RESEARCH ON ECONOMIC EFFECTIVENESS OF EXPLOITING MARGINAL FIELDS IN VIETNAM

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SUMMARY OF ECONOMIC DOCTOR THESIS

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INTRODUCTION

1. The urgency of the Subject

In recent years, economic developments of the country have caused challenging problems in finding energy sources to ensure the sustainability of economic development. Therefore, the National Oil and Gas Group (PetroVietnam, or PVN) has submitted to the Prime Minister of the Government (PM) and got approval for the “Development Strategy of Vietnam Petroleum Industry by 2015 with direction to 2025” in Decision No. 386/QD-TTg dated March 09, 2006; and implemented the Scheme on restructuring the Group in accordance with the Decision No. 46/QD-TTg dated January 05, 2013 by the PM, in which: Specifies the focus for investments on searching and exploring to increasing the oil and gas reserves, and developing oil and gas exploitation; and emphasizes that this is a core task which is very important to the development of PVN, the economic development of the country, and contributes to ensuring energy security for country development.

According to the Summary Report on Development Strategy of Vietnam Petroleum Industry for the past 10 years (2006-2015), about 75% to 80% of the fields detected in the entire continental shelf of Vietnam are marginal fields. On the other hand, based on the reserves detected, 30% of detected oil and gas reserves are from marginal fields. The problem here is that there should be solutions to realize developments of these marginal fields to ensure the achievement of the core objectives, successful implementation of search, exploration and exploitation of oil and gas to increase the annual reserve by about 35 to 40 million tons (of oil)/year, and targeted annual exploitation of 20 to 25 million tons (of oil)/year.

Like in many countries around the world, the marginal fields are often difficult to be put into operation immediately after detection because of the following reasons: (i) Unfavorable geographical conditions and infrastructure, not allowing field exploitation and development; (ii) Market factor and product selling price are not enough to encourage investors to continue investing in development and exploitation; (iii) Preferential policies, financial institutions, and terms and conditions for commitments (Taxes, interest division rate, cost recovery, commissions, surcharges, fees and charges removed, etc.) are not enough to encourage investment; and development effectiveness of fields does not reach expectations of investors; (iv) Investment environment, economic and social stability and macro policies do not guarantee the investors that they can be assured to invest for long-term development in the local country; (v) Policy reforms specific to marginal fields and specialized legal framework are not appropriate and do not encourage investors to develop marginal fields.

In the context of the Oil and Gas industry facing unprecedented difficulties and challenges, the fact that the world’s oil prices fell sharply from October 2014 and deeply in early 2016 to USD27/barrel, the lowest for past 13 years and it is forecast that this is difficult to recover quickly in the next time has a direct negative impact on enterprises operating in oil and gas exploration and exploitation. To ensure domestic oil and gas output, there should have incentive policies to encourage oil and gas contractors to invest in developing marginal fields in Vietnam, contributing to the increased revenue of
the Government, ensuring economic performance of contractors in exploiting marginal fields and taking advantage of precious resources of the country, contributing to ensuring energy security, national political security, especially sea and island security, guaranteeing jobs, ensuring development of related services, etc. These problems are very urgent.

From the above reasons, the author has chosen the matter "Research on economic effectiveness of exploiting marginal fields in Vietnam" as the subject for doctoral thesis to give explanation about the theoretical and practical matters of economic effectiveness of oil and gas exploitation of marginal fields, then proposing suitable solutions to ensure economic effectiveness for exploitation of marginal fields in Vietnam.

2. Objectives of research

Based on the clarification of theoretical and practical matters about economic effectiveness in oil and gas exploitation, the Thesis has proposed the views and policy solutions mainly to ensure economic effectiveness in exploitation of marginal fields in Vietnam.

3. Subjects and scope of research

* **Subjects of research:** The project researches theoretical and practical matters about economic effectiveness of exploitation of marginal fields in Vietnam

* **Scope of research:** The project focuses on clarifying the economic effectiveness in development and exploitation of marginal fields (Chim Sao and Dua fields; Kinh Ngu Trang field; Bao Vang field) in Vietnam from 2005 to present. It proposes views and recommendations on policies and solutions to ensure economic effectiveness of exploitation of marginal fields in line with the conditions of oil and gas industry in Vietnam in the coming time.

4. Tasks of research

- To clarify theoretical and practical matters about economic effectiveness of oil and gas exploitation
- To assess the status of economic effectiveness in exploitation of a number of marginal fields in Vietnam
- To propose views and recommendations on policies and solutions to ensure economic effectiveness of exploitation of marginal fields in Vietnam.

5. Research methodology

Based on the methodology of dialectical materialism and historical materialism, the author uses the following research methods in the process of implementing the Thesis: Statistical method, meta-analysis method, math model method, collation, comparison, expert method and some other scientific methods to clarify research subject.

* **Secondary document collection method:** From Circulars, Directives, Decisions of the Prime Minister and competent agencies of the State. Research by individuals, organizations, departments on economic effectiveness in exploitation of marginal fields in Vietnam through information sources such as: books, newspapers, magazines, conference documents, specialized learning and Internet.

* **Primary document collection method:** The collection of primary documents is mostly based on practical research using the data in report on production and business of PVN, while using analytical method, meta-analysis method, and comparison to resolve the matters rose in the research process.
* Statistical method

This method is used to analyze specific data on output of oil and gas exploitation and often combined with comparison to clarify the matters: Fluctuation of the phenomenon over the periods of time; extent of the phenomenon; the relationship between these phenomena shown via targets on the absolute number, relative number, average number, etc. Then, making science-based conclusions based on such clarification. Data collected is expressed in different types such as bar chart, pie chart, spider chart, etc. depending on each different type of data and requirements necessary to show results.

* Estimation and forecast method

Based on the analysis of current status of economic effectiveness in the exploitation of marginal fields and development orientation for exploitation of marginal fields, the research offers solutions to ensure economic effectiveness in exploitation of marginal fields in Vietnam. The accuracy of forecast results will bring about the success or failure of ensuring economic effectiveness in exploitation of marginal fields in Vietnam.

* Meta-analysis method

Based on assessment on actual situation of economic effectiveness in exploitation of marginal fields in Vietnam, the subject will offer general assessments with the full generality on economic effectiveness in exploitation of marginal fields in Vietnam through research on typical 3 fields.

* Expert method: Consulting with theoretical experts and management experts in the industry to have a general view when analyzing and assessing the actual situation of economic effectiveness in exploitation of marginal fields in Vietnam for the past time.

* Collation and comparison method

Economic effectiveness in exploitation of marginal fields in Vietnam is compared with the original objectives of investment projects; results of the investment projects for exploitation of marginal fields are compared to those of other fields in terms of scale and feasibility to achieve optimal results.

6. Scientific and practical significance of the Thesis

- **Scientific significance:**
  - Findings of the Subject contribute to systematizing, supplementing and enriching theoretical basis of economic effectiveness in exploration and exploitation of oil and gas in marginal fields. Applying and concretizing such findings to evaluate the effectiveness of exploitation of marginal fields of Vietnam.
  - Contributing to supplementing and completing the Law on Oil and Gas by period and laws relating to investment.

- **Practical significance:** Findings are good references for related industries and especially the oil and gas industry of Vietnam in promoting and encouraging domestic and foreign investments to develop exploitation of marginal fields of Vietnam.

7. Achievements and new aspects of the thesis

* Achievements

First, the thesis clarifies the concept and nature of economic effectiveness of exploitation of marginal fields; defines targets, assessment methods and factors affecting effectiveness of exploitation of marginal fields in Vietnam. In particular, the Thesis
systematizes theoretical and practical basis about economic effectiveness of
development and exploitation of marginal fields in general to form a basis for the
research on development and exploitation of marginal fields in specific natural,
economic, social conditions and policy mechanisms of Vietnam.

Second, the thesis analyzes and evaluates the actual situation of economic
effectiveness in exploitation of some marginal fields in Vietnam and points out natural
conditions, policy mechanism, current social and economic conditions that limit
development and exploitation of marginal fields of Vietnam.

Third, The Thesis proposes some views and recommendations on policies and
mechanisms and a number of economic and social solutions aiming at encouraging and
attracting investors to participate in the development and exploitation of marginal fields
in Vietnam.

* New aspects of the Thesis
- Defining the characteristics of targets and assessment methods for economic
effectiveness of exploitation of marginal fields.
- Researching the simultaneous effects of factors on economic effectiveness of
exploitation of marginal fields.
- New viewpoints in evaluating the economic effectiveness of exploitation of marginal
fields: Currently, economic effectiveness values achieved of exploitation of marginal fields in
Vietnam, regarding not only high but also low economic effectiveness, do not meet investors’
expectations. This concept refers to projects which fail to achieve profitability, but still need
to be deployed to recover costs spent on exploration, as well as take advantage of
infrastructure of neighboring fields to collect resources and create opportunities to develop for
potential subjects nearby on the basis of the overall interests of the host country - Vietnam.
- The Thesis gives conclusions and proposes a number of feasible recommendations and
solutions to ensure economic effectiveness in exploitation of marginal fields in Vietnam.

8. Content structure of the thesis: In addition to the Introduction, List of references,
explanations to abbreviated terms, tables, pictures and charts, the thesis consists of 4
chapters and General conclusions, details as follows:
  - Chapter 1. Overview of research works related to the Subject.
  - Chapter 2. Theoretical and practical basis on economic effectiveness of exploitation of
    marginal fields:
    - Chapter 3. Actual situation of economic effectiveness in exploitation of marginal fields
      in Vietnam.
    - Chapter 4. Orientation, Views and solutions to ensure economic effectiveness of
      exploitation of marginal fields in Vietnam.
  - General conclusions.
CHAPTER 1
OVERVIEW OF RESEARCH WORKS RELATED TO THE THESIS SUBJECT

1.1. Foreign research works

1.1.1. Works referring to economic effectiveness

The research on economic effectiveness was soon mentioned by foreign researchers, including some following typical viewpoints:

First, the earliest viewpoint on economic effectiveness was the uniformity of economic effectiveness with indicators reflecting the investment results. According to the author, this viewpoint uniformed the effectiveness indicators with indicators reflecting economic effectiveness; hence, the assessment of economic effectiveness, in fact, is the evaluation of the results obtained from economic activity only, without regard to the investment value to achieve such results.

Second, Economic effectiveness means the most effective use of resources in the economy to meet the needs of the people. This viewpoint showed that, to determine the economic effectiveness, it is necessary to evaluate the saving or wasting of resources used in the production and economic activities of the entity and such evaluation is totally determinable.

Third, there was another school of thought developed at the same time with the above one, suggesting that economic effectiveness is the comparison of the relationship between outputs and costs incurred in the economic production process.

Fourth, the viewpoint defined the economic effectiveness of enterprises as the connection between economic effectiveness and social effectiveness.

Under this viewpoint, economic effectiveness is assessed through a combination of many different economic indicators in the production process; simultaneously, the higher the economic production effectiveness of enterprises is, the more the social effectiveness increases. However, in some cases, to increase economic effectiveness, enterprises influence strongly the social effectiveness (such as causing serious environmental pollution).

1.1.2. Works on economic effectiveness of exploitation of marginal fields

An article on the Oil, Gas & Energy Law Journal of Indonesia states that the Government of Indonesia (GOI) has recognized that there are many marginal fields which have not been developed just because of economic effectiveness. According to the current economic terms and conditions, the marginal fields are not enough to be developed. Therefore, the Government of Indonesia conducted researches on some marginal gas fields to identify the best incentives and policies for exploitation.

An article on Oil & Gas Financial Journal by Don Warlick also considered fields as marginal because their profitability is not high.

In an article about improving investment conditions for marginal field development, the author J.O.Akhigbe compared the approaches to oil and gas finance regime of Nigeria and the UK, thereby making plan to determine the attractiveness of the financial regime Nigeria for investment in developing and exploiting marginal fields.

1.2. Domestic research works
Depending on the approach, the domestic scientists have also stated different viewpoints when researching and evaluating economic effectiveness. The thesis has summarized three main research directions of the scientists as follows:

_First_, economic effectiveness is considered as an important part of corporate financial analysis and business operation analysis.

_Second_, researching economic effectiveness in the form in which the researchers analyze, evaluate part or all of the economic effectiveness of an industry or a specific type of enterprise.

_Third_, researching economic effectiveness in viewpoint of building system of indicators as well as process and methods of analysis of economic effectiveness for a specific industry.

So far, there have been some subjects having built a system of economic analysis indicators for marginal fields. However, there are no works providing sufficient research on economic effectiveness of exploitation of marginal fields in Vietnam.

1.3. Evaluation of related works and matters needing additional research

The above works have researched economic effectiveness of which contents can be divided into the following major matters:

_First_, overall research on economic effectiveness of enterprises. These works have helped the research student better understand the urgency, contents, criteria of improvements to the economic effectiveness of exploitation of marginal fields, thereby forming the methodology and approach to build the theoretical and practical basis of the thesis.

_Second_, the works researching different aspects of economic effectiveness of industries in general, and oil and gas industry in particular. These works help the thesis’s author be generally aware of the actual situation of industrial production effectiveness in general, and oil and gas industry in particular, thereby clarifying the content and system of criteria used to evaluate the effectiveness of oil and gas investment and exploitation.

_Third_, although the subject and objectives of the research are different, some works have used appropriate research methodology and scientific approach. These are important suggestions to help the research student choose, inherit and use research methods, approach in the most reasonable way to solve research objectives and tasks of the thesis.

However, the above works have not mentioned the following matters:

_First_, no works have researched in depth and comprehensively economic effectiveness in development and exploitation of marginal fields.

_Second_, no research works have given a system of overall economic solutions, policies to ensure economic effectiveness in development and exploitation of marginal fields.

In summary, so far there have been no works researching economic effectiveness of exploitation of marginal fields in Vietnam. This is an independent subject with its own research objectives; therefore, the research student has chosen this research subject for doctoral thesis in order to fill the scientific gap, realize the development and exploitation of marginal fields in Vietnam.
CHAPTER 2
THEORETICAL AND PRACTICAL BASIS ON ECONOMIC EFFECTIVENESS OF EXPLOITATION OF MARGINAL FIELDS

2.1. Marginal fields and characteristics of exploitation of marginal fields

2.1.1. Marginal fields

So far, a large number of oil and gas fields have been discovered but considered uneconomical to invest and cannot be developed in a normal way. Such fields are collectively referred to as the "marginal fields". When referring to marginal fields, it means that the economics of development of such fields are difficult to be realized immediately, possibly due to their unfavorable reserves, etc. In other words, the concept of marginal field is not only dependent on the size of the fields, but mainly on the limited profitability of this type of fields.

According to the author that, if fully considering following conditions: geology, geography, investment, engineering and technology, infrastructure, market and the terms and conditions of signed oil and gas contracts, etc., marginal field is an oil and gas field which is uneconomical to invest in and cannot be developed and exploited in a normal way (low economic effectiveness; effectiveness values achieved do not meet expectation of investors). Investors will not develop these fields without incentives, adjusted tax policies, contract terms in order to ensure the mutual benefit between the state and investors.

Some definitions of marginal fields by Indonesia, Ecuador and North American countries, etc.

Based on the analysis and evaluation of the concept of marginal fields around the world, along with learning about the management of oil and gas exploration and exploitation in Vietnam, the author has agreed to develop a general concept for marginal fields in Vietnam as follows:

Marginal field is a field discovered, or one in which the development or continued exploitation under current financial, commercial and technological conditions cannot bring about effectiveness for investors but these fields may be effectively exploited when one of the above conditions is improved.

2.1.2. Characteristics of exploitation of marginal fields

Due to specific characteristics of marginal fields such as small reserves, being located in deep water, offshore area, etc., the techniques used to exploit this type of fields necessarily meet the requirements to minimize costs of construction, installation, operation and clearing. With this type of fields, many appropriate improvements and design have been done on the basis of existing techniques. In the past two decades, many technology solutions have been being tested and applied with many major advances. In particular: Lightweight rigs, lightweight self-elevated rigs, Exploitation using ends of underground wells connected with storage vessels and floating vehicles, etc.

2.2. Economic effectiveness of exploitation of marginal fields

2.2.1. Effectiveness and economic effectiveness

2.2.1.1. Effectiveness
There are different approaches related to effectiveness, specifically including the following two ones:

First, if approached in the traditional method, it can be understood: Effectiveness is a concept showing the relationship between the results of operational objectives and costs incurred to achieve such results of an entity in certain conditions.

Second, the approach to concept of effectiveness associated to the purposes of the subject. With this approach, the concept of effectiveness is mentioned as follows: Effectiveness is an indicator reflecting the level of result gaining in order to achieve a particular purpose of the subject corresponding to a unit of resources spent in the implementation of activities.

According to the above-mentioned concept of effectiveness, the effectiveness of a particular activity is tied to a specific purpose, in which specific objectives have been identified as the "level of result gained". Thus, the effectiveness is always tied to certain objectives, i.e. we cannot determine the effectiveness of the activities without objectives.

Social effectiveness refers to social objectives achieved when the subject conducts economic activity.

Thus, we can see that economic effectiveness and social effectiveness have close relationship. As Lenin said, we can never have economy outside the society. All things related to economy are also related to society. All the business activities of enterprises are not only aimed at achieving their objectives, but also have an impact on economic - social development objectives. So, when enterprises conduct business activities, it is necessary to pay attention to the combination of the plans not only to achieve objectives of the enterprises themselves but also to bring benefits to society, combining economic and social effectiveness.

2.2.1.2. Economic effectiveness

Through the views on economic effectiveness presented in chapter 1, we can see that economic effectiveness is a comparison between the results obtained after production and business and costs spent to achieve such results.

From the above analysis and assessment, the author has summarized the views on economic effectiveness in order to draw the most general concept of economic effectiveness: Economic effectiveness is a concept reflecting the qualification, level of using resources in order to achieve certain objectives, expressed by the system of specific economic indicators, set-up on the basis of comparison between outputs and costs or inputs.

Criteria for evaluation of economic effectiveness

Criteria for evaluation of economic effectiveness specify the nature and quality of a process or a certain aspect of the production and business process of enterprises.

So, criteria for evaluation of economic effectiveness of enterprises refer to the relevance of results of production and business and social results achieved to meet objectives on the basis of economical use of social and labor resources. This also means that
improved economic effectiveness is always associated with the implementation of social objectives.

2.2.2. Indicators to evaluate economic effectiveness of exploitation of marginal fields

* Total investment and operating costs;
* Pay Back Period – PBP;
* Net Present Value – NPV;
* Internal Rate of Return (IRR), etc.

2.2.3. Methods used to evaluate economic effectiveness of exploitation of marginal fields

a) Product division model by PSC contract

Figure 2.4 indicates product division model by PSC between the contractor and the host country. From revenue received from the project, royalties are paid to the host country first. All the costs spent by the contractor (except for those not allowed to be recovered) will be recovered from revenues after payment of royalties. The remaining profit from oil and gas will be divided between the contractor and the host country at the rate specified in each PSC contract. The contractor must pay income tax from their entitled oil and gas profit under the regulations of the tax laws of each country.

b) Calculating the cash flow of the Oil and Gas Exploration and Exploitation project under the PSC contract

Basic components of cash flow

The basic components of cash flow are defined and calculated, Total Revenue, Royalties, Investment costs (CAPEX), Operating costs (OPEX), Commissions, signature, Oil/gas profit, Income tax...

After-tax cash flow of Contractor

Total revenue of Government, host country

2.2.4. Factors affecting economic effectiveness of exploitation of marginal fields

2.2.4.1. Natural factors

* Field reserve:

  The reserve calculating parameters are evaluated in terms of the certainty at the probability of P90, 90% (minimum value - verified reserves); P50, 50% (average value – possible reserves) and P10, 10% (minimum value – probable reserves).

  In fact, Monte Carlo simulations are used to calculate the volume of recoverable hydrocarbons in each aquifer. Input parameters are the parameters of the formula of oil and gas reserves. The result is the hydrocarbon volume corresponding to the confidence level of 90%, 50% and 10% on the cumulative probability distribution curve.

* Average content of main components, beneficial, harmful:

  Oil and gas products exploited are a complex mixture of crude oil and gas (hydrocarbons from C1 to C8), CO2, water, mechanical impurities, impurities containing sulfur, phosphorus, nitrogen, etc. In which, the main components are also useful components including crude oil, associated gas and natural gas, condensate. Harmful components are usually H2S, Hg, etc.

* Reserve of main components:

  In oil and gas, the content of main components (hydrocarbons) takes a very large
proportion of crude oil, associated gas, natural gas and condensate as commodities.

* Field life and exploitation output:

Generally when designing field exploitation, they often calculate the reserve based on the recoverable one on average (P50). Depending on the ability to extend the field (reservoir properties, ability to maintain reservoir energy, etc.) or demands for the minerals to be exploited by the national economy (maximum stable output - peak output to meet domestic consumption demand, export demand) or the development of neighboring fields (in case where development and combination of fields are considered) etc. to determine the time to exploit field (field life).

2.2.4.2. Social, technology and market factors

* Social factors:
  - Stability of political institutions, economic growth rate of the host country;
  - Incentives in terms of financial institutions, tax or others for different specific areas.

* Technology, market factors:
  - Existing infrastructure conditions of nearby fields;
  - Available technologies suitable for exploiting critical fields effectively;
  - Fluctuations in prices of raw materials, equipment and factors related to the market;
  - Market for product consumption (especially for gas fields).
  - Value of products and goods.

2.2.4.3. Legal factors, contractual conditions

- Legal framework: Law on Oil and Gas, several other laws such as Investment Law, Tax Law, Law on Environmental Protection, financial institutions, taxes, fees, surcharges, etc.;
- Contract form: Petroleum Division Contract (PSC), joint ventures, concessions, services, risk services, etc.;
- Contract terms Signature commission, rate of return, oil and gas profit division, participation of the host country and financial institutions, taxes, charges and surcharges.

2.3. International experience in raising economic effectiveness of exploitation of marginal fields and lessons for Vietnam

Currently many countries around the world are experiencing very difficult conditions in exploitation of oil and gas. Researching solutions to increase economic effectiveness in exploitation of marginal fields for some countries to have reasonable proposals consistent with the conditions of Vietnam is very necessary.

2.3.1. Experience of China

China has made very clear energy policies, along with laws and guidelines on tax and some policies and solutions to increase the economic effectiveness of China expressed in some aspects such as:

* Strengthening international cooperation
* Enhancing and supplementing financial capacity for national oil and Gas Company of China by supplementing capital regularly.
* Tax incentives
* VAT incentives.
* Solution for cost recovering oil
* Foreign exchange solution, etc.

2.3.2. Experience of Indonesia

Indonesia is the largest oil production country and is the only OPEC member in Southeast Asia. Oil and gas is the most important industry of Indonesia, annually contributing more than 20% of GDP and 24% of total revenue of the Government, so they have the following specific solutions:

* **Tax and product division solutions**
* **Changes in policies and laws of Indonesia.**
* **Incentive and preferential policies of the Government of Indonesia**

In summary, the Government of Indonesia clearly shows their view through incentive and preferential policies of the Government for oil and gas exploration and exploitation contractors, including economic, financial, tax measures enacted in groups and called package incentives.

2.3.3. Experience of Nigeria

Nigeria is the largest oil producer and exporter in Africa and in the top countries of OPEC, with reserves of 37.2 billion barrels, 2000 billion m³ of gas. Every year, Nigeria produces 91 million tons of crude oil and 15 billion m³ of gas to serve domestic consumption and export, on average about 2.45 million barrels of oil/day, representing 2.94% of the output worldwide. The government of Nigeria has issued many preferential policies to encourage development and increase effectiveness of exploitation of oil and gas industry including:

• Ensuring a minimum profit of USD2.50/barrel of oil;
• Allowing recovering investment quickly through unrestricted minimum period and ability to transfer investment from joint venture... and investment incentives in natural gas industry.

2.3.3. Lessons for Vietnam

From experience and applying solutions, mechanisms and policies of China, Indonesia and Nigeria, we can draw the lessons for Vietnam to ensure economic effectiveness of exploitation of marginal fields as follows:

First, the investors in exploitation of marginal fields are strongly interested in the recovery of investment.

Second, allowing contractors searching and exploring fields to reserve the costs spent up to 10 years to reduce the risk in oil and gas search and exploration for new contracts in the absence of oil/gas detection.

Third, the investors in exploitation of marginal fields always pay attention and interest in the investment environment. Therefore, it is required to create investment environment which is truly free, of economic - social stability, macroeconomic policy, etc. This is a very important issue.

Fourth, tax and product division policies must show consistency and have a close relationship with each other. We always use and apply the policies with adjustment to suit each actual stage to ensure the mutual benefit of the Parties (Win/Win).

Fifth, supplementing and completing the Law on Oil and Gas and reforming tax policy to suit each stage of development of the economy is one of the interested policies to attract investors to explore oil and gas. Since these are basic input parameters
and conditions of the investment project to calculate the investment effectiveness of oil and gas contractors and they even have a material effect on the effectiveness of an investment project.

Chapter 3
ACTUAL SITUATION OF ECONOMIC EFFECTIVENESS OF EXPLOITATION OF MARGINAL FIELDS IN VIETNAM

3.1. Overview of exploitation of marginal fields in Vietnam

3.1.1. Policies of the State on exploitation of marginal fields in Vietnam

For the legal basis and policy of the State calling on foreign investors and managing the oil and gas investment activities which have been happening strongly, the National Assembly enacted the Law on Oil and Gas in: 1993, 2000, 2008 amended and supplemented to complete the Law on Oil and Gas. In addition, the Government enacted the Decrees guiding the implementation of Law on Oil and Gas: No. 48/2000/ND-CP, 115/2009/ND-CP, 95/2015/ND-CP and a wide range of Circulars, Directives, Decisions to enhance the role of state management, timely support robust activities of the Oil and Gas industry.

The State is continuing to research and complete the legal framework for the oil and gas sector as having more preferential policies for foreign investors when operating on offshore lots in the deep waters with geologically complex and difficult conditions. Especially there is a specific mechanism to encourage Contractors to invest in the development and exploitation of marginal fields in Vietnam.

Tax policies for Oil and Gas industry of Vietnam

* Royalties

Regarding the Royalties rate, the Government stipulates as follows: from 4%-25% for crude oil output depending on the output exploited and investment projects; from 0%-10% for natural gases depending on the output exploited of natural gases and investment projects.

The above rate is higher than neighboring countries such as China (0-12.5%), Malaysia (10%), Indonesia (20%), while the Vietnam continental shelf comprises of mostly small and medium fields. This does not actually encourage foreign investors to invest in Vietnam's oil and gas industry.

* Tax payment obligations and collection procedures for oil and gas exploration.

Oil and gas exploration and exploitation, tax policies are currently implemented mainly under Circular No. 48/2001/TT-BTC dated June 25, 2001 of the Ministry of Finance and applicable Tax laws. In the product division contracts signed by foreign oil and gas companies and PVN which are primarily based on financial institutions and financial mechanism, essentially tax policy is required. So far, Vietnam has not had tax law or tax policies specific to oil and gas activities. Therefore, tax rules and provisions applicable to oil and gas exploration and exploitation are defined in the Law on Oil and Gas (royalties, corporate income tax).

3.1.2. Situation of exploitation of marginal fields in Vietnam
3.1.2.1. Chim Sao and Dua fields, Block 12W (Premier Oil)

**Development model of Chim Sao and Dua fields**

When the output of Chim Sao field reduces, Dua field will be developed to tie back to FPSO Chim Sao. This will extend the life of Chim Sao field and increase recovered reserves of Chim Sao field in particular, and Block 12W in general.

Chim Sao field was developed in the time of economic crisis, requiring to minimize costs and therefore unable to develop Dua field simultaneously with Chim Sao field.

3.1.2.2. Exploitation of Kinh Ngu Trang field, Block 09-2/09

With reserves of approximately 260 million barrels, using all related data, research results and conclusions in line with oil and gas potential discovered of KNT field, evaluate technical and economic aspects for field development plans; draw conclusions and suggest a feasible and effective marginal field development plan.

Based on the technical and economic evaluation results, development plan 2.1 (KNT WHP connected the Rang Dong field) was selected to develop KNT field.

**Case: KNT-WHP connected to Rang Dong field (JVPC)**

If connected to Rang Dong field, a WHP rig with full pretreatment equipment and auxiliary equipment will be built and installed at KNT field. Oil and gas exploited will be transported via a common 12” multiphase pipeline to the connection point on the P15 pipeline at the Rang Dong field. Gaslift and water injection will be provided from NCWI and E1 rigs of Rang Dong field to KNT-WHP through separately constructed pipelines.
3.1.2.3 Bao Vang Field, Blocks 112, 113 and 111/04

Scenario 1: Developing Bao Vang field independently on the basis of 2P reserves approved by Vietnamese side;

Scenario 1’: Developing Bao Vang field independently based on 3P reserves approved or C1 + C2 reserves approved by Russian side;

Scenario 2: Developing Bao Vang field based on 2P reserves approved by Vietnamese side together with the Program for additional exploration of Bach Tri formation;

Scenario 3: Developing Bao Vang field based on 2P reserves approved by Vietnamese side and the Program for additional exploration of A1 formation;

Scenario 3’: Developing Bao Vang field based on 2P reserves approved by Vietnamese side and the Program for additional exploration of A1 formation;

Scenario 3”: Developing Bao Vang gas field based on C1+C2 reserves approved by Russian side upon obtaining results of the Program for additional exploration of A1 formation;

3.2. Analysis of economic effectiveness of exploitation of marginal fields in Vietnam

3.2.1. Economic effectiveness of exploitation of Dua field

Development plans need to research many feasible development plans, with the application of modern technologies in line with Dua field 17km away from currently exploited Chim Sao field. Investment cost parameters, input base plans for economic calculation are as follows:

- Developing exploitation by stage: 07 years;
- Number of wells: 3 exploited wells;
- Accrued exploitation output: 6.4 million barrels of oil;
Time of economic evaluation: 2012;  
Field clearing costs: USD16.8 million.  
Past costs: USD287 million.  
Total development costs of Project: USD266 million.

With the oil price calculated as USD65/barrel, results of evaluation on the economic effectiveness of Dua field development (applying the most favorable conditions under current regulations) with the discounted cash flow of 2012, shown in NPV@10% as USD3 million, the revenue of the Government is about USD253 million.

In fact, in recent years, oil prices have continued to fall deeply, so solid economic effectiveness for these small Projects will be very challenging. Applying this oil price, the reserve conditions and financial institutions normally, economic effectiveness of Dua field development with discounted cash flow of 2012, shown in NPV@10% 2012 will be negative USD9 million. Oil price risk causes the Project not to have economic effectiveness to be allowed to develop normally.

Analysis of sensitive factors affecting Project HQ

Economic indicators of PVEP in the basic plans and the high plans are respectively as follows: Net Present Value (NPV@10%) of PVEP reached USD2.95 million and USD24.83 million (equivalent to USD51.02 million and USD93.51 million before discounting); Internal rate of return reached 10.91% of the basic plan and 16.54% of the high plan.

3.2.2. Economic effectiveness of exploitation of Kinh Ngu Trang field

Exploiting using KNT WHP wellhead rig connected to the existing exploitation equipment system of Rang Dong field was the earliest development plan at the time of operating the field (First Oil), with the lowest operating costs and bringing about value
(Net present value) at a discount rate of 10.5%/year from September 2014 (NPV@10.5% September 2014 Look Forward) of the project as USD605.10 million, of which the Owner PVEP enjoyed USD134.36 million. The basic plan NPV@10.5% Full Cycle of the Owner PVEP had value of negative USD202 million. Evaluate the economic effectiveness of KNT field development project as marginal.

**3.2.3. Economic effectiveness in exploitation of Bao Vang field, Block 112**

Development plans for Bao Vang field, PSC Block 112 are non-commercial; Project NPV is negative from USD73 million to USD345 million; IRR for the best basic plan is only 6%, much lower than provisions for developing normal fields (IRR 14% for domestic exploration projects). Based on the above fact report, the development plans for Bao Vang field, PSC Block 112 cannot recover capital spent in the past. In the most optimal, favorable investment scenario, the best gas price Project NPV is negative nearly USD100 million and there are potential risks for normal development.

**3.3. Evaluation on economic effectiveness in exploitation of marginal fields in Vietnam.**

Three field development projects mentioned above are evaluated as having marginal, even negative, effectiveness. However, considering the overall interests of the host country Vietnam, PVN, the above Projects should be carried out.

Considering the private benefits of Contractors as the Owner, the author has found that the Projects still have certain economic-technical risks; however, with the research and evaluations, as well as solutions taken to minimize the risk of field development as presented in the report, the pursuit of the projects is feasible.

Chim Sao and Dua field development project is calculated based on the application of new and modern technologies. In particular: Underground exploitation, wellhead systems to develop exploitation under the plan of staging to develop the fields in the PSC contract area Block 12W. Development of Dua field is considered and developed in stages along with Chim Sao field which is being exploited will ensure the objective of recovering maximum investment cost in the past for oil and gas exploration and exploitation of Block 12W, minimizing losses and taking advantage of resources. For fields of PSC Block 09-2/09 and PSC Block 112, the plan is similar and they should be connected with neighboring fields.

At present, in Vietnam, the newly detected fields in Bach Ho area, Cuu Long basin are also small and dispersed, so putting them into effective exploitation has faced difficulties. Hence, the solutions to increase oil recovery, develop small fields, gas fields with high CO2 content are being actively researched and initially deployed (water injection). There are positive outcomes, but not satisfying the requirements.

Our management capabilities of exploration and exploitation are still limited; the organization of stages from PVN to the sites is inconsistent and inadequate; exploration workforce is limited with uneven qualification, not meeting the requirements of the actual production and development of the oil and gas industry. The current regulations and policies on labor, salaries are not attractive to talented personnel and do not limit the brain drain.
Chapter 4
ORIENTATION, VIEWS AND SOLUTIONS TO ENSURE ECONOMIC EFFECTIVENESS OF EXPLOITATION OF MARGINAL FIELDS IN VIETNAM

4.1. National orientation on development and exploitation of oil and gas fields in general and marginal fields in particular in Vietnam in the coming time

4.1.1. Orientation of the State on exploitation of oil and gas fields

Based on the orientation on development of oil and gas industry by 2025: Development strategy for Vietnam Oil and Gas industry approved by the PM in the Decision No. 386/QD-TTg dated March 09, 2009 specifying strategic objectives, views, development orientations and shortcomings, weaknesses of the Oil and Gas industry, in which, the view and goal in the period of 2015 – 2025 is to make PVN become a domestically and internationally dynamic, competitive economic group, with high effectiveness in the production and business by optimizing all available resources, accelerating operations and focusing investment on 5 major fields as exploration - exploitation, petrochemical filtering, gas industry, power industry and oil and gas engineering services. In particular, the fields of search, exploration and exploitation are the core.

Among the specific objectives of oil and gas search, exploration and exploitation, the indicators on increasing oil and gas reserves and oil and gas exploitation play a decisive role. In which, it requires to increase reserves of approximately 2 times higher than the average exploitation output.

4.1.2. Orientation on exploitation of marginal fields

In fact, in the world as well as in Vietnam, most of the major oil and gas fields with high industrial exploitation effectiveness have been detected and currently exploited at the later stage of the maximum exploitation period. Many small, offshore oil and gas fields in deep waters, with difficult exploitation conditions have been being detected but cannot be put into operation for many reasons. The main causes are unfavorable economic, technical and commercial conditions, making investors not be able to move to the next stage to develop commercial exploitation of small marginal fields detected. These conditions have been standardized through the laws, sub-law legal documents, namely the provisions in the PSC Contract Form issued together with the Decree No. 33/2013/ND-CP dated April 22, 2013 of the Government.

* Orientation on search, exploration and exploitation of oil and gas:

Enhancing the basic survey and exploration of oil and gas in the country, especially in deep waters, offshore areas, with difficult geological and geographical conditions, underdeveloped field infrastructure, and small marginal field clusters. Completing mechanisms and policies to call for investment, sign contracts on search and exploration, attract potential partners to invest in search and exploration in deep waters, offshore areas in all forms including contractor appointment for the areas. Focusing on calling for traditional strategic partners and partners with extensive experience in search, exploration and exploitation in deep waters in the form of a more flexible PSC contract. Encouraging contractors present in this area to accelerate exploration as committed.

Investing robustly in researching scientific, technological and HR solutions to serve exploration and exploitation of oil and gas; Researching and completing exploitation
technology, solutions to increase the oil recovery factor for development of small, marginal fields; Enhancing investment in vehicles, equipment and technology and promoting international cooperation in order to maintain and increase output of oil and gas exploitation.

4.2. The author's opinion on policy and mechanism innovation to ensure economic effectiveness of exploitation of marginal fields in Vietnam

Completing financial institutions in the oil and gas contracts to ensure the benefits for investors when exploiting marginal fields

When the commercial discovery decreases, the improvement of financial conditions and taxes is required so that the host country can attract capital from oil and gas investors. When there are high risks, financial institutions and tax policy should be improved to be more favorable for contractors.

The problem is that how the terms about finance and taxes should be changed to ensure the investors and the host country to not get loss more than the allowed limit. To take the next step to complete the financial mechanism of exploration and exploitation of marginal fields.

Incentives of Vietnam compared with other countries in the region

<table>
<thead>
<tr>
<th>Content</th>
<th>Vietnam</th>
<th>China</th>
<th>Malaysia</th>
<th>Indonesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Royalties</td>
<td>7-29%</td>
<td>0-12.5%</td>
<td>10%</td>
<td>20%</td>
</tr>
<tr>
<td>Corporate income tax</td>
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<td>33%</td>
<td>40%</td>
<td>35%</td>
</tr>
<tr>
<td>Export tax</td>
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<td>No</td>
<td>20%</td>
<td>No</td>
</tr>
<tr>
<td>Profit transfer tax</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>20%</td>
</tr>
<tr>
<td>Oil recovery cost</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>100%</td>
</tr>
<tr>
<td>Commission</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Training cost</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

In our country, main regulations in financial institutions of PSC include royalties, cost recovery limits, the rate of oil and gas profit division, income taxes, commissions and training costs. To attract foreign investors in the oil and gas sector, the Law on Oil and Gas amended in 2008 has flexibly adjusted the financial institutions in marginal field exploitation projects, such as decreasing royalties, decreasing income tax from 50% to 32%, increasing cost recovery limit to 70% ... Together with the increase of oil prices, some oil and gas discoveries which were considered non-commercial previously have been developed with the improved economic indicators for contractors. However, such transformation was not attractive enough for investors in recent years because of low oil prices and particularly fierce competition with other countries in the region because they also adjust financial institutions more flexibly.

Therefore, in order to encourage foreign investors to increasingly invest in exploration and exploitation of oil and gas in the marginal fields and to be able to compete with neighboring countries and other countries in the region, Vietnam should have preferential
policies to encourage investment at least equal to or more than neighboring countries to be able to actually encourage investors. The solutions are as follows: the Government of Vietnam should increase cost recovery rate for oil and gas contracts in the field of oil and gas exploration and exploitation by 50% - 70% for normal projects, depending on the field structure, the depth of water, and 100% for projects to encourage investment in areas of over 200m in depth, having fields with complicated structure, and difficult exploitation conditions.

4.3. Some solutions to ensure economic effectiveness of exploitation of marginal fields in Vietnam

4.3.1. Enhancing international cooperation for reducing costs in search, exploration and exploitation of oil and gas in South China Sea

The search, exploration and exploitation of marginal fields in Vietnam, and promoting international cooperation should be implemented as follows:

- Strengthening international cooperation and technology exchange and transfer in oil and gas sector. Coordinating with other ministries and industries such as the Ministry of Science and Technology, Industry and Trade, Construction, Transport, etc. to gradually build and develop key mechanical industries (including design, construction and installation, commissioning and operation, etc.). Robustly implementing scientific research, researching on geological structure and evaluating the potential for oil and gas in deep waters in the sea areas, continental shelf and exclusive economic zone of the country. Annually reviewing and evaluating the implementation.

- Applying advanced technologies to exploration and exploitation of oil and gas fields, to assess the potential, especially oil and gas reserves in deep waters to increase oil and gas reserves of Vietnam.

- Applying advanced technologies in field development, drilling to optimize field development, enhance oil recovery factor, extend the field life, and develop small fields in the deep waters.

- Further strengthening scientific research capacity, strongly investing in scientific research to improve business competitiveness, administration and development from the Group to its members, subsidiaries of PVN.

4.3.2. Innovating project management in line with the conditions of exploiting marginal fields

In order to improve, innovate project management in line with conditions of exploitation of marginal fields, the following measures should be implemented:

It is required to design a project management model for exploitation of marginal fields in a more positive and dynamic manner. The new model does not only focus on construction investment but also manages exploitation in the most effective manner. The model is the organic link (with implementation, feedback, adjustment and completion) between planning - investment - management of exploitation modules. From the overall model, design an implementation system based on the Law on Oil and Gas and bylaw documents. This system needs to demonstrate the stages of the work, point out the person (or agency) being responsible for settlement; content, scope and duration of each stage, and requirements of staff, equipment, etc. to complete the task should be clearly indicated.
4.3.3. Improving output markets for oil and gas products exploited from marginal fields

The Group should be well prepared for distribution, storage of products so that the business can grow smoothly to occupy 40% of the market for petroleum and LPG products in the country, increasing regional market penetration of oil products. In particular: Building a system of general warehouse, transshipment warehouse and distribution network of domestic oil and gas products; Strengthening the promotion and advertisement of products, increasing domestic consumer demand for oil and gas products; Strengthening exports of oil and gas products to the regional market, etc.

4.3.4. Limiting risks in search, exploration and exploitation of marginal fields in Vietnam

The expansion of search, exploration and exploitation to deep waters is costly, risky and under dispute. Domestic oil and gas reserves are declining due to exploitation speed higher than the search and exploration speed. At the same time, with the invaluable support of capital, technology, etc., the legal documents bring about many favorable conditions; management of the State management agencies is clear and transparent. Thus, Vietnam has attracted the attention of big oil and gas companies, corporations in the world to cooperate in exploration and exploitation of oil and gas and share risks.

For effective operation of PVN, it requires to develop a complete and systematic risk management strategy by value-added chain of the oil and gas industry to establish internal control, risk management systems and monitor and prevent significant and highly potential risks in the priority order. Each activity in the oil and gas value chain will have different significant risks. There are policies, procedures, and regulations on risk management and personal and property insurance in the industry (prevention).

4.4. Some suggestions to ensure economic effectiveness of exploitation of marginal fields in Vietnam

4.4.1. For the State and competent agencies

National Assembly, Government and the Prime Minister should consider and allow PVN to use oil and gas reserves and assets in oil and gas exploitation as collateral. To be allowed to use oil profit to invest in developing the oil industry, particularly for expanding the search, exploration and exploitation of oil and gas. There should be clear policies which encourage oil and gas activities at marginal fields, exploration and exploitation of natural gas, etc.

There should be appropriate policies related to capital arrangement for key projects and ensuring foreign currency conversion to facilitate capital arrangement.

The government needs to assign PVN to appraise reserve reports, field development plan (FDP) with the participation of ministries and departments to submit to the PM for approval for marginal fields, to increase the autonomy and set out clear responsibilities and tasks for the owner.

Completing the legal framework for the operation of the Group in order to facilitate the Group to have financial autonomy. The State does not intervene deeply the business and production activities of the Group, but manages the Group using macro tools such as the legal system, tax system, etc.; separates functions of state management in oil and gas
and production and business functions, transfers functions of state management in oil and gas of the Group to the Ministry of Industry and Trade.

The State needs to amend the Law on Oil and Gas and bylaw documents to meet the requirements to attract investment into exploration and exploitation in Vietnam in the new situation, especially for deep waters, offshore and politically sensitive areas. Continuing to improve policies, economic conditions (exemption or reduction of some taxes, increasing the recovery rate) to make them attractive and competitive enough compared to surrounding countries to encourage investment in deep waters, offshore areas and develop small fields.

The Government might consider promulgating risk service contract (RSC) to encourage the contractors to invest in costs for field exploration, development, exploitation, and bear all risks if the fields are not put into operation. Upon the exploitation, the Government of Vietnam will allow the contractor to recover costs and make profits through incentives and encouragement as follows:

+ Minimum cost recovery of the contractor is 70%: The Contractor can achieve maximum cost recovery as 90% if the committed schedule, cost and output are ensured (based on negotiations after clarifying field reserves);
+ Corporate income tax rate of the contractor is 22%: The Contractor may be exempted from income tax for the first 2 years since commencing exploitation and decreasing 50% of the income tax for the next 2 years.

4.4.2. For Vietnam Oil and Gas Group

Continuing to complete the Group model to enhance the management, as well as monitor and inspect closely. Completing the Group model through the formation of specialized Corporations (Subsidiaries) which focus on key and strong areas and eliminates internal competition. Regular reviewing and appropriately innovating the management and administration at the Group’s parent company and members to improve operational and management effectiveness.

Strengthening management, inspection and supervision of the parent company on subsidiaries (members) and affiliated companies based on characteristics of each activity. Maintaining internal control, strictly controlling special operations at JOCs, PSCs and in companies abroad.

Investing and developing, administering oil and gas services enterprises through governance by representatives and capital.

Joining and converting suitably for current activities such as financial, insurance, banking, services without governance, joint ventures within the regulations of the State.

To maintain and increase output of oil and gas exploitation every year, it is required to continue to promote further exploration to discover and increase the average annual reserves. In which, increasing reserves of approximately 2 times higher than the average exploitation output. Exploiting oil and gas with the target to achieve growth rate of nearly 2 times higher than the current volume in the country by 2020 and 2030. Therefore, it requires policies to encourage investment, especially for Kinh Ngư Trang marginal field, Block 09-2/09 in order to attract capital, high technology, and experience of international oil and gas companies. In addition, PVN should consider increasing the selling price of Block 09-2/09 to ensure effectiveness of the project.
Accelerating the development of the fields, asking the Government to allow the Group to self-organize and take responsibility for approval of the reserve report and general plan, field development plan.

4.4.5. Conclusions and recommendations

The integration and development processes have come with new opportunities for the development of the country. Along with such development, PVN has achieved notable achievements during its organization, management of oil and gas exploration and exploitation. This is shown in such things such as contribution to the revenue of the Government, improving the economic effectiveness of the contractors and taking advantage of valuable resources of the country; contributing to economic restructuring towards industrialization, modernization, etc.

Economic effectiveness of the development and exploitation of oil and gas fields is shown through the economic - financial indicators relating to the value of the fields and the effectiveness of investment. These indicators are shown in the currency associated with time in order to maximize profits, minimize costs; typically these indicators are NPV, IRR, B/I, etc.

From the interpretation and clarification of theoretical and practical issues of economic effectiveness in exploitation of marginal fields, the Thesis has analyzed the current situation of economic effectiveness in exploitation of a number of marginal fields in Vietnam; on such basis, the Thesis proposes 05 policy solutions and recommendations to ensure economic effectiveness of exploitation of marginal fields in Vietnam.

Based on the fact, after 2 years, the PM approved an investment incentive policy particularly for oil and gas for Song Doc field. At the end of 2015, PVEP maintained exploitation of Song Doc marginal field Block 46/13, bringing about a revenue of USD153 million in which the Government owns about 50%, and tax paid to the State is USD31 million. In addition to the economic significance as mentioned above, this project also brings about economic and social significance by maintaining jobs, services and training for more than 100 skilled petroleum personnel. At the same time, the works (rigs, oil vessels, field vessels) of the Project contributed to ensuring national security, protecting national sovereignty in the encroaching sea area between Vietnam and Malaysia. The author suggests to submit application to the competent authority and State management agencies for oil and gas sector to allow specialized contract (operational services contract, nonprofit PSC 46/13) to encourage the contractors to invest in search, exploration and exploitation activities for oil and gas in Vietnam, especially application of policies to guarantee Win/Win mechanism for development, complete exploitation and efficient use of resources from marginal fields in Vietnam.

In addition, the author suggests that these findings would help other research students research, propose a number of views and recommendations on socioeconomic policies and solutions, value chain to attract investors to participate in the development and exploitation of marginal fields in Vietnam in the coming time./.