

Holistic Approach to Ship Performance Analysis for Decarbonization

Bridging the Gap Between Operational Data and Ratio
nal Decision-Making Presenter

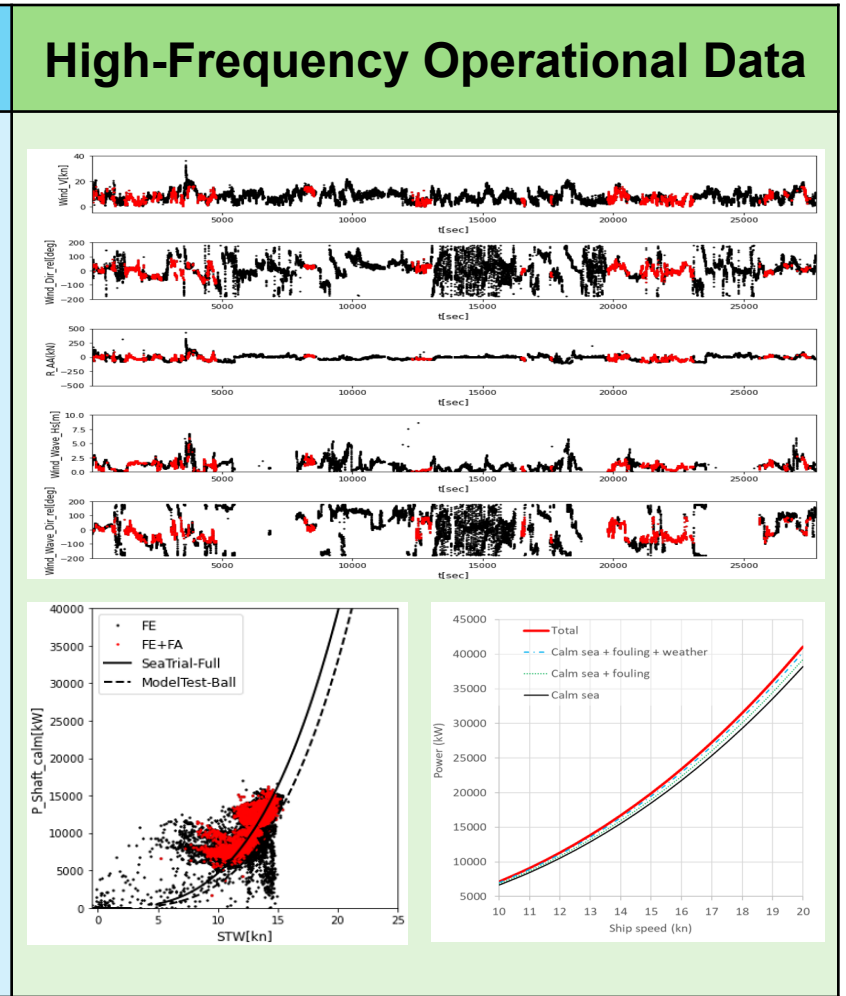
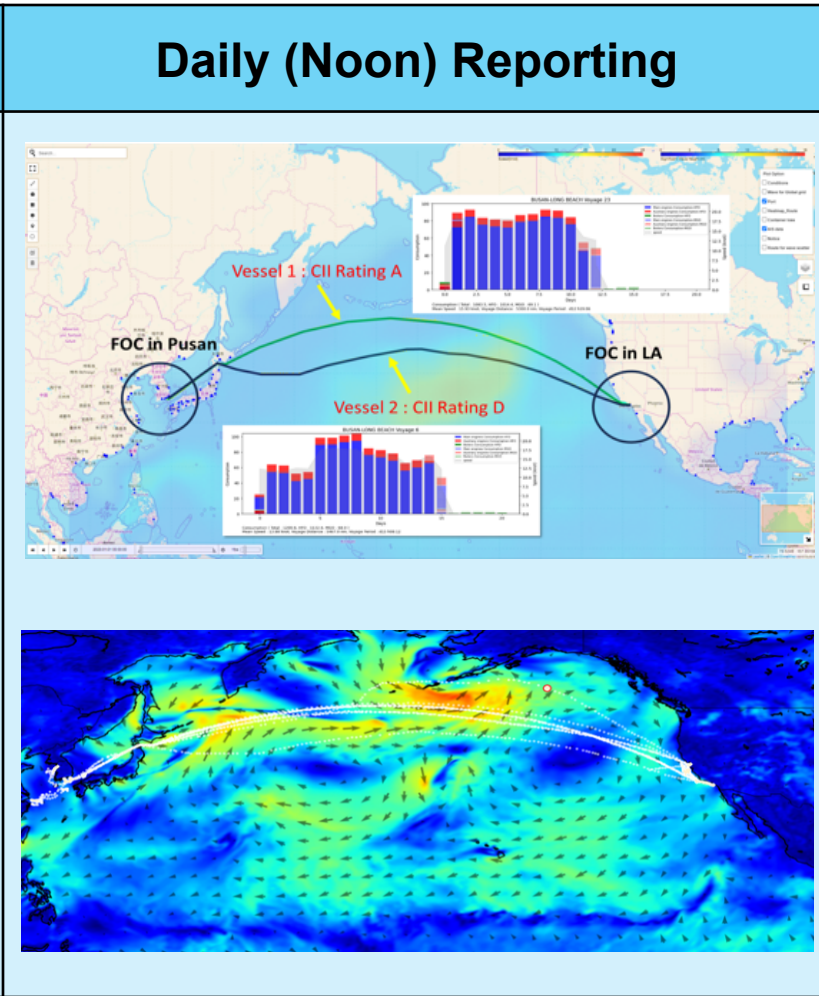
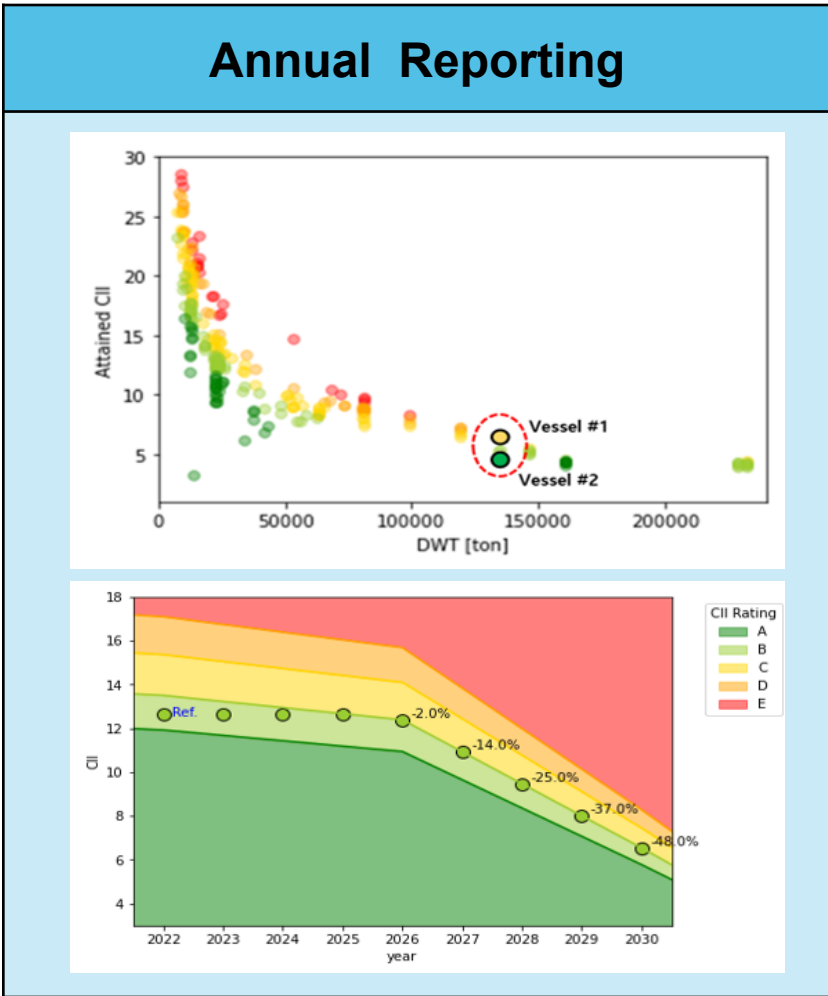


R&D Division
Ship & Offshore Technology Team

Senior Researcher
Sang-Yeob Kim

Data Resolution for Performance Analysis

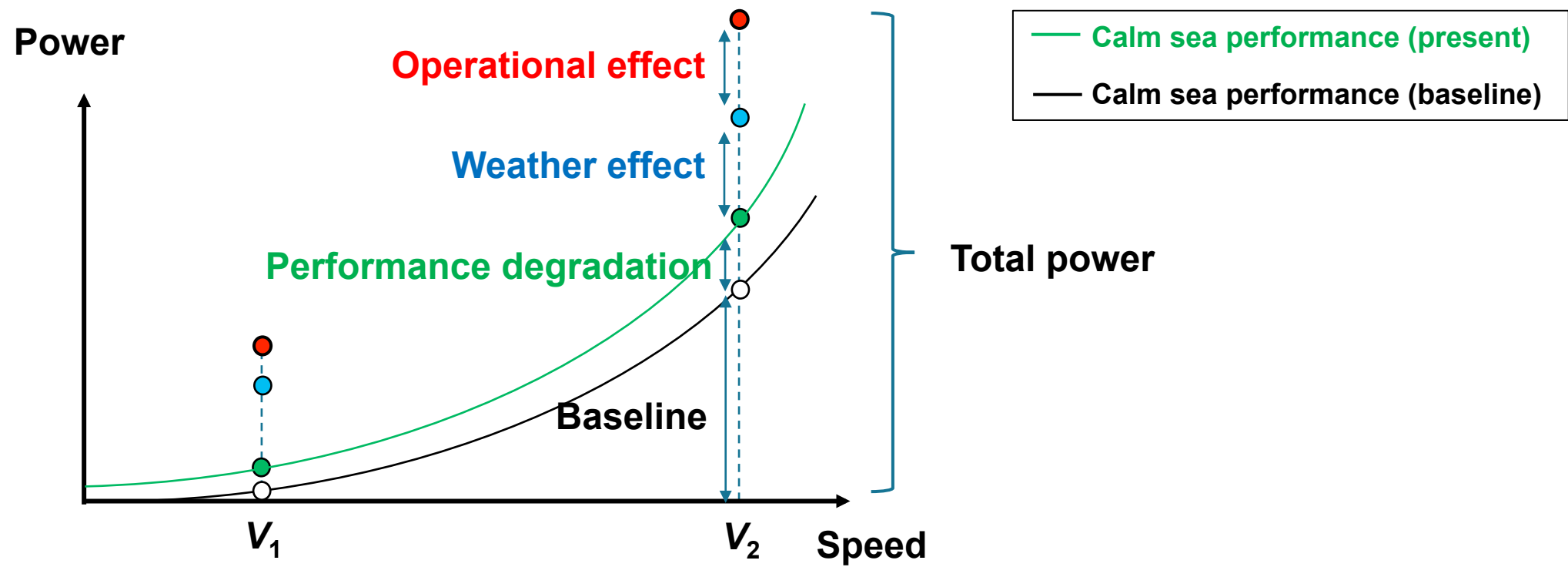
Tiered analysis approach based on data availability.



Speed vs. Power: Decomposing Vessel Performance Factors

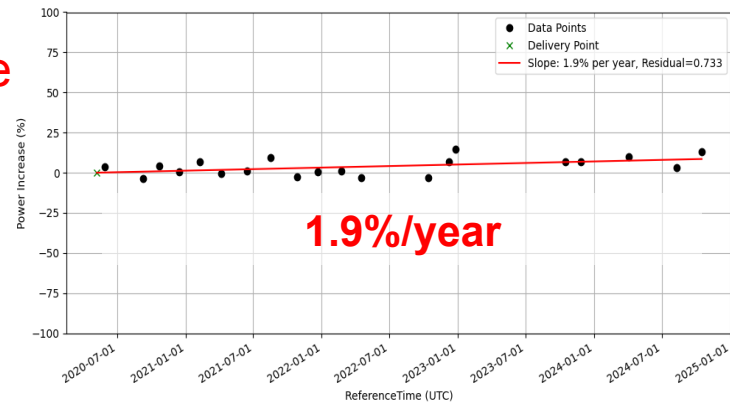
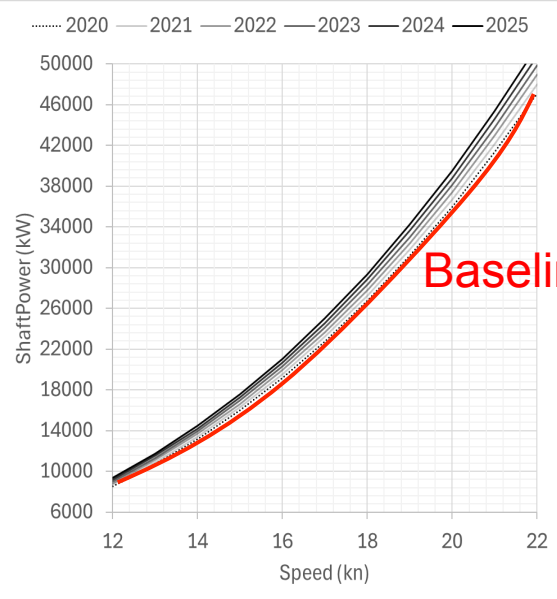
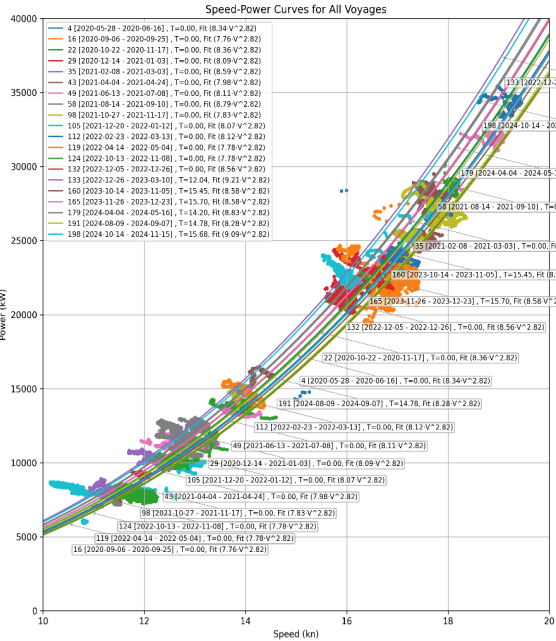
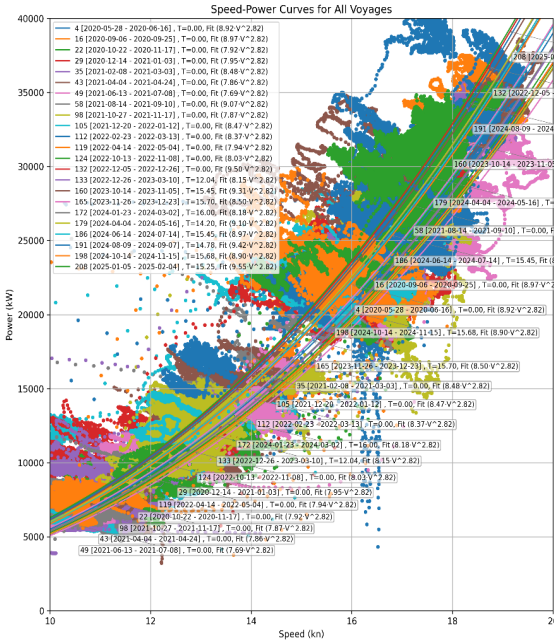
Total Power

= Baseline + Performance degradation + Weather + Operational



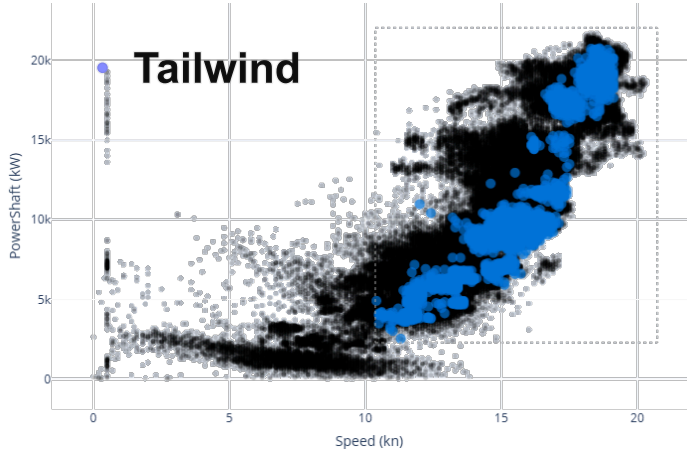
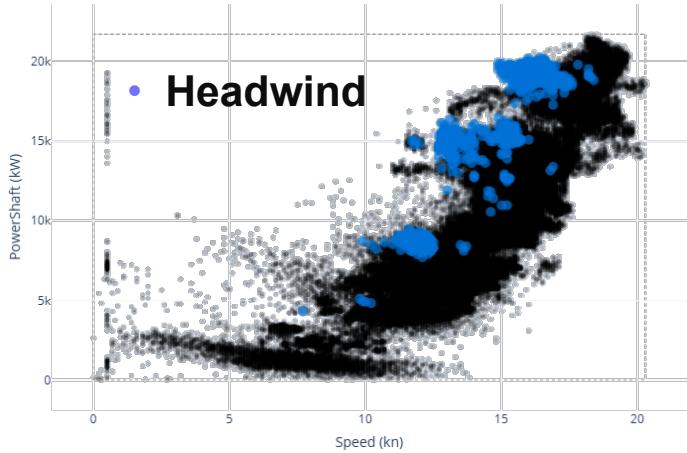
Performance Degradation

- Utilizing steady-state filtering
- Establishing a realistic calm sea baseline
- Identifying the continuous trend of technical degradation
- **Case study for 12 sister ships : 1.5%~2.5% of annual performance degradation**

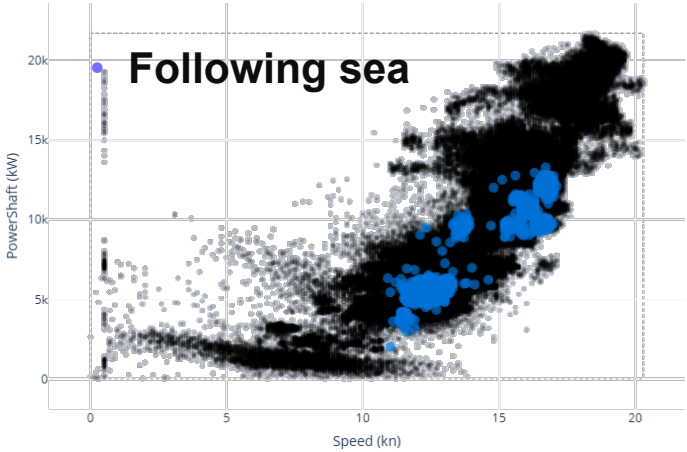
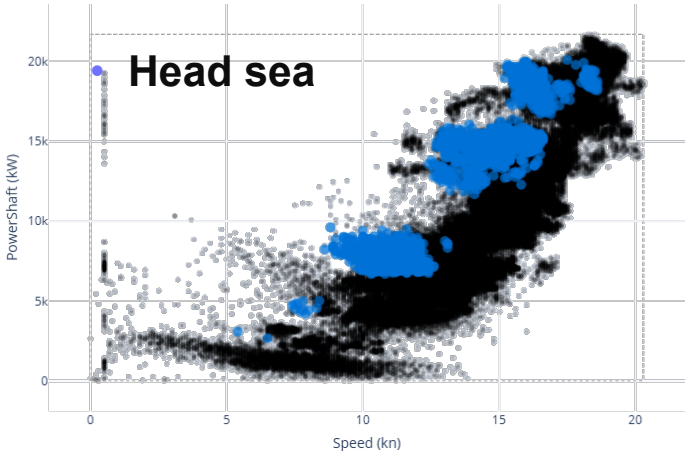


Weather & Trim Effect

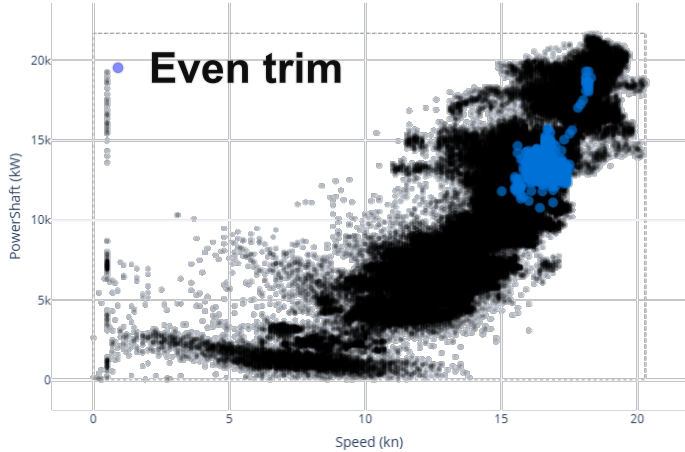
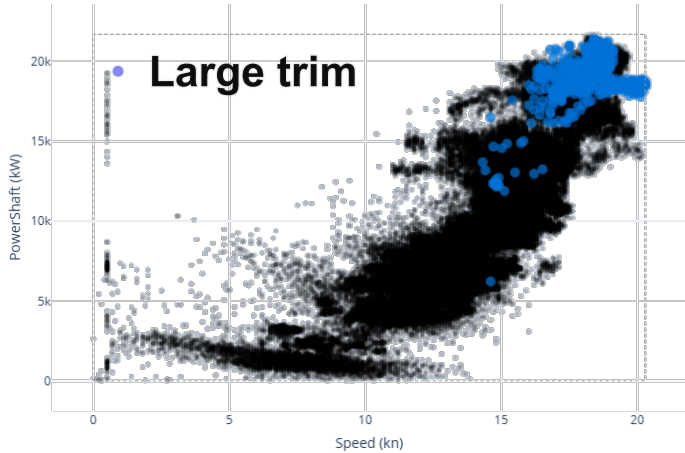
Wind Effect



Wave Effect

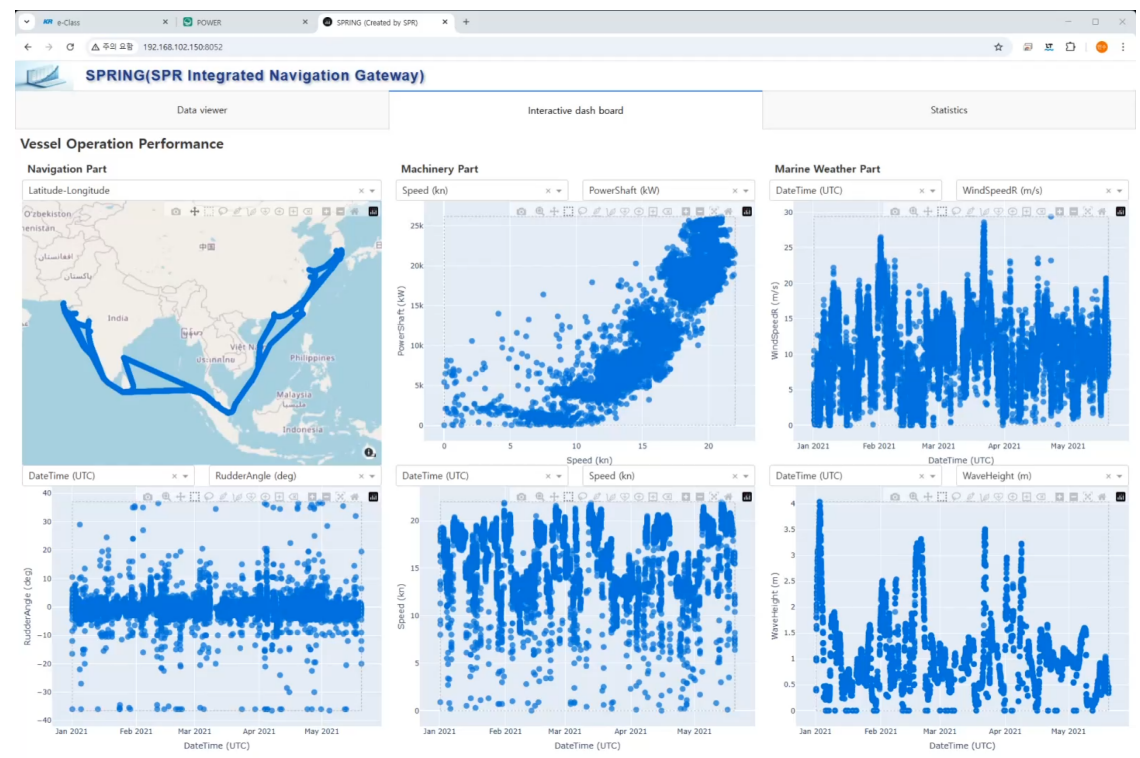
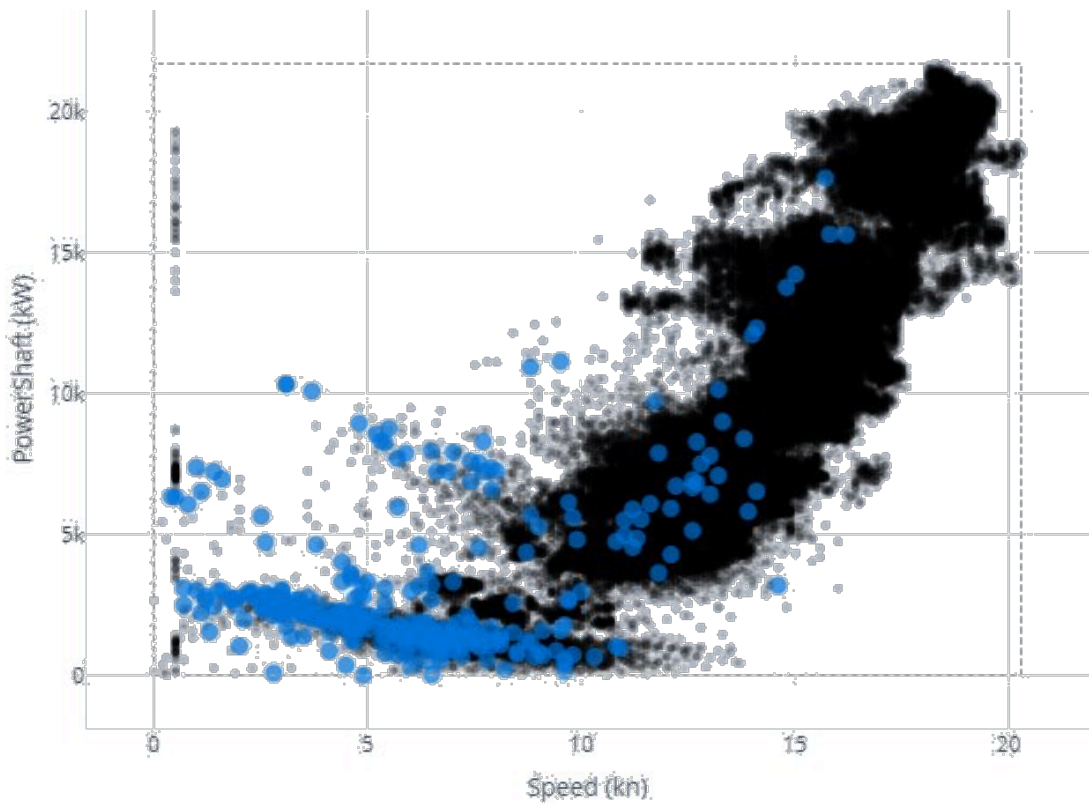


Trim Effect



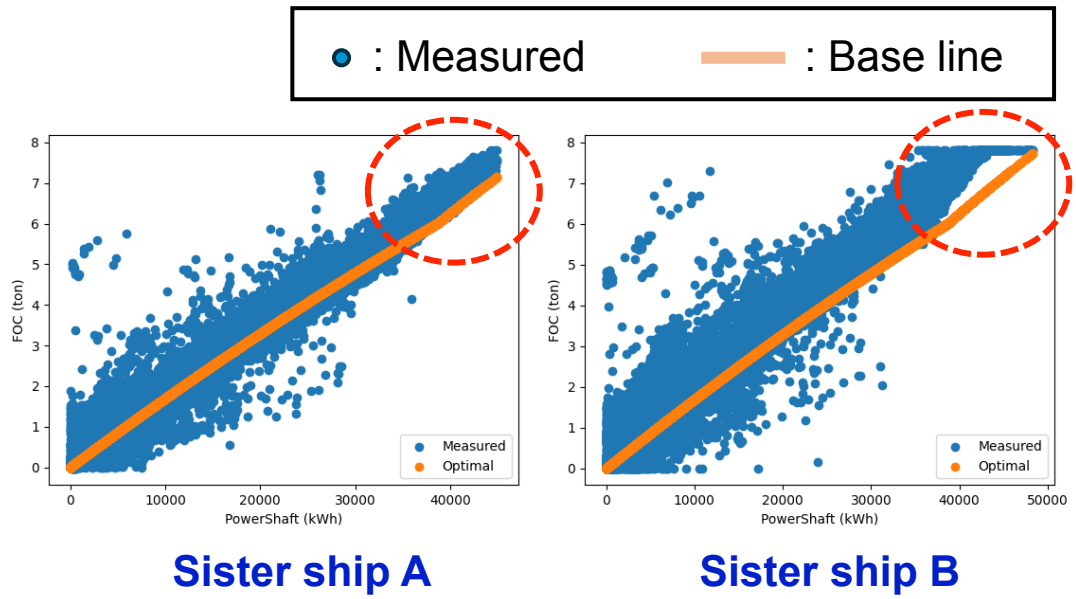
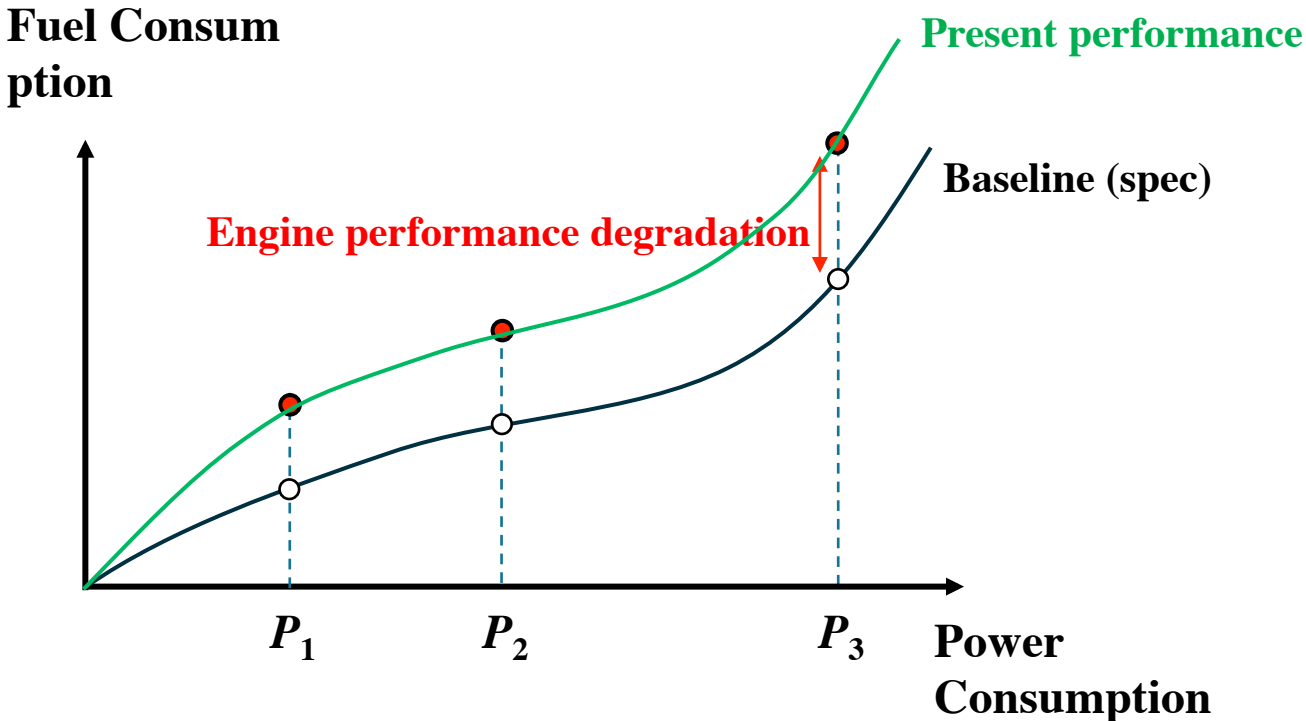
Rudder Angle Effect

Rudder Effect



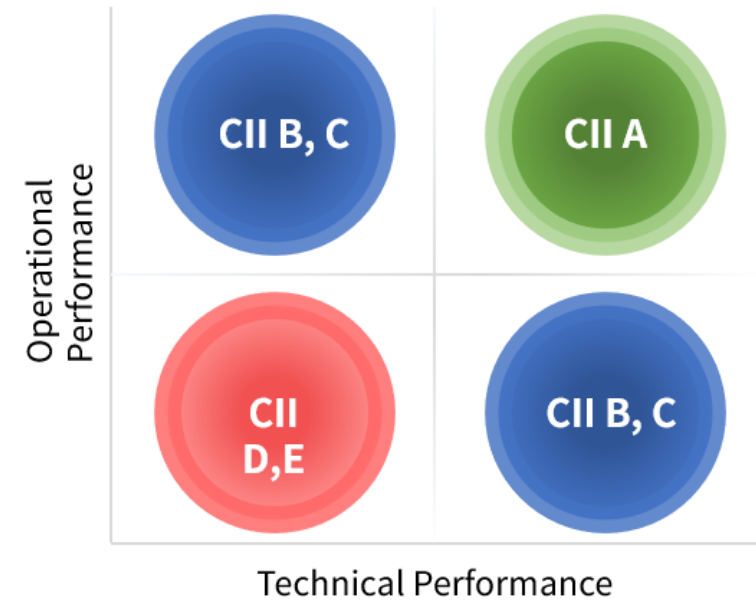
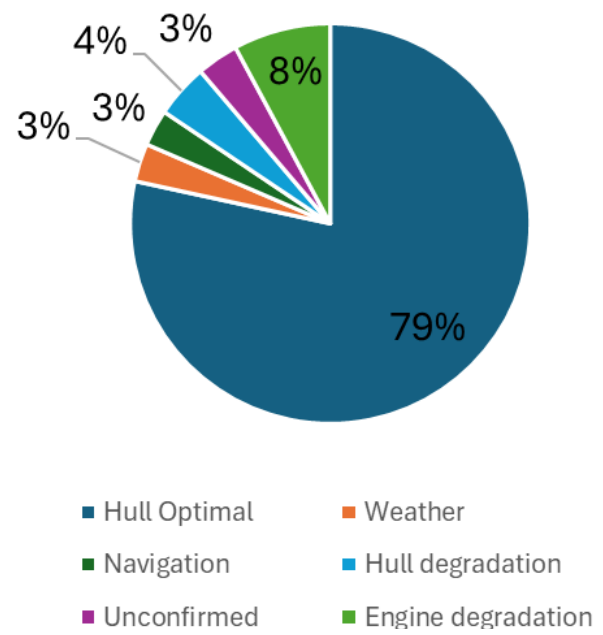
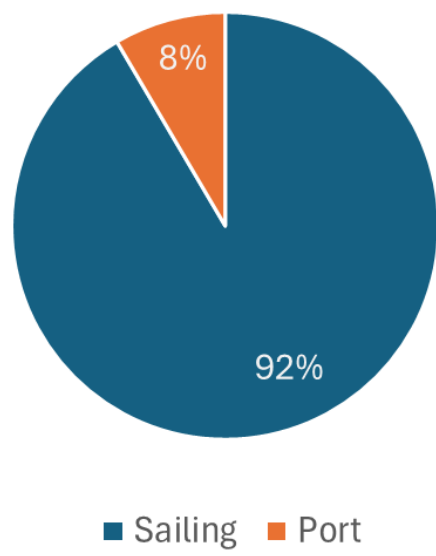
Power vs. Engine : Uncertainty & Performance Degradation

- **Performance Gap:** Measuring actual in-service combustion vs. shop test specifications
- **Independent Diagnosis:** Separating engine-side losses from hull-side resistance
- Even with identical sister ships, real-sea engine efficiency shows significant performance variance

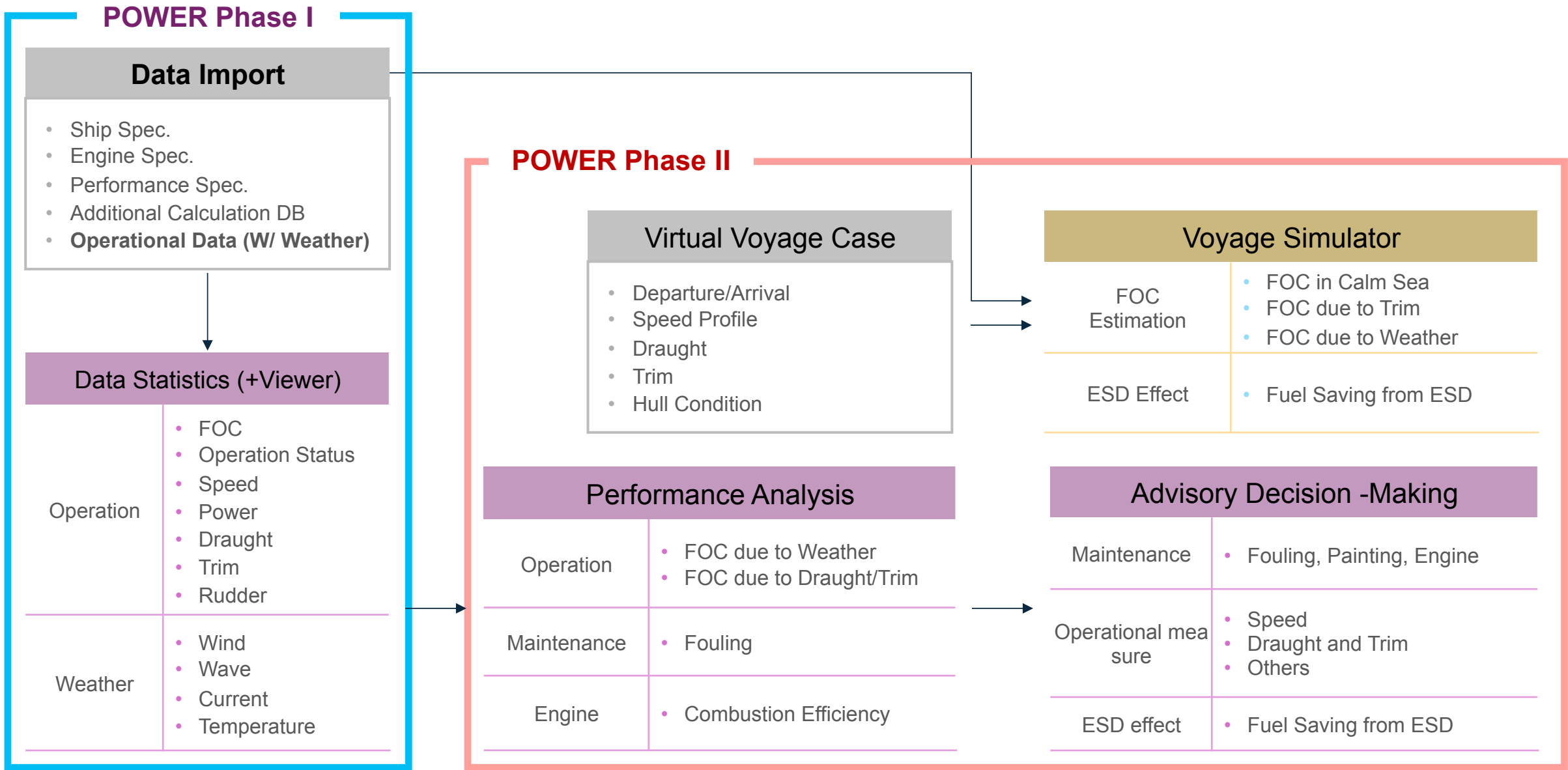


Break Down of FOC Contribution

- Translating HFD analysis into a detailed audit of fuel consumption
- Distinguishing between **technical performance** and **operational variables**
- Enables evidence-based future action



The KR-POWER Ecosystem: Integrating Diverse Data Streams



POWER Phase I

Data Import

- Ship Spec.
- Engine Spec.
- Performance Spec.
- Additional Calculation DB
- **Operational Data (W/ Weather)**

Data Statistics (+Viewer)

Operation	<ul style="list-style-type: none"> • FOC • Operation Status • Speed • Power • Draught • Trim • Rudder
Weather	<ul style="list-style-type: none"> • Wind • Wave • Current • Temperature

POWER Phase II

Virtual Voyage Case

- Departure/Arrival
- Speed Profile
- Draught
- Trim
- Hull Condition

Performance Analysis

Operation	<ul style="list-style-type: none"> • FOC due to Weather • FOC due to Draught/Trim
Maintenance	<ul style="list-style-type: none"> • Fouling
Engine	<ul style="list-style-type: none"> • Combustion Efficiency

Voyage Simulator

FOC Estimation	<ul style="list-style-type: none"> • FOC in Calm Sea • FOC due to Trim • FOC due to Weather
ESD Effect	<ul style="list-style-type: none"> • Fuel Saving from ESD

Advisory Decision -Making

Maintenance	<ul style="list-style-type: none"> • Fouling, Painting, Engine
Operational measure	<ul style="list-style-type: none"> • Speed • Draught and Trim • Others
ESD effect	<ul style="list-style-type: none"> • Fuel Saving from ESD

From Experience to Evidence: Standardizing Fleet Efficiency

- **The Shift:** Replacing intuition-based route planning with standardized data simulations.
- **Measurable Benefits:** Fuel cost saving and improved regulatory compliance (CII, GFI).

Aspect	Experience-Based	Data-Driven
Route Planning	Intuitive & Subjective	Precision-Simulated & Optimal
Speed Control	Heuristic/Fixed Estimation	Dynamic & Performance-Linked
Verification	Anecdotal & Qualitative	KPI-Driven & Quantitative
Risk Management	Reactive Response	Predictive Prevention
Governance	Individual Silos	Standardized Intelligence

"More Data with Good Quality will support Better Decisions!"





PROVIDING
THE BEST SERVICES,
CREATING
A BETTER WORLD

Sangyeobk@krs.co.kr

