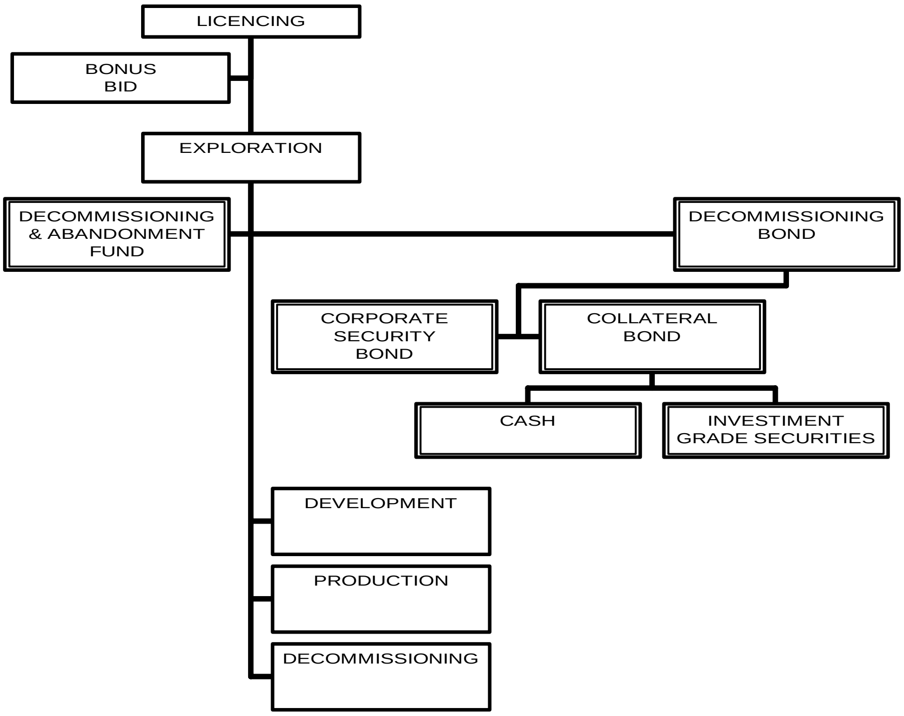

Fig. 1. Flowchart showing all stages of the project and the possible forms of financial bonds

The following hypothetical scenario is based upon several different legal regimes, which adopt financial assurance mechanisms in order to ensure environmental compliance both in the US and Canada. Despite they are not currently adopted in the present Brazilian legal framework they can probably be use as a benchmark for a comparative analysis

Perhaps the most prominent use of financial assurance mechanisms in the resources industry is in the US Coal Mining industry. Presently coal mining operations within the US are under the Surface Mining Control and Reclamation Act (SMCRA) of the 1977 and the attendant US Federal regulations at 30 CFR Part 700 (Bryan, 1998).

This paper assumes for simplification a single licensing period taking place at the beginning of the project. During the licensing period an environmental impact assessment report, a risk assessment report and an environmental control plan will be requested. The license granted will authorize within a particular basin, exploration, research activities, drilling, development and production activities, the installation of units and systems necessary for production and transportation, and finally, operation. Yet, prior to exploring and/or producing oil, decommissioning operations must be permitted and bonded (Decommissioning Performance Bond) under the requirements of the hypothetical Brazilian Decommissioning Act (BDA) enforced by the regulatory agency. In this paper, ANP is adopted as the regulatory agency, that can be replaced by any other agencies where applicable.

The main purpose of the BDA is to ensure that the environment and citizens are protected and the portion of the sea occupied during exploration and/or production is restored to its original state following decommissioning posing no threat to navigation.

2.2 Scenarios Involved in the Decision Model

As far as our scenario is concerned, Decommissioning Bonds come in one of the three major forms: (1) Corporate Surety Bonds, (2) Cash Collateral Bonds, and (3) Investment Grade Securities Collateral Bond. The two other alternative scenarios are (1) the Decommissioning and Abandonment Fund, and (2) the No Compliance scenario, where the operators fail to comply with the BDA .

2.3 Financial Assurance - Bonds

The main objective of the Decommissioning Performance Bonds to ensure that operations involved in the decommissioning process are performed as contractually determined. Such financial instruments move decommissioning costs up front-end, toward the beginning of the project (Figure 2), guaranteeing that resources will be available when required, avoiding any risk of insolvency of the operators, and consequently placing the burden on tax payers.

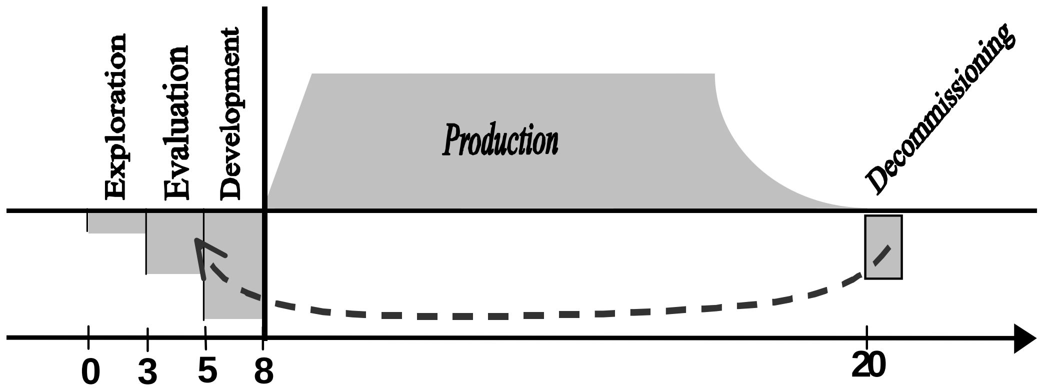

Fig. 2 Finance Assurance Bonds Scheme
0 – 3 yr. → Exploration; 3 – 5 yr. → Delineation/Evaluation; 5 – 8 yr. → Development; 8 – 20 yr. → Production; 20 – 22 yr. → Decommissioning

Decommissioning bonds are financial instruments with unique attributes and requirements. Some forms of bonds are the pledged assets of an oil company (cash, securities, real estate, etc.). Others are guarantees for a company’s performance analogous to an insurance policy (surety bonds), and some are instruments that indicate the deposit of cash (CDs) or the existence of a line of credit (LOC´s) (Bryan, 1998). All form of bonds must be made payable to (or pledged to) the regulatory authority.

The amount or sum of the bond is based on estimated third party costs to complete the decommissioning plan in the event of forfeiture. The regulatory agency sets the bond based upon the operator’s cost estimate for decommissioning. For this paper the bond amount will be equal to the decommissioning cost plus 15%, which represents the third party costs to complete the decommissioning phase.

After decommissioning requirements are met by the operators, the bond may be released. However, even after all the decommissioning process is completed, there is a 1 year waiting period (liability period) that must expire before the bond may be released. The waiting period will increase the life of the project in one year (not including the time already moved up due to the decommissioning).

The regulatory authority will not allow posting bonds for a group of wells (blanket bonding). Bonds are posted to cover a 5-year, renewable term of permit. As production goes forward, bonds get adjusted to cover project additions (incremental bonding). Companies must apply for full or partial bond release after decommissioning is completed.

2.4 The Oil Project

The present paper deals with a simulated offshore oil project in Brazil. The main financial figures for the project can been found at table I. The overall production volume estimated during the life span of the project will be 200 MM boe

The installation used is a Steel Gravity Structure. At the end of the project the structure must be cut into sections, placed on a barge, and transported to shore where they will be mechanically dismantled. The parts will be recycled whenever possible and the remains will be disposed as scrap. The decommissioning process will involve exhaustive diving activities, offshore activities such as lifting with the assistance of winghline and other specialized equipment, towing, etc.

Many other alternatives for decommissioning indeed are available, but for the sake of demonstration, the most expensive procedure was chosen. The total cost for the decommissioning of the offshore installation was estimated at US $78M, giving a cost of 0.20 US$/boe

2.5 Decommissioning Corporate Surety Bond (SB) Scenario

In this scenario, the oil company decides to use the surety bond as the financial guarantee instrument for the project. When a surety company writes a surety bond, it guarantees that the oil company will perform all operations related to the decommissioning process in a specific installation. Otherwise, the Surety Company will pay the bond sum to the ANP, which will pay a private contractor to perform the decommissioning. Corporate surety bonds posted to meet ANP’s bonding requirements are non-cancelable under the law, even for the failure to pay premiums and/or in the event of bankruptcy or insolvency of the operator.

Surety bonds are similar to insurance policies in that oil companies pay annual premiums to keep the surety bonds in place. The annual premium is based on a percentage of the bond. The proposed scenario follows the recommendation of the Surety Association of America (USA) which suggests US$ 12.50 per US$ 1,000 per year as the premium (1.25%). Nevertheless surety companies charge according to the financial standing of the oil company (net worth level), credit rating and experience in the decommissioning of installations, etc. (pre-qualification).

The providers of the bonds are surety companies and banks. Surety bonds may only be accepted from surety companies that are approved by the Federal Government (Central Bank) or other regulatory associations (Surety Associations, etc..)

The ANP and Federal Government rely on the Central Bank to regulate the financial requirements so that surety companies are solvent (financially secure). If the Central Bank finds that a company no longer meets the financial requirements, the company may be closed/liquidated. Oil companies must replace bonds written by surety companies that are liquidated or taken off the Central Bank's list.

Each surety company follows its own financial criteria to judge an oil company and fix premium rates (more net worth, smaller premium rates).

The amount to be bonded is US $89.7 million. The benefit of the use of surety bonds is that no up front funds must be disposed of. In this case, the oil company had a good financial evaluation by the surety company and was able to get a reasonable annual premium rate (1,25%). The annual premium will be allowable against tax.

At the end of the production the company will have to dispose of US $78.0 million to perform the decommissioning of the installation. Note that the bond was acquired only as a financial guarantee for the regulatory agency, but the decommissioning still has to be paid for. When compared to the other forms of guarantees, it is demonstrated that the future value of the funds required at the beginning surpass the total premium paid throughout the project.

If the company remains solvent and concludes the required decommissioning, the bond is released (the premium payment ceases). In case of forfeiture (insolvency or failure in accomplishing the terms of the contract) the surety company that issued the bond will pay for the decommissioning and a penalty (ANP fine, which corresponds to 10% of the total bond amount) will be imposed on the oil company. Note that there are further complications to a company forfeiting the decommissioning of an installation. The company may loose its operating license, its credit, and reputation, among other punishments. The present paper does not consider the further economic consequences of a forfeiting company.

2.6 Decommissioning Cash Collateral Bond (CB) Scenario

Cash collateral bond is placed in a bank in a federal insured account under an escrow agreement between the oil company, the bank, and the ANP. An escrow agreement would specify that the ANP has full control over the account until it is released after decommissioning. The company earns interest on the escrow account and the interest is available to as it is earned (annually). In the proposed scenario the account pays 5.25% interest per year. Since interests are paid annually, there is no change on the total investment and the interests paid will remain the same year after year.

As it will be seen, cash is not an efficient way to finance long-term operations with high decommissioning costs. Long-term (20-year) projects will likely be covered by one or more surety bonds, a trust fund where money is deposited annually in escrow, or letters of credit.

Under the proposed scenario the company would not be able to use the deposited collateral money to fund decommissioning. The company would have to pay for the decommissioning out of operating costs.

After successful decommissioning and release of the bond (bond obligation), the money would be returned to the oil company via federal warrant, bank check or via wire-transferred funds. In case of forfeiture (insolvency or failure in accomplishing the terms of the contract) the bond amount (US$ 98.7 million) would not be returned to the company but instead it would be used by the regulatory agency to contract an independent operator to perform the decommissioning. In addition, a penalty (regulatory Fine, which corresponds to 10% of the total bond amount) would be imposed.

2.7 Decommissioning Investment-Grade Security Collateral Bond Scenario (IGS)

Some bonding instruments such as investment security grade, certificate of deposits and letters of credit are considered to be negotiable instruments. Therefore, the regulatory agency secures such instruments in banks, locked filing cabinets, vaults, etc., in order to safeguard them from loss, theft, etc. The status of the decommissioning bonds being held by the ANP is constantly tracked by the agency.

All forms of instruments used as collateral bond may be held for long term (i.e. 20 years). Certificates of Deposit are set up to be self-renewing so that when they mature, they roll over for the next term(s). In the case of investment-grade securities such as Treasury Bills/Notes, they would have to be purchased with a long-term maturity period to avoid the need for frequent substitution in order to keep earning the interest. To make it interesting (in the present simulated scenario) a US $98.7M treasure bill with a 20-year maturity period is purchased (issued). This cost will be allowable against tax. The interest rate paid by the security corresponds to 5.50% per year. The interest will not be available to the company until its maturity is reached.

After successful decommissioning and release of the bond, the security is then released to the company along with the accumulated interest. In case of forfeiture, the security would be released to the ANP (US$ 98.7 million) which would use the fund to contract an independent operator to perform the decommissioning. Furthermore, a penalty (ANP Fine, which corresponds to 10% of the total bond amount) would be imposed.

2.8 Decommissioning and Abandonment Fund (DAF) Scenario

This fund is set as a “pay as you go” scenario. The decommissioning cost is taken to a future value that is capitalized at a rate of 5.25% per year and spread over the project life. The annual payments are allowable against tax. The fund collected annually is placed in an earmarked federal treasury account assigned to the ANP. The ANP would manage the fund and no interest would be earned.

In this scenario the financial burden upon a company is lighter, since there is no obligation for financial assurance for the decommissioning. On the other hand, it goes back to a traditional domestic scenario, where there is no guarantee for funding at the end of the project. The cost will then be transferred to the taxpayer. The only penalty for the company will be an ANP fine, which corresponds to 10% of the bond. In this case there is no incentive for compliance and the penalty for forfeiture is very light.

2.9 No Compliance (NC) Scenario

The “No Compliance” scenario can be used to demonstrate the financial performance without decommissioning requirements. Since there is no need for decommissioning, the duration of project is 18 years.

In the proposed scenario there is no decommissioning cost. The company operates without directing any resources to the removal of the offshore installation. To make the model feasible, heavy penalties are imposed, such as: (1) ANP fine for failure to perform the decommissioning of the installations (10% of the bond amount); (2) ANP fine for failure to bond all decommissioning activities (100% of the bond amount); and (3) IBAMA fine for environmental aggression (150% of the bond amount).

2.10 The Decision Model

The decision model used for evaluating all five alternatives was a typical decision tree model associated with each cash flow analysis. This model provides a tool for scenario analysis and its tradeoffs, offering visualization of the alternatives for decision making process.

The software used was the TreeAge (1998). Fig.3 presents the output of the simulation with all alternatives.

The oil company faces the problem of choosing the best alternative to deal with the decommissioning regulatory regime. The decision-maker has to identify the option that inflicts the lesser impact upon the company's finances. Therefore, the main purpose of this model is to minimize the economic impact of the environmental regulation upon the company's profitability.

The probabilities used for each scenario do not have specific bases (Fig.3). The probabilities used for the No Compliance obey a common sense rule. The probabilities used for the bonds (Surety and Collateral) roughly follow the statistics collected in the US Coal Industry.

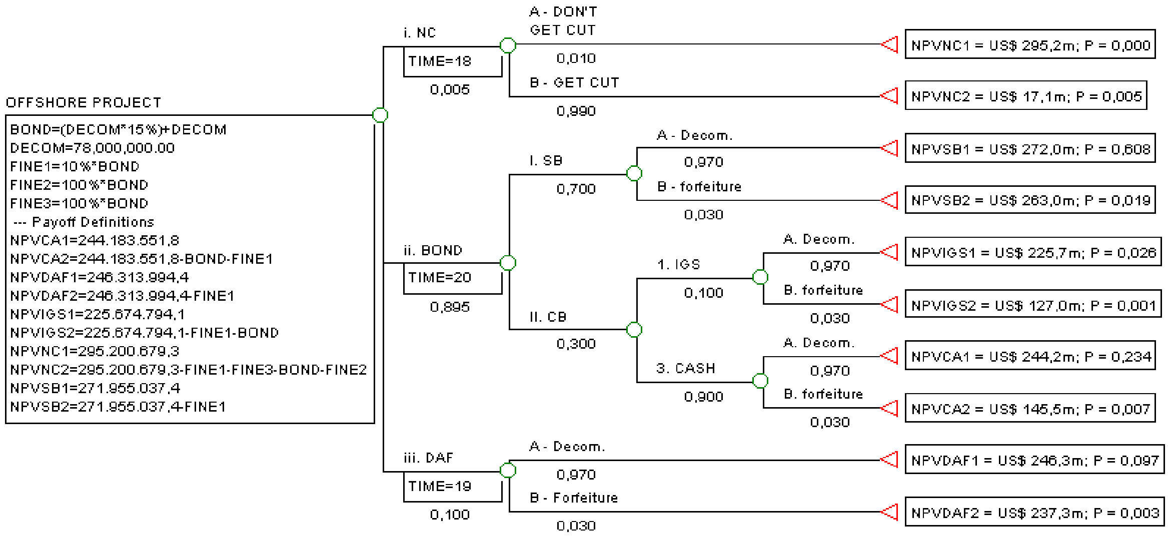

Fig. 3. Decision tree model diagram.

Note: On the left, the Offshore box shows all the variables and payoffs involved in the decision model. Decommissioning (Decom.); Fine 1 (ANP); Fine 2 (ANP); Fine 3 (IBAMA); NPVCA (cash bond); NPVDAF (decommissioning and abandonment fund); NPVIGS (investment grade security bond); NPVNC (no compliance); NPVSB (surety bond). The terminal boxes show in this order payoff name, NPV (@ 15%), and probability of occurrence within the proposed scenario.

2.11 Results

Despite the empirical characteristics of this paper, there are interesting outcomes to be considered (Table I). For instance, the bond mechanism, an economic approach to environmental concerns, provides incentive for compliance. The amount directed to the decommissioning of the installation represents only a small portion of the investment. When accordingly selected, the bond cost may become an investment. The difference between the NPV of the “No Compliance” scenario and the worst NPV (IGSB) is not significant. If the “No Compliance” scenario is not taken into consideration, the difference between the NPV values is only 17%. Even providing financial guarantee for decommissioning in the project, the total net cash flow for all scenarios vary only 9%. Even though the NC scenario offers a good payoff (“getting away with it” scenario), the alternative payoff for the most probable outcome (“getting cut” scenario) is very discouraging (Fig.3)

Table I. Financial Output for the 5 different scenarios

A) OPEX (US$/bbl)	3.16	3.16	3.16	3.16	3.16
B) CAPEX (US$/bbl)	1.56	1.56	1.56	1.56	1.56
C) OIL TAX (rental+bonus+roy+PE)/bbl	2.00	2.00	2.00	2.00	2.00
D) CORPORATE TAX (IR+cofins+pis+CS)/bbl	3.47	3.47	3.53	3.56	3.44
E) GOVERNMENT TAKE (C+D)/bbl	5.47	5.47	5.53	5.56	5.44
F) DECOM. FINANCIALCOST/BBL	0.00	0.52	0.36	0.60	0.60
G) DECOM. INCOME/BBL	0.00	0.00	0.00	0.64	0.89
H) DECOM. BALANCE (F+G)/BBL	0.00	(0.52)	(0.36)	0.04	0.29
K) TOTAL NET CASHFLOW	1,622,8M	1,476,6M	1,504,1M	1,607,9M	1,551,2M
K) TOTAL NET CASHFLOW/bbl	5.81	5.28	5.38	5.75	5.55
L) NPV (@15% NPV)	295,2M	246,3M	272,0M	244,2M	225,7M
M) TIR	25.7%	24.1%	25.2%	23.1%	22.6%

(1) no compliance (NC); (2) decommissioning and abandonment fund (DAF); (3) surety bond (SB); (4) cash bond (CB); and (5) investment grade security bond (IGSB).

The Decommissioning and Abandonment Fund (DAF) mechanism neither provides an incentive or a financial guarantee for the ANP. The DAF scenario provides a good NPV and collects resources for the decommissioning. However, if the company becomes insolvent the burden will be placed on the taxpayer. The difference between payoffs (decommissioning and forfeiture) for this scenario is modest, lacking financial incentive for compliance.

Among the many types of collateral bond we chose to work with IGS and cash bonds. In this specific scenario, the IGS did not provide a good payoff since it had a maturity period of 20 years. The company was only able to receive the security interest at the end of the project. Probably if other types of securities and maturity periods were used the results would have been better. Cash bonds, as mentioned before, is not an efficient way to finance long-term operations with high decommissioning costs.

The Surety Bond is a very interesting tool. It could be compared to an insurance policy, with the advantage of carrying the economic incentive for compliance. Besides, there is no need for up front disbursement. Companies interested in this type of instrument will have to provide good financial and environmental performance records, consequently it works as an incentive. Good ranking guarantees lower premium rates.

Conclusions

There are no significant differences between NPV values on the different scenarios. Therefore, financial assurance instruments, which guarantees availability of resources at the end of the project allowing decommissioning, can be considered feasible by regulatory authorities. The economic impact of the financial assurance system has yet to be compared to other economic regulatory approaches such as environmental trust funds, environmental liens, environmental taxation, environmental insurance, etc.

Additional research on these market instruments is still needed. Some of the issues that should be further studied are: (1) Should environmental bonds be tax deductible? what are the potential impacts?; (2) what would be the macro economic impact of a decommissioning bond regime in Brazil? Allocated funds brought by bonds and kept in place for long periods of time, can positively be leveraged.

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