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VISIONS OLYMPICS

European Student Competitions on visionary concepts for vessels and floating structures for the future

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Abstract

VISIONS and VISIONS–OLYMPICS are European projects funded by the European Commission that aim to increase the European competitive advantage by tapping into the unspoiled/unbiased creative minds of the young generation. The main objectives are to offer out of the box concepts and ideas for the future of European maritime transport and develop these ideas within an environment where purpose driven innovation is cultivated and performed in a risk free environment. The objectives include building bridges and enhancing coordination between EU research networks and strengthen the partnership between research Universities and industry. The network also enhances the skills of future employees in a highly competitive environment and offers targeted dissemination to industry. The paper offers an overview on the results of the student competition which was an integral part of both projects for the past 5 years and demonstrates how the new generation of Engineers and Naval Architects with the support of the European Commission may have inspired the industry in adopting visionary concepts for future vessels and floating structures.

Keywords: student competition;visionary concepts;floating structures;future of EU transportation

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1. Introduction

The European Maritime VISIONS Network is a pre-competitive network initiative of the European shipbuilding industry, together with the European maritime universities and leading research institutes. VISION NoE and VISIONS OLYMPICS organised annual academic contests for the definition and validation of visionary concept ideas for vessels and floating structures. Answering to professional market and society scenarios for the next 5-15 years, VISIONS and VISIONS OLYMPICS is an established "Think Tank" for product ideas with medium to long term commercialisation perspective. The European Maritime VISIONS Network covered 5 market oriented Business Areas. Those include, Maritime Tourism/Leisure, Short Sea Shipping, Inland Shipping, Deep Sea Shipping and Floating Infrastructures. VISIONS OLYMPICS has also been focusing on several research areas.

Within this framework several innovative ideas were submitted by students around Europe during the 6 annual competitions of VISIONS and VISIONS OLYMPICS. Each year the best ideas were shortlisted by industrial & academic experts and further evaluated by academic experts and researchers. Every year the best 3 ideas were selected based on evaluation criteria set by industry and academia. Although the network focused on a medium to long term perspective many of those ideas seem to have already inspired the research community to propose innovative projects and the industry to adopt those or very similar ones.

The paper gives an overview of those ideas stressing the effect of VISIONS and VISIONS OLYMPICS on EU industry and hence the importance of such initiatives for the future. Moreover the findings of a survey initiated by the Commission and conducted by the Tavistock Institute that looked on the efficiency of the Networks of Excellence as an instrument for the EU further demonstrate the positive impact of the original VISIONS network of excellence. It is finally concluded that focusing on long term perspective initiatives such as VISIONS OLYMPICS and VISIONS Network of Excellence is vital for the future competitiveness of the European shipbuilding industry and the EU economy as a whole. To tackle the challenges of the future, Europe will need cutting edge state of the art innovative ideas in order to overcome problems such as climate change, food and energy generation and achieve economic growth even under adverse financial situations. VISIONS NoE was funded by EU for the first 3 loops. The partners recognising the importance of this innovation cyclic process took the initiative to continue the activities for a fourth year (Loop 4) using their own resources as well as assistance from the PROMARC project. Following that the VISIONS OLYMPICS project has supported similar activities for a further 2 years till 2011. The consortium members participating in both VISIONS Olympics and the VISIONS NoE are listed in Appendix A.

2. Impact of VISIONS ideas on industry and forward thinking

In an attempt to determine whether the industry has been influenced in any way by VISIONS NoE and VISIONS OLYMPICS, and encouraged to undertake innovative projects or to consider similar concepts, a thorough impact assessment was conducted. According to the assessment, many concepts and products were identified that have already appeared in the waterborne/maritime industry which are very similar to the original visionary ideas that were generated through the academic VISIONS/ VISIONS OLYMPICS academic contests (although slightly more conservative in terms of their main characteristics).

2.1. Case Study 1

During the first loop of the contest (2005-2006) a Modular Barge System was presented. The system is powered by batteries and fuel cells. The main aim of this idea is to reduce the number of containers transported via Europe's road network reducing road congestion. The idea involves building a modular barge system capable, when linked together, of crossing seas and upon arriving to coastal waters splitting into individual units to tackle the inland leg of the journey. The concept involves the design of the barge, the interlocking system, as well as the dock design.

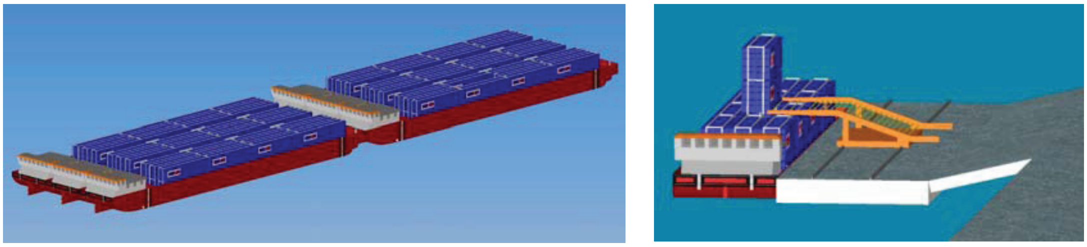


Figure 1 VISIONS Modular barge concept

Figure 2 (a) Damen Shipyard modular barge; (b) CREATE3S concept

Modular barges have appeared in Europe since then e.g. see Figure 2. The modular barge of Damen Shipyards, Gorinchem, The Netherlands, has many similarities to the one designed by the students as part of VISIONS 2006-2007 academic contest. The modular barge concept has also appeared later (2008) in Create3S EU project, Figure 2(b), in combination to a float on float off principle that appeared in VISIONS contest earlier for the Ocean Sport concept, Figure 3. In the latter the vessel was used for transportation of yachts. It is clear however despite the different cargo that the 2 vessels are of very similar design.

VISIONS Ocean Sport vessel is intended to be used for the organization of regatta events. When the vessel arrives to the required location it is anchored and partially submerged to a certain draft. The sailing boats on board are moored on the hull that serves as an offshore port. Sailing crews can sail in and out of the dock quickly and safely. For transit periods, the vessel is on the float-off configuration. Thus sailing boats are on a virtual floating dry dock that allows them to be cleaned and maintained.

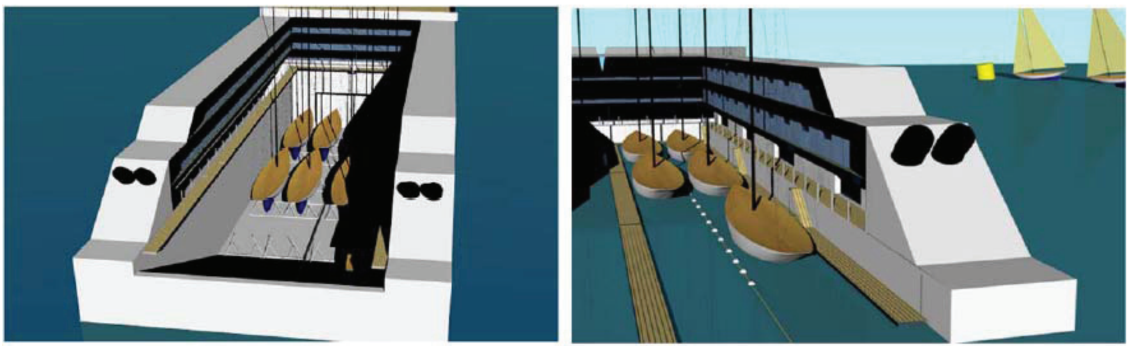


Figure 3 VISIONS Ocean sport concept

CREATE3S project float on /float off (flo-flo) principle utilises the same concept using the ability to alter the draft of the vessel using internal ballast tanks, to allow the free-floating cargo or tailored cargo barges to be floated on and off of the vessel. A similar idea of loading out of port using barges presented in 2008 by CREATE3S project had already been presented in VISIONS second contest in 2007, Figure 4(a). The above examples including many other VISIONS ideas illustrate that through the VISIONS project, EU transport related problems such as the problem of road congestion, problems for effective inland and short sea waterway transport were identified early on and that the proposed solutions by the students were feasible and realistic, reflecting industry's actual needs.

The students also realized that there is a problem of EU port congestion, especially on container docks so they have proposed numerous ideas with the potential to tackle those problems. According to these student ideas loading/unloading out of port seems to be the way forward. Within this framework students presented a container transportation optimisation system (Idea No. L1-25) in 2006. The idea is to design a small autonomous self-propelled standardised and automated transport unit for containers. It is a transportation concept similar to transport on road. Containers carry electronic tags and send a signal with "Pick-up-request", etc., Figure 4(b).

Along these lines VISIONS Riverex was also presented in the second loop. The concept involves an improved interface system between river and road networks. Trailers carrying containers are transported by barges. Mobile decks are employed for the interface system and for the simultaneous transportation of a number of trailers.

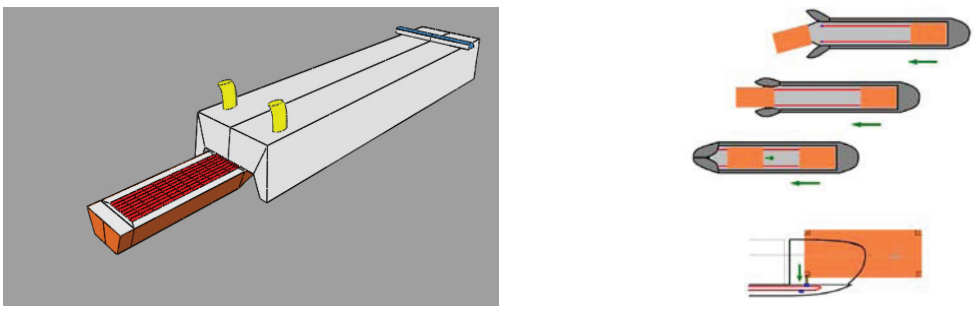


Figure 4 (a) VISIONS Load out of port concept; (b) Container transport optimisation

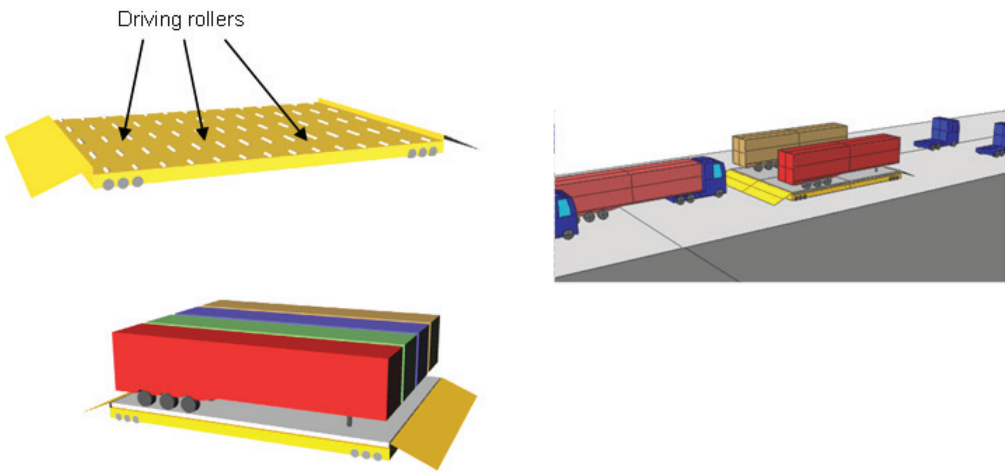


Figure 5 VISIONS Riverex concept

A similar concept was presented later in CREATE3S project by introducing a so called “mega-pallet” which could be ro-ro based as above. There are many similarities between VISIONS ideas and ideas found later in CREATE3S project as published in the Naval Architect issue of September 2008.

2.2. Case Study 2

Many other ideas were presented in the four loops of VISIONS academic contests concerning floating structures. One of those ideas was titled as Waterborne Europe. This idea was presented by students in January 2007. A floating city based on a modular structure. A number of systems ensure viability of the concept.

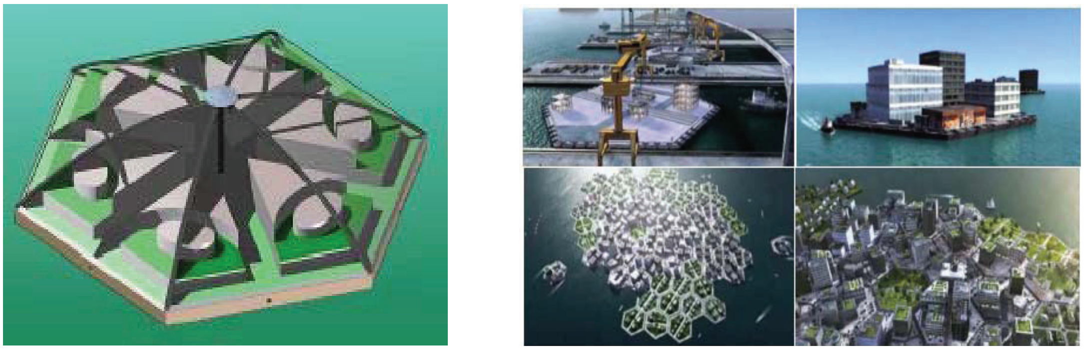


Figure 6 (a) VISIONS module of floating city; (b) Floating City (courtesy of Discovery Channel)

Those included dynamic positioning system, fresh water generation system, innovative communications system, as well as power production systems by utilization of wave, solar and wind energy. The idea for a strikingly similar floating city appeared in the Discovery channel in 2009 as a solution New Orleans hurricane problem such as Katrina disaster (Discovery Channel Videos: Mega Engineering: Building a Floating City). This idea could also be used to solve problems of rising water level in areas of Europe such Netherlands. The similarities of the modules of the floating city idea presented by the Discovery Channel, Figure 6(b), to the modules presented by VISIONS students, Figure 6(a) are obvious.

2.3. Case Study 3

The lack of dock space and the need for offshore floating terminals was identified by the students participating in the contests of VISIONS NoE. Studying different harbours it was found that the demand for storage space is increasing but the space is limited. Therefore the concept of a floating container port of large storage capacity was introduced.

This floating infrastructure has docks on both sides that allow long reaching cranes to load directly from a large container ship to smaller costal transport vessels. Containers are stored on special platforms. Hydrostatic buoyancy effect is used to improve efficiency of operations Figure 7(a). A similar concept is presented in Naval Architect’s issue of May 2008 (pp. 51-52) Article Title: A novel self-propelled floating terminal offers a promising solution of owners of larger ships restricted to in-stream handling. The article presents an idea illustrating how an offshore floating container hub could be used to solve container transport and logistics issues. Another very similar concept had again been generated by VISIONS NoE earlier in January 2007 titled as “Low Environmental Impact Offshore Infrastructure”.

The key characteristics of the idea involved a generic offshore structure (GOS) and a generic service craft (GSC). A case study based on a careful life-cycle analysis from production to disposal was also performed. This platform was designed in a way that not only solves container transport and logistics problems but also offers an environmentally friendly alternative. The above demonstrate once again how ideas very similar to the ones developed under the VISIONS NoE eventually found their way into real life applications.

It also appears that the industry is providing solutions for solving the same transport and energy related problems that VISIONS NoE tried to tackle in a similar fashion to the solutions that were proposed by the VISIONS NoE students. Apart from the above there were many other ideas presented in VISIONS concerning offshore loading and unloading hubs. Although those ideas have not been realized yet in Europe, India has now initiated the manufacture of the first offshore hub.

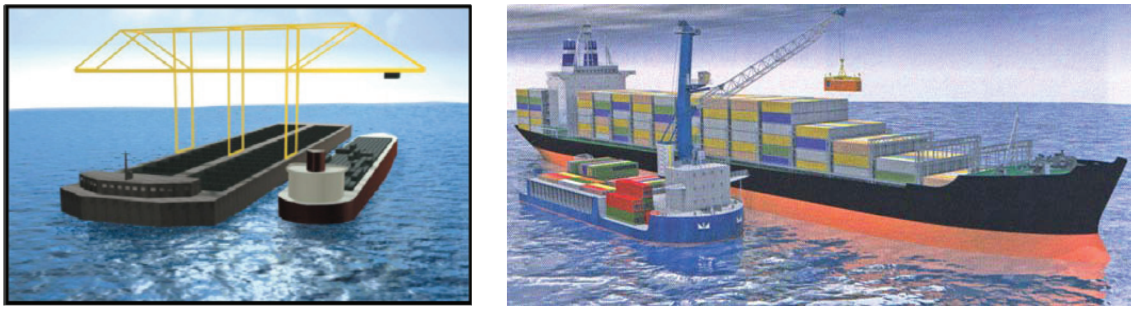


Figure 7 (a) VISIONS floating container port; (b) A novel self-propelled floating terminal

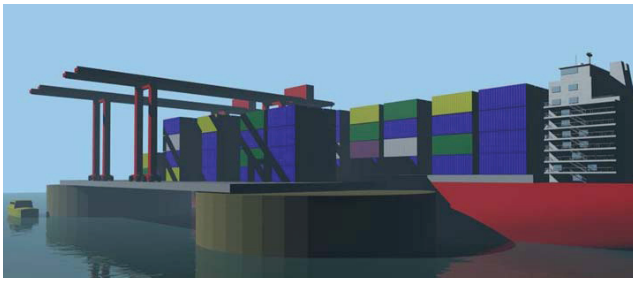


Figure 8 VISIONS Low Environmental Impact Offshore Infrastructure

2.4. Case Study 4

Apart from offshore structures to overcome logistics problems, VISIONS NoE presented offshore structures for power generation. In some cases noticeably similar projects have been considered for realization. One example is a VISIONS offshore wind power generation plant titled as Mobile Power presented in January 2006. The Key Characteristics of this concept include conversion of excess energy to Hydrogen and the design of a Multiuse Hydrogen Storage Container (MHSC). The aim of this VISIONS concept, Figure 9, is the design of a large floating structure consisting of linked triangular modules. This structure carries large wind turbines and a plant to convert the wind energy to hydrogen. The hydrogen is then stored in standardized modules and transported to the consumer. In 2008, 2 year after VISIONS concept was presented, RINA (Royal Institute of Naval Architects) published in the Offshore Marine Technology Journal an article with title: “Det Norske Veritas had granted an approval in principle for a new offshore wind energy concept developed by design company Sea of Solutions”, Figure 10. The idea describes how an offshore floating wind farm can be used to provide solutions to energy related problems. A noticeably similar structural design is used utilizing triangular modules.

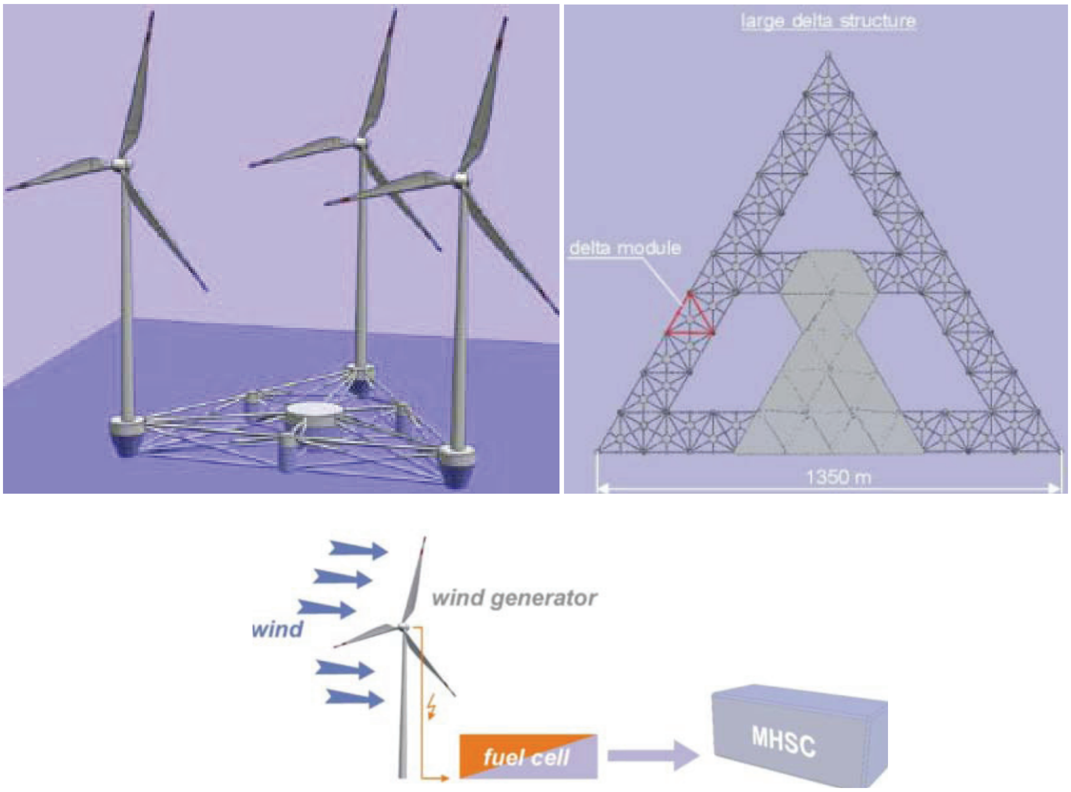


Figure 9 VISIONS Mobile Power concept. Floating energy wind farm

Furthermore a proposal mainly based on the VISIONS Floating energy wind farm idea made up of interconnected floating modules has been submitted to the European Commission for possible financial support. The proposal didn't contain storage of energy in Hydrogen form and included the concept of combining use of wind and waves producing electricity using wind turbines mounted on floating modules harnessing wind energy and an Oscillating Water Column (OWC) device for wave energy.

The proposal was titled as "MODULEWiWa: Multi – purpose modular deep offshore platform for wind/wave energy conversion" and was submitted in the proposals' call for FP7 Collaborative Projects; 10 FP7–Energy–2009 – 1 (ENERGY.2009.2.9.1: Deep offshore multipurpose platforms for wind/ocean energy conversion).

The proposal was submitted by 7 European Institutions, with project leader the National Technical University of Athens (Table 1). The project proposal, although it received a good technical evaluation, could not be supported. However the fact that institutions from Academia as well as the industry grouped together to form a consortium and further develop a project mainly based on a concept that was originally developed in VISIONS NoE, demonstrates the positive impact of the VISIONS NoE ideas to the industry.

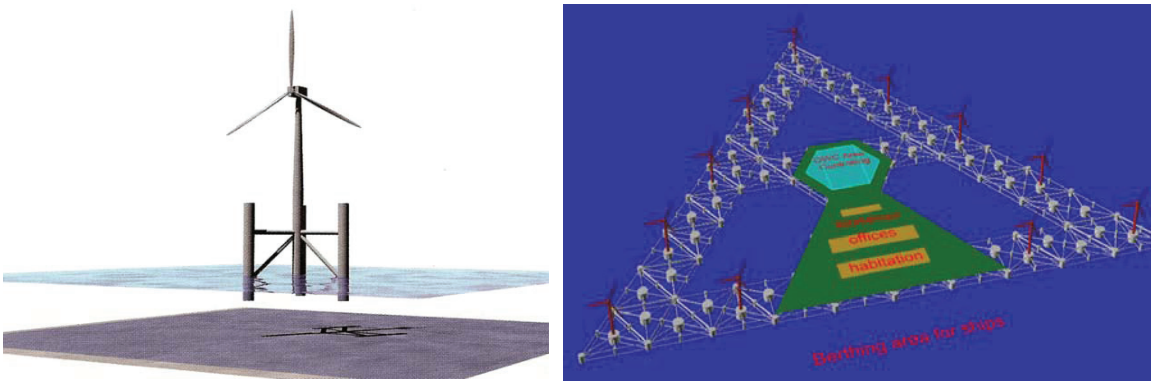


Figure 10 (a) Sea Solutions wind power generation module; (b) MODULEWiWa Concept

Table 1 MODULEWiWa project partners

No	Participant organisation name	Country	Organization type
1	National Technical University of Athens (NTUA)	Greece	University
2	Centre for Renewable Energy Sources (CRES)	Greece	Research Centre
3	DORIS Engineering	France	Engineering Company – Coastal, Maritime, Ocean & offshore engineering
4	Bureau Veritas (BV)	France	Classification Society
5	London Marine Consultants (LMC)	UK	Engineering Company – Mooring design
6	University of Lancaster (ULANC)	UK	University
7	RWTH–Aachen	Germany	University

2.5. Case Study 5

Many VISIONS concepts involving floating turbines in combination to solar panels and wave energy generation have been developed over the 4 annual academic contests, one of them is presented in Figure 11(a).

Figure 11 (a) VISIONS Wind Energy Turbines and Solar Panels on SEASCO; (b) The Ocean Treader Product

Green Ocean Energy ltd is now developing two devices that will harness the waters of the north Atlantic: the Ocean Treader and Wave Treader. Both are designed to bob on the surface of the ocean while waves cause attached floating arms to move up and down, powering on-board generators, which then send electricity back to shore via underwater cables. The Ocean Treader, Figure 11(b), is much like a buoy with a pair of arms, and is meant to be moored 1-2 miles offshore in open water. The Wave Treader shares a similar design but is mounted on the base of a static offshore structure, such as a wind turbine or tidal turbine.

Although SEASCO and the Ocean Treader concepts are not identical they both share the same overall purpose which is to generate power from an offshore floating structure by simultaneously harnessing more than one sources of renewable energy. Many other earlier VISIONS ideas are based on this concept.

2.6. Case Study 6

Another example is VISIONS advanced Floating Power Generation (FPG) Plant that was proposed in January 2007, Figure 12(a).

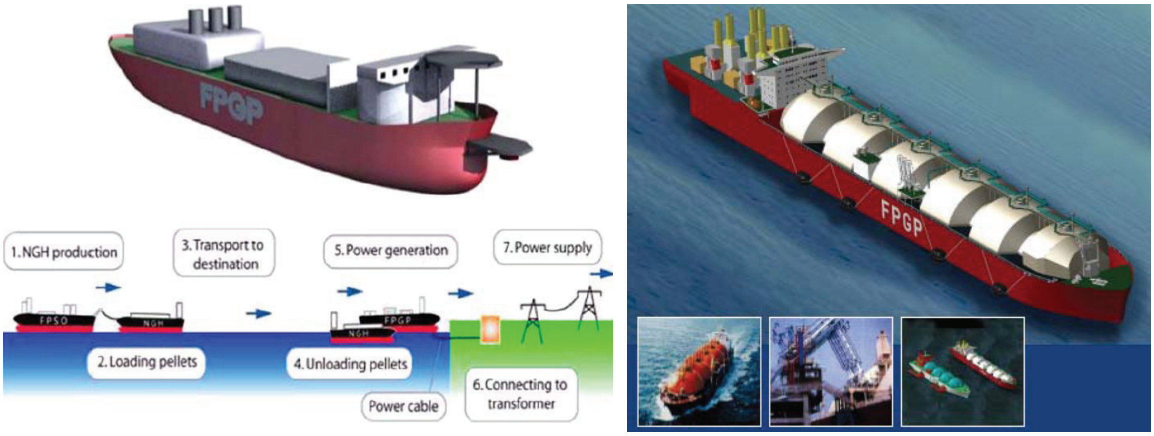


Figure 12 (a) VISIONS Floating Power Plant; (b) Golar LNG Floating Power Plant

The concept involves a vessel that carries a power plant. Natural gas recovered from the exploitation of small natural gas reserves is converted to Natural Gas Hydrate (NGH). NGH is suggested as an alternative to Liquefied Natural Gas (LNG) as NGH offers easier storage and it is not explosive. NGH is re-gasified at the power plant. The re-gasified natural gas contains water that caters for the NOx emissions reduction of the plant. Carbon Dioxide (CO_2) gas emissions are converted into CO_2 hydrate that is injected back to decommissioned oil wells or sold for industrial purposes. The power plant supplies power produced to a shore based station via a cable, Figure 12(a). The expert financial evaluation revealed that the concept is economically viable provided that revenue from power generation is high and cost of production is kept low then an internal rate of return of 20% (not accounting for carbon credits) was predicted.

The analysis showed that most of the technologies involved have reached a stage where commercialisation is imminent. Similar or less innovative FPG plants have appeared since then in the market (Golar LNG website), e.g. the concept of Figure 12(b) Golar LNG Floating Power Plant. This concept although less innovative than VISIONS concept it is very similar in general terms.

2.7. Case Study 7

In January 2009 VISIONS students presented an idea considering a fast nuclear container vessel. China now considers building such vessels. Posted on a forum (Free public website), 15 December 2009:

"Cosco (China's container ship company) is seriously investigating the development of nuclear powered container ships. A study showed that a nuclear ship would be $40 million per year cheaper to operate when bunker oil is at $500/ton. This study also indicated improved economics when bunker fuel is over $300/ton. Bunker oil is currently about $375/ton. Switching to nuclear powered container ships would reduce air pollution by the equivalent of about 20,000 cars converted to electric per container ship that is converted."

2.8. Case Study 8

Another example is the VISIONS Cruising With Wings (CWW) presented in January 2008, Figure 13(a). The concept refers to a cruise ship with three hulls (Trimaran) in order to achieve reduced friction resistance, improved stability and increased deck area. Wing profile sections provide thrust that is expected to be higher than using traditional sails and can be controlled from the wheelhouse. Advanced controls ensure wings are controlled easily and efficiently.

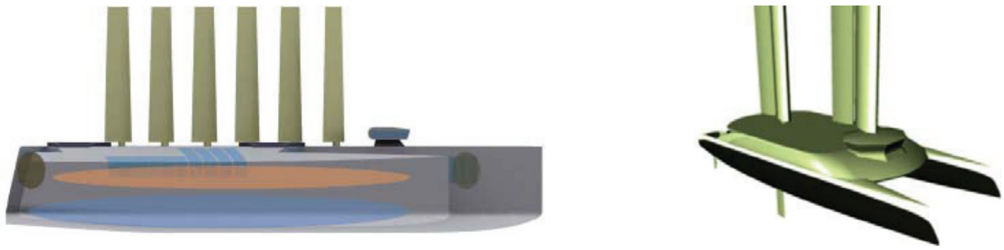


Figure 13 (a) VISIONS Cruising with wings concept; (b) Wing+Wing Technologies concept

In response to the above concept similar concepts later appeared on the market, e.g. for a similar catamaran (instead of Trimaran) vessel, Figure 13(b). In February 2010 it was announced (TriplePundit website) that: "Wind+Wing Technologies, wants to take us back to the future with its concept for ferries equipped with carbon composite wings as sails, an idea that is also taking hold in a different form for ocean cargo vessels. The company says its design uses the wind in conjunction with the innovative wing and clean diesel motors to power and manoeuvre the vessel. "The fuel-saving design could save up to 40% of the fuel costs companies to ferries currently operating in the region". Wind+Wing's design features two sails that resemble aircraft wings, only vertically positioned on a single-deck catamaran hull.

2.9. Case study 9

One of the most striking cases is the the similarity of a new container design presented by MAERSK in 2011 with the student project titled as the "**Ultra Large MEGA-Containership Design"** from the first VISIONS contest back in 2005. The students of National Technical University of Athens presented a study of a container ship design capable of carrying 17500 TEU. The study included the structural arrangement in order for the ship to have the strength required in compliance with classification societies' rules. A twin propeller propulsion system was designed to ensure reaching the required service speed but also good manoeuvrability and space economy. The students also included economic feasibility studies in order to show that it is worthy to built and operate such a "giant ship" as they called it at the time. All studies showed that it this design would result to relatively reduced freight rates between major trade routes e.g. between Europe and Asia.

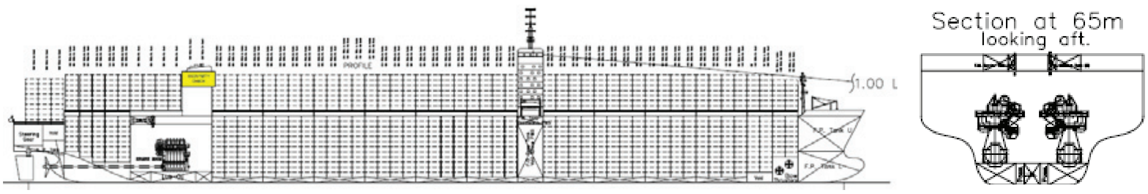


Figure 14 VISIONS Ultra Large MEGA-Containership Design

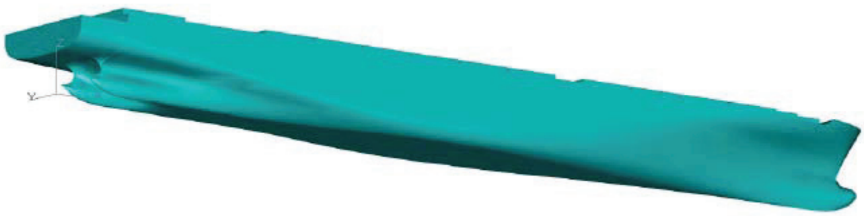


Figure 15 VISIONS Ultra Large MEGA-Containership Design

The students' main conclusion was that "counting on future port infrastructure development plus market trends we are very close to chararecterize this ship design as the carrier of the future".

Indeed just 6 years later in 2011 in the site (www.worldslargestship.com) MAERSC, with the article "At the helm of change", announced the construction of ten vessels, each capable of carrying 18,000 TEU. "The size and capacity of these vessels, at 400 metres long and 59 metres wide, will help reduce energy consumption and lower CO2 emissions." The two container designs are very similar in every respect. The hullforms of the VISIONS vessel and the MAERSC vessel are almost identical both incorporating a twin screw propulsion set up with two main engines. Moving the engine room further aft was also a major innovation in both designs.

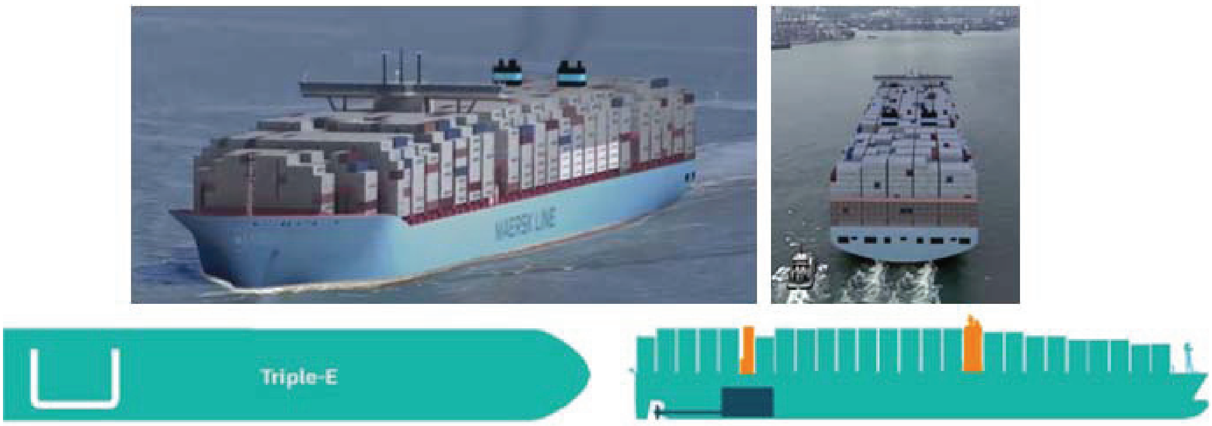


Figure 16 MAERSC EEE vessel

Table 2 below compares the principal characteristics of the two concepts the VISIONS Ultra Large MEGA-Containership Design (developed in 2005) and the MAERSC Triple E concept (developed in 2011) where the striking similarities are immediately aparent:

Table 2 Ultra Large MEGA-Containership Design VS MAERSC Triple E

	VISIONS	MAERSC 3E
Year	**2005**	**2011**
Length (m)	400	400
Bredth (m)	55	59
Height (m)	75	73
Draft (m)	15.25	14.5
No. of main engines	2	2
Number of propellers	2	2
Deadweight (tons)	156844	165000
Propulsion	Twin MAN engines, 57200 kW each	Twin MAN engines, 32000kW each
TEU	17500	18000
Design speed (knots)	25	19 (Top sp. 25)
Other Common Characteristics	• Moving the bridge fore for improving the line of sight and stacking containers higher. • Moving the ER aft for increasing stability and allowing for more containers above and below deck.	

3. Tavistock Institute Survey

The findings of a survey initiated (Tavistock Institute 2009) by the European Commission investigated the efficiency of the Networks of Excellence as an instrument of EU. This survey further demonstrates the positive impact of VISIONS. According to this report there were a number of tangible outputs from the VISIONS NoE. According to the survey it is clear that the network has established a bank of rigorously developed future scenarios that will affect the market in the coming 15 years. VISIONS NoE reveals any gaps in current knowledge and identification of new fields of research.

It was concluded that VISIONS allowed for numerous networking possibilities for all parties, leading to greater integration of industry and academia, while also conferring great benefit to students in terms of learning. Some of the students' ideas have been adopted by industry. Throughout its life cycle VISIONS attracted attention from industry press, culminating in a high profile awards ceremony, with awards being presented by senior members of the Commission itself. The competitions led to the publishing of articles and papers, by both students and experts. Throughout the year loop members of the network would put on workshops, both for internal members and for the public.

A book including profiles of all the ideas, not just those that made it onto the short list, including where available, the evaluations undertaken was also published (WEGEMT 2009). The final conclusion of the survey was that VISIONS represents a successful Network of Excellence.

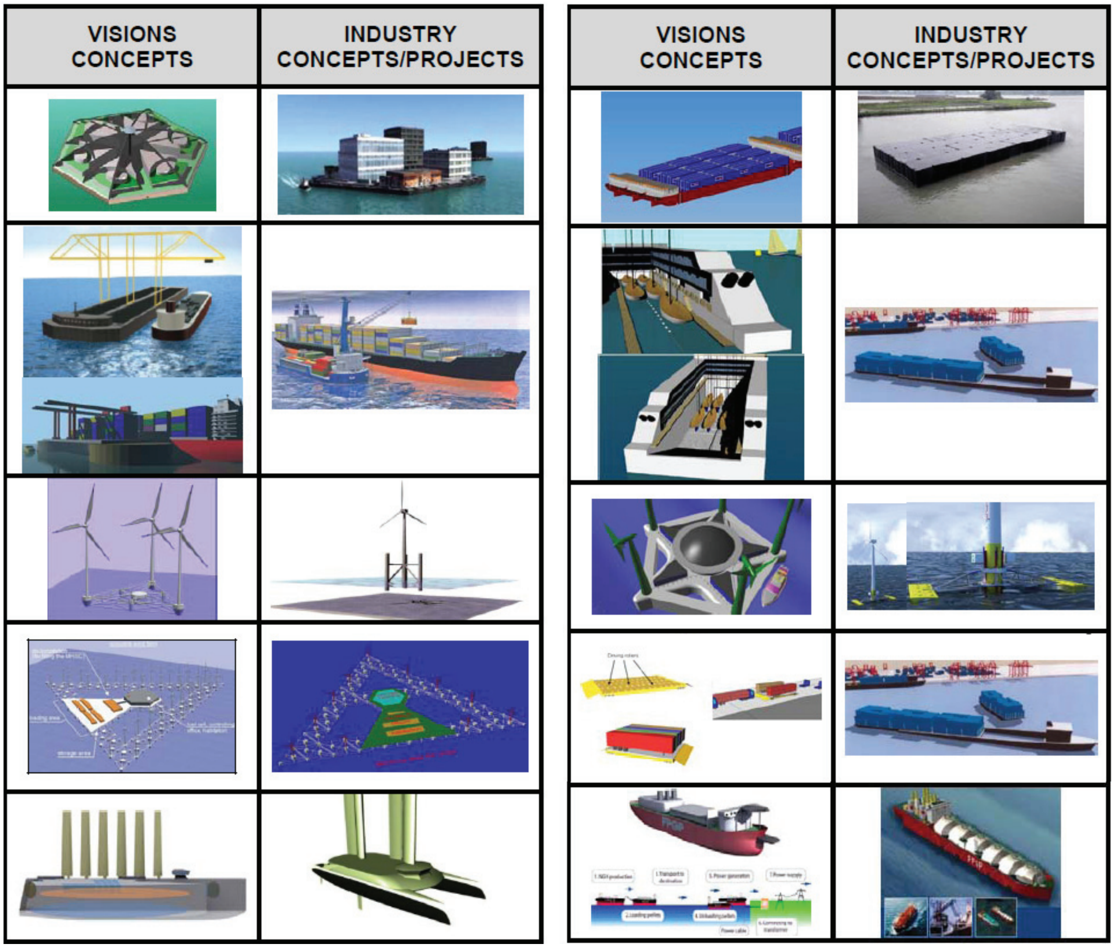
4. Conclusions

VISIONS & VISIONS OLYMPICS by organising annual academic contests managed to develop a wealth of innovative ideas essential for the competitiveness of the European Waterborne industry and also necessary for solving current and future challenging problems related to energy, transport, climate change and others. VISIONS NoE ran for 3 years based on EU finding available. Understanding the importance of the cyclic process, the fourth year was based on initiatives of the partners (not funded period) organising and running the academic contest using own resources and collaborating with other EU funded projects. Following that the VISIONS OLYMPICS consortium supported by the 7th framework programme continued similar activities for a further 2 years. The network partners realise the importance of a visionary academic contest for the industry and work towards making it a sustainable process. Furthermore a European survey on the effectiveness of European NoE showed that VISIONS has been one the most successful networks of excellence under EU FP6.

Following all the latest technological advancements as well as the new concepts and products in the marine industry, one can find many similarities between what VISIONS / VISIONS OLYMPICS developed for the last 6 years and what is now coming to the market. It may also be the case that more VISIONS concepts have been considered for realization in Europe and many more will be realized in the future. As those ideas are still in the conceptual stage of design, there may be confidentiality issues associated with those concepts preventing their publication.

In brief looking back at the achievements of VISIONS / VISIONS OLYMPICS and assessing its impact to the industry it can be argued that the VISIONS / VISIONS OLYMPICS process of annually inviting university students through an academic contest, to develop visionary concepts for vessels and floating structures for the future, backed up by further research and concept validation on the most interesting ideas from University experts and professionals, succeeded in inspiring the waterborne industry with fresh out of the box new ideas that are now being developed as new products essential for the future of the European waterborne industry. It also clearly demonstrates that even if there is no direct relation between the original visionary concepts developed by the students and the Universities and the products that are now coming to market, the ideas generated through the VISIONS / VISIONS OLYMPICS process clearly reflected the future needs of the European waterborne industry.

Many of the VISIONS ideas have started to appear on the market and many more are likely to follow. Moreover there are many new concepts that are now under development that seem to have considered many of the concepts and proposed technologies that first appeared in VISIONS, Figure 17.



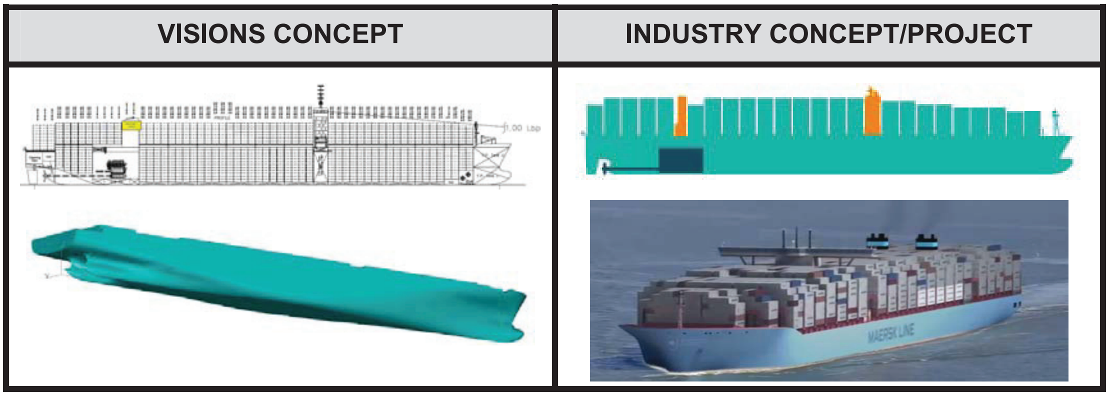


Figure 17 VISIONS concepts and similar industry later projects

5. References

1. Discovery Channel broadcasting network: Building a Floating City, http://dsc.discovery.com/videos/mega-engineering-building-a-floating-city.html
2. Renewable Energy Sources website, http://www.renewable-energy-sources.com/2009/06/11/first-floating-wind-turbine-in-operation/
3. Golar LNG website, www.golarlng.com/media/FPGP.pdf
4. Patentdocks website, www.faqs.org/patents/app/20080283467#ixzz0gal9ZdaW.
5. Free public website, www.freerepublic.com/focus/f-news/2408174/posts
6. TriplePundit website, www.triplepundit.com/2010/02/the-wind-beneath-a-greener-ferry%E2%80%99s-wings/
7. Tavistock Institute survey (2009): Evaluation of the effectiveness, implementation and impacts of new instruments introduced in FP6, (A Study for the European Commission Research Directorate General Under Framework Contract No. DG BUDG No BUDG06/PO/01/Lot 3 ABAC 101908)
8. WEGEMT (2009) VISIONS Academic Contest Results book Loop I to III issued summer 2009, WEGEMT, UK

Appendix A.

VISIONS OLYMPICS MEMBERS

Partic. Number	Participant name	Participant short name	Country
1(coordinator).	CESA (Community of European Shipyards Associations)	CESA	Europe
2.	EMEC (European Marine Equipment Council)	EMEC	Belgium
3.	WEGEMT	WEGEMT	UK
4.	University of Rostock	UROS	Germany
5.	BALance Technology Consulting	BAL	Germany

VISIONS NoE MEMBERS

Partic. Number	Participant name	Participant short name	Country
1(coordinator)	The EU Shipbuilders Association	CESA	Europe
2	IMAWIS - Maritime Wirtschafts- und Schiffbauforschung GmbH	IMAWIS	Germany
3	ALSTOM - Chantiers de l'Atlantique	CAT	France
4	CETENA - Centro per gli studi di Tecnica Navale	CET	Italy
5	Development Centre for Ship Technology and Transport Systems	DST	Germany
6	CONOSHIP International BV	CONOSHIP	Netherlands
7	Aker MTW Werft GmbH	AMTW	Germany
8	Norwegian Marine Technology Research Institute	MARINTEK	Norway
9	JAFO Technologie, Zweigniederlassung der Blohm+Voss in-ternational GmbH	JAFO	Germany
10	EVIMAR A/S	EVIMAR	Denmark
11	University of Rostock	URO	Germany
12	NAVANTIA S.L.	NAVANTIA	Spain
13	Center of Maritime Technologies e.V.	CMT	Germany
14	Rolls-Royce Power Engineering Plc	ROLLS-ROYCE	United Kingdom
15	Wilhelmsen Marine Consultants AS	WILHELMSEN	Norway
16	British Maritime Technology Ltd	BMT	United Kingdom
17	SSPA Sweden AB	SSPA	Sweden
18	Ship Design and Research Centre	CTO	Poland
19	University of Strathclyde	SSRC	United Kingdom
20	BALance Technology Consulting GmbH	BALance	Germany
21	Germanischer Lloyd AG	GL	Germany
22	European Association of Universities in Marine Technology and related Sciences	WEGEMT	Europe
23	EUROGIF - the European oil and gas innovation forum	EUROGIF	Europe