

Port Feeder Barge as Blue Highway for the Port of NY/NJ



Proposal for the intended **Blue Highway** within the Port of New York / New Jersey

in response to the RFEI issued by NYC EDC:

Brooklyn Marine Terminal (BMT) ***Port Operations and Maritime Industrial Uses***

Introductory remark

This proposal does not relate to the BMT itself, but exclusively to a new type of barge service for sea containers and microfreight within the Port of New York/New Jersey as part of the Blue Highway initiative. The new developed **Port Feeder Barge** type of harbor vessel is to be used for the new service (Fig. 1). While the BMT is to be a key hub for the new barge service, the prospects for the BMT would be significantly expanded. Therefore, this proposal should be made available to all involved and interested in the future development of the BMT.

The potential role of PORT FEEDER BARGE Concept UG (PFB-C) within the Blue Highway project is acting as a source of a new barging idea. If the idea was accepted, PFB-C would supply all the necessary design documents (general and detailed design of the vessel as well as all workshop drawings) to the contracted US shipyard (according to the Jones Act vessels for domestic service have to be built in the US).

Respondent: PORT FEEDER BARGE Concept UG

Grosse Elbstrasse 42
22767 Hamburg / Germany
Managing Director: Dr.-Ing. Ulrich Malchow

T: + [REDACTED]
info@ [REDACTED]
www.portfeederbarge.de



Fig. 1: Port Feeder Barge (computer rendering)

Introduction of respondent

PFB-C is a maritime engineering office which was founded by naval architect Dr Ulrich Malchow in Hamburg, Germany, to market the **Port Feeder Barge (PFB)** concept he has developed and gained international patents for. Dr Malchow has a background in liner shipping (Hapag-Lloyd). Later he studied naval architecture and mechanical engineering. After obtaining his PhD in maritime transport economics from the Technical University of Berlin he served for a decade at Blohm+Voss shipyard in Hamburg, most recently as the head of sales and in parallel as head of the project department for merchant shipbuilding. He left the shipyard to become managing director of the biggest barge operator in the port of Hamburg, which was followed by a call to become professor for maritime economics at Bremen University of Applied Sciences a few years later. After returning to Hamburg, he devoted himself to the **PFB** concept. He also serves as a senior consultant for international port and shipping projects (e.g. for the World Bank, the European Union and private companies) and for the decarbonisation of ship propulsion systems.

1. General considerations

The idea for the **PFB** is based on the insight that carrying containers using conventional deck barges over short distances is very expensive overall and therefore not an economically viable alternative to road haulage. While the pure transport by barge is relatively cheap, the high container handling costs at both ends for loading and discharging have to be added. It is in particular the huge gantry cranes, whose high costs

per move make barge transport uncompetitive compared to road haulage. This disadvantage becomes even greater the shorter the distance (i.e. the higher the portion of the handling costs). By nature, distances within ports are generally rather short. This insight is confirmed by the fact that the existing twice a week barge shuttle between the Red Hook Terminal (at BMT) and New Jersey needs to be subsidised to be competitive.¹

1.1. LoLo vs. RoRo

When water has to compete against road haulage the RoRo mode is at first the most obvious choice as it is quick and does not need any expensive cargo handling by crane. When it comes to barging of containers, in particular the high costs of cargo handling caused by the big gantry cranes make the RoRo mode appear to be a cheaper alternative. However, RoRo concepts require large areas ashore for ramps and parking spaces for the (container) trailers, i.e. valuable spaces in urban areas like NYC! Furthermore, moving containers on trailers on a RoRo barge is actually an expensive waste of onboard space and deadweight as a lot of stowage losses are involved and only one tier of cargo is utilized.

If the large quayside gantry cranes did not have to be used, the LoLo mode would be much more efficient! That is why the barge has to be equipped with its own full size container crane. Furthermore, the vessel's own gear allows also to handle containers at small urban places where no quayside handling equipment is available at all. Hence, when containers have to be moved by barge over short distances, the better alternative is to move the crane onto the vessel. That is why for an efficient Blue Highway for containers and microfreight a LoLo barge is being proposed whose essential piece of equipment is its own crane.

1.2. Propulsion

The LoLo container deck barge currently deployed between Red Hook Terminal and New Jersey has no crane and is not self-propelled but needs to be towed by a harbor tug. It is actually a 'cold' vessel. Docking and undocking of towed barges is generally time-consuming and also prone to accidents. With only two round trips per week at present, swift harbor manoeuvres are not essential. However, this configuration is completely unsuitable for a regular service with many points of call during the day some of them being very small. That is why a self-propelled and highly maneuverable barge is being proposed. Power supply for the onboard crane has to be provided anyway. Therefore, it is no longer a 'cold' ship.

2. The idea behind the Port Feeder Barge

The **PFB** is a new type of harbor vessel which has been designed to improve container logistics within ports including their neighborhood while shifting container haulage from road to waterway in order to...

- significantly ease congestion on the roads within and around ports,
- reduce GHG emissions from container trucking within and around ports,
- protect infrastructure (especially heavily burdened bridges),
- cut costs for intra-port haulage to improve the competitiveness of the port as a whole.

¹ BMT Collective Market Assessment and Planning Implications Brief, Memorandum by Moffatt & Nichol, January 24, 2025

2.1. Basic vessel concept

The internationally patented concept of a **PFB** is a self-propelled container deck barge of 168 TEU capacity (completely stowed on the weather deck), which is equipped with its own full size container crane, providing independency from the availability and most importantly from the high costs of the quayside gantry cranes (Fig. 1). Hence, contrary to conventional barges it can offer not only a green but also a competitive alternative to road haulage.

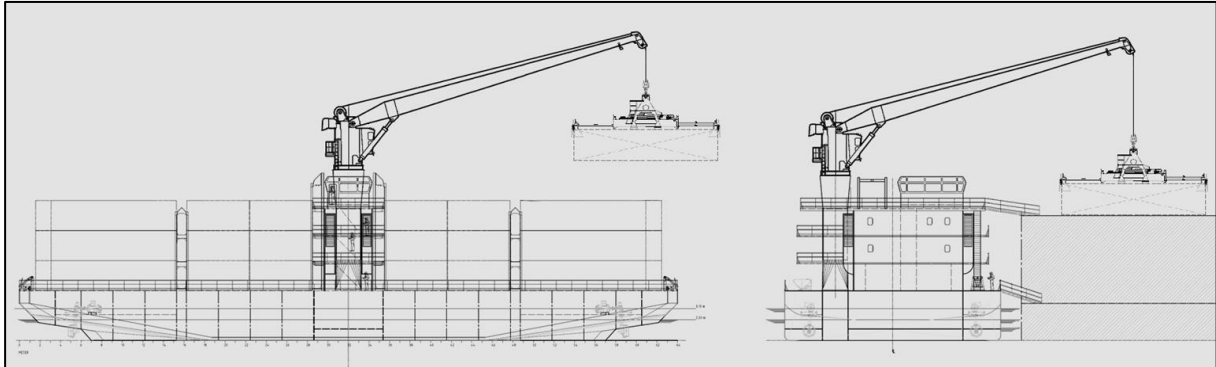


Fig. 2: Side and front view of the Port Feeder Barge

The **PFB** is of double-ended configuration, intended to make it extremely flexible in connection with its sideward mounted crane (Fig. 3). Due to the wide beam of the vessel no operational restrictions (stability) for the crane shall occur. The vessel is equipped with 2 electrically driven rudder propellers at each end in order to achieve excellent maneuverability and the same speed in both directions. Hence, the vessel can easily turn on the spot or even navigate sideways. In connection with its max. draft of only 10 ft berthing even at small and tricky facilities is not an issue.

Port Feeder Barge

Main Data

Type: self-sustained, self-propelled, double-ended container deck barge
Length o.a.: 63.90 m / 210 ft
Beam o.a.: 21.20 m / 70 ft
Height to main deck: 4.80 m / 16 ft
Max. draft (as harbor vessel): 3.10 m / 10 ft
Deadweight (as harbor vessel): approx. 2,500 t
Tonnage: approx. 2,000 GT

Fuel: HVO 100, hydrogen, ammonia, methanol or battery
Propulsion: 2 x 2 electrical rudder propeller of 4 x 280 kW
Speed: 7 knots at 3.1 m / 10 ft draft

Class: DNV ✕ 100 A5 K20 Barge
equipped for the carriage of containers, Solas II-2, Rule 19 ✕ MC Aut

Capacity: **168 TEU** (thereof 50% in cellguides), 14 reefer plugs
Crane: LIEBHERR CBW 49(39)/27(29) Litronic (49 t at 27 m outreach)
Spreader: automatic, telescopic, 6 flippers, turning device, over height frame

Accommodation: 6 persons (in single cabins)

All containers are stowed on deck while half of them are secured by cell guides, the other half is not, enabling the vessel to carry also containers in excess of 40ft length as well as any over-dimensional boxes or even breakbulk cargo. 14 plugs allow for the carriage of electrically driven reefer containers.

Key element of the worldwide unique **PFB** concept is its own heavy duty container crane mounted on a high column which normally could only be found on seagoing vessels. The crane has a capacity of 40 t under the spreader, at an outreach of 27 m (maximum outreach: 29 m). Unusual for a shipboard crane it is equipped with an automatic spreader extendable from 20 to 45ft including a turning device. A telescopic overheight frame to handle container flats with overheight cargo is also carried on board. While it looks like a standard shipboard crane, all its mechanical components have been especially designed for continuous operation – unlike standard shipboard cranes, which are designed for operation only every few weeks when the vessel is in port. Due to its nature the load cycle requirements of the **PFB** are even higher than for many quayside cranes, which has a significant impact on the design of the mechanical components.

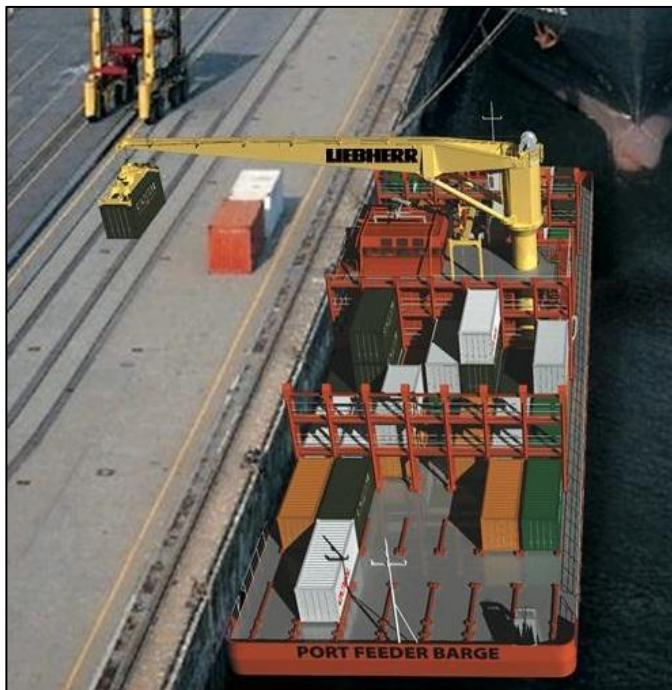


Fig. 4: The Port Feeder Barge is working independently from quayside equipment at a deep sea terminal requiring only a small gap between two deep sea vessels (computer rendering)

Due to its short length of 210 ft the **PFB** needs only a small gap between two deep sea vessels for self-sustained operation at a quay (Fig. 4). When berthed, the **PFB** is able, without being shifted alongside the quay, to load or discharge 84 TEU in three layers between the rails of a typical quayside gantry crane (Fig. 5b). This is more than sufficient with a total cargo capacity of 168 TEU. That is why the full outreach of the crane is not always needed. Berthing the vessel with the crane on the opposite side of the quay (Fig. 5a) would speed up the crane operation as the turning time of the boom is less. The height of the crane column is sufficient to serve even high quays in open tidewater ports at low tide while stacking the containers in several layers on the quay. With a skilled driver the crane performance is estimated to 20 moves/hr.

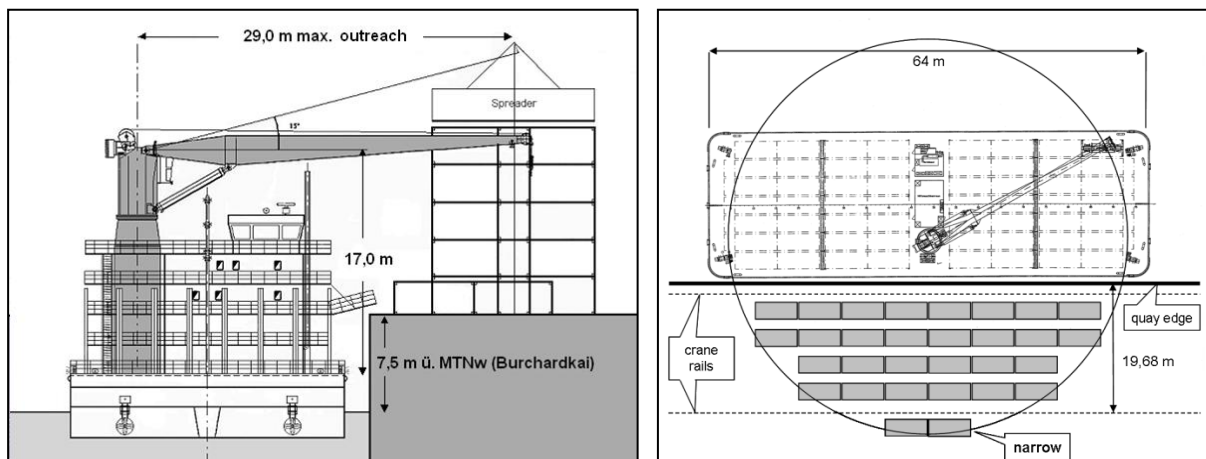


Fig. 5 a+b: Port Feeder Barge: outreach of crane and turning circle

The operation of the **PFB** is not limited to inside seaports or their neighborhood. As the hull is classified according to the notification for seagoing vessels the operation in (sheltered) open waters off the coast is also possible which opens some further interesting opportunities for additional employment.

Crewing is a matter of the local rules and regulations. The **PFB** can be physically operated by a minimum crew of 3 whereas in total 6 persons can be accommodated in single cabins.

2.2. Carbon-neutral energy supply

Bundling containers by waterborne transport is already significantly more energy efficient per TEU than road haulage of single containers and consequently causes less emissions per TEU. Additionally, the standard shipboard crane of the **PFB** is less energy consuming than the huge quayside gantry cranes of which many are meanwhile designed to serve 20,000 TEU vessels and above. These cranes are completely oversized and consequently work only at very low efficiency when serving small vessels like barges.

The **PFB** is running on electricity for propulsion and crane operation. The energy supply can be arranged 100% carbon neutral if a respective energy storage medium is chosen and produced by renewable energies. As per now 5 green storage media are suited in principle: hydrated vegetable oil (HVO 100), hydrogen, ammonia, methanol, battery. These fuels can be converted into electricity either by means of combustion engine or 3 of them by fuel cell. In total 8 different combinations are available (Fig. 6). For the special case of the **PFB** it might be advisable to 'containerize' also the energy storage, as the **PFB** could load its 'energy boxes' by its own crane. In this case the energy supply to the vessel could be easily arranged by using intermodal modes. All 4 types of fuel can be carried in special tank containers. In European inland shipping special battery containers have also been introduced in the meantime.

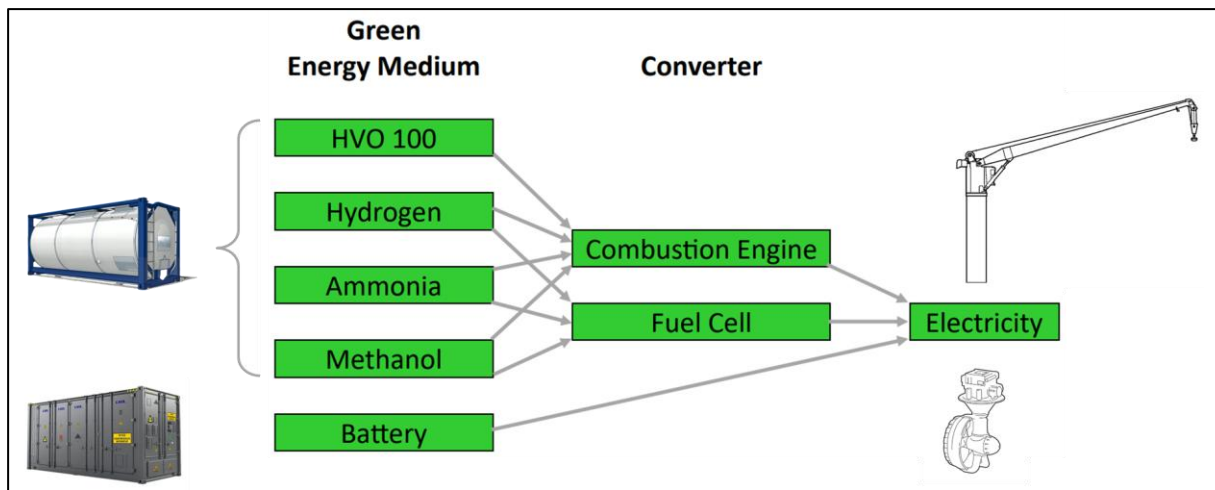


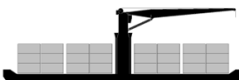

Fig. 6: Possible alternatives for energy supply

Choosing the most favorable combination of green energy depends on many aspects (e.g. various prices and their forecast, efficiency, weight, availability, technology readiness, logistics, safety, practical handling, maintenance). Some of them are depending very much on the specific local conditions.

3. Economics

Without going into the local economic details for **PFB** operation in the Port of New York/New Jersey it must be realized that major costs items of a container carried by the **PFB** (incl. handling by its crane) are lower than of road haulage: The specific investment per TEU (incl. crane) into the **PFB** (168 TEU) is much less than into a truck (1-2 TEU), provided **PFB** and truck are running on the same fuel (Tab. 1). Potential subsidies for pilot operation of the **PFB** would further increase its competitiveness. In particular, the specific personnel costs per TEU of the **PFB** are much lower than of a truck: with a typical crew of 4 the **PFB** can be almost regarded as an 'autonomous floating truck' with only 0.02 'drivers'/TEU (even without any artificial intelligence!).

Tab. 1: Specific CAPEX and personnel costs: Port Feeder Barge vs. Truck

			Factor Truck Port Feeder Barge
Investment/TEU			≈ 4
Personnel/TEU	0.02	0.5 ... 1.0	25 ... 50 !

From the investment point of view one PFB could replace (Fig. 7):

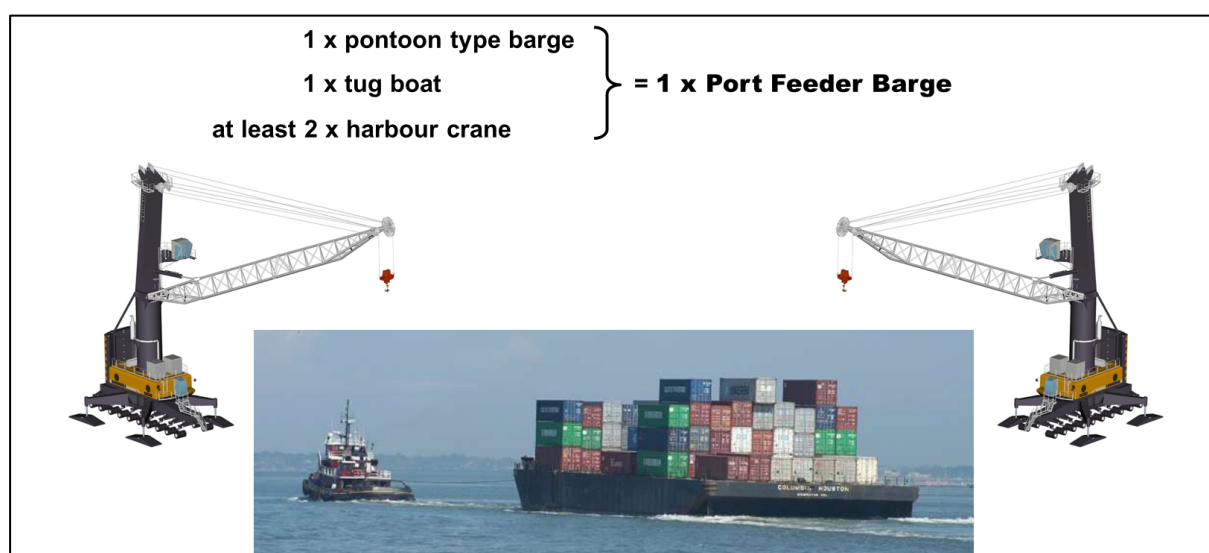


Fig. 7: Asset replacement by Port Feeder Barge

In waterborne transport it is the cargo handling which only needs a few seconds but values a big portion of the entire freight costs. Only if the container handling becomes an integral part of the transport offered by the carrier, short haul waterborne container transport has a chance to compete against the road.

4. Blue Highway

4.1. Containers

For the intended Blue Highway in the Port of New York/New Jersey it is proposed to deploy the **PFB** on a regular basis as a neutral (not belonging to any ocean carrier) liner service throughout the port with a fixed daily starting point and a regular sequence of calling points. This would especially allow booking of single containers which represent presumably the majority of all boxes to be hauled within the port.

Such a service could start in New Jersey at Port Newark Container Terminal and proceed via Maher Terminals, APMT, the former Global Container Terminals New York and Bayonne (now Port Liberty), crossing the New York Bay to Brooklyn calling at various places at South Brooklyn Marine Terminal and at various places at BMT (e.g. Red Hook Container Terminal, where the **PFB** can also dock in the Atlantic Basin without blocking any deep sea berth) and finally reach Hunts Point up in the North (Fig. 8). Its own crane allows all places to receive containers. At Hunts Point no new quayside cranes need be installed for serving the **PFB**. As the **PFB** is not dependent on the allocation of quayside crane capacity, it can berth at the busy deep sea terminals in New Jersey wherever only approx. 240 ft of free quay length is available.

Of course, not all containers do necessarily need to be brought up to Hunts Point. Any other possible loading/discharging combination on the way can be realized. Especially the connection between the two former Global Container Terminals appears to be a useful link to exchange full and empty containers of shipping line CMA CGM as the new owner of both terminals.

If organized like a liner service, all customers can prepare themselves for the scheduled sailings and arrivals. With an air draft of approx. 65 ft the **PFB** can easily pass underneath all the bridges up to Hunts Point.



Fig. 8: Proposed itinerary for the Blue Highway provided by the Port Feeder Barge

One leg measures approx. 28 nautical miles which corresponds to a pure sailing time of 4 hrs. Assuming 100 boxes were to be loaded and discharged would take in total 10 hrs at the various places. Hence, one single voyage would last approx. 14 hrs in total and it would need 2 PFBs to offer daily sailings in both directions. That leaves some time to call also at some of the many minor facilities on the way in order to carry also microfreight.



Fig. 9: Artist impression of the planned new facility at Hunts Point (the two cranes shown on the image handling containers at the quayside from a conventional barge are much too small: to handle containers massive and expensive mobile harbor cranes would be needed, but can be saved when deploying Port Feeder Barges), source: NYC DOT & NYC EDC

4.2. Microfreight

With a max. draft of only 10 ft the **PFB** can even cope with shallow waters at small facilities for microfreight. Tricky berthing situations are not a problem for the **PFB** either due to its excellent maneuverability.

Microfreight could be carried in dedicated containers which would belong to the **PFB** and would be placed by the vessel's crane on the landing for quick stripping/stuffing and then would be put back on board again or just exchanged to shorten the duration of the stop. Side opening containers would accelerate the operation (Fig. 10). The containers could be outfitted with lockers and shelves for the various last mile service providers.



Fig. 10: 40 ft open side container

5. Floating container terminal

The **PFB** could even serve as a dedicated 'floating terminal' for inland navigation. During its daily voyage the **PFB** could collect and distribute the containers also for inland navigation and would act as a consolidator. Once a day, the **PFB** called at a dedicated berth to meet with the inland barges where the containers are being exchanged ship-to-ship by its own gear, independently from any terminal equipment. Not even a quay is needed but the transshipment operation could take place somewhere midstream ('virtual terminal') (Fig. 11). With a capacity of 168 TEU the **PFB** has enough buffer capacity for intermediate stowage of the containers.



Fig. 11: The Port Feeder Barge is serving an (European) inland barge midstream (computer rendering)

6. Emergency response

Another very useful secondary purpose of the **PFB** would be salvage which hopefully is not needed. However, quite some spectacular groundings of mega container ships close to ports have been already experienced (Fig. 12, Tab. 2). With the exception of the 'Ever Forward' incident only very fortunate circumstances have prevented the need for lightening operations with these vessels. With only makeshift equipment it took 35 long days to lighten the rather small 'Ever Forward' and get her afloat again. The **PFB** can also serve as an emergency response vessel on a stand-by basis for the quick lightening of grounded container vessels.

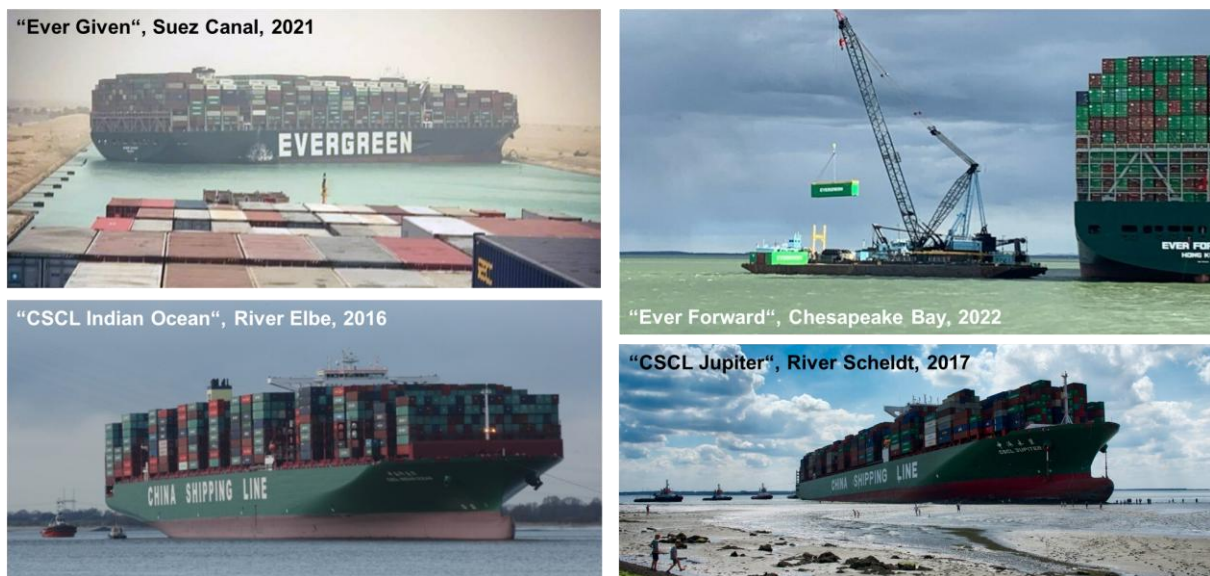


Fig. 12: Some spectacular groundings of mega container ships

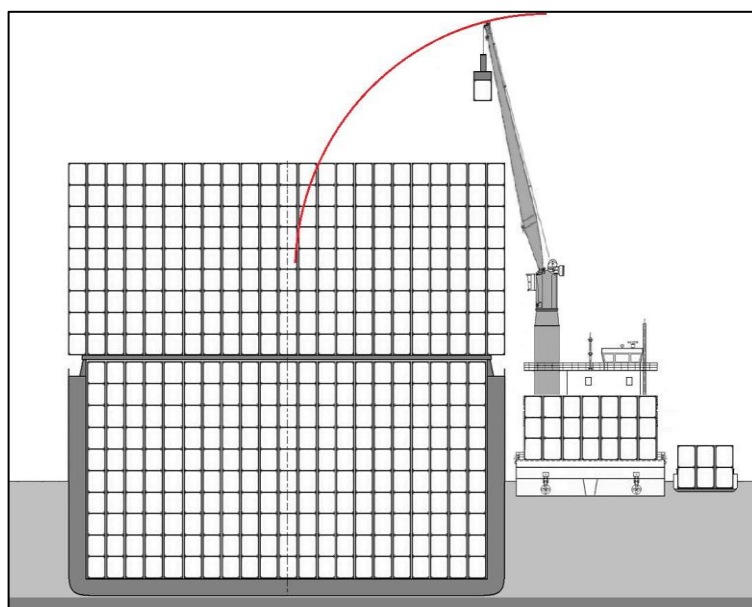


Fig. 13: Port Feeder Barge lightening a grounded 20,000 TEU vessel

It has to be conceded that virtually no major container port is really prepared for such incidents. The bigger the vessel the less salvage equipment is available. To lighten a 20,000 TEU vessel a floating crane with a hook height of approx. 195 ft is needed. For serving such mega vessels the standard **PFB** had to be slightly enlarged by lengthening the crane boom and heightening the crane column (Fig. 13). Unlike some other heavy floating equipment, the **PFB** can navigate in very shallow waters due to its light ship draft of only 4 ft.

Any major container port which claims to be 'green' has to make provisions for such a scenario as a stranded vessel can easily suffer from structural damage which could cause a serious oil spill. Furthermore, it could completely block important waterways or the access to important ports for weeks (the grounding of the 'Ever Given' in the Suez Canal had even an impact on global trade!).

Tab. 2: Some spectacular groundings of mega container ships

Ship	Size	Year	Location	Duration
CSCL Indian Ocean	19,000 TEU	2016	River Elbe / Germany	6 days
CSCL Jupiter	13,300 TEU	2017	River Scheldt / Belgium	1 day
Ever Given	20,400 TEU	2021	Suez Canal / Egypt	6 days
Ever Forward	12,000 TEU	2022	Chesapeake Bay / USA	35 days !

Of course, the **PFB** can also be deployed as a floating crane for any kind of cargo other than containers.

7. Conclusion

The **PFB** represents a new way of short haul of containers on barges. Despite its innovative character (the concept is worldwide unique and protected by patents) it can be concluded that the construction and operation of the **PFB** would not be a technical challenge. Apart from the deliberately innovative power generation, all other components represent proven shipbuilding technology.

By deploying **PFBs** the objectives of the Blue Highway Initiative would be fully achieved, as the **PFB** can carry containers and microfreight competitively with trucks within the Port of New York/New Jersey while, unlike current barge operation, it would most likely create a business case for its operator (depending of course on the detailed local conditions, especially with regard to labor issues, which we are not fully aware of). Not only a substantial number of containers would be removed from the roads and terminal gates but their transport would become even carbon neutral. At the same time significant improvements for the local container logistics would be achieved (win-win-situation). In addition to its intended primary function, the **PFB** can also be used for other useful purposes (floating terminal, salvage). This may open up further financing options.

In any case, the implementation of the Blue Highway using the **PFB** will result in considerable savings in terms of required quayside investments compared to the haulage with conventional barges thus maintaining full flexibility of use on the quays. Rather, currently unused areas along the waterfront can be made usable again by the **PFB** without much effort, e.g. as empty container depot or container repair shop.

However, the concept requires a new kind of cooperation among all involved stakeholders within the Port of New York/New Jersey. Hence, new paths of joint efforts have to be followed when introducing the **PFB** in order to get the full ecological, logistical and commercial return out of the concept. In particular the BMT would benefit, as it would be given a new lease of life thanks to an efficient new barge connection.

Closing remark

This is just a suggestion from the other side of the Atlantic, where the efforts to shift freight transport from road to waterway within the vibrant Port of New York/New Jersey have been closely monitored for some time. I would be delighted if this suggestion met with interest and of course even more if a **Port Feeder Barge** might one day become part of the landscape of the Port of New York/New Jersey moving containers and microfreight carbon neutrally throughout the port!

Dr. Ulrich Malchow
Managing Director
PORT FEEDER BARGE Concept UG, Hamburg/Germany
December 2025