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Legal and Policy Issues While Evaluating the Sustainability of a Floating Storage Regasification Unit: The Case of Alexandroupoli Greece

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Abstract: Floating Liquid Natural Gas (FLNG) facilities are increasingly being used in developing countries since floating regasification and storage units (FSRU) are proven to be more cost-effective per thermal unit than traditional land-based facilities. The purpose of this study is to assess the main issues and the sustainability of an FSRU project, namely the regional and international energy policies and the need to develop a novel regulatory framework, considering all relevant international policies and legislation. Therefore, the Alexandroupoli FSRU was elected because it has several advantages for Greece, the Balkans and the European Union since it supports the basis for a competitive, secure and time-consuming energy market. In addition, the project helps the E.U. to achieve its energy goals and climate objectives in line with the Paris Agreement and provide affordable, safe and sustainable energy to all citizens. Most importantly, the project was elected to demonstrate the volatility of this specific market in light of the Russo–Ukrainian conflict.

Keywords: natural gas; floating regasification and storage units; Orpheus–Alexandroupoli project; legal and policy issues; sustainable development

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1. Introduction

There is a growing recognition of the role of gas and liquefied natural gas (LNG) in a world where poor air quality and climate change have become major issues. Studies [1] indicate that global energy demand is set to grow by 18% by 2035, and by 2070, the world is likely to be using at least 50% more energy than it does today as the population grows and people seek to improve their quality of life. Gas is set to meet approximately 40% of this additional demand, and LNG continues to be the fastest-growing gas supply source. In addition, more than 50% of LNG imports are associated with Asia. Thus, the gas industry is evolving in an unprecedented way, with market fluctuations being a factor that creates uncertainties [2].

As the role of gas in decarbonising global energy usage is unequivocal, many new markets need access to existing gas infrastructure and may need more funds or technologies to construct onshore facilities to receive LNG and regasify it. Consequently, countries with access to sea and land gas networks may invest in flexible, floating storage and regasification units [3]. This access will be vital to reducing the early risks of gas market development and significantly altering the dependence on oil or coal for energy production. Floating regasification and gas storage terminals (FSRUs) have been proposed to present the most likely solution. Today, many floating units are being developed on the high seas [2].

2. The Concept and Function of an FSRU

In recent years, a number of gas import markets, such as Egypt, Jordan, Pakistan, Abu Dhabi and Colombia, have, for the first time, joined the global liquefied natural gas market by adopting the technology of floating regasification plants. FSRUs (Floating Storage Regasification Units) can be connected more quickly and directly to existing gas networks from onshore terminals, allowing for faster fuel exchange. This may be important for new markets, which aim to meet the potential increase in gas demand in the near future. The first FSRUs appeared in 2005 only either in the form of retrofitted old LNG carriers or as new buildings with limited propulsion that are permanently anchored and act as long-term regasification terminals [4].

Other floating terminals are mobile and used for limited periods of time. These FSRUs can operate as standard LNG carriers, i.e., as LNG Carriers when they are not chartered as FSRUs and are always subject to the legislation to which they are subject. In March 2018, nine new FSRUs with capacities of more than 60,000 cubic metres were announced, indicating the market's tendency to shift towards this activity. So, although it seems that multiple FSRUs will be available for chartering at the same time, indicating the capacity adequacy for regasification, it is, however, likely that these available FSRUs will be used directly in projects. Already, many of the FSRUs based on the shipyards' order books have been reserved for specific projects. This creates an apparent capacity adequacy that is not actually the case. This rapidly increases the value of a turnkey FSRU in the new market. LNG shipping companies were of course open to ordering new FSRUs but also to converting existing ones, thus underlining the importance of FSRUs in supporting new liquefied natural gas markets [5].

From an operational perspective, an FSRU operates primarily like an onshore LNG terminal with the difference that it is permanently anchored in the water at a connection facility and at a location close to the access point to the LNG network and the market. In short, an FSRU is a shipwreck used to receive, store and regasify liquefied natural gas (LNG). This floating structure is in the form of a tanker, that is, looking at it and a conventional tanker, it is difficult—if you are not an expert—to discern that it is an FSRU and not an LNG Carrier, which has a regasification plant installed on it capable of restoring liquefied natural gas (LNG) to a gaseous state and then supplying it directly to the natural gas network. Essentially, an FSRU has the length, width and draught of an LNG ship and, therefore, can carry the corresponding capacities of an LNG found in water or built presently [6].

The ships themselves are large, up to 290 m long and 49 m wide with a draught of 11–12 m. A typical FSRU can travel at 19.5 knots and has a load capacity between 125,000 m^3 and 177,000 m^3. FSRUs, like LNG ships, have four to six separate cargo tanks inside the hull. As LNG is stored at very low temperatures, the cargo tanks are separated from the vessel structure by thick insulation. There are two commonly used designs of cargo tanks. Membrane tanks are box-shaped, and LNG ships with membrane tanks resemble any other liquid cargo tanker. The other tanks are the so-called Moss type, and which are spherical. LNG ships equipped with Moss tanks have the recognizable dome-shaped tanks, and LNG tankers are powered by the LNG they carry, making them one of the most environmentally friendly ships in the world, emitting less CO_2, NOx, SOx and particulate matter than other types of ships that burn heavy fuel oil. Therefore, an LNG ship will carry relatively small amounts of fuel. The LNG load is a clear, colourless and odourless liquid. If a small amount is accidentally spilled, it will evaporate quickly and completely, without leaving the imprint behind [7].

FSRUs are usually permanently anchored, storing LNG at a temperature of -161 °C in cryogenic storage tanks. The cold temperature keeps the LNG load in a liquid state, which we want in order to keep it in larger quantities until it is fed into the natural gas network. Liquefied natural gas has a much smaller volume (one volume of liquefied natural gas equals 600 volumes of natural gas), and so it is possible and economically advantageous to transport it in LNG tanks. LNG is generally stored and transported in bulk storage tanks at a slightly higher pressure than atmospheric pressure [8].

So, when the regasification process begins to turn the liquid back into a gas, seawater is used to heat the LNG, causing it to return to a gaseous state. Essentially, liquefied natural gas heats up until it comes to its gaseous form. The heater is usually in the form of a pipe and a shell where water is pumped that heats up around the shell, and liquefied natural gas passes through the pipes. The difference in temperature between inlet seawater and seawater initially is about −7 °C; this is then stirred to ambient temperature. An FSRU typically pumps gas into the grid at a pressure of about 60–80 bar and at 5 °C. Working at the maximum allowable limit, a load of 170,000 m^3 could be regasified in about six days [9].

Once the FSRU is in an unladen state, i.e., it has pumped its gasified cargo into the network, another ship can arrive to transport liquefied natural gas to the FSRU (ship-to-ship transfer).

Thus, a Floating Storage and Regasification unit can be:

1. A self-propelled vessel that regularly travels between different locations without any permanent or semi-permanent attachment to land or marine installations;
2. A floating vessel that does not resemble the conventional concept of the ship, either in terms of construction or operation. These vessels are not ship-shaped or self-propelled and, therefore, belong to the barge vessel type, with clear advantages over ocean-going vessels. This category may include vessels with permanent anchoring systems;
3. Floating vessels belonging to both the first and second categories. This category includes all kinds of vessels, including exploration; production; storage; and unloading vessels, such as Floating LNG liquefaction Vessels (FLNG), Floating Production Storage and Offloading Vessels (FPSO), Floating Storage and Offloading Vessels (FSO), Floating Storage Units (FSU), and Floating Storage and Regasification Vessels (FSRU), as well as drill ships [10].

3. FSRU versus On-Shore Installations and Other Emerging Issues

3.1. Advantages of Using an FSRU

Today, natural gas is the world's fastest-growing primary energy source [2] given its economic and environmental superiority over its respective energy sources and its decisive contribution to sustainable development, providing 24% of the overall energy supply. Moreover, it is more energy efficient than all other fuels and has fewer impacts on commercial, industrial and residential applications [11]. Therefore, in line with their environmental and financial interests, especially last decade, many states have invested in the exploration, extraction and utilisation of natural gas. In addition, following a growing global trade, the global fleet size has rapidly expanded in the last five years [12].

FLNG is becoming increasingly popular, increasing its contribution to gas imports. FLNG usage has grown significantly in developing countries due to its low start-up costs and fast market speed. In most cases, a floating regasification unit is more cost-effective per MMbtu than a traditional land-based solution. In addition, a floating solution can be implemented in one to three years, whereas a land-based terminal takes over five years to develop since it involves fewer project risks and requires less design time [13].

The FSRU can, in the first place, since it is a floating structure, travel (either by trailer or by its own means if it can do such based on the requirements of the flag). It can, therefore, be moved with its cryogenic tanks and regasification units that are ready to operate at any time, avoiding the effect of building large infrastructure on land. So, if it is judged by the economic or social conditions that it should be removed, the FSRU simply moves from the sea position where it is anchored and does not leave the unnecessary infrastructure of an onshore facility to the local community. The FSRU also allows its operators to be able to meet the demand for natural gas in the midst of high or low periods of demand, or in times of prosperity. The gas can be immediately fed into the grid to meet its needs, stored in its tanks until it is required or sent to existing onshore storage facilities. In terms of the flow and number of LNG ships to be moored for cargo transport, it can be adapted to meet the needs of the market. However, the most important thing about this gas import system is that it allows access to gas cargoes from other producer states and international players in the gas market, thus providing security of supply to the states located in the wider region [14].

The main advantages of FSRUs are the optimisation of costs and the reduction of time duration in the market, as well as the reduction of regulatory and complex regulation.

FSRUs offer flexibility benefits through the possibility to relocate the facility and can resume production immediately in another location.

On the other hand, like all major industrial projects, an FSRU cannot help but carry certain risks. The key issue is to identify, minimise and manage risks to the maximum extent possible. Liquefied natural gas contains large amounts of energy; however, in a liquid state it cannot explode or burn. Only in its gaseous state, and when mixed with the right amount of oxygen, can it ignite (methane must be diluted to a concentration of 5–15% in the atmosphere to ignite) [15].

LNG ships are some of the most technologically advanced ships in the world and are equipped with automated leak detection systems and emergency systems. Fortunately, very few incidents have ever occurred at liquefied natural gas import terminals, and there are now hundreds of LNG ships and terminals that work safely, so these risks are understandable and manageable. The FSRU and the ships carrying the LNG have advanced safety features just like the pier itself. Double hulls increase the structural strength of the hull and provide additional protection for cargo tanks in the event of an accidental collision, grounding of the vessel or deliberate attack. All containment systems include load monitoring, measurement, control and safety systems designed to operate at cryogenic temperatures. Nitrogen gas is used to remove the spaces between the tanks and insulate the tank and the hull. Nitrogen is an inert non-flammable gas used to displace oxygen in these spaces and prevent the outbreak of fire. All FSRU and LNG ships are equipped with an Emergency Shut Down System. The ESD system is programmed to automatically stop the transport of liquefied natural gas or methane gas and close the isolation valves in the event of a problem. If the ship or FSRU is removed from the position during cargo transport, e.g., if the FSRU tanks are accidentally overloaded by the LNG ship, then an emergency stop is made before any damage [7,16].

Floating stations, FSRUs are placed strictly at such distances that they are away from possible flashpoints. In addition, they are isolated from other facilities to avoid the transfer of fire in case of fire or explosion. Safety distances are strict and approved by the competent authorities before the permitting of the project installation [17].

3.2. Economic Feasibility of FSRU

The capital expenditure required to set up a regasification plant has been charting two distinct trends in recent years. Since 2012, the cost of a new onshore facility has shown a higher cost trajectory than the construction of an offshore terminal that remained fairly stable, slightly declining over the same period of time. In the previous years and before 2012, especially between 2009 and 2010, costs for an FSRU increased significantly as the number of floating terminals increased. More generally, gas regasification equipment, storage tanks, dispatch pipelines, mooring of vessels and measurement of new facilities are the factors determining the cost of a new regasification terminal. The average cost for an onshore facility per ton of capacity for 2017 was $274/ton. This is slightly lower than the 2016 average of $307/tonne, as the Hitachi (in Japan) and Swinoujscie (in Poland) plants, with a relatively higher dollar-per-ton cost, began operating in 2016. Although some onshore facilities with higher unit costs started operating in 2017, such as Yuedong (in China), other new onshore terminals that had been connected to the network, including Dunkirk (France) and RGT2 (Pengerang) (Malaysia), had a much lower unit cost [18].

However, the general increase in costs since 2012 is inextricably linked to the prevailing trend of increasing liquefied natural gas storage capacity. As the countries with the highest demand, such as Asia, and regions southeast of the Pacific Ocean, such as Australia, Malaysia and Polynesia, are constantly adding larger storage tanks to allow for higher imports and greater supply stability, this has resulted in an increase in the size of storage capacity per regasification plant. If all regasification development projects operate in the same period, then capital expenditure on offshore capacity will increase to $361/tonne in 2018, after which, for 2019, it is expected to decrease to $269/tonne as the expected terminals deployed are smaller. In any case, however, the required capital expenditure required to build a floating station is lower than an onshore terminal, since FSRUs usually require relatively limited infrastructure development to operate. On the other hand, the operating costs for an FSRU may be higher than an onshore terminal depending on the charter agreement agreed [19].

The capital expenditure on an FSRU has, as we have said, remained quite stable and has fallen slightly. So, based on market data, the average cost of an FSRU for 2017 was $129/tonne. The increase in retrofittings of existing LNG ships to FSRUs can be a factor in reducing the average cost of a floating terminal. However, this figure is slightly distorted due to the limited reporting of capital expenditure figures for new entrant floating stations. However, floating terminals typically have fewer cost variations compared to onshore regasification facilities due to their uniform planning in terms of tonnage and size of ship-based storage [20].

3.3. FSRU versus Onshore Installations

Depending on the requirements of the market and its needs, onshore terminals can offer several advantages over FSRUs. Storage capacities, i.e., storage and shipping volumes, can be of strategic importance in many markets.

The land-based terminals have a comparative advantage because they usually provide the opportunity for larger storage tanks and extensions. Still, given the location of offshore FSRUs terminals, floating regasification can address a number of potential risks avoided by onshore installations, such as prolonged interruption of liquefied natural gas reception, vessel performance and heavy seas or meteorological conditions. Additionally, FSRUs may face limitations or challenges with loading capacity, which can be bypassed by many terminals on land. In addition, depending on the location, onshore projects can allow future expansion plans on the construction site and storage expansion [8,21].

FSRUs have the advantage of transporting where needed around the globe, and analysts estimate that it will be the new big bet of the LNG transport industry. FSRUs can be transported online faster than terminals on land, allowing for faster fuel exchange. This can be important for new markets, with the aim of meeting the potential increase in gas demand in the near future. With FSRUs often chartered by third parties, these floating terminals are usually less capital-intensive than onshore facilities and can often be completed through faster permitting procedures. In many cases, FSRUs allow more flexibility in choosing a desired location for regasification with fewer space constraints and limited construction requirements than an onshore terminal. Depending on the requirements of the target market, land-based terminals can offer several advantages over FSRUs. Warehousing and shipping capabilities can be of strategic importance in many markets, while onshore terminals typically provide the opportunity for larger storage tanks and expansions. Given the location of offshore terminals, floating regasification can address a number of potential risks avoided by shore projects, such as prolonged interruption of LNG reception, vessel performance and heavy seas or meteorological conditions. FSRUs may also face limitations or challenges with loading capacity, which many onshore terminals can bypass. In addition, depending on the location, onshore projects can allow future expansion plans on the construction site and storage expansion [7].

Subject to Table 1 below, he most critical advantage is that an offshore regasification facility requires less land use, thus minimising environmental impacts to the surrounding environment, which in many cases involves urban development [22]. In addition to providing regasification services, the FSRUs can act as hubs for small-scale LNG deliveries. Small-scale LNG offers an effective solution for delivering clean-burning natural gas to consumers who need access to pipeline networks due to geographic conditions or small demand. The rapid expansion of FSRUs has undoubtedly altered the economic landscape in many countries. At the same time, their operation created legal issues outside the scope of the present maritime regulatory framework [23].

Table 1. Comparative Assessment of FSRU vs. Onshore Terminals.

Onshore Terminals	FSRUs
Provide a more permanent solution	Quicker fuel switching
Longer-term supply security	Greater flexibility if there are space constraints or no useable ports
Greater gas storage capacity	Need for law capital expenses (CAPEX)
Lower operating expenditures (OPEX)	More mobile and able to satisfy market needs
Option for future expansion	Depending on location, fewer regulations

(Made by authors, 15 February 2023).

Specifically, in comparison to pipelines and other on-shore installations, FSRUs have (i) low start-up costs due to decreased implementation periods, (ii) they do not depend on high-cost port facilities, (iii) they have fewer project risks, (iv) they facilitate speedy interconnectivity of existing pipeline gas transportation networks and markets and (v) have minimal environmental impacts to the surrounding environment since they do not impede urban and city developments [3].

3.4. The Methane Slide Phaenomenon

While LNG is presumed to be one of the most sustainable solutions, which can effectively make the decarbonisation of the shipping market viable, there are cases that even the emission-neutral LNG can cause serious pollution. Specifically, during LNG combustion, there is often an unplanned methane slip, which can emit nitrous oxide and methane into the atmosphere. This methane "leakage" is presumed to be much more harmful as a greenhouse gas compared to CO_2 by nearly 80 times, comparing the same amounts of emission [24].

Thus, by utilising LNG more as a fuel in general, we will achieve emission neutrality from 98% of the burned gas, but 2% of unburned methane will be released into the atmosphere, with severe adverse effects [25].

In May 2019, the IMO, in a working session, discussed the issue and methods of prevention, but no regulatory requirements have yet been imposed on any stakeholder. Among solutions, it was suggested that the engine design is the most critical factor that will eliminate the phenomenon, along with specific operational practices, such as the utilisation of fixed-arm connectors and advanced exhaust gas recirculation processes. Thus, by achieving a 100% fuel burn during an LNG engine combustion, it is possible to unconditionally eliminate this newly emerged pollutant [26,27].

However, there is yet little awareness of this phenomenon, which, combined with a misleading CO_2 emission reduction, leads to the expansion of a newly emerged pollutant with no regulatory framework being installed. Even the implementation of the newly introduced EEDI and CII legislation has no provision upon methane slide and it is fearsome that, while the utilisation of LNG is dramatically increasing, provisions that will cover methane slide will delay, causing unnecessarily enormous amounts of pollution [28,29].

3.5. Legal Approach of FSRU

The gas industry is evolving without precedent, with market fluctuations due to factors such as fluctuating oil prices, depletion of reserves and fear of global climate change imposing increasingly stringent regulations as we move, as everything points to a low-carbon or even carbon-free energy future. It was at this point that onshore and floating gas regasification and storage terminals appeared. The object at the present is the regulatory treatment of floating gas stations that seem to be a quick and economically advantageous solution for the sharp increase in gas demand in relation to the construction of an onshore installation [7].

Thus, the legal and institutional treatment of floating gas stations, which have come to the fore in recent years, needs further legal scientific investigation. The primary question that has preoccupied the offshore plant industry is how courts and regulators will deal with the various kinds of floating storage and regasification takeovers. From a legal and regulatory point of view, one aspect is to treat these structures in a similar way to commercial ships, such as tankers. Another view argues that they should be regulated as if they were permanent offshore installations, such as offshore mining platforms installed on the seabed. So, although floating stations are nothing new, as they have existed for the last fifteen years, there is no single regulatory framework. This has to do with the fact that any fixed position in one direction would have serious consequences for the parties involved, the states seeking energy security, the investors and shipping companies that would like to enter this industry, the project financiers and, in general, all the operators of such a floating gas regasification plant. Each of the players above in such a project would certainly have a different opinion as to which arrangements would be advantageous [8].

For this reason, the international community distances itself from adopting a strict specific framework as you cannot regulate markets and jurisdictions of different capacities with the same regulatory framework. Nevertheless, everyone agrees on a minimum framework for safety and the environment. Thus, the answer can be given to each legal order by the state body and the competent regulatory authorities [27].

To this end, each nation has adopted its specific set of legislation for the operation of such facilities. Nevertheless, while in most cases the onshore installations are regulated separately by each national authority with specific sets of legislation, this is not the case for FSRUs. A great example is the legislation of the USA upon both installations. While on-shore installations are regulated by sets of regulations, this is not the case with FSRUs, where in many cases the "near-to-shore" regulations (which are supposed to apply only to onshore installations) are applied to FSRUs to be effectively regulated [30].

The question of the legal treatment of FSRUs by national courts and regulatory authorities is the decisive factor for both the flag state and the persons investing in it because the legal classification gives rise to all the legal consequences.

4. Legal and Institutional Issues

An FSRU is characterised as "*a floating LNG Terminal anchored in the water at a connection facility and a location close to the LNG access point and the market*". It is similar to an LNG Carrier since a regasification plant for liquefied natural gas (LNG) and systems that directly supply the natural gas network on land are installed. Though, on the other hand, an FSRU has the length, width and draught of an LNG vessel and can transport the corresponding capacities of LNG as an LNG carrier [31].

The legal and institutional pertinence to floating storage regasification units that have seen a significant increase in numbers and capacity in recent years need further scientific and legal study. As an industry currently developing rapidly, the regulatory framework has to follow the rapidly growing new technological advances in the field, thus making it almost impossible to arrive at a definitive legal characterisation of this group of floating ships [10]. The prime question for the offshore industry is how courts and regulators deal with the different types of waterborne storage and regasification facilities. From a legal and regulatory point of view, one view is to deal with these ship buildings similarly to merchant ships, such as tankers. Another argument is that they should be regulated as permanent offshore installations, such as offshore mining platforms. Although floating stations have been around for the last fifteen years, until recently (Law 4602/2019), there was no single regulatory framework [32].

Additionally, taking a concrete stance in one direction would have severe consequences for the parties involved, including governments seeking energy security, investors and shipping companies, project financiers and, in general, all operators interested in a natural gas regasification plant. Moreover, any player from the above in such a project would undoubtedly have a different view of what arrangements would be advantageous to their business model. The international community is thus seeking to avoid adopting a strict and particular framework, as it seems unreasonable to regulate markets and business activities of different capacities with the same regulatory framework. Nonetheless, everyone agrees that minimum security and environmental framework are necessary. Thus, state bodies and the corresponding regulatory international authorities seek a novel, just and efficient legal framework [33].

On the other hand, it is also worth noting that because the shipping industry is global, there are risks if there is no clear and decisive regulatory model for the operation of FSRUs. In addition, a clear and effective legal framework is a decisive factor for both the flag state and the investors, especially when dealing with the Convention on Limitation of Liability for Maritime Claims. It remains to be seen whether FRSUs will be subject to the laws and international regulations applicable to merchant ships or the rules governing offshore facilities such as exploration and production platforms. In many ways, it is possible for both legal frameworks to govern FSRUs. Thus, a stable legal framework should govern depending on the market and the legal order addressed to an FSRU. However, what must be cultivated in national legislation is that even if an FSRU is subject to the status of a particular state, the national legislator should bear in mind the transnational nature of this offshore industry, trying to minimise unnecessary national bureaucracy and harmonise the coherence between existing legislation and international regulations. In addition, two major international conventions allow shipowners to limit their liability. One, as mentioned above, is the International Convention on Limitation of Liability for Maritime Claims, which deals with a wide range of claims. The second Convention is the commonly known CLC, the 1969 International Convention on Civil Liability for Oil Pollution Damage. The international legislator wished to stipulate that the abovementioned conventions apply only to ships where the English terminology is referred to as "ship" rather than floating marine constructions, which, in the English legal sense, refer to the term 'vessel or floating vessel' [34,35].

Consequently, in each case, it should be determined whether an FSRU falls within the concept of "ship" under the relevant contract. Another issue is whether the IGC code, an international standard for the safety of the transport of liquefied gases and other substances by sea as bulk cargo, can be applied to floating gas regasification stations. Until recently, this code could not be applied to floating shipyards of the FSRU type [36].

However, following its recent revision in July 2016, the new IGC Code applies to FSRUs intended to operate in a fixed position in gas discharge operation and in the reception, treatment, liquefaction and gas storage operation but only to the extent that the provisions of the code are applied. In addition, the code required flag states and port authorities to set additional requirements for FSRUs based on the principles of the code and recognised standards for specific risks not provided for in the code [37]. Additionally, an international approach to FSRUs is gradually being developed regarding their legal classification of whether they should be treated as ships or floating craft. Each category has its particular legal framework. A definitive and internationally accepted position would solve many issues regarding the applicable legal and institutional framework of FSRUs. IGC Code, adopted by Resolution MSC.5(48), has been mandatory under SOLAS Chapter VII since 1 July 1986 [38].

a. International Convention on Limitation of Liability for Maritime Claims

Under the International Convention on Limitation of Liability for Maritime Claims (LLMC), the term "ship" is not strictly defined. Many countries have court rulings that distinguish which vessels are considered ships and which are not [39]. However, two critical considerations can be found in LLMC. First, Article 15 (4) of the Convention stated that "*The Courts of a State Party shall not apply this Convention to ships constructed for, or adapted to, and engaged in, drilling: (a) when that State has established under its national legislation a higher limit of liability than that otherwise provided for* in Article 6; Or *(b) when that State has become party to an international convention regulating the system of liability in respect of such ships*". I.e., in certain limited cases, the LLMC does not apply to ships built or adapted to drilling. From this expression, one can infer that the LLMC also applies to drill ships. Article 15 (5) states that "*This Convention shall not apply to (a) air-cushion vehicles; (b) floating platforms constructed to explore or exploit the natural resources of the sea-bed or the subsoil thereof*". Pursuant to which, the LLMC does not apply to float platforms constructed to explore or exploit the natural resources of the sea-bed or its subsoil. Again, this provision has no official interpretation of the types of floating units. Still, it seems reasonable to expect that FSRUs that are purely morphologically specific to and generally have the shape of a ship are unlikely to be considered "floating platforms" [40].

Leaving these exceptions and focusing on the broad meaning of the word 'ship' in the LLMC, arguments can quickly be developed in both directions. For example, one could focus on the physical properties of an FSRU and conclude that because it is similar to a merchant ship in its construction, this amounts to a "ship" within the LLMC [41].

On the other hand, we could focus on the operations of an FSRU and conclude that because it is usually anchored in a single location and deals with the delivery, storage and gasification of LNG, it does not operate in the same way as a merchant ship whose purpose is to travel by transporting cargo from one port to another and, therefore, we cannot recognise the benefit of limiting the liability enjoyed by the ship to an FSRU. However, strictly within the LLMC, it cannot be stated with certainty whether the FSRU falls within the concept of a ship. This is a matter of interpretation falling under a court that will be called upon to rule on whether to grant the right to limit liability to the entitled owner. In any case, the purpose of establishing the provisions is to mitigate the risk to the sea operator and to give him the incentive to trade without bearing all the responsibility if such damages are caused to third parties that, in the eventuality alone, would prevent him from shipping. The international legislator recognises that the risk borne by a shipowner, whose ships operate on a sea voyage carrying cargoes, is entirely different from the risk of the shipowner that his floating vessel is permanently and firmly anchored just a few miles away from the shore [42].

b. International Convention on Civil Liability for Oil Pollution Damage

In the context of the International Convention on Civil Liability for Oil Pollution Damage (CLC), the concept of a ship is even more complex [43]. In the original text of the CLC of 1969, the term "ship" was defined in a new but relatively clear way as "'*Ship' means any seagoing vessel and any seaborne craft of any type whatsoever, actually carrying oil in bulk as cargo*". However, by amending the CLC with the 1992 Protocol, we have been led to a different and more complex definition of "Ship", which means "*any seagoing vessel and seaborne craft of any type whatsoever constructed or adapted for the carriage of oil in bulk as cargo, provided that a ship capable of carrying oil and other cargoes shall be regarded as a ship only when it is carrying oil in bulk as cargo and during any voyage, following such carriage unless it is proved that it has no residues of such carriage in bulk aboard.*" [44,45].

Although most contracting states have now adopted the 1992 Protocol, the wording of 1969 remains in force in some jurisdictions. Therefore, it is appropriate to analyse the newer and more complete definition of the 1992 Protocol and its legal consequences on the right to limit liability. The elements that this definition gives us are as follows: A. It refers to any sea vessel and naval vessel of any type. While the exact meaning of this phrase depends on what we mean by the words "'seagoing vessel'; that is to say, what makes a seaborne craft' sea voyage by sea. These concepts are not defined in the preamble to the Convention, which is why many would place the FSRUs in the concept of 'seagoing vessel-borne craft', which does not involve the performance of a sea voyage unlike the concept of 'seagoing vessel'. Again, however, this interpretation needs to be revised. In practice, the difficulties of interpretation are based on the individual determinants of the definition. The Convention states that this vessel should be 'constructed or adapted for the carriage of bulk oil as cargo'. This wording raises the question of what exactly is meant by 'transport', which needs to be defined in the CLC. This expression may suggest that the vessel is constructed or adapted to carry passive bulk cargoes passively in bulk, in the sense of 'possession' or 'storage'" of them, as the verb "carrying" denotes that the boat carries and lifts the weight of cargo. If this interpretation is accepted, then the floating stations FSRUs that can store cargo fall within the scope of the CLC. However, since the convention does not define this, the transport concept should be taken as a transfer movement from one port point to another [36].

However, the correct legal approach of an interpreter is to consider exactly what they wanted to regulate and the will of the then constituent legislator in the context of the time in which they were living. CLC was created, as was the title of the Convention on Civil Liability for Oil Pollution Damage, to regulate the obligations of the persons who control the ships from possible pollution resulting from the trade in oil tankers and to enable them to limit their liability. Based on this interpretation, FSRUs are not ships within the meaning of the convention, firstly because they do not carry cargo, particularly oil cargo. However, the following question arises: what happens in the case of FSRUs temporarily anchored to the surface or the seabed by the network and have the possibility to be disconnected and carry out transport as regular ships if required? Although that singular form of FSRU, which has the technical capacity to perform a transport operation, falls entirely within the concept of a ship, according to CLC, the owner and other marine aiders could rely on the limitation of their liability [35].

In a case known internationally under the title "The Slops" Case, the last aforementioned interpretative approach was also followed by the Supreme Court in decision no. 23/2006 of the Plenum, which said the following. First, the concepts of the ship and other terms have the same meaning as that referred to in Article 1 of the 1992 Convention on Liability. It follows from the provisions of the international conventions concerning the definition of a ship that describes two types of ships, namely "*(a) the one defined as 'the vessel moving at sea; as well as any type of marine structure, which has been constructed or arranged for the transport of bulk oil as cargo', and (b) that defined as 'ship capable of carrying oil in bulk and other cargoes shall be regarded as . . . '*, i.e., *a 'mixed cargo' vessel*" [24]. Then, following the Court's literal interpretation of the provision on the definition of a ship, it accepted that the reservation made in that definition applies only to mixed-cargo vessels, that is to say, to those which are 'capable of carrying oil in bulk and other cargoes', and not generally to all ships. The actual transport of oil in bulk as cargo is optional as a condition to qualify. According to the minority opinion of the Court, it is sufficient for their ability to move independently or by towing and their ability to transport oil in bulk as cargo, without it being necessary, for the application of the above International Conventions, for the accident to take place during the transport of oil in bulk as cargo, that is, during the voyage. In other words, the minority and the Court of Appeal considered movement a crucial factor in classifying a floating object as a ship [46].

According to the majority opinion, however, the concept of a ship is to have it constructed or arranged for the carriage of bulk oil as cargo, provided that that vessel must carry oil as a bulk cargo during a given journey or during the journey immediately after unloading of the oil ensuing, unless it is demonstrated that after unloading there are no oil residues in the tank. The above interpretation results from the purpose of the international conventions concerning the movement of navigable means at sea and the transport of oil as bulk cargo. However, for the majority of the Court to be classified as a ship, it is sufficient for it to have the ability to move by construction or retrofitting. According to the facts that the Court of Appeal accepted on the floating separator, specifically in its holds, a fire broke out. At the same time, it was permanently anchored in the sea area of Salamis since 1995 when it was retrofitted and acquired this use, which consists of separating the residues and storing the pure oil product in its tanks until it was transported by other means to a refinery. For this use, the propeller was removed along with its axis, as it was no longer necessary, and its movements were subsequently carried out with the help of tugs, and the engine was kept unmanned but in full composition. This floating separator was granted a 'floating convenience' permitted by the Minister of Mercantile Marine [8].

While the owner company entrusted the applicants with the decontamination and cleaning of the beaches and the land environment, which the plaintiffs carried out by decontamination, they were not compensated for their detergent work. On this basis, the Court of Appeal held that a floating separator does not fall within the conventional concept of a ship or marine shipbuilding and, therefore, the requirements of the applicants in the scope of the provisions on the liability of the defendant legal person, in so far as their application, presupposes acceptance of the concept of the ship or marine shipbuilding under the 1992 Liability Convention. In particular, the Court of Appeal ruled that the floating separator did not have such status at the time of the incident causing the damage because it had a static purpose, regardless of whether it was built as a tanker and still had all its characteristics, equipment and could at any time unlock its engine, reposition its propeller and operate, or it could at any time be moved and carry out oil transport as a trailer, it did not carry out a bulk oil transport nor was it able to the transportation of oil and even the polluting incident did not occur during a journey by sea transport of bulk oil so that there could be the talk of residual oil, all the more so because of five years since its last voyage as a ship and its retrofitting [45,46].

That is, despite all the readiness it had to operate as a ship, it did not accept that it falls under the definition of a ship and thus violated the provisions of international conventions, which are also substantive law provisions of domestic law since they have been ratified by law. In the prevailing opinion of the Court, all the above characteristics are sufficient for the definition of the ship because, at the time of the incident, it had the character of a marine structure, in which, after its fitting on a floating separator, petroleum products were stored in bulk. In addition, it could move by towing, with the further consequence of the risk of pollution. It is not necessary to apply these provisions when a pollutant occurs during a journey to transport bulk oil. It is, therefore, in the opinion which was in the majority of the floating shipwreck, within the meaning of the international conventions [47].

The third component of the definition of “ship” is in line with the Court’s majority opinion, namely that “A ship capable of carrying oil and other cargoes is regarded as a vessel only when it carries bulk oil as cargo.” It could be argued that floating regasification plants fall under this term because they are theoretically capable of having tanks to carry not only “oil” but also “other cargoes”, such as bulk liquids, which are also LNG. The approach, however, is entirely theoretical and probably would not find practical application no matter how broadly one might interpret the existing provisions, as there is a risk that we will be led to a contra legem interpretation [46].

The definition of the CLC for the “ship” certainly raises several substantive and complex issues for implementation in FSRUs at the international level. The most appropriate approach should be given by the contract itself or by a revision of it or ad hoc by the national courts, which of course, is to be interpreted and does not provide security for the shipowner who chooses to invest in an FSRU. The limitation of liability is the most important and challenging, mainly because of the economic impact. Limitation of liability is, of course, a legal field between the many areas of law and regulation where issues have arisen about treating an FSRU as a ship or as a permanent floating installation at sea. An example of a country that has established a special liability and compensation regime in case of pollution for both ships and offshore floating facilities is the United States of America with the Oil Pollution Act of 1990 [48,49].

Thus, in the scenario where the parties involved, the shipowner, the charterers and the insurers cannot rely on the limitation of their liability, they are exposed to the risk that in a possible accident, they will indemnify a value which may exceed that of the capital [50].

c. International Gas Carrier Code

The IGC Code is an international standard for the safety of transporting liquefied gases and other substances by sea as bulk cargo [51]. The objective of the IGC Code is to minimise the risks to this type of cargo, as far as possible, with existing technology and knowledge. The IGC Code covers fire, toxicity, corrosivity, reactivity, low temperature and pressure. The specific solutions required by the IGC Code may be fulfilled by other solutions, provided that they have an equivalent level of safety to the specific solution required by the IGC Code [10].

The question, therefore, arises as to whether this code can be applied to floating gas regasification plants. Until recently, pursuant to MSC.370(93), this Code could not be applied to floating FSRU-type shipbuilding. However, following its revision in July 2016, the new IGC Code applies to FSRUs intended to operate in a fixed position in gas discharge mode and gas reception, treatment, liquefaction and storage mode, but only to the extent that the provisions of the code apply to the proposed regulations. In addition, the code requires flag states and port authorities to establish additional requirements for FSRUs based on the principles of the code, as well as recognised standards relating to specific risks not provided for by the code [36].

An international approach to FSRUs is gradually developing regarding their legal qualification of whether they should be treated as ships or as floating vessels with their legal framework. A definitive and internationally accepted position would resolve many issues relating to the applicable legal and institutional framework of the FSRUs, such as the IMO Regulatory Framework [52].

The FSRU obeys the requirements of the regulations of the IMO Codes, IMO Resolutions, ILO regulations and International standards (ISO) that also apply to ships and, in particular, the International Convention for the Safety of Life at Sea (SOLAS) and the International Convention for the Prevention of Pollution from Ships (MARPOL). In addition, the FSS (International Fire Safety System) Code applicable to ships is typically applied to FSRUs [53].

In any case, and until there is a consolidation in all legal issues, stakeholders will be called upon to operate an FSRU; there should always be legal control of the respective national laws, but always in the light of the application of the international rules of shipping [54].

Floating production, storage and offloading (FPSO) facilities, which are designed to handle liquefied gases in bulk, do not fall under the IGC Code. However, designers of such units may consider using the IGC Code to the extent that the Code provides the most appropriate risk mitigation measures for the operations the unit is to perform. Where other more appropriate risk mitigation measures are determined that are contrary to this code, they shall take precedence over the code [37].

Table 2 below summarises the legal aspects of a FSRU with regards to the abovementioned Codes and Conventions.

Table 2. Evaluation of International Codes' response to FSRUs' legal implications.

Legal Aspects of FSRU	International Convention on Limitation of Liability for Maritime Claims	International Convention on Civil Liability for Oil Pollution Damage	International Gas Carrier Code
FSRU (or other platform) is defined as a vessel	Disputed interpretation.	No	Yes, after the revision of 2016.
Effective regulation of FSRUs' (or other platforms') operation	Yes, pursuant to the scope of the Convention.	No	No

(made by authors, 15 February 2023).

5. FSRU Orpheus–Alexandroupoli

The floating storage regasification unit (FSRU) in Alexandroupoli in, Greece, called "Orpheus", is situated 24 km south of the Apalos region, east of the city and port of Alexandroupolis, connected by an underwater transport pipeline to the mainland). This unit addresses the rising trend of natural gas consumption in the international energy scene and the expansion of gas networks and installations throughout Europe in a timely and spatial manner since the project has to utilise the geographical area in the North Aegean, upgrading the geostrategic role of Greece, complementing existing and future development projects in the region (Greece–Bulgaria interconnector pipeline (IGB), TAP—Transadriatic Pipeline and IGB—Interconnector Greece–Bulgaria, Kavala port "Philip II" and underground warehouses). In addition, it is expected to boost the security of the supply of the national gas system (NNGS). The project is funded primarily through its resources, commercial banks and equity, with possible public co-financing. Public funds are provided through the Greek Public Investment Program, National Participation and partly through the European

Regional Development Fund (ERDF) within the 2014–2020 programming period and under the Operational Program "Competitiveness, Entrepreneurship and Innovation" [55,56].

The infrastructure, which is named Independent Natural Gas System of Alexandroupolis, involves a new offshore, temporary storage and gas storage facility in the Thracian Sea (Floating Storage Regasification Unit, FSRU), about 17.6 km southwest of the port of Alexandroupolis and at a distance of 10 km from the coast, as well as its connection with the National Natural Gas System (NNGS) [31].

For this purpose, a joint venture was established between the founding company Gastrade with 40%, the shipping company Gaslog LNG with 20%, the Greek public company DEPA with 20% and the Bulgarian gas company Bulgarian Energy Holding with 20%. The underground natural gas depot in the exhausted South Kavala gas field will be utilised and connected to the National Natural Gas Transmission System (NNGS) operated by DESFA, with a 34 km pipeline, of which 32 km will be offshore. The Hellenic Republic, Asset Development Fund, will conduct divestiture of this installation. The Alexandroupolis oil and gas facility can connect and supply natural gas through many gas transport systems planned to be developed, such as the Trans-Adriatic Pipeline (TAP) [56,57].

The project of the Alexandroupolis Independent Natural Gas System (ASFA Alexandroupolis) has the backing of the European Union since it is considered a project of common interest (PCI) according to Regulation E.U. 347/2013 and is also associated with the interconnector pipeline between Greece and Bulgaria, which aims to serve consumers in Greece and Bulgaria but also Serbia, FYROM, Turkey, Romania, Ukraine and Hungary. The project aims to provide an alternative gas source for Southeastern European markets and provide the region with the security of supply, diversification of gas routes and sources, price flexibility and enhanced competition [58].

Furthermore, it will satisfy the additional gas demand in the region in the medium and long term, give access to LNG, help remove the isolation of these markets and enhance gas penetration. When in full operation, the FSRU will receive liquified natural gas LNG tankers and temporarily store them in the cryogenic tanks of the unit. The gas will then be gasified at the gasification facilities located on the floating unit and, through a special arrangement (turret and flexible ducts), will be transported from the floating unit to the 24 km submarine transport pipeline arriving at the Apalos region, east of Alexandroupolis. On land, a pipeline will direct the gas 4 km north to a new Metering and Regulating Station in Amfitriti, where it will be connected to the National Natural Gas Transmission System. The floating unit will be permanently anchored at a fixed point 10 km from the shore of Makris, and the mooring turret will allow it to rotate 360° depending on the direction of wind and waves. This FSRU will have a nominal gasification and exhaust capacity of 530 mmscfd, equivalent to 600,000 cubic meters per day (5.5 billion cubic meters per year), and a maximum technical gasification and extraction capacity of 800 mmscfd, equal to 950,000 cubic meters m per day (8.3 billion m/year) [59].

On 31 December 2018, the initial phase of the tests executed for assessing the capacity commitment at the terminal of Alexandroupolis was successfully finalised. Twenty companies expressed their interest in reserving a total of up to 12.2 bil. cubic meters/year on regasification capacity at the floating terminal to be delivered to the Greek National Natural Gas Transmission System. After the successful market tests, the project entered the next binding phase [60].

The low utilisation rate of Revithoussa LNG Terminal, the only Greek LNG terminal in operation, has sparked controversy between the opposing political parties for developing another LNG Terminal. In a 2019 study, it was found that from January 2012 to March 2019, the terminal of Revithousa operated at about 14% of its total capacity. Even during 2011, when gas demand peaked in Greece, the terminal's utilisation was less than 25% of its capacity [61].

The inoperative state of the project led, in November 2021, to the exclusion from the fifth PCI list published by the European Commission [62]. In January 2022, Gastrade announced that it had taken an FID for the project, also stating that the terminal would become operational by the end of 2023. The FID was welcomed by United States Ambassador to Greece, Geoffrey Pyatt. In February 2022, after the commencement of the Russo–Ukrainian conflict and the consecutive shift in the market, Gastrade launched a tender to construct the terminal [56].

In May 2022, Gastrade began construction of the terminal. At an event to mark the start of implementing the project, it was confirmed that the FSRU would be able to regasify 5.5 bcm/y of LNG and store 153,500 m^3. Planned to begin operating by the end of 2023, Gastrade said that contracts were in place for up to 60% of the project's technical regasification capacity [63].

6. Trade Aspects for Strategic Development

a. Greece–Balkans

The FSRU of Alexandroupolis will (i) provide a new source of energy to Greek and regional markets of S.E. Europe, (ii) contribute to the expansion of the sources and routes of natural gas supply, (iii) promote competition for the benefit of the final recipient-consumer, (iv) establish the security of supply of Greece and the Balkan countries, (v) improve the reliability and the flexibility of the National Natural Gas System as well as the Regional and Trans-European Systems, as well as (vi) the strengthen of the country's environmental objectives [31].

It is therefore estimated that Greece can be the energy gateway and the passport for those countries of the western Balkans that wish to deepen their ties with the European Union and NATO. Another prospect of developing such a floating terminal is increased investment interest in the port area of Alexandroupolis. It is also underlined that after the TAP and the Greek–Bulgarian pipeline, IGB is a priority for American gas, which sees Greece as the new import of American gas in the Balkans and Europe. At the same time, upon completing this project, Greece will be the third European country to import LNG from the USA. The Alexandroupolis regasification and storage station is a new energy gateway for Greece and the countries of southeastern Europe. Its location is strategically located because it can attract a wide range of international suppliers, including eastern Mediterranean suppliers, in the future. At the same time, it is situated at an energy crossroad of pipelines in the region [64].

Moreover, its direct connection with the Hellenic Natural Gas Transmission System is a connection with the local Greek market and contributes to its energy security, promotes healthy competition in the internal market with apparent benefits for final consumers and enhances the resilience and flexibility of the national natural gas system and supports energy sustainability and the high environmental aim of reducing emissions of gaseous pollutants [61].

It has direct access to the market of Bulgaria and, through that, of Romania, Serbia and FYROM and further; Hungary and the markets of Eastern Europe through the interconnector between Greece and Bulgaria (IGB); and the other interconnectors that are either operating or planned to operate, such as Bulgaria–Romania, Bulgaria–Serbia, and Hungary–Romania. It can also supply Turkey's large and rapidly growing market through the reverse flow of the existing interconnector network [65].

It has the potential to interconnect and support the future gas infrastructure of the southern corridor, such as TAP, and to gain access to markets through the western Balkan gas ring. For the Balkan countries and southeastern Europe in general, it offers access to alternative sources of natural gas supply, significantly reducing their energy isolation. The project enhances competition in the wider region and supports the development and operation of a competitive regional trading hub [66].

At the same time, the development of this energy hub is in line with and supports the European Union's strategy for diversifying energy supply sources and routes. Within this framework, a market test is carried out in the first non-binding phase. Companies interested in services and capacity commitment to the navigable vessel are conducted in the first non-binding phase. The terminal has 45 days to express their interest initially. In other words, it is a survey of the future market. The second phase will follow, where the domestic and international political support offered to the Alexandroupolis LNG will now be called upon to be transformed into practical commercial interest. The first samples, however, are positive, as there is beneficial interest among others and, in addition to the well-known stakeholders, from many large international traders who wish to use the Terminal of Alexandroupolis to bring LNG and supply gas to the broader region. It is generally acknowledged that it is a comparative advantage for the Alexandroupolis project to ensure quick access to the markets and synergies with the TAP and IGB pipeline that will be built in parallel, and is already in completion rates close to 70% [67].

It is worth noting that Wood Mackenzie predicts that, by 2025, the LNG-importing countries will reach sixty instead of just thirty-seven at the moment, which indicates the sharp and rapid increase in demand for natural gas and, by extension, floating gas regasification plants. Moreover, the combinations of FSRUs with FSUs (floating storage stations) can offer solutions suitable for purposes that allow the achievement of markets that set a required schedule [68].

Consecutively, determinants for strategic growth are:

1. The proper operation and maintenance of the pipelines;
2. The connection in particular with the Bulgarian market, as mentioned;
3. Increased capacity of the TR/GR interconnection point;
4. Participation in the project of UGS (Underground Gas Storage UGS) south of Kavala, which will immediately ensure larger storage capacities;
5. Further expansion of Revithoussa land station capacity through FSU or FSRU;
6. Installation and operation of the Node;
7. Future projects based on FSRU technology including floating stations to supply natural gas as fuel to ships (LNG Bunkering).

b. Current International Trade Aspects

The growing role of natural gas in the international energy scene combined with the region's key geographic location creates prospects for a broader interconnection of existing infrastructure with neighbouring countries' infrastructure, such as the Turkey–Greece interconnector, which has been in operation since 2007 transporting Caspian/Azeri gas through Turkey to Greece. In addition, there are plans to extend this pipeline to Italy. At the same time, the Greek–Turkish interconnection forms the basis of the 160 km long deployed Greek–Bulgarian intermodal pipeline Komotini–Stara Zagora with a view of further expansion [68].

The increasing role of natural gas in the international energy scene, combined with the country's key geographical position, creates prospects for the broader interconnection of the existing infrastructure with the infrastructure of neighbouring countries. The public company exploits this geostrategic comparative advantage with its active participation in similar projects [64].

The Turkey–Greece interconnector has been operating since 2007 and transports Caspian/Azeri gas via Turkey to Greece. This pipeline is planned to be extended to Italy. At the same time, the Greek–Turkish interconnection is the basis of the 160 km long parallel Greek–Bulgarian interconnector between Komotini and Stara Zagora, under development with the prospect of further expansion [69].

The effective presentation in energy projects and the involvement of international shipping companies such as Gaslog and Cheniere, who have a unique position in the LNG sector with their multifaceted experience in natural gas, give particular importance to the project's impact on the international market [70].

Moreover, the European Union supports important energy projects such as this through its financial programmes, especially those whose positive synergy transcends the country's borders and extends primarily to a large part of Europe and the wider European area. This broadens the investment horizons and multiplies the business opportunities throughout the network of respective activities inside and outside the country. Therefore, it is fundamental to create conditions for supplying the market at a competitive level, safely and over time [71].

The project also aims to meet the additional demand for natural gas in the region in the medium and long term, provide access to LNG in regional markets, contribute to the lifting of the isolation of these markets and enhance the penetration of natural gas in the market. Therefore, new recipients are constantly being added to the list, recipients who are now entering the gas market, and the energy charter is expanding. This is because energy will be the "oxygen" of the future as all human activity is based on it and cannot be without it [64].

This is also incorporated in the PCI list of Projects of Common Interest of the E.U. The PCI projects are critical cross-border development projects connecting E.U. countries' energy systems. They aim to achieve specific climate and energy objectives, namely "affordable, secure and sustainable energy for all citizens and long-term reduction of carbon dioxide emissions in the economy", in line with the Paris Agreement [62].

The impact of the project will be significant, affecting the energy markets and integration of markets in many E.U. countries, enhancing competition, contributing to the E.U.'s energy security by the diversification of sources and contributing to the climate of E.U. and supporting the E.U.'s energy objectives by integrating renewable energy sources [72].

The PCI projects can be benefitted from (i) accelerated planning, (ii) the installation of a single national licensing authority, (iii) the installment of more favourable regulatory conditions, (iv) enhanced procedures that lower administrative costs, (v) the evaluation of environmental sustainability, (vi) better public participation and (vii) more investments. Additionally, funding can be requested by the Connecting Europe Facility (CEF) [73].

With the support of the European Union, these development plans broaden the investment horizons and multiply business opportunities across the full range of relevant activities both within and outside Greece, as it is essential to create the conditions for a competitive, secure and time-consuming market. Moreover, for the E.U., this project, amongst others, helps the E.U. to achieve its energy goals and climate objectives and provide affordable, safe and sustainable energy for all citizens and long-term carbon savings in the economy in line with the Paris Agreement [73].

7. Conclusions

Conclusively, the primary factors and, at the same time, challenges for the development FSRUs are unquestionably the location, regional energy and country policies, environmental impacts, business model flexibility, funding and, of course, the regulatory and regulatory framework. As far as the FSRU industry is concerned, it is clear that it has come to the forefront of energy developments, and its expansion will certainly influence technological, institutional and legal issues.

Concerning the international legal framework and relevant institutions, the development of minimum security and environmental framework is necessary. Thus, state bodies and the corresponding regulatory international authorities should seek a novel, just and efficient legal framework. From the assessment of the relevant legislation, it is evident that the FSRUs cannot even be safely regarded as vessels, and even the characterisation of their nature—being vessels or not—remains vague. From the assessment of the legislation, it can be safely assumed that FSRUs should unhesitatingly be regarded as vessels and should be under the scope of all relevant maritime legislation.

Nevertheless, even in the absence of an international regulatory framework, environmental and safety issues can be resolved with national legislation. The only issue that cannot be resolved is the continuous feasibility of the project due to the volatility of the global market, the differentiation of national policies and many other external factors. A distinct example is the "Alexandroupolis" FSRU project, which was near discontinuation due to the shift of the market to pipelines and other similar installations and the Russo–Ukrainian conflict which "restructured" the market's intent with the utilisation of FSRUs in conjunction with the geopolitical significance of the area.

Conclusively, it should be stated that on the 15 February 2023, the amended version of the Greek Maritime Legislation (Law 5020/2023) was introduced after sixty-five years, and in the first articles there was a clear distinction between vessels and fixed floating structures and a clear definition of what should be regarded as a fixed floating structure and under which legislation this should be subject to. Thus, it becomes evident that with national initiatives such as the above-mentioned, efficient international measures regarding FSRU platforms will be gradually installed and, in general, more effective international standards regarding the safe and secure utilisation of fixed floating structures will be taken.

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