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Financing of Renewable and Fossils Related Projects: A Critical Appraisal of Subsidies and Risks in South Sudan

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Abstract

The paper argues one of the greatest subjects in oil and gas industry known as project financing of renewable and fossils related projects. The importance of project financing is to assist in implementation of the projects related to renewable energy as well as fossil fuels. The paper appreciates the concept of subsidy and its various types. It argues impacts of implemented subsidies and related risks on the financing of new renewable energy projects amongst the developing countries. These impacts have been discussed on positive as well as negative wavelengths. Besides, the paper argues technical projects risks related with midstream and upstream oil and gas projects and found out that these risks are critical and must be identified and managed before commencing the projects. Moreover, the paper argues policy project risks related with downstream, midstream and upstream value-chain of oil and gas projects are imperative and must be addressed for successful project financing. While the paper notes various risks associated with projects financing of hydrocarbon resources, it analyses these risks, drawing similarities and variations between midstream and upstream oil and gas projects and offers ways of managing the risks. The paper dives on the importance of Joint Operating Agreements (JOAs) in projects financing. In addition, the paper assesses financing alternatives in stock to oil and gas upstream players and it discusses the financing of Liquid Natural Gas (LNG) product which is sold in South Sudan as Liquid Purified Gas (LPG) and known in other countries as Liquid Natural Gas (LNG). The successful model of financing LNG/LPG is through united single operation with financing separate parts of the entire value chain in oil and gas industry. The paper deploys a case study of South Sudan, process-tracing and empirical literature review as a methodology for this study. It concludes that project financing of renewable and fossils related projects must be urgently prioritized by the governments and private institutions. Risk's analysis must be carried out prior to any project financing and all the associated risks must be avoided. The paper recommends that project financing for renewable and fossils related projects must be conducted by the governments in charge of hydrocarbon resources and Government of South Sudan should take responsibility to finance its projects in this capital and technological intensive oil and gas industry in addition to giving subsidies to relieve citizens and manage associated risks.

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1. Introduction

Project financing of renewable and fossils related projects is very essential topic in oil and gas industry. Although many academics have attempted to critically examine project financing, many of them have never thoroughly examined the specifics and connections between project finance, subsidies, and related dangers (Diallo et al., 2024). In fact, one of the key facilitators and a crucial component of project management and start is project finance. Project finance is a need, not an option, in the project life cycle and has emerged as one of the world's leading project

implementation endeavors, despite being regarded as a modern science (Wohlgemuth and Madlener, 2024). Hoffman (2022) asserts that project finance is a type of guaranteed financing that is characterized by a complex yet equitable distribution of risk in each given project. Among the many forms of project finance are equity and non-equity consortiums, off-balance-sheet, limited recourse, highly leveraged deals, and above-non-recourse project financing. This study is quite significant in the sense that oil and gas industry can easily collapse when there are no projects financiers and subsidies from governments and private institutions. While the focus is on the financing strategy, subsidies and risks have been critical issues in the overall model of successful project financing (Macmillan, 2019). Indeed, subsidies are very key in the management of any economy and they are designed to bail out the consumers, citizens and even the government of the day. Because economic shocks and distortions may cause economic failure and ultimately state collapse, states will always design their economies to avoid and eliminate them. Governments do not just provide subsidies mindlessly, even if they may be eager to provide them to private persons and businesses. In order to manage an affected industry by providing subsidies, governments always start by evaluating it to see whether there is a chance of economic external sanctions or distortions (Zhong, 2014). In other suitable terms, subsidies are incentives provided by governments to encourage the production of necessities and to ensure that there is a plentiful supply of commodities and services available for purchase. For the benefit of the general public, subsidies are also provided to lower the costs of products and services. Subsidies provide advantages, but they can have disadvantages. Both the merits and demerits often fall on the shoulder of the consumer who smiles when the government offer sustainable subsidies and cry when the government pushes the subsidies as burden to the consumer/citizen through high taxes

So, what does a project financing subsidy mean? Which typologies exist for it? What effects do they have on the taxing oil and gas industry's ability to finance new energy projects connected to fossil fuels and renewables? Which project risk evaluations apply to upstream and midstream oil projects? What project risk studies compare and contrast upstream and midstream oil and gas projects? How can a project's risks be assessed and controlled? In project financing, what are Joint Operating Agreements (JOAs)? What evaluations of available financing options are available to upstream oil and gas companies? How is a Liquid Natural Gas (LNG) project financed as a single, integrated operation that finances several value chain components? This article will attempt to answer these questions. The structure of the paper is as follows: The question is introduced in Section 1. The definition of a subsidy is given in Section 2. The types of subsidies are examined in Section 3. The effects of subsidies on the funding of new fossil fuel and renewable midstream and upstream oil and gas projects are covered in Section 4. Project hazards related to upstream and midstream oil and gas projects are evaluated in Section 5. The parallels and differences between midstream and upstream oil and gas projects, as well as how to manage them, are evaluated in Section 6. The significance of Joint Operating Agreements (JOAs) in project finance in the oil and gas sector is covered in Section 7. The evaluation of financing options for upstream oil and gas players is covered in Section 8. The financing of the Liquid Natural Gas project is evaluated in Section 9 as a single, integrated operation that finances several value chain components. While Section 10 wraps up, Section,11 offers a path for further research.

2. Definition of a subsidy

Various experts in the fields of finance, economics, and petroleum, including Inkpen & Moffett, Tinsley, and Sharp, to name a few, have explained subsidies and made the case that they are crucial incentives for growth and output in every nation. David Sharp defines a subsidy as a tax stimulus provided by the government to businesses in order to ensure that their prices are lowered so that the citizens can afford their products (Sharp, 2009). Inkpen and Moffett (2011) define a subsidy as an incentive given by the government to individuals and business owners in the form of cash, grants, or tax breaks (holidays) with the goal of increasing the availability of specific goods and services in the nation. Furthermore, according to Richard Tinsley, a subsidy is

the purposeful removal of taxes or levies from a business in order to encourage the business, and especially the owners, to increase the amount of goods and services they offer to the market while simultaneously lowering prices so that customers can afford them (Tinsley, 2000). Subsidies undoubtedly provide customers access to lower-priced goods and commodities in the nation, which advances their socioeconomic development. In order to significantly increase the supply of products and services, markets with a favorable appeal and those that directly benefit individuals and business owners are more likely to be chosen when implementing subsidy policies. Crucially, and as previously stated, governments provide subsidies to specific industries in order to keep the cost of goods and services low enough for people to afford them and to ensure both production and consumption in the nation in question. Richard Tinsley's term is the most appropriate for this study out of the three pundits' definitions.

3. Typologies of subsidies in project financing

Project finance is endowed with various typologies of subsidies which are meant to enhance the sustainability of the different projects and in particularly, giving relieve to the consumers in a given country. Typologies of subsidies are discussed as follow:

First, there is the subsidy for consumption. When the government balances the expenses of healthcare, education, food, and water, this kind of subsidy is used (Nie, 2016). This is to encourage the use of a certain product in a nation that guarantees inhabitants, and customers in particular, have access to products and services at more affordable costs. Secondly, there is production subsidy. This typology of subsidy argues that government takes care of cost of production of goods. For instance, critical goods such as fuels, medicines and foods items are shielded by the government in ensuring that the producers of these goods and their factories are tax relieved or offered holiday taxes for quite sometimes. This is to increase the production of that particular product which is in high demand from the citizens aka consumers. To be sure, the government plays a role of protector so that local industries and producers don't collapse because of high cost of production in one and then on the other hand, the citizens are not burdened with high prices when products produced become scarce (Taylor, 2020). As an outcome, production and consumption grow, but the price remains the same for both the producers and consumers. Such a motivator has the drawback of potentially increasing overproduction. In fact, by providing producers with incentives, producer subsidies encourage investment in production. Thirdly, there is employment subsidy. This typology argues that there is a need for government to motivate organizations and companies so that they in turn employ more people in a country. This motivation includes lowering of taxes and protection of the organizations and companies for abuse and exploitation of by senior government officials (Kavanagh, 2016). Fourthly, there is investment subsidy. This typology is applied to reduce project investors' capital and operating costs and therefore offer incentives to project initiators and developers to invest in project and particularly, renewable energy projects for environmental protection and safety (Wohlgemuth and Madlener, 2024). Like the other types of subsidies mentioned above, these are often funded by the government through the general tax base or by utility users through additional fees on their bills. Fifthly, a subsidy for exports exists. The premise of this typology is that a nation's export earnings help the government maintain economic equilibrium by promoting economic diversification. Therefore, in order to encourage more exports, the government must lower the cost of exports by eliminating relevant taxes on the exported commodities (Yang, 2015). However, exporters may readily exploit this pattern, especially by inflating the pricing of their goods to gain significant incentives, thus increasing their profits at the expense of taxpayers (Zhong, 2014).

4. Impacts of subsidies on financing of renewable energy projects amongst the developing world

In place of fossil fuels, which include, among other things, crude oil, coal products, derived gas, n atural gas, and non-renewable wastes, renewable energy has emerged as a significant worldwid

e energy source. Debates on switching from fossil fuels to renewable energy have been going on since 2020. Proponents desired a complete switch to clean and renewable energy by 2050, while opponents wanted a phase-in of renewable energy using the energy mix model. While renewabl e energy is non-depletive energy that is driven from the nature, it is a clean energy that requires exploitation and policies to protect its existence (Wohlgemuth and Madlener, 2024). Indeed, it is energy produced from sources that do not exhaust and can be refilled within a human's life time. Although renewable energy systems at certain circumstance may produce less greenhouse gas e missions than fossil energy sources, they are the best for the natural world protection since they produce less emissions than other sources of energy (Martinot, 2002). The common sources of r enewable energy include biomass, geothermal, photovoltaics, power, hydroelectricity, hydropow er, solar, tidal and marine energy. The renewable energy subsidy aims to provide energy securit y, boost local production, adjust for externalities, and assist the impoverished in accessing electr icity. Subsidies are undoubtedly important in the pursuit of renewable energy projects and ultim ately affect the funding and viability of those projects. Thus, in conjunction with sustainable proj ect finance, the effects of subsidies on the financing of new renewable energy projects in develop ing nations are examined in both positive and negative ways as follows.

4.1 Positive impacts of subsidies on financing of new renewable energy projects

I. Encouragement of investment in a country

When renewable energy projects receive subsidies, investors find it advantageous since taxes are either eliminated or drastically lowered. As a result, they are more than willing to fund renewable energy projects with the assurance that their investments would be recouped soon. Kenya's investment climate has quickly changed to encourage additional investments, particularly in renewable energy projects, thanks to the incentives offered by the subsidies. Kenya is the only nation in East Africa with significant investments in renewable energy, with over 80% of its 3,500 megawatts of electricity coming from renewable sources (Podobnik, 2024).

Table 1: Generation Capacity of Electricity in Kenya

Source (As of October 2022)	Capacity (MW)	Capacity %
Hydro	1,194	33.31%
Fossil Fuels (incl. gas, diesel and emergency power)	650	18.82%
Geothermal	1,153	32.95%
Bagasse Cogeneration	58	1.57%
Wind	335	9.50%
Solar	114	3.145%
Others	26	0.705%
Total	**3,500**	**100%**

Source: Podobnik (2024)

According to the table, fossil fuels account for 18.82% of energy generation, while other sources account for 0.705%. Since this adds out to 19.545%, the remaining 80.455% comes from renewable sources. For nations that have undertaken renewable energy projects, such as Kenya and Tanzania, which have advanced cleaner energy in their nations, the World Bank and European Investment Bank (EIB) have provided energy grants as incentives. These countries have been christened by World Bank and EIB are climate smart in their policies and will continued to get climate smart grants for their full transition to cleaner energy (renewable energy).

II. Lowered prices and controlled inflation in a country

Prices tend to drop and inflation is kept in check whenever a government body offers subsidies. When it comes to talking about how to pay for renewable energy projects, subsidies have helped

keep prices stable in countries like Tanzania, where investors have kept pouring money into solar panels and wind turbines. In the case of Tanzania, for example, Masdar Co-Ltd and Tanzania Electric Supply Company (TANESCO) signed a contract for 2 gigawatts of solar power in 2024, thanks to solar subsidies that have reduced prices and stabilized inflation (World Bank, 2024).

III. Preventing the long-term decline of critical institutions in a country

While there are institutions that are connected to renewable energy projects in the country, these institutions require robust policies for their actionable activities. Some of these institutions include but not limited to water management authorities such as Ministry of Water Resources, Ministry of Energy and Dams and National Water Cooperation. Other institutions include geothermal, wind, hydropower, biomass institutions etc. When these institutions cannot function due to lack of investments and incentives due of peak taxes, subsidies become quite imperative so that they reserve and let the institutions operate (Belyak etal, 2024). Therefore, robust renewable energy institutions are necessary for the implementation of government subsidies to increase investment and funding for renewable energy projects and activities (Bond, 2019).

IV. A greater supply of goods and services in a country

Ideally, subsidies can increase a nation's access to products and services. For the consumers/citizens, these commodities and services include food, water, housing, and education. Although the government frequently provides incentives in the form of tax credits, tax holidays, or even direct cash, these advantages are typically received by markets with positive externalization in a particular state (Kaygusuz, 2012). The market supply of renewable energy projects would rise as soon as subsidies were made available to them. When there are more products and services available on the market in a certain nation, the financiers will be overjoyed.

4.1.1 Negative impacts of subsidies on financing of new renewable energy projects

I. Difficulty in measuring success in a country

In a particular nation, subsidies are often seen as beneficial and generally successful. Nonetheless, it would be a failure if the ruling government of a nation, like South Sudan, claimed to have been successful while utilizing subsidies. This is because it is syntactically difficult to assess the effectiveness of subsidies in developing nations since the recording and measuring of subsidies are impacted by daily shocks, market issues, and security concerns. Furthermore, because one can not physically oversee the financiers of a particular project, it is very difficult to know how the new renewable energy projects are being financed (Xiaoling and Lin, 2014).

II. Higher taxes in a country

The problem is that when subsidies are only offered, the government would generate money to support other industries, including the renewable energy industry. Although the government raises money through increased taxes to fill the gaps caused by subsidies, higher taxes would also have an impact on the cash flows and liquidity levels of businesses since they boost state prices (Diallo et al., 2024). Therefore, the resources that allow the government to support certain industries are provided by the people and businesses. As a result, the incentives may benefit the new financiers of renewable energy. But without raising taxes to make up for the income losses, the government won't bear the burden of the substantial subsidies (Yang, 2015).

III. Shortage of supply of goods and services in a country

Although a polity's increased supply of products and services is one of the benefits of subsidies, there may also be a scarcity of these items. This is due to the fact that reduced pricing may result in increased demand, which many producers may find extremely challenging to provide (Boqiang and Yongjing, 2024). However, it may result in extremely high demand, which might raise costs. As a result, despite government subsidies in the oil and gas sector, which government senior officials and consumer/citizen representatives have yet to demand and pursue, financiers of new renewable energy projects may find it challenging to finance any renewable projects in an economy like South Sudan where there are shortages of supplies of goods and services (Taylor, 2020).

IV. Timing of subsidies in a country

The project's competitiveness when the subsidies expire is crucial, even if the subsidies are also timed carefully and eventually run out.

V. Continued subsidies for fossils fuels in a country

Continuous subsidies for fossil fuel energy sources are a significant obstacle to funding for renewable energy, even if they promote investments and cash flow in a particular economy. Consumer subsidies for fossil fuels are anticipated to have totaled US$762 billion in 2023 (World Bank, 2024). An estimated US$388 billion was spent on renewable energy subsidies in the same year (Wang et al., 2024).

5. Technical project risks related with midstream and upstream and oil projects

It is reasonable to contend that project risks are unavoidable and will always influence how a project is carried out. Several academics have provided intriguing, groundbreaking, and contemporary definitions of technical project risks, including Johnston (2013), Leveson (2011), Badiru and Osisanya (2017), and Macmillan (2019), to name just a few. Technical project risks, according to Johnson (2013), are unforeseen future occurrences that, if they materialize, would adversely affect the creation of project deliverables that are suitable for their intended purpose. In other words, all project risks are linked to project deliverables; if the deliverables are not met, project risks have already happened and will continue to undermine the project as a whole. Technical project risks, according to Leveson (2011), are the degree of exposure and seriousness of all hazards across a project's life cycle. Furthermore, according to Badiru and Osisanya (2017), technical project risks include the likelihood of unforeseen circumstances pertaining to the oil and gas project's scheduling, technical, quality, and cost results. Last but not least, technical project risks are described by Macmillan (2019) as unpredictable conditions or occurrences that, if they materialize, might have an impact on the project's objectives, scope, budget, schedule, and quality in both positive and negative ways. The concept of technical project hazards provided by Badiru and Osisanya is appropriate for this article based on the academic definitions mentioned above.

5.1. Types of technical project risks

Throughout the whole project life cycle, from pre-feasibility and feasibility to the operational phase, oil and gas projects are intricate and subject to many hazards. However, the bulk of project risks often occur in the oil and gas industry's upstream and midstream value chains. Extreme risks are associated with these value-chain initiatives, which are fundamentally complex, volatile, and variable-rich. Below is a discussion of a few chosen categories of project risks:

Firstly, there are performance-related risks. These risks emanate from pitiful performance and operation of any organization or institution of any government. Because of their pitiful and poor performance, the organization or government institution will not achieve its goals or objectives. Hence, performance related risks in turn lead to abysmal project implementation (Harris and Krugger, 1999). This been a challenge in South Sudan for government institutions as well as non-governmental institutions. The project will always fail to generate results that coheres with project goals, objectives, mandate, mission and vision. Secondly, cost-related hazards exist. The project initiators, developers, and implementers' exaggerated project expenses are the source of these dangers (Leveson, 2011). Cost-related hazards are those that arise when project expenses exceed the project's real budget at the time of project costing and determination. Market risks arise when the market is highly speculative and unstable due to price volatility and distortions, although cost-related risks are different from changes brought on by market risks (Azizan, 2015). Thirdly, schedule-related hazards exist. These kinds of project hazards are brought on by inadequate planning, timing, or complete disregard for the project timetable plans. Poor planning and monitoring are frequently the cause of these schedule-related hazards, which often take longer than anticipated to complete (Tinsley, 2000). Schedule-related hazards result from poorly executed project schedules. Additionally, the project contractor may not get timely disbursement of the project's intended financial resources. It impacts the project's timeframe and leads to

hazards associated with the schedule. There are many examples of schedule risks in South Sudan oil and gas industry. one of the eamples, is the headqauters building of Nile Petroleum Corporation (NILEPET) in Juba, which was planned to be completed in three years based on the schedule agreed between the contractor and NILEPET. However, the building later took took nine years and both the contractor and NILEPET management become affected by scheduled-related risks.

Fourthly, there are technological risks. When executing any project, the technology is an integral part and it is a multifarious requirement for the success and high performance of any project. It is important to be noted that quite often, there are high turnover of new and advanced technologies and thus project designers and implementers must watch out what type of technology can be used for the project so that it doesn't turn out as a risk during project implementation. According to Inkpen and Moffett (2011), the technological component of a project poses a serious risk to data security, information security, organization services, and compliance, especially in oil and gas juxtapositions. Because deploying a new technical system or program usually requires software procurement and human training, technology-related risks are costly and highly demanding. Other hazards associated with technology, such as service demand, might cause delays or even project failure. Fifthly, there are threats to one's health and safety. This kind of risk has the potential to weaken acceptance guidelines and eventually result in project hazards. Safety and health policies should be developed, reviewed, monitored, and continuously assessed to identify potential hazards that might result in institutional or organizational losses (Johnston, 2013). In addition to safety and health risks, personnel health complications may raise concerns about the organization's and the institution's reputation. It is incumbent upon the management of given organization or leadership of government institution to take responsibility for safety and health risk by continuously monitoring and putting in place related mechanisms in the organization and institution to minimize safety and health risks so that the organizational products and services are not affected.

5.2 Strategic project risks related to midstream and upstream management of oil and gas projects

The entire oil and gas industry, particularly, midstream and upstream value-chains are troubled by strategic risks related with the projects in refining, piping, storage, transportation, distribution and marketing as well as in exploration, development & production related projects. Some of the related common risks for midstream and upstream projects are discussed as follows:

Political risks

When it comes to their operations or initiatives, there are serious hazards that neither the government nor any business can ignore. Political risks include governmental and organizational changes, as well as parliamentary and organizational-level amendments to laws, policies, acts, and regulations (Macmillan, 2019). Due to the possibility of unfavorable commercial conditions, these modifications frequently impact both upstream and midstream projects. Violent conflicts and civil wars are serious project hazards that have the potential to halt both upstream and midstream operations. The pipeline and midstream crude oil transportation from the field processing facilities (FPF) projects were shut down in every block during the violent conflicts and civil war that broke out in South Sudan on December 15, 2013. Once more, because the personnel needed to be evacuated to Juba for their safety, the exploration and production projects (upstream) in block 3 and 7 in Paloch, block 5A in Tharjah, and block 1, 2, and 4 in Bentiu were shut down. Due to political violence, certain oilfield wells and field processing facilities are still in shutdown status as of the time this article was written.

Extraction and installation risks

These hazards are associated with the production of gas and oil. As it searches for crude oil through exploration, the licensee or the International Oil Company (IOC) contractor may invest

its financial resources during the exploration, appraisal, and development phases of crude oil extraction (Azizan, 2015). During exploration, airborne magnetic survey or aerial surveys will be conducted by the international contractor. After the magnetic survey, the acquired data will be processed, interpreted and presented. Then the international contractor will shoot seismic surveys; 2D and 3D to get into depth of data acquisition. The contractor might, however, encounter a dry well during the drilling phase, which is a serious risk for upstream operations. During the midstream projects, the contractor may invest on a pipelines or refineries and at the time of installation of either a pipeline or a refinery, the two facilities may be incompatibility or security risks could easily affect the installations. This is a risk that affected Bentiu modular refinery during the time of installation. It was destroyed by the rebels during 15th December 2013 political violence leaving the government to compensate Russian, Safinat Limited Company.

Operational risks

Both upstream and midstream projects are frequently impacted by these hazards. They include cost risk, which frequently affects how profitable midstream and upstream project operations are. It is advisable to retain experienced people throughout periods of poor production or stoppage, notwithstanding the high operating costs of these projects. Furthermore, these skilled workers in oilfields may be eligible for maximum insurance and better compensation under new laws (Badiru and Osisanya, 2017). The financial impact on the business can be extremely difficult when a certain project has an incident, such as an onshore or offshore explosion. Risks associated with extraction and installation are directly related to each of these possible expenses and operational hazards. When the Sudanese pipeline that transport crude oil from South Sudan to Port Sudan was shut down in February 2024, it was due to the operational risks where the pump station 3, 5 and 6 were shot and destroyed by Rapid Support Force (RSF) fighting the Government of Sudan. Due to the ruptures of pumps stations, the crude oil was shut down. The operational risks need to be assessed before resumption of oil flows. Basher Petroleum Company, known as BAPCO, the company operating the pipeline is yet to furnish both the government of Sudan and the government of South Sudan about the operational risks on the pipeline.

Demand and supply risks

These risks are mostly related with the midstream, particularly, on the ferrying, distribution and retailing of petroleum products. When petroleum products such as fuels (diesel and petrol) are inadequate supply in the country, the demand will shoot up and the prices will superbly rise. This causes conundrums such as public transportation risks as the buss fares increase due to the high demand for fuel. Nevertheless, there are times when the supply of oil and gas products fill the market. In this situation, the demand risk will be low and the prices will come down and this cannot aid in recouping of the investments by the investor in the midstream projects (Ahmed and Aziz, 2024).

Environmental-related risks

Midstream and upstream projects are frequently associated with these project hazards. In the midstream and midstream value-chains of the oil and gas sector, these are the intricate strategic risks to understand (Johnston, 2013). Governments would always be in the vanguard of exploiting their oil and gas resources for the socioeconomic growth of their nations, as is widely known and accepted. Nonetheless, most governments will always neglect environmental policies, laws, regulations, standard operating procedures in protecting the environment from the contractors.Thus, environmental pollution such as gas flaring, oil spillages, gas flaring and water contamination's will surface and will posit risks to the midstream and upstream projects. Despite the establishment of various oil and gas environmental systems aimed at reducing the environmental risks associated with the midstream and upstream value-chains of the oil and gas industry, environmental risks have attempted to impact these projects, resulting in losses amounting to billions of US dollars. In South Sudan for example, the environmental pollution committed by international oil companies in all the blocks could amount to over 6 billion United

States Dollars in compensation.

6. Analyses of the project risks similarities and differences between midstream and upstream oil and gas projects

6.1 Similarities

These project risks fall under commonalities and affect both upstream and midstream projects. The following is a discussion of them:

-**Political risks.** As was previously mentioned, political risks arise when a nation's political systems, statutes, or rules, regulations, and policies change. These changes have a substantial impact on the projects (Azizan, 2015). Additionally, they are demonstrated by violent confrontations and civic unrest. Both upstream (exploration and production) and midstream (piping, refining, and transportation) are frequently impacted by these hazards. This is because oil and gas workers who are conducting exploration and production at refineries, pipelines, or block sites in oilfields are all evacuated to safe regions as soon as a violent conflict breaks out. Oil workers have frequently been evacuated from the Paloch, Bentiu, and Tharjah oilfields in South Sudan in order to seek safety in Juba. In South Sudan, this has frequently had an impact on upstream and midstream projects.

-Environmental risks. As previously mentioned, the midstream and upstream operations have been similarly impacted by environmental issues. The environmental impact of exploration, appraisal, development, drilling, and production is significant. Environmental deterioration or pollution are the causes of this. Environmental hazards are not entirely eliminated, despite the fact that environmental social repercussions are assigned. Environmental risks associated with midstream projects include refinery emissions of pollutants and pipeline breaks or leaks during the pipeline transportation of crude oil, while upstream projects include oil spills, contaminated water discharge, and gas flaring during exploration, drilling, and production (Johnston, 2013). The oil and gas sector in South Sudan has faced difficulties as a result. Fascinating foreign oil companies have yet to compensate the government and communities for the severe environmental harm caused in South Sudan.

-Market risks. These hazards are connected to both upstream and midstream projects. Despite being based on hyperinflation, pricing, and market volatility, these risks frequently impact both midstream and upstream products. For example, in many nations, the price of refined and piped oil and gas products has been impacted by the decline in crude oil prices. Under such conditions, businesses running upstream and midstream operations will have low revenues, which will result in losses rather than profits (Harris and Krugger, 1999). This has frequently occurred in South Sudan, where market risks have had a significant impact on South Sudanese crude oil exported as cargo to the global market, causing it to be drastically reduced in price in order to find a customer.

-Operational risks. As was previously mentioned, these risks—which are once more connected to upstream and midstream projects—continue to have an impact on the performance of numerous businesses and, to a greater extent, governments of the day. Similar hazards arise during exploration, drilling, and production as well as during refining, piping, and transportation. The majority of these hazards are related to maintenance and operations. For example, pressure vessels, fired heaters, piping systems, heat exchangers, storage tanks, compressors, and pumps may dislocate during refinery and pipeline operations, rendering the refinery or pipeline inoperable. Crude oil production can be challenging on upstream projects due to the possibility of production, drilling, or servicing rigs moving, a phenomenon known as downhole activities (Leveson, 2011). Thus, operational risk is a risk that both upstream and midstream projects share or are comparable to.

-Technological risks. These hazards are similar or shared by midstream and upstream projects. In the oil and gas sector as well as other industries, technology is a major enabler. Therefore, technology plays a critical role in midstream refinery and pipeline projects. For this reason, sophisticated technologies like heating, polymerization, catalytic cracking, and alkylation are essential to a refinery's performance. The midstream value chain of the oil and gas sector is at

risk from a lack of technology. Additionally, useful and cutting-edge technologies in aerial magnetic survey and airborne magnetic survey with 2D, 3D, 4D, or 5D seismic surveys, as well as more importantly, artificial intelligence (AI), are required for the upstream projects. In addition to being crucial for data collection, technology is also crucial for data interpretation and reporting. At the upstream value chain of the oil and gas sector, a major technological threat and risk is the absence of new technology (Macmillan, 2019).

6.2 Differences

Under differences, these are projects risks that occur either at the midstream upstream projects. They are discussed as follow:

-Liquidity risks. The midstream value chain of projects is mostly associated with these risks. Since International Oil Company rarely makes investments in the midstream value chain, bankers, lenders, and sponsors are constantly asked to fund midstream projects, as the project finance makes evident. If nothing else, most IOCs would fund upstream projects where they could easily get their money back. Therefore, midstream projects like pipelines and refineries will be at risk of liquidity once financiers like commercial banks refuse to fund them on the grounds that they don't meet the bankability criteria. This is extremely concerning in the project finance industry (Inkpen and Moffett, 2011).

-Investment risks. Upstream initiatives are mostly associated with these risks. Because of the high internal rate return and net presence value, the oil and gas sector places a greater amount of money on upstream (exploration, development, drilling, and production) than midstream (refining and pipelines). Investment risks become commonplace whenever such a large sum of money, such as billions of US dollars, has been invested and there has been no recovery of the investment. In this instance, midstream operations are primarily labor-intensive, whereas upstream initiatives are primarily capital-intensive (Blake and Roberts, 2016). Although, many international investors always wish to invest in the upstream projects, few of these international investors would also invest in midstream projects depending on their comparative advantage. Investments risks can be caused by legal risks. This mostly happen when the legal environment is not conducive to the investors.

-Legal-related risks. Every danger has legal implications. Legal hazards affect the whole oil and gas business as well as the financing of oil and gas projects, even though the majority of these risks are associated with upstream and midstream operations. Although upstream projects bear the majority of legal risks, it is crucial to remember that the upstream sector of the oil and gas business is rife with legal agreements. The production sharing agreement/contract (PSA/PSC) is one of the noteworthy agreements that always have legal implications. These legal documents summarize both the contractor's and the government's responsibilities. Legal risks always result from either party's inability to implement the legal direction or to expressly state legal agreements like PSC or any other legal document (Wright, 2017). The midstream value chain has many legal deeds, but they are not as valuable as those at the upstream value chain, which are worth billions of US dollars. The project's Final Investment Decision (FID) and cash flows will be impacted by legal concerns, which will also raise liquidity risks.

-Cash call-related risks. These project hazards are sensitive to the oil and gas upstream value chain. Each of these operators will have to pay a specific amount of money as an expense when the contractor or the oil and gas operating consortia hits wet wells and produces the first oil; in oil and gas parlance, this expense is known as a cash call. Given the greatest hazards associated with petroleum resources, such as the paradox of plenty or the resources curse, the majority of upstream oil contractors may frequently neglect to pay the operator's cash call. The failed company or partner will be liable for cash call risks once this happens numerous times (Wright, 2017). Midstream value-chain projects may require a cash call, although it is not as significant as the upstream value-chain of oil and gas projects.

-Extraction risks. These risks are solely related to upstream projects (exploration, development, drilling and production). While these risks are found mostly during the drilling of the crude oil where contractor halted with a dry well, they are often quite huge and expansive. Thus, it is also

advisable to carryout adequate pre-feasibility studies so that they these risks are predicted and mechanisms of mitigation are put in place. Whenever a contractor had spent enormous finances, it becomes crystal clear that extraction of petroleum resources is very risky business. The difference in this case is that midstream value-chain doesn't undertake extraction of oil and gas and hence doesn't face this type of risk (Sharp, 2009).

It is critical to note that the implications of these project risks are that they have continued to discourage new investors as well as affect projects viability. Most of upstream, downstream and midstream investors have decided to shy away from South Sudan due to political, environmental, legal and security risks. For instance, PETRONAS Carigali Nile Ltd exited South Sudan due to operational, environmental and security risks. Although not official, the results of Environmental Audit has largely blamed PETRONAS Carigali Nile Ltd for massively contaminated the environment for block 3 and 7 in Paloch, Melut County.

6.3. Analysis of project risks and management in oil and gas industry

Source: Kleimeier (2010)

In order to have robust project risks analysis and management in oil and gas industry, it has to go through the following stages of analysis:

Firstly, there is risks identification. This is the first stage of project risks analysis. It begins with the identification of risks. For instance, is the risk political, economic or legal? Is it operational, environmental or construction risk? The risk should be distinctly identified and segregated. Secondly, there is risks assessment**.** After the identification of the risk, an assessment should be promptly carried out to ascertain the nature of the risk, its locus, strength, threat and weakness. Indeed, assessment in general definition refers to the approximation or the appraisal of the quality, ability, nature of someone or something (Gatti, 2013). This is an imperative step that can aid in rating of the risks. The third is the examination of risks. This is a thorough analysis of the risk component. Even if the risk analysis can be rather detailed and comprehensive, it should be comprehensive, taking into account all relevant variables and indicators to effectively illustrate the risk (Grimsey and Mervyn, 2004). The fourth is risk control. Once the risk has been thoroughly and properly analyzed, it must be controlled to prevent it from becoming out of hand. According to Merna and Al-Thani (2008), control is the capacity to guide or affect the course of action about a certain circumstance or phenomena. Therefore, it is crucial to have control over the risk that has been discovered, evaluated, and analyzed. The risk can be reduced when the control is insufficient to eliminate the risk. Fifth, lowering risks. As a result, the risk is becoming less acute and dangerous. To diminish is to lessen its severity or degree. Bringing something to a weaker or lower state, role, or condition is called reduction (Hoffman, 2022). Reducing risks entails bringing them down to a level that is less severe throughout project finance and execution. Project finance experts have made the case time and again that no project has ever been risk-free, whether that

risk is related, direct, or indirect. Project managers should therefore make every effort to lower project risks by making sure that the project is scaled down to a less severe condition in order to make it less risky. The sixth is the transfer of risks. It is possible to assign risks to a third party or a surrogate to assume. Transfer is the act of moving something to a different area for a specified purpose. The contractual transfer of a risk from one party to another is, in fact, a risk control strategy and management technique (Daube, 2008). The project involving the purchase of insurance coverage, in which a specific risk of loss is transferred from the insured to the insurer, is a prime illustration of this risk transfer. The six points listed above are all strategies for controlling or reducing risks in the petroleum sector. To understand this, risk management refers to strategies or tactics implemented to lessen the likelihood and negative effects of losses on upcoming initiatives (D' Agoot, 2019). In a nutshell, risk management is the process of expanding prospects in order to subsequently control project losses. It promotes advantageous circumstances throughout the project life cycle. Payment of liquidated amounts, defects liability clauses, turnkey contracts, insurance, performance bonds, and agreements to avoid double taxation are all ways to handle the financial risks associated with a project.

7. The importance of Joint Operating Agreement (JOA) in projects financing in oil and gas industry

A joint operating agreement (JOA), often known as the JOA in industry parlance, is a semi-legal contract between two or more operating organizations who choose to collaborate in order to manage their daily operations. Despite being widely used in the oil and gas sector, JOA's legal standing is still up for question (Hughes, 2016). However, JOA continues to be a suitable method for risk dissemination through consortiums. According to the JOA, the consortium's member companies share rights, responsibilities, and liabilities with regard to the day-to-day operations of the company. In many instances, the JOA's partners choose an operator to manage the running of business. It also specifies how the operator is to manage the business operations and how the operating committee is to oversee the operator (Josephson, 2002).

The operator is granted the greatest amount of authority in relation to any business endeavor by the JOA. This authority determination comprises preparing and adhering to the work program and budget, as well as monitoring and overseeing them. The host government and non-operating partners must receive daily reports from the operator regarding the operation of the business project. According to Wright (2017), the operator must embrace all applicable laws and maintain the integrity of the license by meeting all requirements. In the petroleum business, the lender for any project is typically a project company or special purpose vehicle (SPV). Upstream projects typically just have JOA partners that are subject to the JOA contract; there is typically no project company involved. As stated earlier in this article, a JOA is a loose partnership of comfort between the parties rather than a stand-alone legal corporation (Hughes, 2016). The JOA is unable to make loans on its own or take on legal obligations related to lending. JOA partners have maintained their independence and consistently manage their funds on their own. The use of this antiquated project finance model is therefore limited to the upstream value chain of petroleum projects. There are no JOAs for midstream projects including pipelines, refineries, and storage facilities; instead, the project company supports the standard project finance model (Josephson, 2002). The JOA is undoubtedly the most important operating agreement for the upstream industry. With JOA plans, a single borrowing vehicle (SBV) is not appropriate. The JOA does not include the fundamental idea of project finance control over the project operations and cash flows quarterly (Stockley, 2021). Special purpose vehicles, or SPVs, may be effective in projects involving the quarry sector, but not in projects involving the upstream value chain of hydrocarbons.

How Joint Operating Agreement (JOA) works

JOA works in the following ways:

I. The operators percentage interests

Identifying the operators and precisely defining their various percentage shares and interests is a crucial part of every JOA. It lays up the rights, responsibilities, and interests of the project under the agreement with the host government. According to their proportion shareholdings, it also specifies petroleum generated under the agreement, costs, liabilities, and joint property, costs, and liabilities as shared or owned by the participating operators (Hughes, 2016). It's important to remember that JOA creates an operating or management committee and chooses the committee's voting based on the percentage of shares held by participating parties (Paterson, 2019).

II. Management of the project

JOAs are typically used to address specific challenges, such managing operators' interests properly. In the oil and gas industry, the joint management committee, also known as the joint operator committee, makes sure that there are no management dilemmas. As shares of top management positions in operating companies are done in tandem with shares invested in the project, other senior staff would not need to establish another management against the one that has been created if one of the operating companies' senior staff members in the JOA is assigned to run the consortium on a daily basis as a president or general manager. The partner with the largest shares in the consortia is the one in charge of JOA management in any establishment, as is only seen in the JOA. When management issues arise, JOA can work with the interests of the participants to find solutions. For instance, the operator is the business with the biggest proportion of participating stocks (Zetnik and Dewar, 2018). The rationale for this common approach is that the company with the highest stake in the consortium plays a major role in the project's success and is therefore most motivated to work diligently. JOA typically uses a management or operating committee to give non-operator participating companies some rights and responsibilities to oversee the chosen operator when other interest operating owners are realistically reluctant to entrust everything to an operator (Ramos, 2014). In summary, the JOA arrangement primarily establishes the boundaries between committee and operator responsibilities. However, if a committee took part, an operator's authority and responsibility under the JOA are probably sufficient to enable efficient administration of day-to-day business operations.

8. Assessment of financing options available to oil and gas upstream players

The following are the financing options available to oil and gas upstream players:

I. Carried interest

This is party's share of project expenditure paid by a single partner in the JOA either fully or in part in the daily running of the business. The carried party is required to repay with its equities of production determined by production sharing agreement with or with no interest depending on the agreed terms of JOA amongst the parties. While there is carried with interest, there is free carry without any interest or payment obligations. Although carried interest can only be efficacious during development and production and not at the exploration milestone, there are some circumstances where it is also efficacious and particularly during exploration time (Wealey, 2021). In South Sudan, for example, Nile Petroleum Corporation, which is the National Oil Company (NOC) is freely carried with 10% interests from exploration in all the blocks. However, the carrying company will recover its cost during production and Nile Petroleum Corporation will be required to pay. While the carried interests are governed by applicable laws, they are often negotiated and agreed upon.

II. Self-financing

This is a financing alternative organized by the upstream players who are mostly supermajors with enormous capitals (Mosot, 2020). Given their stand financially, these upstream players will be able to support their own projects.

III. Multiple loans/individual borrowing

This financing option allows JOA partners to take out separate loans from one another, and each partner's interest is financed separately with the aim of timely loan repayment (Ramos, 2014). It is possible to declare JOA partners to have failed when they failed to make loan payments. A violation of JOA principles and eventually the inherent license could result from this failure.

IV. Net profit interest

It is an additional funding option intended for upstream participants. It is acquired when one of the JOA's parties sells all of its participating stocks but retains the right to a portion of the anticipated cash flows (Zetnit and Dewar, 2018). When an owner of any property, such as an onshore or offshore oil and gas field, leases it out or ships it off to another party for exploration and production, they establish a net profit interest, which is a non-operating interest (Paterson, 2019). Revenues from capex and opex costs are subtracted to obtain it. Royalties, which are paid out of gross revenues, are different from net profit interest.

V. Government funding

With this financing option, the government uses the money it receives from the sale of petroleum to fund its own NOC. This could fall under the heading of debt, equity, or revenue reinvestment. There are numerous drawbacks to this funding, including the bureaucratic process of obtaining it, shifting governmental priorities, and, most importantly, corruption (Ahmed and Aziz, 2024).

VI. Farm in/farm out/farm down

This financing option suggests selling a portion of a partner's or party's participating stake to a t hird party in the hopes of receiving funding for project costs and capital expenditures. It is typica lly presented such that the business that is farming down would be compensated financially as p art of its interest-based approach and as a duty from the farming in firm. In fact, the JOA contains information about any upcoming cash calls for farming in the company (Stockley, 2021). The liab ilities incurred during the exploration and production phase will have to be borne by the farmin g out firm. Therefore, one financing option that is frequently used to build new oilfields is farm i n/farm out/farm down. In both exploration and production, the transfer of title to the third part y may occur at the gold signature.

9. Financing of liquid natural gas project as a united single operation with financing separate parts of the value chain.

For safety and convenience of uncontrolled storage and transportation, it is important to remember that liquid natural gas is a natural gas that is produced from a mixture of methane and ethane. Make sure that it has cooled to liquid form (Ruester, 2015). Although liquid natural gas is thought to be 1/600th of the volume of natural gas in gaseous form, it is a very useful gas in both the house and the business since it is non-toxic, non-corrosive, odourless, and colourless. Projects involving the utilisation of liquid natural gas are referred to as liquid natural gas projects (Guthrie, 2019). Gordon, which is estimated to cost 55 billion USD, Queensland Curtis, which is estimated to cost 22 billion USD, Yamal, which is estimated to cost 21 billion USD, Sapine Pass, which is estimated to cost 12 billion USD, and Mozambique LNG, which is estimated to cost 13 million USD, are examples of liquid natural gas projects (Ruester, 2015). For a variety of reasons, project finance has undoubtedly attempted to be a desirable financing alternative for liquid natural gas projects. First of all, initiatives involving liquid natural gas require large, quick investments. For import projects, these investment opportunities would cost between $10 million and $1 billion in US dollars, whereas for export-driven projects, the range would be between $2 billion and over $50 billion (Howley, 2021). Second, a project consortium consisting of one or more sponsors is common for liquid natural gas initiatives. This is primarily from businesses who have a business connection to the project of choice. For instance, several power utilities, importers and exporters of natural gas, and petroleum mega companies are banding together with upstream to obtain significant investment (Ruester, 2015). Thirdly, there is less technological risk because natural gas regasification and liquefaction technologies are well-established, sophisticated, and well-known from many decades ago. Fourth, cash flow creation depends on one main source of income, which in this instance is the amount of natural gas. Project

finance may lower the cost of debt as the resulting project credit risk and, in certain situations, the sponsor's own credit risk in national, regional, and international financial institutions. This is the ultimate reason for financing liquid natural gas projects, particularly for national oil consortia (Cocklin, 2020). The two most important models for funding liquid natural gas projects are gas sales and supply agreements. Joint business ventures are used to bring together different organisations in the oil and gas industry because no single firm is permitted to carry out the large, capital-intensive, and riskiest liquefied natural gas projects on its own (Ruester, 2015). Liquid natural gas projects are suitable for excellent project finance measures, although they are not on par with crude oil. Typically, financing consists of both loan and equity financing. Each party's shares should be equivalent to the portion of the project costs that the parties want to raise from equity earnings. The majority of the additional funding is often obtained through debt finance. This refers to project funding that is restricted or non-recourse. In terms of the project's cash flows and asset values, external debt, sometimes referred to as debt financing, is higher than equity financing (Guthrie, 2024). In South Sudan, Nile Petroleum Corporation (NILEPET) sells LNG under the brand name NipGas, which stands for Liquid Purified Gas (LPG). Although it is difficult to obtain NipGas or other LPG goods in South Sudan because of a lack of money, this product is incredibly helpful as a clean energy source in the developing nation. Since South Sudan focusses on greener and cleaner initiatives that protect the environment, other project financing choices, such as green bonds, are appropriate and relevant.

9.1 Contrasting and comparing of the risks of financing an LNG project as a united single operation with financing separate parts of the value chain

Oil funding ceases at the wellhead, as is well recognised across the world. Namley, production, liquefaction, transit, and regassification are the steps that LNG projects go through. Although natural gas is the end product, considering the risks associated with financing an LNG plant, obtaining this end product is always troublesome from a syntactic standpoint. There are two different kinds of LNG project financing models, specifically:

- Single united operation. This refers to the funding of the entire project as single chain (Ruester, 2015). And
- Separate parts. This refers to the parts of the chain being financed separately (Ruester, 2015).

The above two typologies of financing model are faced by several risks of financing an LNG project. These risks are discussed as follow:

Firstly, there are price risks. The volatility of the oil and gas markets is the cause of these hazards. Because of the price fluctuations, lenders will be reluctant and afraid to fund any LNG project. Gas transported via pipelines and LNG tankers becomes significantly less competitive whenever gas prices decline (Guthrie, 2024). Additionally, there won't be a ready market due to the low petrol prices, which makes it a major risk. Long-term offtake agreements could reduce market and price concerns. The long-term offtake agreements serve as both loan and price risk securities. Secondly, there are contractual termination risks. Although contracts for LNG supply are sometimes referred to as diminution contracts, diminution contracts have a set length of time. When it becomes unprofitable to continue producing oil and gas, the seller is entitled to promptly end the agreement (Howley, 2024). Declining or diminution contracts that give the customer and seller the identical exclusive rights might reduce the likelihood of contract termination. Thirdly, there are reservoir risks supply. Although it is commonly accepted and geologically true that natural gas is present in the reservoir, declining contracts contend that the amount of gas, whether associated or natural gas, at the reservoir will remain constant throughout the contract's predetermined duration (Ruester, 2015). There is always a severe risk associated with this reservoir. It is a geological truth that gas can readily fall as a result of both poor reservoir features and a decline in reservoir pressure. To put it another way, petrophysical tools' deficiency may be the cause of the depletion. Enhancing gas recovery and upgrading gas recovery procedures can

help reduce reservoir supply threats. Large gas fields are eager to guarantee a steady supply of liquid natural gas in the long run. Fourthly, there are transportation-related risks. Although there are risks associated with long-distance liquid natural gas delivery, extreme caution is necessary because mishaps can easily occur. As previously stated, delays and accidents are typically discovered during the shipment process. According to estimates, shipping accounts for 40% to 50% of the finance of liquid natural gas projects on average (Cocklin, 2020). Additionally, shippers might form autonomous, chartered parties and owners. For example, the project sponsors and other independent financiers kept offsetting the risks associated with transportation. There are potentially serious concerns, such boil-offs, when passing over liquid natural gas in tankers. Fifthly, there are force majeure risks. These dangers arise as a result of the "Act of God." To put it another way, neither the purchasers nor sellers of liquid natural gas projects are to blame. Civil wars, floods, constitutional crises, coups d'état, state and economic collapse, and more are some of these hazards. Risks of force majeure have a significant impact on the seller-buyer agreement for liquid natural gas and will also make it more difficult for sponsors to fund liquid natural projects. Although the hazards of force majeure are always there, they are difficult to manage and reduce. Finally, there are performance risks. These hazards have to do with managing liquid natural gas projects. Performance hazards are identified when project sponsors, owners, or buyers permit bad management, carelessness, poor communication, missed deadlines, and total financial investment in fraudulent initiatives (Ruester, 2015). Performance risks frequently lead to massive financial resource losses and, more crucially, the company's systematic collapse. Effective corporate governance, which all stakeholders must follow and implement, helps reduce performance risks. Even if performance risks are only associated with the workplace, they are now prevalent in every setting where performances are held with a positive attitude. Conducting regular performance reviews within the organisation is one of the best methods for identifying performance risk.

10. Conclusions

The paper has discussed an important and interesting argument on projects financing of renewable and fossils related projects, subsidies, risks and joint operating agreement in oil and gas industry as well as financing alternatives available to oil and gas upstream players. It does so by appreciating the project financing for both renewable and fossils related projects. However, it laments the risks associated with project financing and urge the financiers to carryout risks assessments and analyses so that losses are avoided. Many scholars of project financing, subsidies and risks have noted that project financing of renewable energy and fossils-related projects can be supported through good subsidies policies that strengthen the citizens to buy products from downstream, midstream and upstream projects. The risks though quite inherent can be avoided through strategic assessments and control. The Government of South Sudan should finance its renewable and fossils related projects and should offer genuine subsidies to relieve the citizens. The policy implication of the study is that subsidies and project financing options are critical and should be taken up by government as key priorities for energy sector. Hence, renewable and fossils related projects need to be scanned and documented in Joint Operating Agreements (JOAs).

11. Study implications and further research

The implication of this study is that governments should watch out about poor designed subsidies and project risks so that they don't affect their investments in the country. While the topic of financing of renewable and fossils related projects has been adequately covered, another research is desired in the foreseeable future. Further research is hereby recommended to the midstream and upstream projects scholars to exhaustively discuss challenges associated with subsidies and how project related risks can be immediately identified and avoided in petroleum producing countries such as Nigeria, Libya and Angola.

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