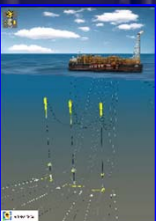




« GIFT » LNG IMPORT FLOATING TERMINAL

A NEW DESIGN



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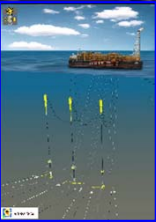
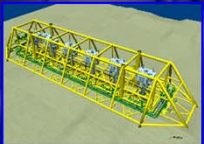


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A new design developed by DORIS Engineering

DORIS Engineering is developing a new concept of a LNG import terminal as an alternative to classical onshore terminals or offshore GBS terminals. This concept is named "G.I.F.T." standing for LNG Gas Import Floating Terminal.

The proposed concept allows berthing facilities for LNG carriers, LNG storage, and re-gasification. Taking advantage of its experience with large FPSO hull design and the Monaco floating quay, DORIS Engineering has developed a unique concept which meets operators' needs and is very effective in terms of cost and delivery schedule.



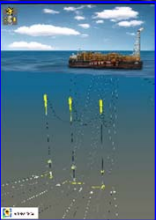
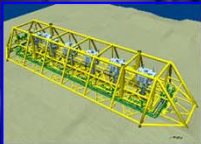


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A new design developed by DORIS Engineering

The concept is based on a large hull with conventional membrane-type tanks which can weather-vane around a turret. The structure is orientable with stern transversal thrusters, and is fitted with horizontal skirts at keel level in order to allow berthing and side-by-side unloading of conventional LNG carriers.

The thrusters rotate the terminal, transversally to the waves and winds, creating a sheltered area, allowing unloading operations in up to 2.5m significant waves.



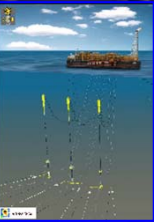
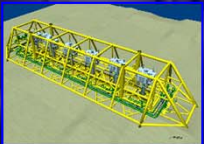


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A new design developed by DORIS Engineering

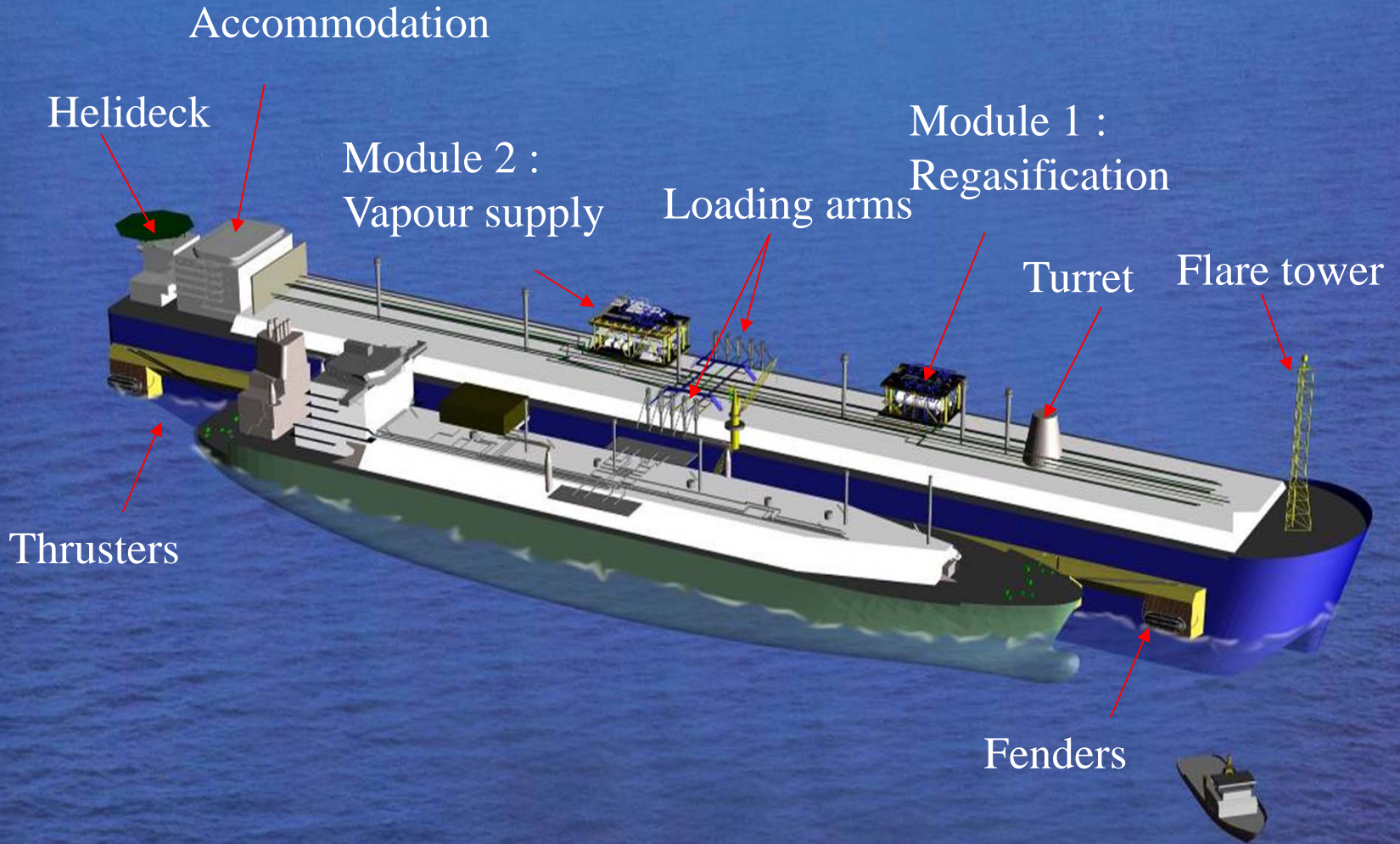
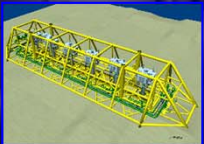
Construction of this floating terminal can be achieved by shipyards already experienced in LNG-carriers.

Such an offshore terminal solves all the local constraints of onshore LNG terminals. DORIS is developing (with industrial partners and the support of the European Union) the concept for 350 000 m³ storage, 8 MMm³ /year gas delivery and can adapt it to a specific operator's needs.



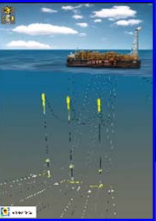
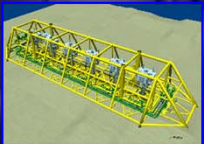


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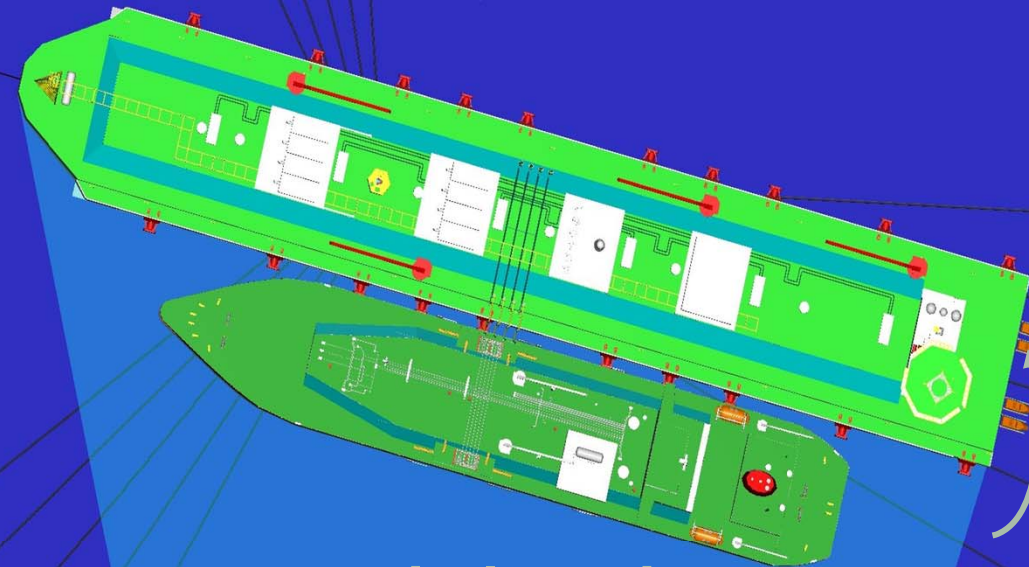




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Wind, waves,
& current
directions



Rotate by
thrusters

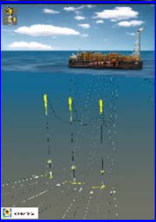
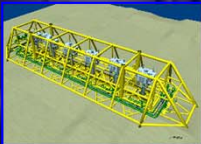
sheltered
area

⇒ Need of turret & thrusters
⇒ Unloading capacity increased up to $H_s=2.5m$



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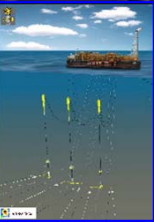
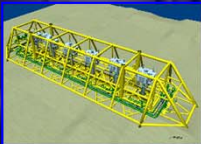
ADVANTAGES of offshore terminals over onshore terminals



- ➔
 - No local constraints ("NIMBY" issue).
 - Fewer administrative constraints (land acquisition, harbour, regulations...).
- ➔ **Increased Safety :**
 - Terminal and carriers away from populated/industrial areas,
 - No marine traffic issue,
 - Quicker emergency carrier disconnection,
 - Improved security.
- ➔ **Cost and Schedule Effective :**
 - Cost higher if dredging cost are not taken into account, Effective overall schedule,
 - Flexibility in project implementation (contractor selection).



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ADVANTAGES of GIFT concept over other offshore terminals

➔ Berthing operating limits :

- Hs=2.5m
- Wind = 15m/s

➔ Increased Safety :

- Safe lee side for LNG carrier approach and departure
- Approach and departure from both sides (no dead end)

➔ Use of proven technologies :

- Ship to ship transfer with alongside mooring of standard LNG Carriers
- Use of existing loading arms for LNG transfer



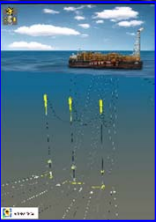
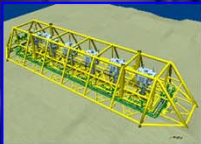
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Project status and developments

The "GIFT" concept derives from DORIS studies for LNG-GBS over the past 10 years and its recent experience in designing and managing the large floating structure quay for Monaco harbour.

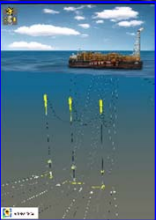
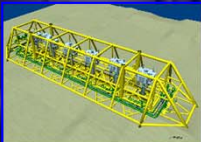
The development of the GIFT design has been carried out during 26 months by a consortium of industrial partners (Akeryards, London Marine Consultants, DNV, National Technical University of Athens) for a basic case ; the budget for these studies is 3,2 M Euros, partly funded by the European Commission. Constructability, price levels and schedule have been checked against current European yard prices.

The GIFT design can be tailored to each Client's needs (capacity, site conditions, regasification plant data, etc.), and should be developed by FEED studies that DORIS proposes to perform in parallel with the basic case.

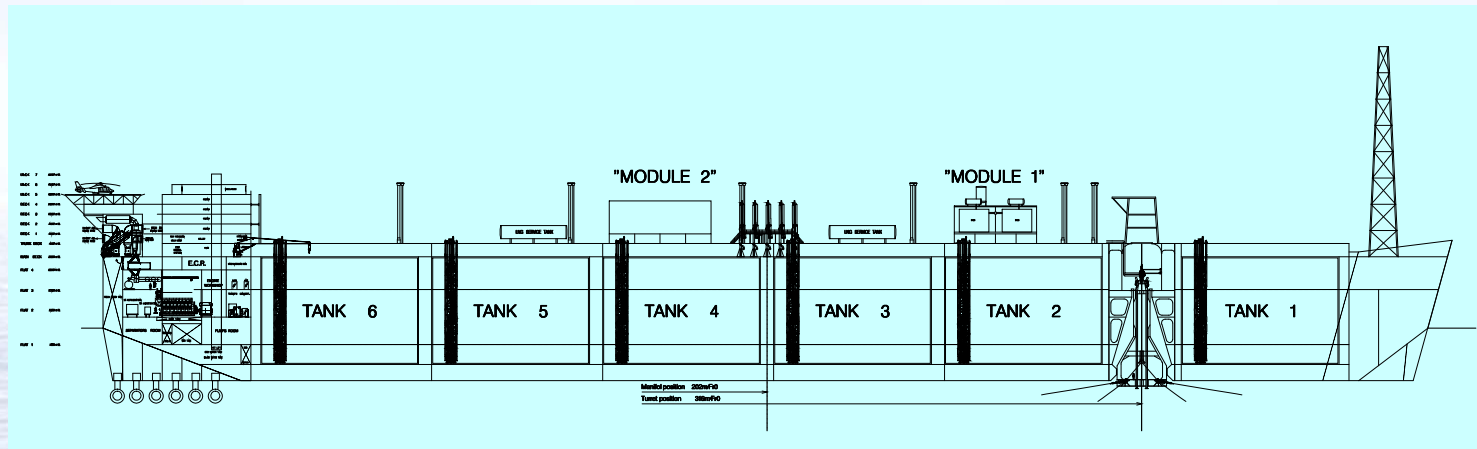




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Typical data



- Storage : 350 000 m³ in 6 membrane type insulated tanks
- Berthing capacity : Up to 250 000 m³ LNG carriers
- Regasification capacity : 8 MM m³ /year at 100 bar.g. (~ 0,8 B cuft/day)
- Hull dimensions : 400 x 60 x 40 m approx.
- Water depth : 75 m
- Export : 30" subsea pipeline to shore (via 2 or 3 risers)
- Environmental conditions : G.O.M. as reference
- Availability for berthing : 95 %



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Schedule estimate

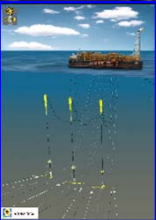
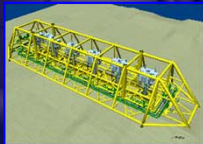
	Year Month	1	2	3	4	5
FEED + CFT's for EPCI's/LLI's	6 m	[Bar chart showing 6 months in Year 1]				
Project sanction	-	[Starts at beginning of Year 1]				
Detailed Engineering	10m	[Bar chart showing 10 months from start of Year 2]				
Industrial Engineering	16m	[Bar chart showing 16 months from start of Year 2]				
Hull construction	34 m	[Bar chart showing 34 months from start of Year 2]				
Cargo containment	22 m	[Bar chart showing 22 months from start of Year 3]				
LLI's (including turret) to yard	24 m	[Bar chart showing 24 months from start of Year 2]				
Facilities integration + Pre-commissioning	6 m	[Bar chart showing 6 months from start of Year 5]				
Final Commissioning at yard	2m	[Bar chart showing 2 months from start of Year 5]				
Tow / Installation	3m	[Bar chart showing 3 months from start of Year 5]				
TOTAL from sanction	45 m	[Bar chart showing 45 months from start of Year 2]				

=> A total of 45 months from detailed engineering to final commissioning on site





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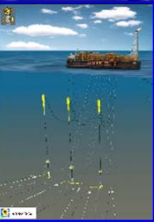
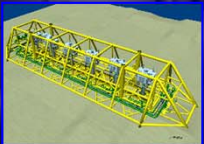
Cost estimate for 350 000 m³ storage capacity (EPCI contract)

■ Hull	=	80 000 t	=	170 M€
■ Machinery, power gen., thrusters	=	4 700 t	=	55 M€
■ Outfitting and quarters	=	4 900 t	=	80 M€
■ LNG outfitting	=	5 400 t	=	125 M€
■ Regasification facilities, flares	=	1 800 t	=	50 M€
■ Offloading facilities / fenders	=	1 000 t	=	28 M€
■ Turret	=	1 200 t	=	20 M€
■ Equipment integration	=	11 400 t	=	17 M€
■ Mooring system: 16 x 6" chains x 1240 m and 16 x anchors	=	-	=	30 M€
■ Export system: 2 x 16" risers, PLEM	=	-	=	12 M€
■ Marine operations				
- Mooring system installation	=	1 month	=	16 M€
- Export system installation	=	1 month	=	4 M€
- Tow/installation	=	3 months	=	8 M€
■ Yard indirect costs and miscellaneous construction costs (includ. yard profit)	=	-	=	90 M€
■ Management, coordination	=	45 months	=	45 M€
TOTAL				750 M€ ≈ 1 000 M\$
■ Excluded : 30 km Export pipeline				around 40 M€

=> Thrusters represent around 5% of total CAPEX



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OPEX

GIFT OPEX is dependant on terminal availability (capacity) to unload and regasify LNG carriers:

- **Yearly OPEX varies from 35 million euros at 50% availability to 38 million euros at 100 % availability (Berthing operations)**
- **Thrusters operating costs represent 1.5 million euros per year i.e. around 4 % of the total yearly OPEX.**



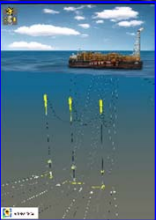
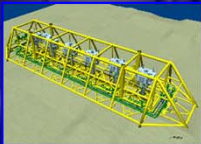
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Impact of Thrusters

⇒ Thrusters represent less than 5% of total costs
(CAPEX amortisation + OPEX)

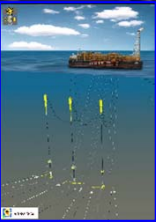
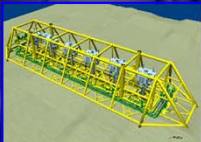
⇒ GIFT availability to unload and regasify LNG in
selected sites:

- around 95% with thrusters
(i.e. around 120 LNGC of 138,000m³ unloaded per year)
- ≤ 80% without thrusters
(i.e. ≤ 100 LNGC of 138,000m³ unloaded per year)

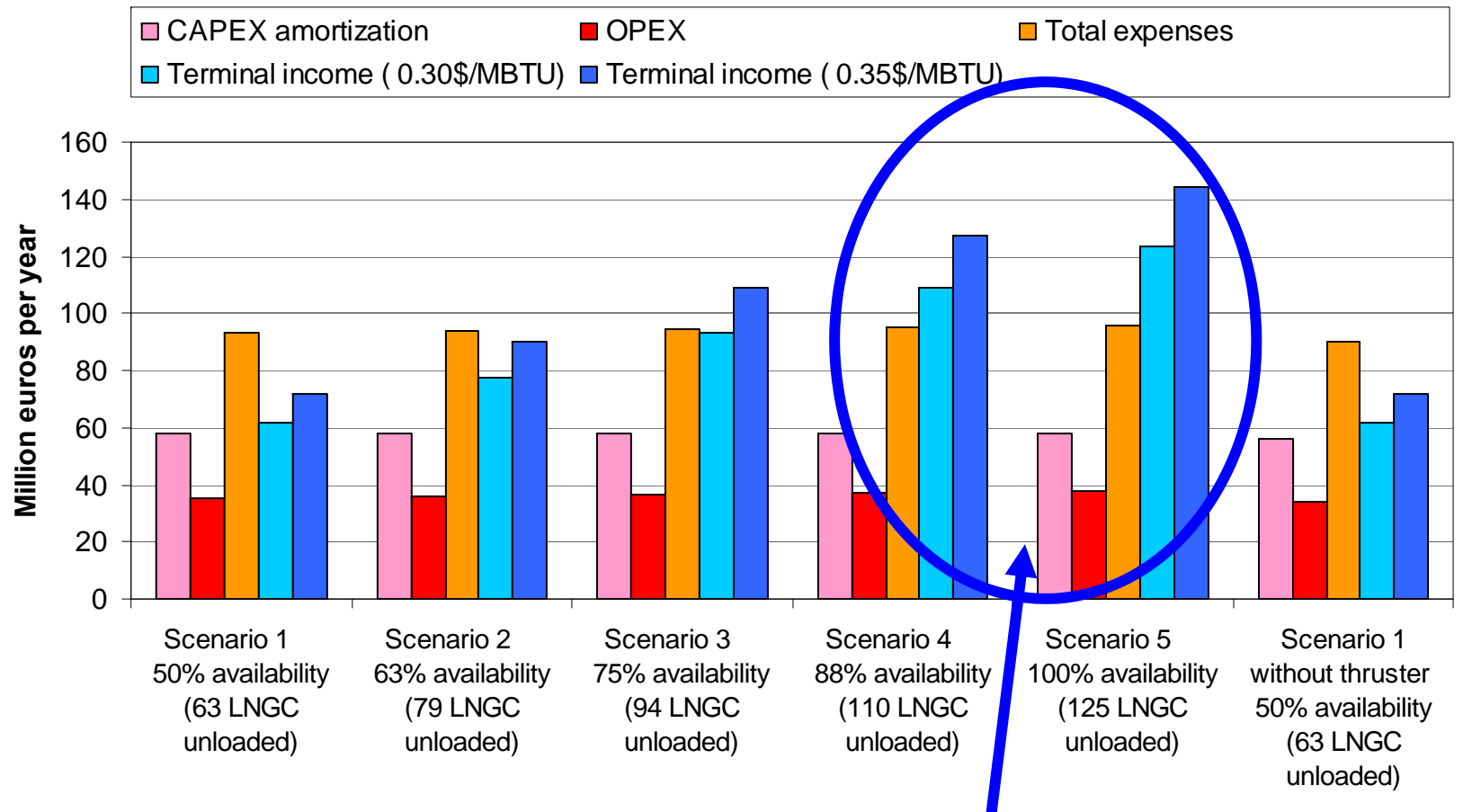




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Economic analysis of GIFT concept



=> GIFT with thrusters is Cost effective