ARUP

Electrifying Port Operations and Maritime Industrial Uses

A Vision for Brooklyn Marine Terminal

April 2026


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Executive Summary

Achieving Full Electrification for Brooklyn Marine Terminal

The maritime sector is beginning a shift toward low-carbon, resilient hubs to reduce local air pollution and greenhouse gas emissions while improving efficiency. To accelerate this shift, ports, shipping lines, and operators must update operations and assets and move from fossil fuels toward clean, electric systems.

The City of New York has a major opportunity to be at the leading edge of this movement in North America. The City's **Brooklyn Marine Terminal (BMT) Vision** Plan imagines transforming BMT into a modern, all-electric maritime port and mixed-use community along the Brooklyn waterfront. The Plan focuses on maintaining, modernizing, and electrifying the port to align with industry trends, remain financially sustainable, and support efforts to move more freight by waterways under the Blue Highways initiative.

Arup developed this concept paper to contribute to this Vision, drawing on our extensive global port electrification work and strong New York City presence to assess the potential to fully electrify BMT's port elements. We apply real world insights, engineering knowledge, and grounded assumptions to consider the following:

- **Components of an all-electric port**
  We identify the operations, assets, and systems of a future-state BMT, consistent with the City's vision, and assess their potential for electrification. We consider both mature technologies and emerging strategies that show promise for commercialization within the next 5-10 years.
- **Electrical demands and solutions**
  Demand management staggers concurrent power loads and shifts flexible loads to off-peak times. Starting with projected power requirements for a future BMT terminal, we evaluate practical operational and digital options to mitigate near-term electrical capacity constraints.
- **Onsite energy generation and storage**
  Even with demand management, BMT will likely need supply and storage strategies to accommodate heavy electrical loads. Onsite supply and storage can meaningfully reduce reliance on grid imports, improve resilience, and support the transition to a low-carbon energy system. We assess on-site renewables, such as solar PV, to supplement grid power, and energy storage systems to capture surplus energy off-peak and discharge it during spikes.

> "With strategic preparation and expert advice, ports can cut pollution while increasing energy resilience and operational efficiency today."

Josh DeFlorio
Principal
joshua.deflorio@arup.com

The Vision: An All-Electric Brooklyn Marine Terminal

Although BMT is currently constrained by electrical capacity, our analysis indicates that full electrification is likely feasible through a phased energy strategy that combines dynamic demand management with on-site renewable generation and energy storage. The Brooklyn Marine Terminal Vision offers a compelling pathway toward port electrification, more efficient operations, and a cleaner environment for the communities it serves.

About Arup

As a global consultancy with over 500 staff based in New York and New Jersey, Arup unites deep technical expertise and local understanding of New York's urban waterfront and energy challenges. We offer comprehensive experience in port electrification, shore power, cargo equipment, energy planning, port decarbonization, and resilience.

Further information on our maritime expertise can be found at: arup.com/markets/transport/maritime/

The Opportunity: A Modern, All-Electric Urban Port

Current Operations at Brooklyn Marine Terminal

The BMT is nestled amid a dense and diverse urban community in Brooklyn, New York. The terminal currently serves smaller container vessels up to 4,000 TEU, handling around 90,000 container moves annually, with regular weekly and bi-weekly services to the Caribbean, Central America, and West Africa, as well as barge operations to New Jersey. Cruise activity is also significant, with the Brooklyn Cruise Terminal (BCT) accommodating regular calls from major cruise lines. BMT operates on a 60-acre site, five days a week.

New York City's Vision for BMT

In 2024, the City of New York acquired the property from the Port Authority of New York and New Jersey, framing it as "a generational opportunity to transform a key site on the Brooklyn waterfront into a modern maritime port." Included in the City's vision for (BMT) is the goal to consolidate maritime operations next to deep water, while freeing up other parts of the site including the Atlantic Basin and BMT North for mixed-use development. The aim is to transform the portion remaining in maritime use into a modern, all-electric, and sustainable hub. The redeveloped terminal would provide upgraded infrastructure, including a new marginal pier, electrified cargo-handling equipment, and shore power, enabling it to handle increased container and bulk cargo volumes efficiently while reducing emissions and noise.

In this vision for BMT, the facility is split across the following key categories:

Cruise

- Brooklyn Cruise Terminal, currently receives ~40 vessels per year.
- By 2040, it is projected that the total number of passengers per year will reach more than 800,000.
- Plans for a new cruise terminal including integrated public open space and an adjacent hotel in Atlantic Basin.

Container

- The City aims to grow container operations to around 135,000 moves per year by adding one additional regular shipping service.
- Expansion enabled by a new port layout, reconfigured pier, modern cargo handling equipment, and updated infrastructure.
- Potential to scale up to 170,000 moves annually by extending operations into the flex maritime zone.
- Future terminal layout and equipment choices are yet to be finalized. Assumed terminal setup: RTG cranes and truck trailer units, supporting densification and freeing space for further development.

Flex Maritime

- Will accommodate a variety of operations, such as supplementary container storage, bulk cargo handling, and construction staging activities.
- Identified as an important component of New York City's Blue Highways waterborne freight network to reduce truck traffic on local roads.

Mixed-Use Districts

- BMT will feature two mixed-use districts: BMT North and Atlantic Basin.
- Up to 6,000 housing units and provide approximately 28 acres of public open space.
- It will also integrate industrial and commercial uses.
- **This report is solely focused on the port-related components, not on these mixed-use areas.**

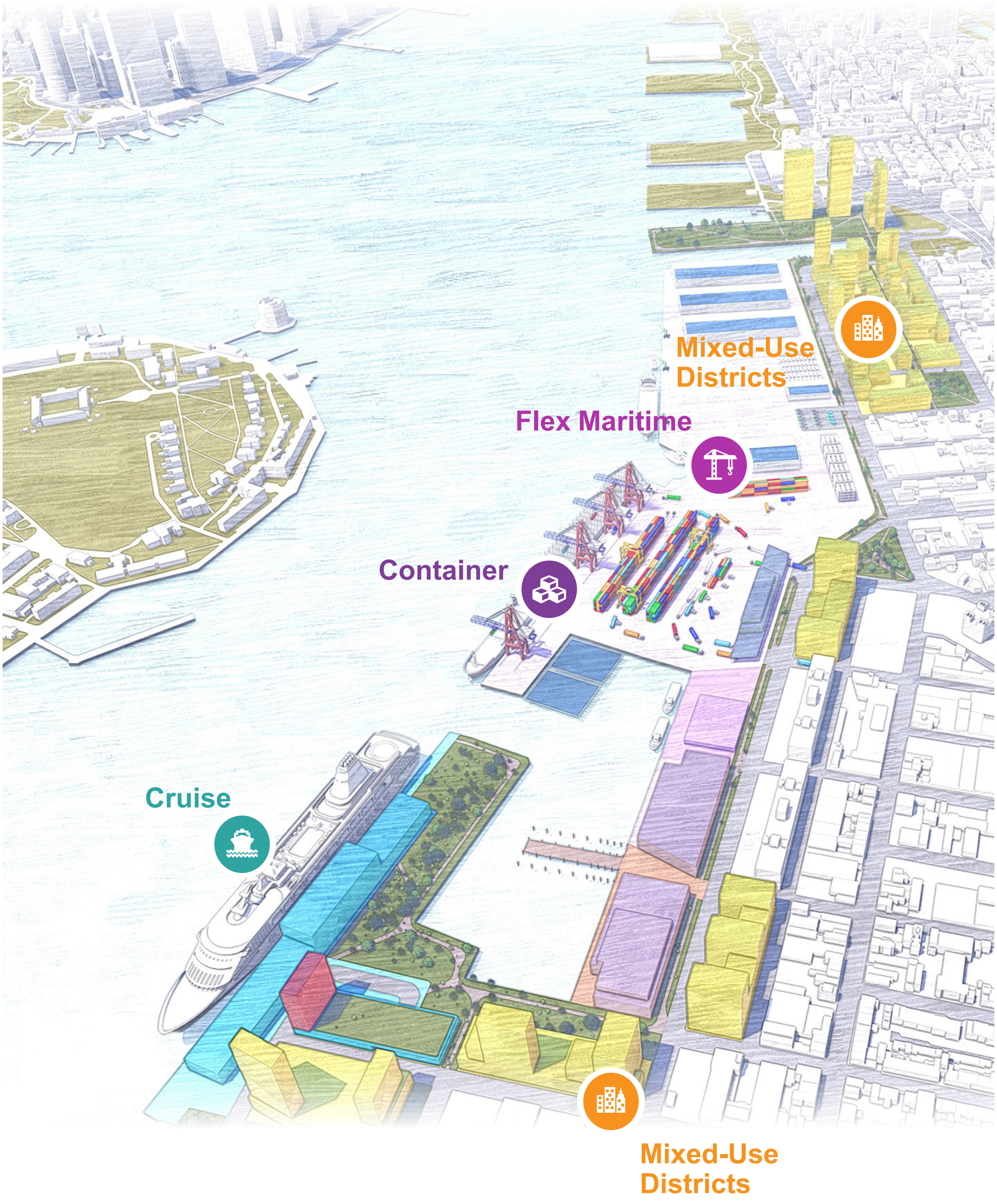


Figure 1: NYCEDC's Vision for BMT (interpretive rendering developed by Arup)

Achieving an All-Electric BMT

In this concept paper, we discuss what the potential future maritime-related electrical demands might look like given the City's proposed program and explore solutions which could be considered to deliver an all-electric, efficient, and resilient port of the future. (All accompanying renderings are interpretive and were developed by Arup based on the future program established in the City's Vision for Brooklyn Marine Terminal, released in September 2025).

Our focus is on the port elements, noting that significant non-maritime electrical demands may exacerbate the challenges discussed. Such loads could include new residential, industrial, and commercial spaces, as well as land-based transport such as buses, passenger vehicles, and heavy-duty trucks entering the port, all of which may be electrified and require charging on or near the BMT site.

We recognize that the solution to delivering an all-electric, resilient, and sustainable port will require extensive data gathering, engagement, technical and economic modeling and more – all taking a whole system perspective. As a first step, we set out an initial view of the key parts of the puzzle to inform future thinking about an optimized solution. We think our findings present a compelling view of what may be possible and show that many levers are available to make the vision of an all-electric maritime operation for BMT a reality for New York City.

This paper contains the following sections:

Components of an All-Electric Port

Describes the different energy demands that could make up an all-electric port of the future at BMT. It considers what may be possible, reflecting on both mature strategies and maturing solutions.

Planning for an Electric Future

Assesses the projected electrical requirements for a future BMT terminal and examines how BMT can develop an effective supply strategy to support increased electrification. It addresses demand management and the various supply mechanisms available, as well as evaluating the potential impact of these solutions on overall electrical supply.

Future Vision: An All-Electric Brooklyn Marine Terminal

Our paper concludes with a vision for the all-electric BMT port of the future, featuring demand management, energy supply, and storage to support utility capacity in meeting electrified demands. We see this work as a launching point for further discussion and analysis.

Components of an All-Electric Port

Context

Increasingly, the maritime sector is embracing a shift toward low-carbon, resilient, and sustainable intermodal hubs that deliver for both people and planet. Ports, shipping lines, and terminal operators are adapting their assets, reshaping their operations, and refocusing on our future economy and its needs. At the heart of this change is the rise of smart, efficient, and clean facilities powered by electricity.

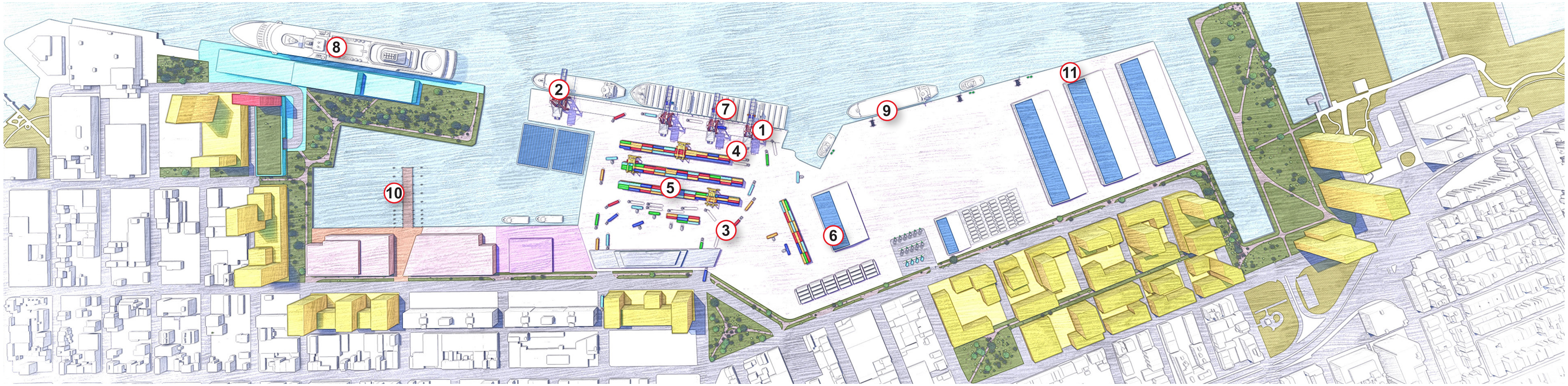
Electrify Everything?

Achieving decarbonization within the maritime sector necessitates the adoption of a variety of solutions. At a global scale, maritime decarbonization will involve energy saving strategies, low-carbon fuels (such as hydrogen-derived molecules and biofuels), carbon capture technologies, smart operations to do more with less, and a spectrum of innovations—many of which exist today but which are not yet widely commercialized.

We believe that electrification offers significant promise for BMT, recognizing that the terminal is likely not ideally suited for other low-carbon solutions in the immediate future. For example, although hydrogen and similar alternative fuels may have a role in supporting energy management within port operations, their widespread adoption at BMT faces significant challenges, including economic viability, safety considerations, and operational complexity. Similarly, carbon capture technologies would require significant space, infrastructure and safety requirements which do not align to the future vision of a mixed-use BMT site at this time.

What Could an Electric Future Look Like at BMT?

Thinking holistically, extensive electrification is possible within a port. Some assets lend themselves more readily to electrification, with viable solutions and proven commercial cases already developed. For others, electrification presents challenges which may depend on operational changes, future technology, and/or cost reductions to build viable business cases. The following diagram provides a conceptual representation of how these developments could manifest at BMT, illustrating the various components and systems involved in creating an all-electric port environment.



① Onshore power supply for container vessels at berth

Vessels typically run auxiliary engines at berth to power hotel loads. Onshore Power Supply (OPS) allows these systems to instead be powered from clean energy, cutting emissions. While ships will increasingly adopt sustainable fuels, these are likely to have high costs which would still make OPS use an attractive alternative. OPS is already in use at several ports, but its business case remains uncertain and often relies on government support. At BMT, demand will align with port operating hours, with occasional overnight connections.

② Electrified barge transport to New Jersey

A key part of the future vision could be an electric barge service to New Jersey using an electric tug towing a dumb barge or, alternatively, as an integrated electric vessel. The port electrical demand will come from charging the tug. Electric tugs are already in operation, though only in limited numbers. At BMT, charging outside port hours is likely to be able to support a single daily barge transport.

③ Refrigerated containers

When at the port, refrigerated containers (reefers) require a constant power supply to maintain their temperature, which is provided through electricity. As numbers of reefers increase, this can lead to a significant electrical demand, which can exceed what the port can provide, potentially necessitating the use of diesel generators to supplement power from the grid.

④ Shore-to-ship (STS) cranes

Electric StS cranes are widely used in ports because they offer proven reliability, lower operating costs, and reduced emissions and noise. BMT is in the process of replacing their existing crane fleet and have recently invested $15 mn in a new all-electric crane. These cranes are connected to main power and will run during the port's operational hours.

⑤ Other cargo handling equipment

Cargo handling equipment is used to move the containers from the StS cranes through the port. Several different equipment types exist but at a future BMT, we assume this includes rubber-tire gantry (RTG) cranes, truck trailer units, reach stackers and empty container handlers. Electric versions of this equipment are in operation at many ports, though alternative solutions exist powered by hydrogen and other sustainable fuels. Electric RTGs are commonly tethered to the port's electrical supply and so demand will come during operational hours. Other equipment types are battery powered and will likely require high-power opportunity charging during the day and slower trickle charging outside of port operational hours.

⑥ Cold storage

BMT plans to develop a new cold storage facility at the port. Temperature control like this is almost always electrified, which will require a relatively constant electrical demand 24 hours a day. Given the site's proximity to the East River, there is potential to utilize water-source heat pumps, which can offer improved energy efficiency compared to conventional air-source systems. However, the feasibility of this approach will depend on factors such as river water quality, seasonal temperature variations, regulatory requirements, and careful system design to maximize performance and reliability.

⑦ Container vessel propulsion

Ships using conventional fuels emit harmful pollutants while maneuvering in port, often near residential areas, impacting local communities. Even if ships transition to sustainable fuels, these fuels can still produce local pollutants when combusted. Emerging solutions like hybrid propulsion aim to cut these emissions. One promising approach is removable containerized batteries, charged gradually at the port and installed during berthing, enabling zero-emission operations within port boundaries. Though still in development, these technologies could significantly reduce future port-related pollution.

⑧ Cruise vessels at berth

Cruise vessels have a significant hotel load to power onboard systems while at berth. This is traditionally delivered by onboard boilers and auxiliary engines which can have significant impact on local air quality. Cruise vessels have been one of the earlier segments of the vessel market to start to adopt OPS and BMT plans to have 39 of the 40 vessels calling at BCT in 2026 plug in. This is likely to occur mostly during in port operational hours.

⑨ Blue highways

A key part of BMT's Vision is the Blue Highways initiative, which proposes a daily barge service to Hunts Point. The route's distance makes it potentially suited for electrification via an electric tug charged overnight at BMT, or an integrated electric container vessel. While electric tugs exist today, tugs powered by sustainable fuels are also used, presenting an alternate option for decarbonization. At BMT, overnight charging outside port operational hours could be a practical option.

⑩ Ferry Homeport II

BMT is set to serve as a hub for up to 40 NYC Ferry vessels. Electrifying these services is technically possible with examples of electrified ferries in operation globally. However, due to the duty cycles of these ferries, it is a more challenging demand to electrify, which may require adjusting operations to accommodate opportunity charging along the NYC Ferry routes during operational hours. This could make sustainable fuels a compelling alternative. If electrified, charging at Homeport II is assumed to occur overnight, mostly outside port operational hours.

⑪ Mobile harbor cranes

Mobile harbor cranes at the flex terminal may be utilized to support construction staging and other cargo handling needs. These cranes can be electrified through a tethered connection to the port electrical system with several examples deployed globally. Often these cranes are hybrid, enabling an alternate power source to maneuver the cranes when not connected (e.g. when moving between berths). They will demand power during the port's operational hours.

Technical Maturity (electric)

High

Medium

Low

Scale of Power/ Energy needed

Very High

High

Medium

Low

Other Technology Options

Fuels

None

Planning for an Electric Future

In most maritime contexts, electrification is both technically achievable and increasingly desirable over time. However, realizing this transition for BMT will require careful, forward-looking planning as the scale of potential electrification at the port is significant. Energy planning for BMT will entail aligning supply and demand in a way that is resilient, cost-effective, and sustainable.

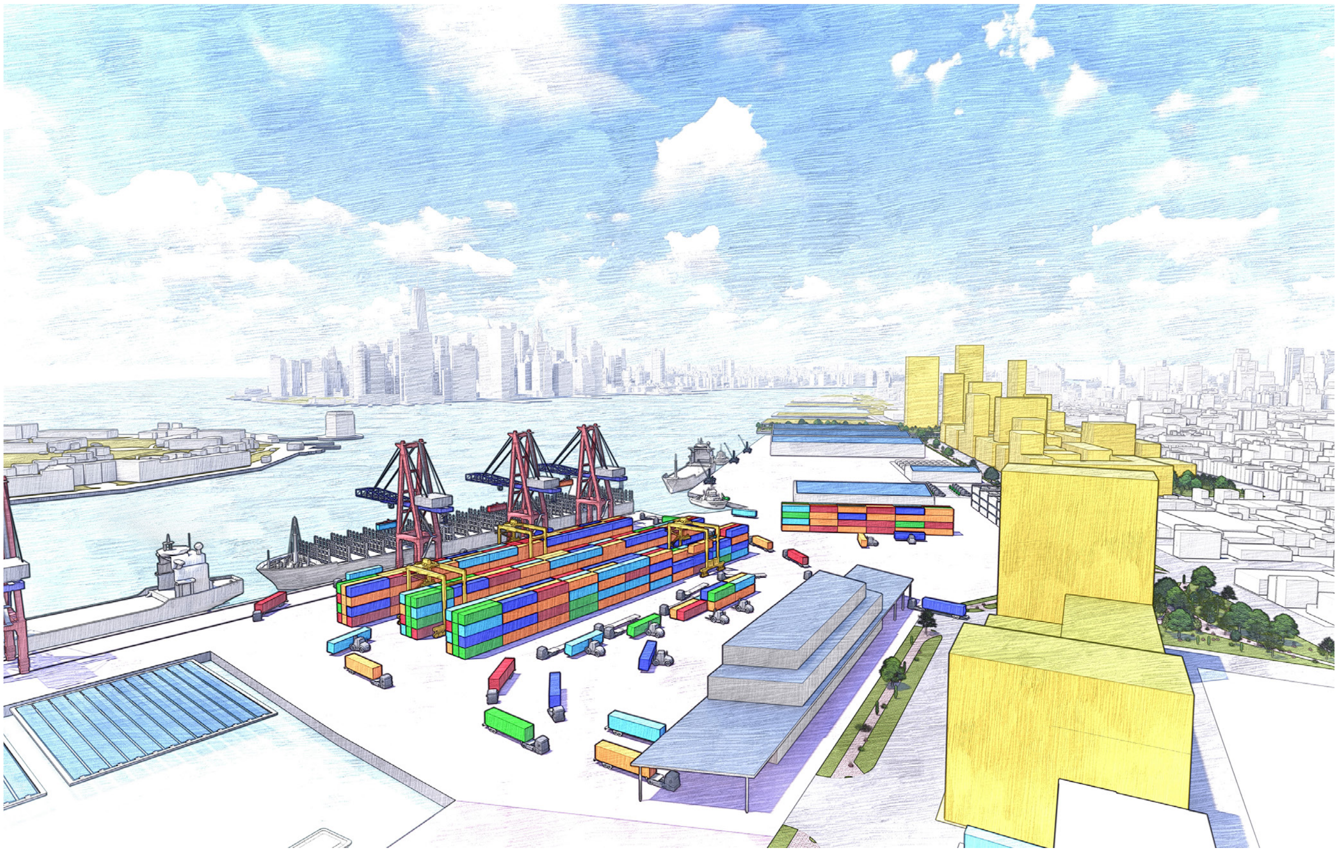
Realizing BMT's vision for growth requires a competitive port: one that is efficient (doing more with less), effective (meeting customers' needs), and reliable (able to deliver despite shocks and stresses). Energy planning and port competitiveness must work hand-in-hand.

To think about managing supply and demand, it is important to start with a long-term view of what this demand could look like. This means considering peak power demand as well as overall energy use, and how usage may change throughout a given day. This is important for sizing key infrastructure and informing your overall supply strategy.

Energy Supply Strategy Approach

In the following sections, we explore strategies for managing potential power demand profiles at BMT, using a three-step approach:

1. **Establish the peak.** We begin by assessing the estimated unmitigated peak demand. This figure represents the estimated upper bound case for energy demand at an all-electric BMT, illustrating a high load scenario that could occur if all major systems operate simultaneously without any intervention to manage demand.
2. **Manage the demand.** Next, we considered strategies to reduce or smooth this peak. By applying demand-management techniques, we can create a more practical demand profile, forming a baseline for supply planning.
3. **Scale the supply.** Finally, we examined the available supply levers, including onsite renewable generation, energy storage, and grid imports. Combining these options as supplements to utility power could provide a pathway to electrification at BMT that is cost-effective, resilient, and aligned with low-carbon goals.



Unmitigated Electrical Demands at BMT

At full development, we estimate that peak unmitigated demands from electrified maritime operations at BMT could exceed 30 MW. This scale of demand will likely exceed what is currently supplied to the port.

The following table considers the overall projected energy used per day, unmitigated peak power, and potential demand profile. To estimate these values, we have used a combination of publicly available information, our own estimates on input gaps, and our own benchmarks from previous project examples. The aim here is to understand the order of magnitude of energy and power needs to support initial thinking, rather than to provide fully accurate estimates.

Table 1: Estimation of unmitigated power and energy demand at BMT

Electrified Demand	Unmitigated Peak Power (MW)	Energy Required Per Day (MWh) [1]	Demand Profile
Container vessels at berth	2.5	44.5	During port operational hours when containership is at berth
Barge transport to New Jersey	1.0	7.0	Charged outside port operational hours
Refrigerated containers	1.0	4.5	Constant power through 24 hours
Shore-to-ship cranes	4.5	8.5	During port operational hours
Other cargo handling equipment	Operational Hours = 4.5 Other Hours = 1.0	14.0	Tethered demands (e.g. RTGs) and opportunity charging through the day; slow charging overnight
Cold storage	0.5	12.0	Constant power through 24 hours
Container vessel propulsion	0.5	9.5	Constant power through 24 hours
Cruise shore power	10.0	49.0	When cruise vessel is in berth through port operational hours
Blue Highways	1.5	7.0	Charging of vessels outside port operational hours
Ferry Homeport II	6.5	60.0	Charging vessels outside of ferry schedule (mainly outside port operational hours with potential brief overlap with port operational hours)
Mobile harbor cranes (Flex Maritime)	1.5	7.5	During port operational hours
Total	**31.5 MW (during port operational hours)**	**223.5 MWh**	

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[1] Energy is calculated based on an average power demand during use. For some demands such as reefers, the peak value is only infrequently experienced on an odd occasion, while a lower average demand has been used to calculate energy use. For other demands such as cold storage, we expect power to remain relatively constant and have therefore used the peak power demand to calculate energy use through the day.

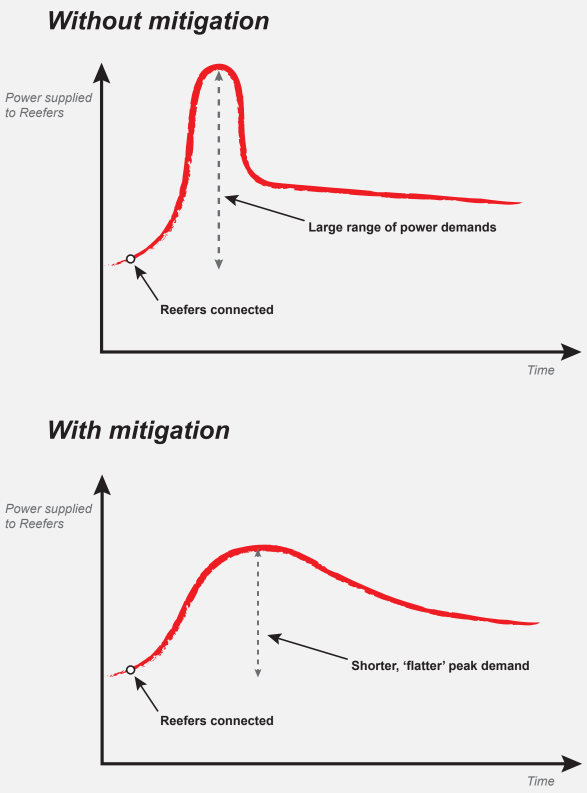
Approaches to Demand Management

Demand management facilitates the optimization of energy consumption by reducing concurrent loads and reallocating non-essential energy use to periods of lower overall demand. We have chosen to focus on demands experienced in port operational hours as this is where we estimate that BMT will likely experience higher peak demands.

There are several operational and digital solutions which can mitigate challenges and help to deliver an all-electric, efficient, resilient port. A relatively modest investment can reduce the scale of grid infrastructure investment by smoothing the overall demand from the port over the course of a day.

For example, if many reefers (refrigerated containers) are connected at once to the port energy system via the reefer stack, energy demand jumps as compressors start up together. By digitally staggering compressor activation, this load is spread out, flattening the demand curve without changing total energy use.

Similarly, when all shore-to-ship cranes lift fully loaded containers simultaneously, their peak demands combine, resulting in a sharp spike. Local energy recovery or storage during crane lowering, along with digital monitoring to stagger heavy lifts, helps cut energy use and smooth the peak.



Without mitigation

Reefers imported to BMT and connected to power. Compressors all power on simultaneously causing sharp peak

With mitigation

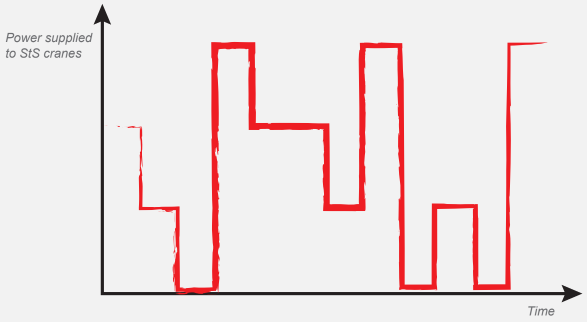
Reefers imported to BMT and connected to power. Compressors are powered on in phases to "flatten" sharp peak.

Figure 2: Potential impact of demand management on energy demand from port reefer stacks

These types of techniques have the potential to deliver a meaningful reduction in peak power demand across the port and therefore could be key to enabling an all-electric port. We estimate that for a fully electric BMT future state, smart load management could result in a reduction in the region of ~40% during port operational hours, compared to an unmitigated peak value. This reduction represents a more realistic peak from which to plan BMT's energy supply strategy.

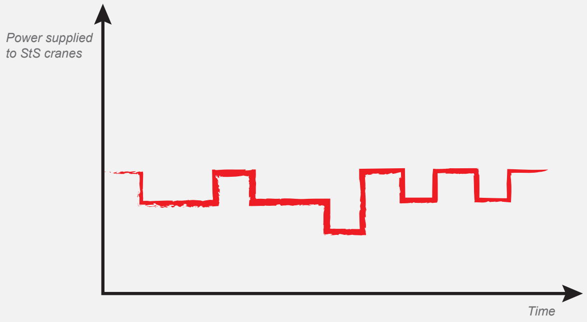
While estimated mitigated demand is lower than the unmitigated peak, it is still a significant load contributed largely by newly electrified assets not covered by BMT's current utility-provided electricity supply. The next section looks at energy supply options which can allow BMT to meet this demand and unlock electrification

Without mitigation



STS cranes lifting containers causing high peaks when lifting simultaneously and low troughs when not lifting.

With mitigation



Three cranes equipped with localized energy storage to recover energy from lowering operations, supported by digital systems that monitor and stagger lifts to prevent simultaneous lifting. This results in a more consistent power demand and energy use across the day.

Figure 3: Potential impact of demand management on energy demand from shore-to-ship cranes

Table 2: Demand mitigation for peak demands during port operational hours

Electrified Demand	Day/Night*	Unmitigated Peak Power (MW)	Example Mitigation Strategy	Mitigated Peak Power (MW)
Container vessels at berth	Day	2.5	None	2.5
Refrigerated containers	Day/night	1.0	Compressor timings monitored and managed to avoid simultaneous activation	0.5
Shore-to-ship cranes	Day	4.5	Staggered lifts combined with localized energy storage to recover energy during lowering movements.	1.5
Other cargo handling equipment	Day/night	4.5	Staggered lifts combined with localized energy storage to recover energy during lowering movements. (RTG only)	2.5
Cold storage	Day/night	0.5	None	0.5
Container vessel propulsion	Day/night	0.5	None	0.5
Cruise shore power	Day	10.0	None	10
Ferry Homeport II	Day/night	6.5	Based on current NYC ferry timetables, most charging at Ferry Homeport II would occur outside of the port's operational hours. However, there may be brief periods where some ferries charge during operational hours. It may be possible to adjust the charging schedule so that it only happens outside of port operational hours, ensuring minimal overlap and reducing this demand during peak port activity	0
Mobile harbor cranes (Flex Maritime)	Day	1.5	Staggered lifts combined with localized energy storage to recover energy during lowering movements.	0.5
Total		**31.5 MW**		**18.5 MW**

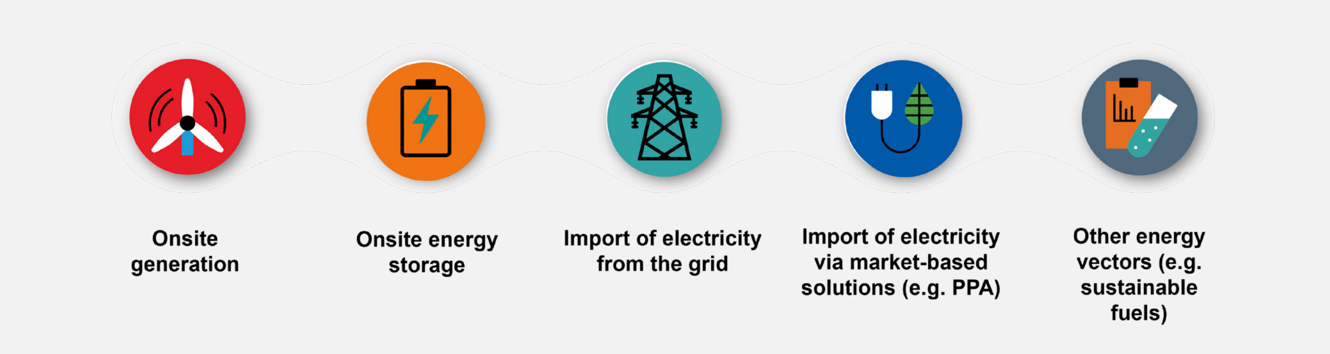


Figure 4: Energy supply levers available to BMT

Approaches to Energy Supply

Context

Delivering reliable, low-carbon power to BMT presents significant challenges. Like much of New York City, the area’s power infrastructure is highly constrained, meaning the addition of substantial new demands could be difficult. BMT is located between the Farragut and Gowanus 345kV substations, yet there is likely little to no capacity to accommodate additional connections or equipment. Even with upgrades planned near Farragut to support the Brooklyn Clean Energy Hub, these constraints remain. These realities underscore the need to explore alternative supply strategies at BMT.

It is also important to consider the carbon content of electricity. The emissions intensity of the New York grid is currently 243 gCO2/kWh, but this is reducing as the state shifts to renewable sources.[1] There may be opportunities for BMT to further reduce its effective emissions intensity through onsite renewable generation and energy storage, or even by importing renewable energy via mechanisms such as Power Purchase Agreements (PPAs). These approaches could also help lower overall energy costs.

Importantly, these strategies align with the ambitious targets set out in the New York Climate Leadership and Community Protection Act, including:

- 70% of electricity generation from renewable sources by 2030
- 6,000MW of energy storage by 2030
- 100% zero-emission electric grid by 2040
- Net-zero emissions statewide by 2050

Figure 5: Local Electrical Distribution Near to BMT

Energy Supply Levers for BMT

Given this context, BMT must consider a range of mechanisms to deliver the required power and energy. Figure 4 illustrates these options. For this concept paper, we focus on two critical levers: onsite generation and onsite energy storage. Both can reduce reliance on grid imports, improve resilience, and support the transition to a low-carbon energy system—and both are commercially available today.

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[1] https://www.eia.gov/electricity/state/newyork/

Onsite Energy Generation

Ports are increasingly looking at renewable sources to generate electricity. One common approach is to install solar PV panels on top of warehouses, over car parking areas or even container stacking areas to supplement power supplied by the grid. Alternatively, onshore wind turbines are used in ports (one exists at Sims Municipal Recycling just south of BMT), but these are typically better suited to areas which are less space constrained.

Some ports are looking at floating solar installations to avoid taking up high-value land area. However, these installations are typically more costly than land-based solar, largely due to technical challenges including specialized anchors and floats, underwater cabling and complex maintenance.

At BMT, we estimate that if onsite solar is installed across 20% of the 60-acre site, between 35–40 MWh could be generated on average per day, which is approximately 15–20% of the overall estimated electricity demand for maritime operations.

This could equate to a reduction in peak demand of approximately 2-3MW, helping to reduce the need for grid reinforcement while also potentially saving on energy costs.

In Figure 6, we have outlined what this might look like for a typical day at BMT.

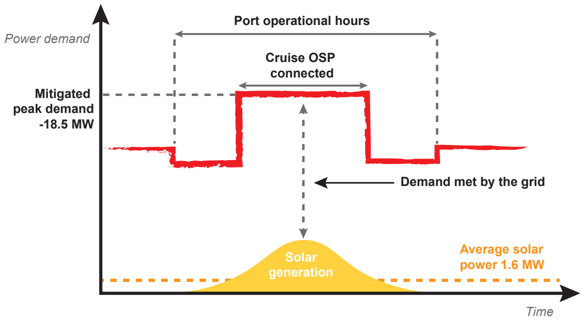

Figure 6: The effect of onsite generation on peak power and energy supplied by the grid for a typical day at BMT

Onsite Energy Storage

Energy storage allows ports to capture surplus energy during off-peak times and use it when demand spikes. Various energy storage technologies exist, such as thermal storage and compressed air storage, but battery energy storage systems (BESS) are the most common option for ports. These systems are primarily used for peak shaving, enhancing resilience, and supporting renewable energy by storing excess onsite generation.

To illustrate the potential impact of energy storage, we have assessed the potential of a 100MWh battery at BMT which charges when the cruise shore power is not being used, as shown below.

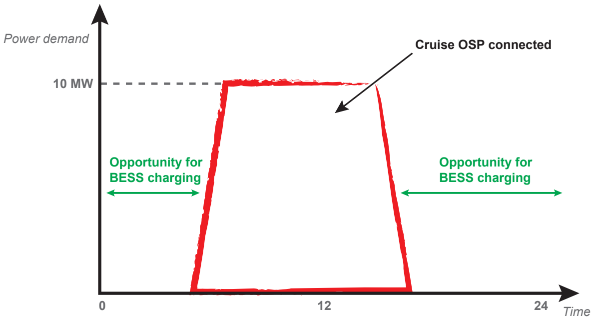

Figure 7: Impact of BESS on the demand profile for cruise OPS

Applied to the port as a whole, we believe a battery of this size could further reduce the grid-supplied peak demand to approximately 10-12MW.

Battery energy storage systems of this magnitude represent a significant investment and require substantial physical space. We estimate that a 100MWh battery could cost between $20m and $30m and would occupy approximately 2% of the port's total area.

To address space constraints, floating battery storage offers a potential alternative. For example, there are proposals to install up to 1,200MWh of floating energy storage in Wallabout Channel at the Brooklyn Navy Yard.[1] This initiative aims to better synchronize grid energy demand with periods of peak renewable generation, highlighting the potential of floating battery technology in comparable settings.

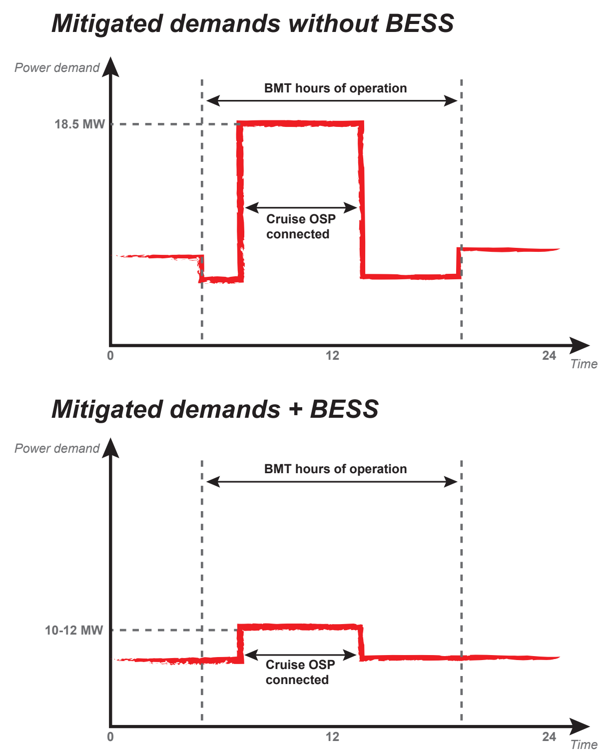

Figure 8: The impact of BESS on BMT's demand profile on a typical day

Example Supply Scenario for BMT: Combining Onsite Generation and BESS

Combining onsite solar generation with battery energy storage creates a powerful solution for delivering a resilient, low-carbon, and cost-effective energy system. This approach leverages the individual benefits of each technology while unlocking additional synergies. Energy storage allows excess renewable energy to be captured and used later, maximizing the value of onsite generation and reducing reliance on the grid during peak periods.

There are several ways these levers can be combined at BMT. Below, we explore two options to showcase the possibilities:

1. Onsite solar energy used as it is generated during port operational hours, with the battery storing excess grid power supplied during low demand periods. Our analysis suggests this combination could reduce peak grid demand to as little as 7–10MW, even when a cruise vessel is connected to shore power. This represents approximately a 60% reduction compared to mitigated peak demand, and up to an 80% reduction compared to the unmitigated peak.
2. Onsite solar energy is stored in the BESS alongside additional grid supply and uniformly discharged throughout the day. We estimate that this could reduce the overall power supplied by the grid by 1–1.5MW throughout the day compared to using BESS alone.

Figure 9 shows what these approaches might look like for a typical demand profile at BMT. The choice of which is better suited will depend on several factors including the quantity of solar energy generated and whether certain key demands (such as OPS for cruise vessels) are needed on a given day. However, these results highlight the potential of an integrated demand management strategy to enable successful port electrification at BMT.

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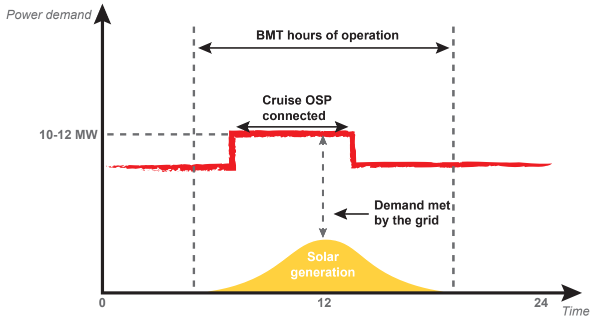
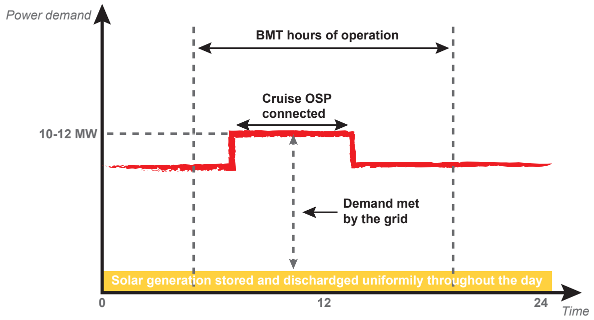


1. Onsite solar energy used as it is generated during port operational hours.



2. Onsite solar generation is stored in the BESS and uniformly discharged throughout the day.

Figure 9: Combined effect of onsite generation and BESS at BMT

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[1] https://www.energy.gov/sites/default/files/2025-04/draft-ea-2274-floating-energy-storage-2024-8.pdf

The Vision: An All-Electric Brooklyn Marine Terminal

The transformation of BMT into an all-electric, sustainable port represents both a significant opportunity and a complex challenge. As outlined in this concept paper, electrification is technically feasible but will require strategic planning, combining demand management, onsite energy generation, and energy storage with grid supply. It may even leverage other supply levers not considered here, such as private wire connections to independent power producers.

By embracing a holistic, forward-looking energy strategy, we believe that BMT can achieve the City's vision, becoming an all-electric port that delivers benefits for the maritime industry, the local community, and the wider region.

Electric Cargo Handling Equipment

① Electric Cargo Handling Equipment
② Electric StS cranes with energy recovery and digital monitoring for staggered lifting
③ Electric mobile harbor cranes with energy recovery and digital monitoring for staggered lifting
⑧ Charging area for electric cargo handling equipment

On-Site Energy Generation & Storage

④ Rooftop solar on warehouses and port buildings
⑤ Floating photovoltaics in the port basin area
⑥ BESS hub with energy management system to store and discharge energy from onsite generation and the grid

Electrified Vessels

⑦ Charging of electric tug for Blue Highways and New Jersey barge services
⑨ Ferry Homeport II with charging for electric ferries
⑩ Barge transport to New Jersey, powered by an electric tug
⑪ OPS for cruise vessels
⑫ Container ship with battery units for zero emission operation in port limits
⑬ Blue Highways cold storage powered by water-source heat pumps

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