PPM Residency Report – PortMiami, Florida

Submitted by Matthew Creswell – PPM Candidate, Bravo Cohort

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Harbormaster

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Biography

CAPTAIN MATTHEW CRESWELL, CMM, AMPE

HARBORMASTER

CITY AND BOROUGH OF JUNEAU DOCKS AND HARBORS

Matt Creswell has served as the Harbormaster for Juneau, Alaska since March 2020, following his tenure as Deputy Harbormaster from May 2017 to March 2020. With a robust background in maritime operations and leadership, Matt's responsibilities are diverse and demanding.

At the helm of managing four small boat harbors encompassing 1,100 slips, six launch ramp facilities, and a commercial loading and repair facility, Matt oversees a vast area spanning 70 statute miles. He also assumes a pivotal role in managing the CBJ Cruise Ship Port, comprising two floating berths and a lightering facility, while contributing to capital improvement projects averaging $10 million annually.

During the bustling summer season, Matt coordinates reservations and moorage arrangements for nearly 100 mega yachts, ensuring seamless operations and exceptional service. He upholds the safety and security of approximately 1.6 million cruise ship passengers in his role as the Facility Security Officer throughout the season, a testament to his commitment to maritime excellence.

In his leadership capacity, Matt supervises a team of 50 Harbor Officers, Harbor Technicians, and administrative staff, managing a substantial annual budget of $7 million. His tenure in the United States Coast Guard (USCG), where he retired in 2015, equipped him with invaluable experience in vessel operations, security protocols, and personnel administration.

Committed to professional development, Matt has pursued numerous certifications, including a 100-ton near coastal master’s license, Certified Marina Operator accreditation, Certified Marina Manager accreditation, Accredited Maritime Port Executive accreditation. He also completed an 18-month leadership course through the City and Borough of Juneau, reflecting his dedication to continuous improvement and innovation.

Beyond his professional pursuits, Matt is a devoted father to two sons, Nathan and Griffin. While Nathan aspires to follow in his father's footsteps with a career in the military, Griffin has dreams of becoming a professional musician and attending the Juilliard School. Matt's upbringing in South Carolina instilled in him a profound love for the outdoors, evident in his family's penchant for boating and outdoor adventures in southeast Alaska.

In his leisure time, Matt enjoys embarking on expeditions aboard his boat, the "SOUTHERN C's," in pursuit of halibut and salmon. An accomplished Alaskan big game hunter, he loves the challenge of hunting moose, brown/grizzly/black bears, and Sitka black-tailed deer, embodying his passion for outdoor exploration and adventure.

Proposal

This report presents the outcomes of a residency conducted by the candidate at PortMiami from February 26th to March 7th, 2024. The primary aim of the residency was to investigate the complexities of shore power planning, design, and execution within the framework of a major cruise port. Additionally, the goal was to pinpoint operational enhancements at a large port that could be tailored to bolster the efficacy of a smaller, seasonal cruise port.

Before embarking on the residency, the timeline for the shore power project at the Port of Juneau was accelerated, resulting in its heightened priority within the port's agenda. This shift prompted a reassessment of the residency's focus, leading to the realization that concentrating on the shore power component, as outlined in the initial proposal, held significant merit over a broader examination of port operations.

Given the Port of Juneau's classification as an enterprise fund (non-recipient of sales/property tax funds), the insights gleaned from PortMiami concerning shore power design and implementation possess considerable potential for financial advantages. Consequently, the report underscores the importance of translating lessons acquired from a large port setting to the distinctive operational environment of a smaller port like Juneau. These insights are poised to guide and optimize the execution of shore power initiatives, thereby augmenting the overall efficiency and sustainability of the Port of Juneau.

As shore power in cruise ports becomes more prevalent, I hope that my findings will benefit smaller ports similar to Juneau as they navigate the process of developing and constructing their projects.

Executive Summary

In 2001, The Port of Juneau proudly welcomed the world's first shore-power capable cruise ship facility at the privately owned South Franklin Street Dock, operated by Franklin Dock Enterprises. This innovative system provided clean, renewable hydropower to cruise ships docking at the berth. Over the years, the City and Borough of Juneau recognized the need to modernize their two cruise ship berths to accommodate larger vessels and improve operational efficiency. As the size of cruise ships grew, the city owned berths were limited to only serving vessels up to 965’.

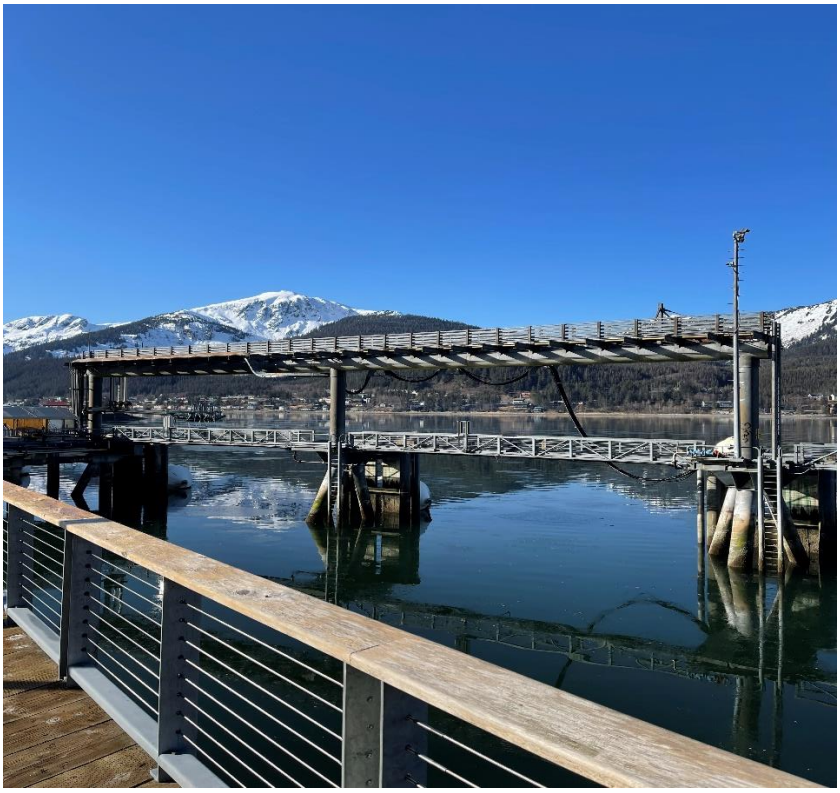

Figure 1- South Franklin St. Dock in Juneau, AK, Matt Creswell

In 2015, a significant initiative was undertaken to recapitalize Juneau's two, city-owned cruise ship berths. This involved relocating the berths offshore by several hundred feet and integrating floating pontoons to accommodate larger Neo-Panamax ships safely. The incorporation of floating berths also facilitated easier line and gangway management, particularly considering the port's extreme tidal range of up to 30.7 feet. As part of this recapitalization effort, the port began exploring options for installing shore power systems at these berths, aiming to extend the availability of clean, renewable energy generated entirely using hydropower from the local utility provider, Alaska Electric Light & Power (AEL&P).

Figure 2- Port of Juneau's Cruise Ship Docks. Completed 2017. Matt Creswell

In 2019, CBJ Docks and Harbors initiated a comprehensive shore power study to assess the feasibility and cost-effectiveness of electrifying the two cruise ship berths. One of the primary challenges identified was ensuring sufficient generation capacity to supply power effectively to cruise ships in Juneau. It was determined that in a normal "water year", there would be sufficient generation capacity to power the three, shore power capable berths 25% of the time. Generation capacity is directly related to the amount of water stored in the reservoirs that supply our generation facilities. Additionally, the existing transmission lines in the port operated at a voltage of 69 KV, while most shore power projects typically draw power from lines at 13 KV and the step it down to 6.6 or 11 KV. Addressing this voltage disparity will require the installation of additional transformers to step down the voltage from transmission to distribution levels before constructing standard substations for shore power projects [(1)].

Before significant progress could be made on this project, the world was hit by the COVID-19 pandemic in spring 2020. However, as the pandemic subsided in 2021 and 2022, the cruise industry began to regain momentum, prompting the federal government to introduce grant programs for pandemic relief and infrastructure improvements. At the same time, support for this project increased due to the creation of the Pacific Northwest Green Corridor initiative[(2)]. This encouraged the CBJ to recommit to its shore power project, initiating plans to electrify the berths.

As the Harbormaster for the City and Borough of Juneau and a participant in the American Association of Port Authorities (AAPA) Professional Port Manager Program (PPM), I recognized the opportunity to leverage the experiences and lessons learned from Miami's ongoing shore power project. To further this endeavor, I engaged with colleagues at the Port of Miami and embarked on a two-week study in February and March of 2024 to gain insights into their own shore power construction project.

PortMiami stands at the forefront of cruise port innovation and environmental stewardship within the industry. In 2021, the port initiated a pivotal project to electrify its cruise berths, responding to directives to expedite the project's completion. Helga Sommer, a fellow member of the PPM cohort and Chief of Engineering at PortMiami, graciously extended an invitation to conduct my residency at the port.

Originally, my residency proposal encompassed a broader examination of port operations, with a lesser focus on shore power initiatives. However, as Juneau's shore power project gained momentum in the fall of 2023, I recognized the opportunity to pivot my residency's focus to align more closely with the lessons learned from PortMiami's electrification project. This strategic shift allowed me to better serve Juneu's needs and leverage the expertise gained from PortMiami's endeavors.

During my residency, I had the privilege of collaborating with and shadowing key members of the PortMiami team, gaining invaluable insights into the planning, execution, and impact of their electrification project.

Background

Juneau, Alaska, hosts the Port of Juneau, a seasonal cruise port catering to approximately 1.7 million cruise passengers annually. Operating from mid-April through mid-October, the port accommodates 692 cruise ship calls during this period. With four berths, including three floating and one fixed, along with a lightering float for an additional anchored ship, the port serves as a pivotal entry point for cruise travelers. Notably, on peak summer days, the influx of over 20,000 passengers inundates this small city, which has a resident population of merely 32,000.

Managed by the City and Borough of Juneau (CBJ) Docks and Harbors Department, which operates as an enterprise fund, meaning little to no support from the local government general fund, the port oversees two floating berths and a vital lightering facility. Additionally, the enterprise holds ownership and operational responsibility for a majority of the port's parking lots and essential upland facilities. While primarily functioning as a port of call, Juneau occasionally serves as a turn port for smaller vessels.

Currently, the Docks and Harbors Enterprise is undertaking a significant initiative to implement shore power infrastructure at its two floating berths, aimed at enhancing environmental sustainability and reducing carbon emissions.

Figure 3- Six ship day in Juneau, CBJ Docks & Harbors

Contrastingly, PortMiami stands as the world's busiest cruise port, having welcomed nearly 7.3 million passengers in 2023[3]. Operating year-round, with peak activity occurring during the winter months, the port has nine terminals and maintains a reputation for pioneering cruise port innovation and efficiency. Recently, PortMiami initiated a transformative project to bolster

environmental sustainability by installing shore power infrastructure across five existing and planned berths.

Upon being elected in 2020, Miami-Dade County Mayor Daniella Levine Cava launched an initiative to bring shore power to PortMiami. A shore power joint statement was signed by the mayor, leading cruise ship companies and Florida Power & Light Company on February 17, 2021.

Miami-Dade County's Shore Power Program is a partnership between PortMiami, its cruise partners Carnival Corporation, MSC Cruises, Norwegian Cruise Line Holdings, Royal Caribbean Group, and Virgin Voyages and Florida Power & Light Company.

Shore power allows a cruise ship, which uses as much electricity as a small city, to turn off their engines and plug into landside electrical power, while docked at PortMiami. When ships are berthed, they need electricity for lights, refrigeration, operating equipment and other vessel functions.

PortMiami is the first major cruise port on the U.S. eastern seaboard to construct shore power capability at five cruise berths:

- Cruise Terminal AA, MSC Cruises
- Cruise Terminal A, Royal Caribbean International
- Cruise Terminal B, Norwegian Cruise Line
- Cruise Terminal F, Carnival Cruise Line
- Cruise Terminal V, Virgin Voyages

Plugging into shoreside electricity allows cruise ship engines to be switched off, reducing emissions by up to 98%. On any given day, PortMiami can plug in three ships safely and simultaneously. The annual emission reduction estimate associated with the connection to shore power at one terminal is equivalent to the emission reduction associated with the removal of 7,500 cars from the road, according to the Moffat and Nichol analysis of reduced GHG emissions when the vessels are plugged in at PortMiami. PortMiami is one of 35 seaports around the world to offer at least one cruise berth with shore power. This represents about 2% of the total number of cruise ports globally.

Miami-Dade County's Shore Power Program cost an estimated $125 million ($25 million per terminal). PortMiami received $21.7 million in grants for shore power, including $19.7 million from Florida Department of Transportation and $2 million from U.S. Environmental Protection Agency. [(4)]

Figure 4- Busy Day at PortMiami, Greater Miami Convention and Visitor's Bureau

Figure 5- Busy Day at PortMiami, Miami Dade County

Residency

Monday- 2/26

I began my residency on February 26th with a productive session with Helga Sommer, who adeptly organized my schedule to maximize efficiency. Following this, I dove into the day's activities alongside Armando Amet, a seasoned Construction Manager at PortMiami. Our comprehensive tour of the port encompassed both cargo and cruise operations, providing invaluable insights into the site's diverse functionalities.

During our excursion, we scrutinized four containerized transformer sites, each comprising eight 20’ units, shedding light on the infrastructure’s scale and complexity. Additionally, our inspection of three nearly completed Cavotec, Cable Management System (CMS) units offered a glimpse into imminent installation processes, highlighting the project's advancing stages. Cavotec was selected as the supplier for the CMS units and will also manage the first year of ship connections.

Figure 6- Containerized Transformer Unit, Matt Creswell

Our encounter with Hypower (PortMiami prime contractor) at a berth undergoing chiller unit installation underscored the challenges inherent in construction amidst operational constraints. Discussions ensued regarding the imperative of seamless coordination between the prime contractor and subcontractors, emphasizing the criticality of timely milestone achievement.

Notably, I observed the extensive cut and fill operations required for cabling routes throughout the port, recognizing the disruption this process entails. With WSP serving as the engineer of record for this design-build project, our observations underscored the meticulous planning and execution imperative for project success.

Figure 7- Pre-cast cable trench installation, Matt Creswell

Tuesday- 2/27

My morning with Juan Bergouignan proved to be an enlightening exploration of PortMiami's intricate infrastructure. Digging into the labyrinth of utilities, Juan provided background into the strategic placement and sophisticated interplay of various systems within the port.

Our discussions veered toward the challenges posed by selecting the lowest bidder as the prime contractor. Juan astutely pointed out the wisdom in considering a civil contractor for such electrification projects, emphasizing the paramount importance of civil works in ensuring project

success. With the bulk of the work revolving around civil infrastructure and equipment installation, Juan's perspective shed light on the nuanced considerations in contractor selection.

Beyond project logistics, Juan shared anecdotes about the financing mechanisms underpinning port projects, unraveling the narratives behind the port's current layout. It became evident that the port's evolution is often intertwined with the dictates of cruise companies, highlighting the delicate balance between accommodating industry demands, local politics and optimizing port operations.

In sum, my time with Juan illuminated not only the technical intricacies of port infrastructure such as each cruise line having dedicated terminals with specific needs for their ships but also the complex dynamics shaping its development and governance.

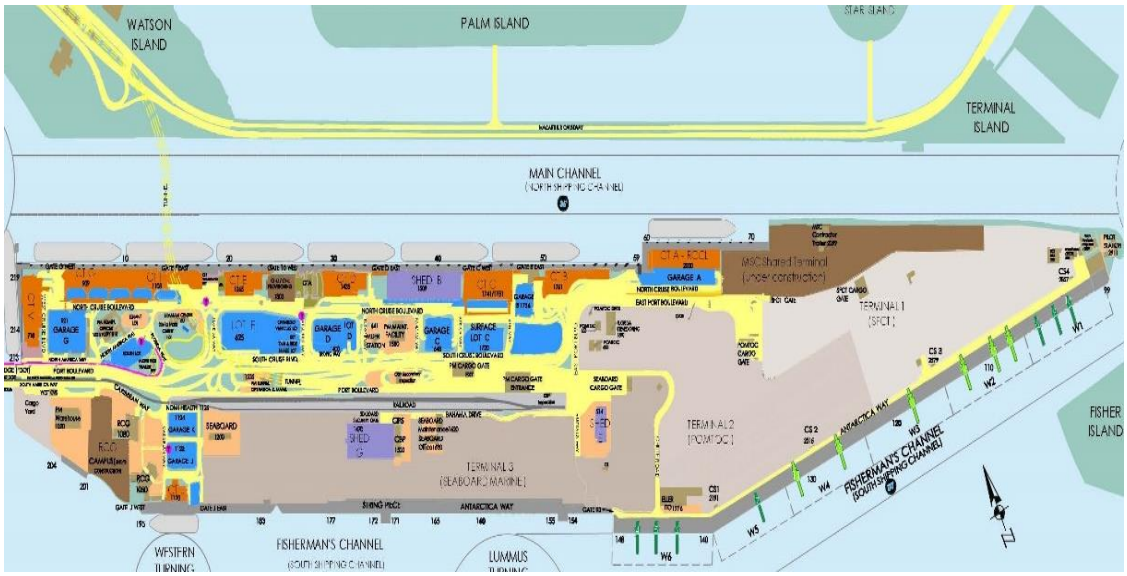

Figure 8- PortMiami Layout, PortMiami

Wednesday- 2/28

Wednesday morning commenced with a fruitful meeting with Frank Matera, where we discussed the complexities of installing large conductors and the meticulous process of splicing cables. Frank's expertise illuminated the difficult challenges inherent in handling such critical components of the electrification project.

During our discussion, Frank generously shared multiple visual aids, including photographs and a detailed port map, which will undoubtedly enrich the final report with valuable insights and visual documentation. Moreover, his commitment to transparency and collaboration was evident as he extended an invitation to accompany him on future inspections, providing an opportunity to gain firsthand experience and deepen my understanding of the project's operational challenges.

Figure 9- Cable splicing, Frank Matera

In essence, my interaction with Frank not only provided critical technical knowledge but also underscored the importance of collaborative efforts in navigating the complexities of the electrification endeavor. He stressed the importance of ensuring all parties meet regularly to ensure seamless communication and coordination during construction.

My meeting with Tatiana Fernandez this morning was exceptionally informative and productive. She provided invaluable insights into the complexities of PortMiami's agreement with Florida Power & Light (FPL) regarding power supply and usage. Under the terms of the agreement, POM is obligated to sell a minimum of $18 million worth of power within four years of energizing the system. If this threshold isn't realized, POM will be required to pay FPL the remainder of the balance on their investment in the project. Despite having installed five shoreside power connections, FPL can only accommodate power supply for three ships

simultaneously. To ensure compliance with FPL's power delivery system, special relays have been installed in the switchgear to prevent interference from ships.

Tatiana highlighted a significant challenge stemming from the lack of standardization in shore power connection points across the fleet, necessitating meticulous planning by the operations team to optimize shore power connections through proper ship positioning. She emphasized the importance of closely examining fee structures to establish appropriate rates for initial calls, given the substantial effort required to determine hookup procedures for each vessel. In a proactive approach, Cavotec has been selected by Hypower to handle hookups for the first year, with the possibility of extending the contract thereafter, alongside provisions for cancellation fees in case of non-connection.

Furthermore, Tatiana shared insights into the cost projections for Miami's electrification project, which is nearing $125 million, translating to approximately $25 million per berth—a testament to the substantial investment required for sustainable port operations.

My time with Rick Pena was truly enriching. As the former Harbormaster for the port, his wealth of experience was extremely helpful. Although he retired in 2020, his expertise was called upon once again in 2022 to provide operational guidance to the electrification team and navigate the complexities of this monumental project.

During our visit, Rick shared his knowledge as we toured the berthing office, providing me with a firsthand understanding of how ships are strategically positioned based on their individual requirements and the port's operational constraints. Witnessing the traditional method of using scaled paper cruise ship cutouts on a master map for positioning was particularly fascinating, showcasing the blend of traditional practices with modern technology.

Our discussions shed light into various challenges faced during the Covid era and the daily hurdles encountered in port operations. Rick articulated the intricacies of interpreting schedules from different shipping and cruise lines, each presented in unique formats, and the painstaking attention required to ensure no details are overlooked—a task that demands precision and adaptability.

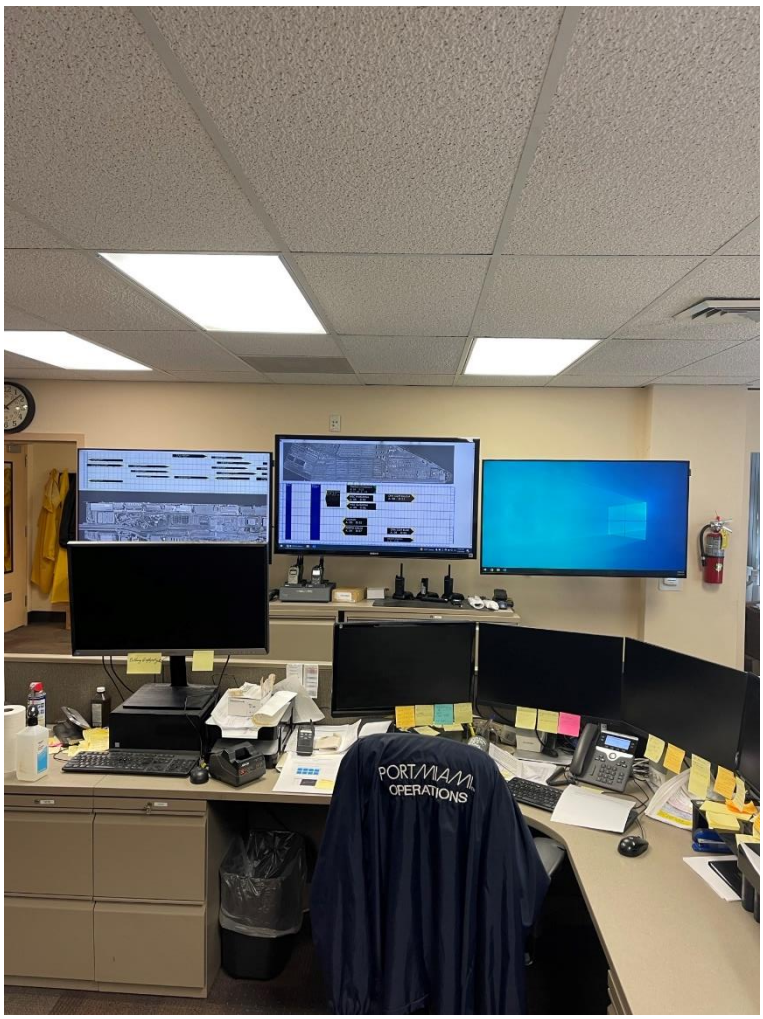

Figure 10- PortMiami Berthing Office, Matt Creswell

Thursday- 2/29

My meeting with Eduardo Leal proved to be incredibly insightful. Despite being a recent addition to the port engineering team, Eduardo demonstrated a profound understanding of the operational details surrounding shore power. One of the key challenges he highlighted was the necessity of transitioning from 13.2KVA distribution voltage down to the ship's specific requirements, which could vary between 6.6 or 11KVA, depending on the vessel.

Fortunately, this voltage adjustment is seamlessly achieved within the PowerCon (manufacturer of the containerized transformer units) system. However, our primary concern lies in the transition from transmission voltage to distribution voltage. Eduardo explained that within these containers, power undergoes a conversion process from AC to DC for step-down and conditioning before being converted back into AC for supply to the ship—a critical step in ensuring compatibility and safety.

Figure 11- PowerCon Transformer Unit, Matt Creswell

Eduardo emphasized the multi-step process that vessels must undergo prior to their initial connection. This process involves precise ship positioning to align with the CMS, followed by comprehensive meetings with the ship's crew and the operations/engineering team. These discussions are vital for configuring the system settings tailored to each ship's requirements, ensuring a seamless connection process.

During subsequent visits, the initial connection is established, requiring the ship representative to physically inspect the power unit to verify its de-energization and grounding—a crucial safety measure to prevent accidents and ensure compliance. This process must be repeated upon disconnection to maintain operational integrity.

Eduardo also addressed the challenge of staffing the system effectively, particularly given the potential 18-hour operational window. He emphasized the necessity of training multiple personnel to operate the system proficiently, guaranteeing continuous coverage and operational efficiency throughout the duration of each call—a testament to the complex logistical considerations inherent in shore power implementation.

My discussion with Javier Rey-Brooks, a Construction Manager at PortMiami, provided valuable insights into the challenges and considerations surrounding the routing of cables to the CMS floats in Juneau. Javier emphasized the potential drawbacks of submarine cabling, strongly advising against its use. He articulated various hazards associated with this approach, including the risk of damage caused by marine life such as whales, which could inadvertently impact the cables and lead to operational failures.

Moreover, Javier proposed an alternative solution: entrusting the connections to ships to a third party. This strategic decision would not only facilitate enhanced training opportunities for personnel but also ensure greater availability of skilled individuals dedicated to managing the connections effectively. By outsourcing this aspect of the operation, the port could potentially mitigate risks and streamline the process, thereby optimizing the overall efficiency and reliability of the shore power system.

Friday- 3/1

During our thorough examination of the CMS (cable management system) installation at Terminal F with Michael Scinta, a consultant from AECOM (engineering consulting firm retained by PortMiami), we encountered significant challenges posed by the size and weight of the equipment. Weighing in at 30 tons, the CMS presented clearance issues for passing vehicles, pedestrians, and forklifts, especially within the narrow confines of Terminal F, which represented the narrowest point in the entire facility.

Figure 12- Cavotec CMS (cable management system) Unit, Matt Creswell

To mitigate potential safety hazards, PortMiami strategically positioned multiple jersey barriers around the CMS, creating a protective buffer zone against accidental collisions from passing equipment. Additionally, we identified the need to place steel plates beneath the outriggers to effectively distribute the weight across four outriggers with a relatively small footprint, ensuring stability and preventing damage to the pavement.

Figure 13- CMS unit with outriggers, Matt Creswell

Achieving precise placement of the CMS was crucial for optimal functionality. It required careful positioning directly over the cable trench to prevent cables from entering at awkward angles, thus minimizing the risk of damage or malfunction. Moreover, ensuring that the CMS was as perpendicular as possible to the connection door was essential to prevent cable chafing against the door's edges. I was part of a discussion about the implementation of shock-absorbing mats along the door's periphery to further mitigate chafing issues and protect the integrity of the cables.

Another critical aspect we addressed was maintaining a safe distance between the CMS boom head and the ship to prevent potential contact caused by external factors such as wind and wave action. Given the dynamic nature of maritime environments, such precautions were paramount to safeguarding both the CMS and the vessels it served from damage or disruption.

Figure 14- CMS unit in position, Matt Creswell

In terms of operational logistics, we learned that the CMS moved at a speed of 1.5 mph and relied on battery power for transit, controlled through a remote system. These operational constraints highlighted the level of planning and precision required to manage the CMS installation process effectively. By prioritizing safety and efficiency, PortMiami aims to seamlessly integrate the CMS into port operations, ensuring smooth functionality and minimizing operational disruptions.

Monday- 3/4

I spent several hours with Ariel Rodilla, Project Construction Manager, this morning. We spoke at length about the complexities of the shore power project for which he serves as the construction manager. Our discussion revolved around the unique challenges confronting us in Juneau, particularly regarding the placement of CMS systems and ship positioning. Ariel demonstrated a deep understanding of our layout in Juneau and highlighted the pressing issue of determining optimal CMS locations to accommodate ships of varying sizes.

Unlike PortMiami, where the Cavotec CMS units boast a 300-foot range (150 feet on either side of the connection point), our options in Juneau are constrained by the absence of a long, shoreside apron suitable for conventional CMS placement. This limitation necessitates innovative approaches to ship positioning, potentially requiring extensive long-range planning to maximize our capacity to accommodate a diverse range of vessels. Additionally, we anticipate potential conflicts with the concept of "best ship, best dock," as our requirement for ships to

connect to shore power may override traditional considerations based on passenger load, size, and other factors. The Port of Juneau needs to select a system that provides the maximum amount of flexibility for operations.

Ariel expressed enthusiasm for our proposal to have AEL&P coordinate the design efforts, believing that such collaboration would significantly streamline the process.

During our field visit, we observed Hypower's efforts to address a grade issue around the cable trenches. Hypower opted for pre-cast cable trenches instead of pouring them in place, a decision that has posed unforeseen challenges. The mismatch between the edges of the pre-cast sections and existing conditions has necessitated corrective measures, leading to the demolition of existing infrastructure to accommodate the discrepancy. This situation underscores the importance of thorough planning and expertise in civil work, an aspect where Hypower, an electrical contractor, faced limitations. Casting the cable trenches in place would have likely avoided these issues, ensuring seamless integration with existing infrastructure and minimizing disruptions to the project timeline.

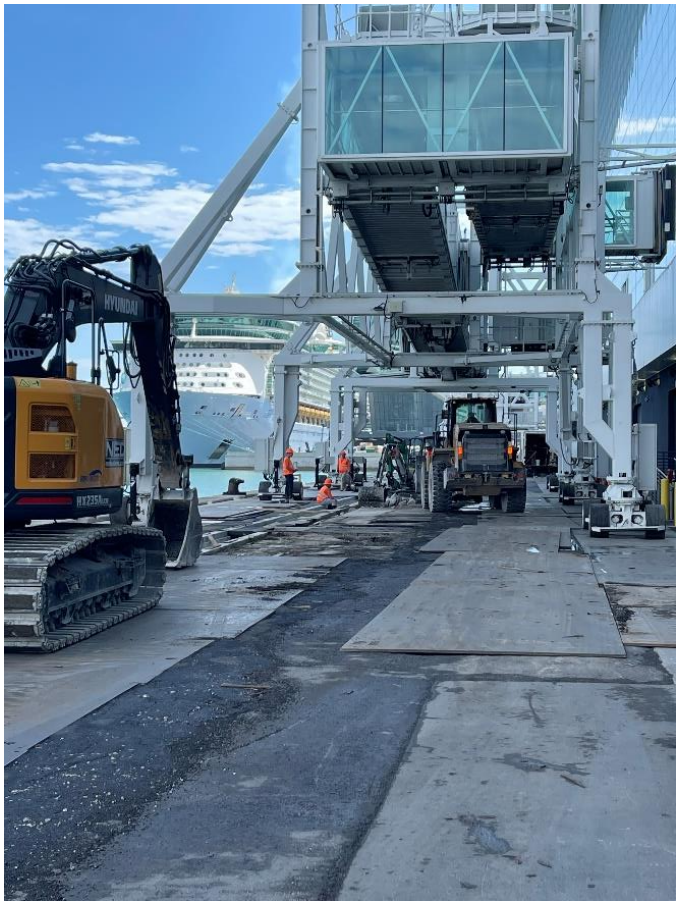

Figure 15- Work in progress to match grades, Matt Creswell

Tuesday- 3/5

Ronnie Alvarez, a consultant serving as the scheduler for the project, plays a crucial role not only in this endeavor but also in coordinating schedules for all major projects across the port. During our discussion, Ronnie emphasized the challenges posed by the aggressive timelines set by the Prime Contractor (Hypower). Given the predominantly civil nature of the project, Ronnie identified significant hurdles hindering timely task completion.

Over several months of observation, Ronnie gained insights into the challenges of the prime contractor's operations. Armed with this knowledge, he took the initiative to develop his own schedule to ensure realistic timelines and to effectively communicate project progress to leadership. Ronnie's proactive approach extends to sharing his schedule with the GC, fostering collaboration and often resulting in revised schedules that better align with project requirements.

This proactive and collaborative approach underscores Ronnie's commitment to overcoming challenges and ensuring the project's success, despite the complexities and constraints inherent in the construction process. His dedication to refining schedules based on practical insights reflects a strategic mindset aimed at optimizing project efficiency and mitigating potential delays.

I had the opportunity to meet with Grace Patino this morning, and it proved to be an insightful session. Grace, representing WSP as the engineer-of-record on the project, brings a wealth of experience, particularly in addressing challenges similar to those we face in Juneau. With her background in floating bridge projects in the Northwest, Grace is well-versed in navigating large tidal ranges and deep waters, making her insights invaluable to our endeavors.

One of the first pieces of advice Grace offered was caution against using submarine cables to connect to the CMS float. She raised concerns about the weight of the cable extending from the float to the sea floor and the challenges of adequately supporting such weight. Instead, she mentioned a company specializing in conductor mounting/handling systems that might offer a solution, potentially allowing us to suspend the cables on the floats—a promising alternative that warrants further exploration.

Grace also stressed the importance of conducting a detailed berthing study to optimize the design of our CMS floats, ensuring they can accommodate the maximum number of ships possible. Drawing from her experience, she highlighted the significance of versatility in CMS design, citing the example of Cavotec CMS units at PortMiami, which boast the capability to traverse 150 feet on either side of the connection point. Grace suggested that incorporating multiple connection points on our CMS float could significantly reduce its size while maintaining functionality.

In addressing the challenge of voltage conversion from 69kV down to 6.6-11.2kV, Grace expressed confidence in finding a suitable solution tailored to our needs. However, she noted potential issues with the footprint of transformers and the possibility of encountering "Buy

America" regulations. Nevertheless, she provided reassurance that PowerCon is actively seeking to establish a facility in the US to mitigate these concerns.

Moreover, Grace shed light on the design principles behind PortMiami's system, which achieves a power capacity of 16MVA per berth using PowerCon units with four-4MVA transformers in each container. By specifying transformers with copper windings over aluminum, they were able to optimize space utilization. Additionally, she highlighted FPL's implementation of relay systems to protect against feedback from ships, underscoring the importance of robust safeguards in our design.

Figure 16- Transformer units, Matt Creswell

Overall, Grace's expertise and strategic insights offer invaluable guidance as we navigate the complexities of our project, ensuring that we implement solutions that are both efficient and resilient in the face of potential challenges.

Wednesday- 3/6

During a site visit with Armando and Frank to various terminals, we encountered a series of observations and considerations that shed light on the complexities of the project. At Terminal V, designated for Virgin Cruise Line ships exclusively, we identified a significant discrepancy concerning the placement of the fixed power unit. Upon closer inspection, it became apparent that the connection pit was misaligned by approximately 68 feet. This oversight is particularly critical given that Terminal V exclusively serves Virgin ships, all of which have standardized connection points and consistent berthing positions for each call. Rectifying this misplacement will be imperative to ensure seamless operations for Virgin vessels at the terminal.

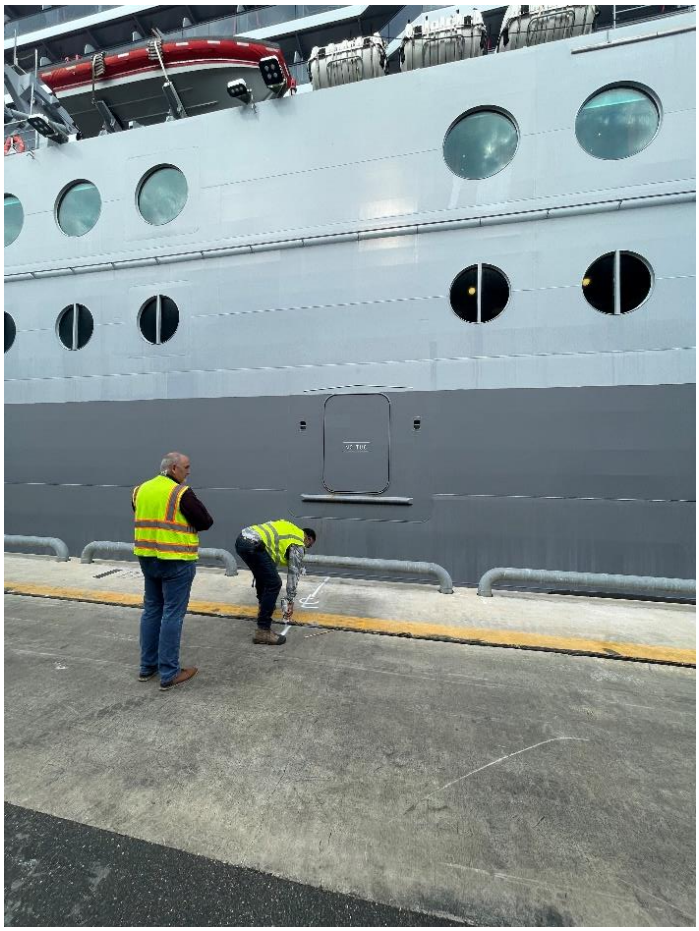

Figure 17- Frank and Armando measuring for proper fixed CMS placement, Matt Creswell

Transitioning to Cruise Terminal B (CT-B), our attention turned to a switch responsible for managing load distribution between CT-B and CT-A. However, upon scrutiny, several concerns emerged regarding its installation. Originally designed to sit on a concrete foundation, the switch was instead installed on a raised platform with open grating underneath, leaving the bottom of the switch cabinet exposed to the elements. Furthermore, we noted an inadequacy in the welding of the door panel on the main controller, with only six spot welds detected, leading to subsequent

breakage and repairs. This stands in stark contrast to a similar switch observed at another berth, which boasted ten spot welds and remained undamaged. Addressing these design and construction discrepancies is crucial to uphold the reliability and longevity of the switch system.

Figure 18- Inspecting spot welds on switch panel door, Matt Creswell

Our inspection continued at the PowerCon unit located at CT-A, where I had the opportunity to explore the inner workings of each container. One notable observation was the considerable space occupied by cooling equipment within the system. Given the lower temperatures typically experienced in Juneau, it prompts consideration as to whether the same level of cooling infrastructure will be necessary for our operation. Additionally, we observed a deficiency in safety features, notably the absence of stairs and railings around the unit, highlighting an area for potential improvement to enhance worker safety and accessibility.

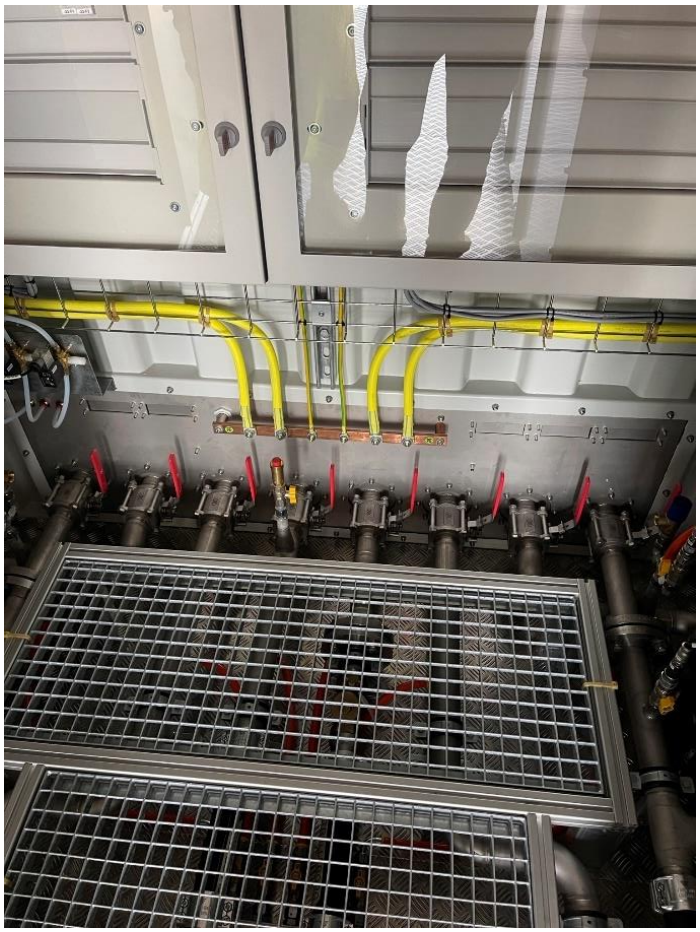

Figure 19- PowerCon transformer cooling system, Matt Creswell

Overall, these site visits provided important insights into the operational challenges inherent in the project. Addressing these observations with diligence and foresight will be essential to ensure the seamless functionality, reliability, and safety of our electrification infrastructure.

Thursday- 3/7

On my last day at the port, I embarked on a final round of visits with the remarkable team members with whom I had the privilege of meeting over the past nine days. It was a bittersweet moment, filled with gratitude for the knowledge shared and bonds formed during our time together.

Throughout the morning, I revisited each team member who had generously extended commitments to provide essential project documents. Ensuring that they had my updated contact information, I reaffirmed the importance of their contributions to the project's success. Their dedication and willingness to assist me underscored the collective effort driving our endeavors forward.

Reflecting on my experience, I cannot overstate the warmth and hospitality extended to me during my stay. From providing me with a dedicated office space to embracing me as an integral part of their team, their hospitality was truly exemplary. It was evident that their commitment to fostering a cooperative environment extended beyond mere professional courtesy; it was a testament to their genuine camaraderie and dedication to our shared goals.

As I bid farewell to my colleagues and friends at the port, I left with a profound sense of gratitude for the invaluable experiences gained and the relationships forged. While my time here may have come to an end, the memories and lessons learned will undoubtedly endure, serving as a foundation for future endeavors.

Figure 20- Several members of the team, Matt Creswell

Reflection on Learning

As I embarked on my residency, I was in the infancy stages of understanding shore power systems. By the time I left Miami, my knowledge had increased exponentially. My stint with the engineering team at PortMiami was extremely enlightening. As a Harbormaster, my primary focus is operations. Due to our organizational structure, I often wear many hats and cross disciplines on a daily basis. Our shore power project is a prime example of this. With our limited "bench strength", my thorough understanding of shore power design and construction is critical to ensure the smooth design, completion, and operation of our project. After my experience in Miami, I was surprised to find that many of the issues that my port is finding with shore power are very similar to the issues being faced at PortMiami.

The most notable challenge that both Juneau and Miami faced is the public perception that shore power is as simple as running wires and plugging in a ship. This couldn't be further from the truth. These systems are very complex and require extensive planning, design, financial resources, and coordination to complete. Along with this is the accelerated timeline that both ports are expected to adhere to in completing their projects.

As a seasonal port, Juneau doesn't have extensive financial resources to draw upon to complete a project of this magnitude. Especially when there isn't a substantial Return on Investment (ROI) expected from shore power. We are anticipating our project to cost around $70M. Currently, we have $10M in hand for the project. We have submitted an EPA Clean Ports Grant application for $65M and are hopeful that we are successful. However, if we are not successful in securing the grant, we have other options available to fund the project.

The City and Borough of Juneau (CBJ) collects a $5 per passenger Marine Passenger Fee (MPF) on each arriving cruise passenger. CBJ also collects a $3 per passenger Port Development Fee (PDF). The state of Alaska collects a $34.50 per passenger state commercial passenger vessel fee, of which CBJ is entitled to $5 per passenger. These fees equate to CBJ receiving an additional $13 per passenger arriving in Juneau. With nearly 1.7M cruise passengers expected to arrive in Juneau over the course of the 2024 season, these fees will be close to $22M for the season. The $10M we already have obligated for this project was allocated through these fees. Should we not be successful with our grant application, we will continue to leverage these fees as a funding source. Should this be the case, the project may be delayed by a few years until we have a sufficient fund balance to complete the project.

The third funding option identified for the project would be bonding. We were successful in receiving funding for our cruise ship dock recapitalization project that was completed in 2017 at a cost of $53M through revenue bonds. The $3 PDF is used to pay this bond debt. This option is not preferred as it requires us to take on debt. It is our desire to complete the project using grants and Marine Passenger Fees.

As mentioned above, the ROI on this project is negligible. However, it is our desire to recover some of our costs. We are prohibited from making a profit from the sale of electricity due to regulatory requirements. However, we will be charging a fee for use of the system. Even without

a substantial ROI, we still believe that this is an endeavor worth undertaking for the good of the community as well as the environment.

The political and community pressure/desire to see this project completed is considerable. Juneau is at a crossroads in regard to the perception of some that we are approaching or even exceeding the number of cruise passengers that the city can support. This project, even without a significant financial ROI, is a crucial step in helping to ease some of this pressure. The investment in environmental stewardship is perceived to have a great enough return to warrant the large capital expenditure.

PortMiami has a thorough tariff schedule outlining their charges and requirements for connecting to shore power. The cost of electricity is calculated by Florida Power and Light (FPL). The port has multiple charges relating to connection and commissioning. The charge for a commissioning call is $3600. This is required anytime a vessel connects for the first time. The port also charges a connection fee of $4,115 per call where shore power is utilized. There is also a $170 processing fee assessed to each vessel connecting. [(5)]

If these same charges were used at the Port of Juneau and 2024 was used as the example year, we would be expected to collect nearly $1.3M. While $1.3M seems like a sizeable amount, it is quite low when the costs of operating the system are considered. We are too early in the process to determine what our system's operating costs will be, but it will most likely approach $1M annually. This leaves very little money left over to pay for the initial capital investment of $65M.

One area that I really enjoyed learning about was the importance of completing a detailed berthing study. A port can install all the infrastructure it wants to but if ships can't be positioned at the berths to take advantage of the new infrastructure, the effort is all for nothing. We have to pay particular attention to this in Juneau. Our berths serve multiple cruise lines, hence the importance of determining the shore power connection locations on each (existing) ship as well as the location on ships that are planned to visit Juneau in the future. This is a particularly daunting task given the construction of our berths and the lack of shoreside uplands to install Cable Management Systems (CMS) that have the range of movement to reach connection points on the ships.

While Miami has the luxury of selecting a mobile CMS that can traverse 150' each side of the fixed connection point, Juneau has no such luxury. Prior to the residency, I hadn't given extensive thought to this challenge. We are currently in the conceptual design phase of our project, and it is the perfect time to address this challenge. Shortly after I returned from my residency, we selected a consultant (through our local utility company) to assist in advancing our design. The consultant, H3 Engineering Solutions, has extensive experience in port electrification projects.

Very shortly after I returned from Miami, H3 arrived in Juneau for an introductory and site visit. I immediately brought up my concerns of CMS and berthing challenges to H3. My input was very well received and taken for action. We have decided on multiple floating CMS floats that will be placed between our mooring dolphins between the berths. This will provide us with the

maximum capability to connect the many different ships that call on Juneau. Having up to four CMS floats will undoubtedly increase costs but it is necessary to ensure that nearly every ship that wishes to connect has the ability to do so.

As we advance in our design efforts, we will enlist the services of our consultant and our industry partners as part of a berthing study to update our records with up-to-date information on each ship's shore power connection point locations. This will be completed early in the design process so that we don't advance too far in the process and potentially miss key details that are integral to a successful project.

PortMiami's experience highlighted the importance of selecting a prime contractor with relevant experience. In their case, choosing an electrical contractor as the prime for a project that involved extensive civil work posed challenges during construction. As we progress with our project in Juneau, we will keep this lesson in mind and ensure the prime contractor has the necessary management experience for all aspects of the job.

Another noteworthy issue discussed pertains to ships mandating crew visits to the switchgear before and after connecting to visually confirm power de-energization—a process potentially complicated by the distance to the switchgear if infrastructure is situated on a mountainside in Juneau. At the current time, it appears a solution may have been found to allow the proper verification of open circuits without requiring a visit to the substation. These insights underscored the multifaceted considerations involved in ensuring seamless shore power implementation.

As we continue to advance our design, we will be looking to source step-down equipment that will make the transition from transmission voltage to service voltage easier. H3 and our utility provider have experience in this area and their expertise will be invaluable as we progress through this phase of design. When conversations started about this project, it seemed that this may be a major hurdle. However, as time has passed, this hurdle is becoming easier to overcome with the advancement of switch gear and transformers available.

After my time at PortMiami, I now have first-hand knowledge that I can share with my team, Board of Directors, City Assembly, and the public. This is crucial as we work with our consultant to design a system that will be both affordable as well as practical. Prior to my residency, I had a basic understanding of shore power and could speak about the topic in general terms. After the residency, I am definitely not an expert, but I can speak in more detail about shore power. This will enable me to provide valuable input as our project progresses.

Conclusion/Findings

It's fascinating how alike the projects in Juneau and Miami seemed to the public eye. Despite this perception, the reality of installing shore power and connecting ships to the grid is far from simple. The details of a shore power system go well beyond laying a few cables and plugging in an extension cord. This has become increasingly evident to me as we embark on planning and designing our own onshore power project in Juneau. Shore power systems are not only complex but also come with a hefty price tag. This price tag is especially high in Juneau. PortMiami's system cost around $25M per berth while Juneau's system will likely be $35M per berth. Where PortMiami receives ships year-round, Juneau has a short, six-month season. Using that math, the argument could be made that our system costs nearly three times as much per berth (based on usage) as Miami's does when you consider that ours will only operate for half the year.

Comparatives	Juneau	Miami
Tidal Range	25'	2'
Apron Width	<2'	>30'
Distance to Substation	1000-2000'	2000'
Flex Between Lines/Ships	Multiple lines/ Multiple Ships at each birth	Primarily Single brands
Community Interest/Pressure to Electrify	Extreme	High
Availability of Funding	Accessible	Easily Accessible
Cost of Construction	$35M per Berth	$25M per Berth
Complexity of Construction	Very Complex	Complex
Availability of Energy	Limited	Slightly Limited

Table 1- Comparative between Juneau and Miami, Matt Creswell

Upon arriving at PortMiami, the importance of investing adequate time in planning and design for a shore power project immediately struck me. Both PortMiami and the Port of Juneau are operating under tight timelines due to public demand for greener energy options for cruise ships. However, the misconception that installing a shore power system is a straightforward task can lead to complacency and shortcuts in the design process. I am grateful to PortMiami for hosting me during my residency, where I not only learned about their project's successes but also gained valuable insights into areas for improvement.

A notable difference between PortMiami and the Port of Juneau is the available space around each cruise ship. While PortMiami benefits from ample uplands and apron space, the Port of Juneau's floating berths require separate structures for cable management systems. Conducting a detailed berthing study before finalizing the shore power system design is essential to ensure efficient ship alignment and maximize space utilization.

Energy supply presents a common challenge for both ports. Despite installing electrical infrastructure at multiple berths, both ports face limitations on the number of berths that can be powered simultaneously. In Juneau, hydropower availability dictates the ability to supply electricity to ships, posing challenges during low water years.

Based upon historical precipitation existing hydroelectric generating capacity, and electrical demand, AEL&P projects will be capable of offering electrical energy to the CBJ cruise ship docks only 25% of the time it is requested. It is expected this will improve over time as the firm load increases, requiring the construction of additional hydroelectric power plants. Such construction will likely facilitate additional capacity for interruptible loads.[3]This uncertainty underscores the importance of strategic funding allocation and exploring grant opportunities to mitigate financial risks.

In conclusion, while the implementation of shore power projects is crucial for environmental sustainability, it also presents significant challenges. Through diligent planning, thoughtful contractor selection, and strategic funding, both PortMiami and the Port of Juneau are poised to overcome these challenges and lead the way in green port initiatives.

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