LionRock Maritime
Ports Explored

Dispatch Efficiency

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About LionRock Maritime

LionRock Maritime provides highly accurate data and data-derived insights about tugboat operations across every port in the world. LionRock Maritime combines towage industry expertise, human creativity and data technologies to deliver decision-grade tugboat analytics software.

Executive Summary

Problem: Tug operators are rightfully focusing on speed as the primary driver of fuel consumption during light sailing. Yet in day-to-day harbor operations, a significant share of fuel cost and sailing hours arises not ONLY from how fast a tug travels, but also from how far it travels for reasons unrelated to serving a vessel. Repositionings across large ports, unnecessary returns to base between closely sequenced jobs, and long light legs resulting from dispatch decisions all accumulate into a fuel and availability cost that typically goes unmonitored. Without a structured view of these routing patterns, operations managers cannot identify which movements are potentially avoidable, which tugs generate disproportionate light mileage, or where in the port dispatch decisions are consistently suboptimal.

Solution: PowerCaptain's Routing Efficiency module tracks and classifies all light sailing movements, identifying repositionings, short stays at rest stations, and return-to-base decisions that result in additional distance that could have been avoided. Each metric is broken down by tug, rest station, and port area, and tracked over time so that changes in dispatch behavior become visible as a trend. The aggregate of avoidable movements is expressed as a single Potentially Avoidable Mileage figure that converts routing decisions into fuel, hours, and availability impact in one number.

Benchmarks: Routing metrics are derived from AIS position data without onboard hardware. Repositionings are identified as light transits exceeding a configurable distance threshold between two defined port areas. Short stays at rest stations are identified when a tug returns to base within a configurable time window before departing for a job originating near the terminal it just left. All thresholds are agreed with the operator before reporting begins and are configurable per port. Light sailing distance is measured as all distance sailed with no vessel connected, forming the denominator against which routing decisions are assessed.

Typical Impact: Operations with structured visibility into routing patterns can identify avoidable mileage that represents a measurable share of total light sailing distance. Because each nautical mile of avoidable light sailing carries a direct fuel cost and ties up the tug for the duration of the transit, reductions in avoidable mileage translate proportionally into lower fuel expenditure and increased tug availability for productive jobs. Specific improvement figures are dependent on port configuration, fleet size, and dispatch practices and should be confirmed with the LionRock team based on operator-specific deployments.

Executive Answer

Harbor towage is, at its core, a positioning problem. A tug can only serve a vessel when it is in the right place at the right time, and the cost of being in the wrong place is paid in fuel, in sailing hours, and in reduced availability for the next job. Speed optimization addresses one dimension of this cost: the energy consumed per nautical mile. Routing efficiency addresses the other: the number of nautical miles sailed that deliver no operational value.

The executive pain is that this category of operational waste is structurally invisible. Speed can be measured in any AIS dataset. But avoidable distance requires knowing what the alternatives were: what was the next job, where did it start, which tugs were available, and what did the tug do in the gap? Without a system that reconstructs these decision contexts and classifies the outcome, operations directors have no basis for knowing how much of their light sailing is a function of geography and job mix, and how much is a function of routing decisions that could have gone differently.

There are numerous inefficient patterns that account for the potentially avoidable mileage in most deployments, and they often differ per port or operation. Some notable examples are movements like repositionings: long cross-port transits that move a tug from one area of the port to another without a job attached. In a port where different areas have distinct job concentrations, each repositioning bypasses the principle that tugs stationed in one area should serve work in that area, and the fuel and availability cost is proportional to the distance crossed. Another one is short stays at rest-station: instances where a tug returned to base between two jobs at the same terminal, completing a return trip that would have been unnecessary had it simply waited. And there are many more. All these patterns are individually small, operationally unremarkable, and in aggregate significant.

PowerCaptain's Dispatch Efficiency module makes these patterns visible. By classifying every light movement against defined operational thresholds, it separates unavoidable transit from potentially avoidable movement and shows where, at what frequency, and by which vessels the potentially avoidable movements are being generated. This gives dispatch managers a concrete basis for operational feedback, and gives operations directors a port-level view of how routing decisions are trending over time.

LionRock Maritime's Dispatch Efficiency Solution

Dispatch Efficiency is organized around five interconnected views, each addressing a distinct dimension of light sailing behavior.

Light Sailing Distance tracks all distance sailed without a vessel connected across the fleet. It is expressed as a share of total distance sailed and broken down by tug, forming the denominator that contextualizes the other routing metrics. A tug with a high light sailing share relative to its peers warrants investigation into whether its station location, dispatch allocation, or job sequencing patterns are contributing to excess empty transit.

Repositioning tracks long cross-port transits that are not attached to a job. A repositioning is defined as a light transit exceeding the agreed distance threshold between two identified port areas. The view shows the number of crossings per tug over the selected period, the total distance and fuel generated, and the utilization impact expressed in hours of availability lost. Because repositionings are often associated with specific tugs or station assignments, the by-tug breakdown enables targeted dispatch review.

Short Stays at Rest Station identifies instances where a tug returned to base and departed again within the configured time window when the next job started near the terminal it had just left. Each instance represents a case where waiting at the terminal would have removed both the return leg and the subsequent departure leg from the tug's light sailing total. The view shows the count, distance, and fuel generated, and the breakdown by rest station, identifying which bases show the highest frequency of avoidable returns.

Return to Base vs Wait at Terminal provides the decision-level view underlying Short Stays. For every gap between two sequential jobs, it records whether the tug returned to its rest station or waited near the terminal, and flags returns that would have been better spent waiting. This gives the operations manager a fleet-wide split of return versus wait behavior and a port-area breakdown showing where the return tendency is highest.

Avoidable Mileage aggregates all light sailing distance classified as avoidable across repositionings, short rest station stays, off-station job pickups, and early returns into a single summary figure. It is expressed in

nautical miles, fuel equivalent, and sailing hours, and compared against the prior period to show whether dispatch efficiency is improving or declining.

Proven Results

Operators using the Routing Efficiency module gain a structured view of which light sailing movements are avoidable and which are inherent to their port geography and job mix. The module makes visible a category of operational cost that is typically not tracked in dispatch operations: the aggregate effect of individually small decisions, each of which appears unremarkable in isolation but which accumulates into a measurable fuel and availability impact across a fleet and a quarter.

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Common Issues

The following patterns are the most frequent contributors to elevated avoidable mileage in harbor towage operations:

- Tugs regularly repositioning across the port when job allocation does not respect geographic station areas, placing vessels far from where their next jobs originate
- Returns to base during short gaps between jobs at the same or adjacent terminal, driven by habit or dispatch convention rather than optimized instruction
- Commercial assignments that routinely place tugs at stations distant from their most frequent job terminals, generating structurally long light legs across the fleet
- No fleet-wide tracking of light sailing share, making it impossible to identify which tugs operate with disproportionately high unladen mileage relative to peers
- Off-station job pickups where a tug further from the terminal is dispatched rather than the closest available vessel

Solution Overview: Reducing Avoidable Light Sailing

The metrics in this module reflect patterns observed across current deployments and are intended as a starting point. LionRock works with each operator to define thresholds and, where relevant, additional metrics tailored to the specific geometry and operational conventions of their port. Other behaviors may be relevant in other ports and can be custom-defined and measured accordingly.

Step 1: Identify the largest driver of the avoidable mileage

Open the Avoidable Mileage view and examine the driver breakdown. Repositionings, short stays, off-station pickups, and early returns each contribute a share. The largest driver is where operational attention will produce the most direct improvement.

Step 2: Investigate repositioning targets by tug

Review the Repositionings by-tug breakdown to identify which vessels generate the most cross-port transits, then assess whether berth assignments or job allocation can be adjusted to keep those tugs closer to their natural work area.

Step 3: Review short stay behavior by rest station

Examine the Short Stays by-rest-station breakdown. A high count at a specific base points to a pattern of returns that could be replaced by terminal waits. Review the flagged instances to understand the job sequences involved and identify where targeted wait instructions from dispatch would reduce the pattern.

Step 4: Analyze the return versus return split by port

Use the Return to Base vs Wait view to identify which port areas have the highest return rates. Areas where rest stations are geographically distant from the main terminals carry the highest avoidable distance per return and are the priority for dispatch guidance.

Step 5: Monitor light sailing share by tug

Compare each tug's light sailing share against fleet peers. A consistently higher share points to a station location, dispatch allocation, or scheduling pattern worth investigating further.

Step 6:Track avoidable mileage as a trend

Monitor the weekly trend in Avoidable Mileage following any dispatch or allocation changes. A declining trend is the primary evidence that operational adjustments have had effect.

Evidence & Governance

All Dispatch Efficiency metrics are derived from AIS position data using standardized detection algorithms applied consistently across all vessels and ports in the PowerCaptain platform. Light sailing legs are identified from speed profiles and the absence of a connected vessel. Repositionings are classified using configurable port area boundaries and distance thresholds agreed with the operator before reporting begins. Short stays are identified from the sequence of rest station arrivals and departures cross-referenced against the location of the subsequent job.

All thresholds are set per port and confirmed with the operator before the first report, ensuring that what is classified as avoidable reflects the operational geometry and scheduling norms of that specific port. Fuel figures are modelled from the AIS speed profile and the tug class consumption curve. No onboard hardware or flowmeter data is required.

The definitions and threshold settings applied for a given deployment are documented in the Definitions and Thresholds page within the Dispatch Efficiency module.

Key KPI Definitions

- Inefficient Mileage The aggregate light sailing distance classified as potentially avoidable across repositionings, short rest station stays, off-station pickups, and early returns. Expressed in nautical miles, fuel equivalent, and sailing hours. The primary summary KPI for routing efficiency, used to track whether dispatch decisions are improving or deteriorating over time.
- Repositioning A light transit exceeding the agreed distance threshold between two defined port areas, not attached to a job and not associated with bunkering, dry dock, or crew change. Represents cross-port movements that could typically be avoided by keeping tugs in their station area. The distance threshold is configurable per port.
- Short Stay at Rest Station An instance where a tug returned to its rest station and departed again within the configured time window, where the next job started at or near the terminal the tug had just left. Each instance represents a case where waiting at the terminal would have removed both transit legs from the tug's light sailing total.
- Return to Base vs Wait Ratio The proportion of job gaps where the tug returned to its rest station versus waited near the terminal. Tracked fleet-wide and by port area. A high return rate in areas where job sequences regularly originate at the same terminals indicates a dispatch pattern that generates avoidable mileage.
- Light Sailing Distance Total distance sailed with no vessel connected, expressed in nautical miles and as a percentage of total distance sailed. Forms the denominator for all routing efficiency metrics. A high light sailing share indicates a fleet or individual tug whose unladen transit occupies a large proportion of operational time.
- Light Sailing Share by Tug Each vessel's light sailing distance as a percentage of its total distance sailed, compared against the fleet average for the same port and period. Identifies tugs whose routing patterns generate disproportionately high unladen mileage relative to peers operating under comparable conditions.
- Light Sailing Distance per Job Total light sailing distance divided by the number of jobs completed, providing a normalized view of how much unladen transit each job generates on average. Can be segmented by tug, captain, terminal, and rest station to identify where higher-than-average mob and demob distances are concentrated.

Do you still have questions?

Contact our support via email

Frequently Asked Questions

How does PowerCaptain distinguish between avoidable and unavoidable light sailing?

Not all light sailing is avoidable. Every job requires the tug to travel from its station to the vessel, and the mobilisation leg is an inherent cost of the operation. PowerCaptain classifies a light movement as potentially avoidable only when the actual sailed distance deviates from the optimal sailing distance. We stress the word "potentially" as there can be different causes to this efficiency and not all of them are solvable. It however starts with making the mileage transparent, engage dispatchers and captains in the review of this and over time reduce excessive mileage by addressing the rootcauses.

Why does the return versus wait decision matter more in some port areas than others?

The operational geometry of the port determines how much distance a return trip generates. In a compact port area where the rest station is close to the terminals, a return trip may produce only a small amount of avoidable mileage. In a port area where the rest station is several nautical miles from the main terminals, each unnecessary return generates significantly more avoidable distance. The Return to Base vs Wait view shows the return rate by port area precisely so that dispatch attention can be directed to the areas where the behavior carries the highest distance and fuel impact.

Can these metrics be used to give feedback to individual captains?

These metrics are very much a captain feedback tool. First impressions from customers suggest that inefficient routings, specifically those associated with return vs wait and short stays at rest station, sometimes reflect captain preferences rather than dispatch instructions. The by-tug breakdowns in Repositionings and Light Sailing Share make individual vessel patterns visible over time, giving operations managers a concrete basis for captain-level feedback and performance conversations.

How is the fuel figure in Potentially Avoidable Mileage calculated?

Fuel is modelled from the AIS speed profile for each light leg combined with the tug class fuel consumption curve. The calculation applies the observed speed during each transit to the consumption model, producing a fuel estimate per leg that reflects how the tug was actually operated. The per-NM figure in the Avoidable Mileage summary represents the average across all classified avoidable legs in the period. No onboard flowmeter or hardware installation is required.

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