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BERGEN **16-11-2025**

ANTARCTIC ICE REMOVAL PROGRAM
SHAREHOLDERS TOWAGE RESEARCH AND DEVELOPMENT

1. Ice Transport Logistics for Eugenix P.S.A. Shareholders.

This document outlines the operational goal, assumptions, calculations, and summary for transporting a targeted volume of polar ice over a multi-decade horizon. It also includes a first-order horsepower estimate for towing a single ice block with a tugboat-type vessel. The numbers below are engineering scoping figures intended for early planning; they are sensitive to operational speed, hull form, sea state, and towing configuration.

Goal and scope

- **Goal:** Transport a cumulative total of 10,000,000 km³ of ice over 50 years.
- **Unit block:** Rectangular piece of ice sized 1 km×0.5 km×0.2 km
- **Volume per block:** 1km x 0.5km x 0.2km =0.1 km3
- **Operational constraint:** Each ship requires a 30-day turnaround per delivered block (one completed delivery every 30 days).
- **Objective:** Determine daily throughput, fleet size, and towing horsepower for a tugboat moving a single block.

Assumptions

- **Calendar basis:** 50 years × 365.25 days = 18,262 days (includes leap years).
- **Ice density:** piece ≈ 917 kg/m3

- **Seawater density:** ρ water ≈ 1000 kg/m3
- **Drag coefficient of a blocky shape:** Cd ≈ 0.8 (order-of-magnitude).
- **Tow speed baseline:** 3 knots ≈ 1.543 m/s
- **Frontal area when towing along the 1 km length:** A = 0.5 km × 0.2 km = 0.1 km2 = 100,000 m2
- **Turnaround interpretation:** One ship completes one delivery (one block) every 30 days, including load, transit, unload, and return. Times will vary based on the distance from the ice removal area.

2. Throughput and fleet sizing

Daily volume requirement

- **Target daily average volume:** 10,000,000 km3 / 18,262 days ≈ 547.5 km3 per day
- **Meeting the target in 50 years:** requires a transfer of ice equal to 547.5 km3 each day.

Blocks per day

- **Blocks needed per day:** 547.5 km3 / day of block size 0.1 km3 / block = 5,475 blocks per day
- **Meeting the target in 50 years:** requires a transfer of 5,475 ice blocks each day.

Turnaround constraint per ship

- **Blocks delivered per ship per day:** 1 block / 30 days = 0.0333 blocks per day
- **Meeting daily ice block target:** Considering that one ship's turnaround time is 30 days, the number of blocks delivered per day is equal to 0.3333.

Fleet size

Ships required (each carrying one block per 30 days): 5,475 blocks / day with 0.0333 blocks / day / ship ≈ 164,250 ships.

- **Interpretation:** With the stated block size and a 30-day round-trip per ship, a fleet on the order of 1.6×10^5 ships would be required to maintain the daily cadence over 50 years.

Other Considerations

- **Block sizes based on harvesting technology:** Considering that planned blocks are large pieces and cutting of such blocks might be technology constraint that requires development of ice removal technology that harvests much smaller ice blocks Eugenix P.S.A. Shareholders Technology and Fleet developers should consider:

    - Towage of smaller pieces of cut ice sheets
    - Use of ice-on-ice stacking method for marine transport
    - Use of side-by-side ice joining method for marine transport
    - Use of adequate types of holding and roping devices on smaller ice blocks for marine transport

3. Tugboat horsepower estimate for one block

This section estimates the shaft power needed for a tug to tow a single 0.1 km³ block at a steady speed in calm water. It uses a simplified drag model; real operations would likely use shaped, rafted, or partially melted/fragmented configurations, or multi-tug arrangements, to reduce resistance.

Block properties and tow configuration

- **Block volume:** *0.1 km3 = 100,000,000 m3*
- **Ice density:** ρ ice ≈ 917 kg/m3
- **Seawater density:** ρ water ≈ 1000 kg/m3

- **Frontal area in tow:** *A=100,000 m2 (500m x 200m)*
- **Practical margin:** multiply ideal power by 1.3x – 2.0x for sea state, towing losses, and propulsive efficiency.
- **Trip duration:** 30 days = 720 hours.
- **Distance:** will vary based on speed choice and weather.

Towing Speed and Power Assumptions

SPEED (KNOTS)	DISTANCE (NMI)	DISTANCE (KM)	IDEAL POWER (HORSEPOWER)	ADJUSTED POWER (HP x 1.3 – HP x 2.0)
1	720	1,333	7,289	9,476–14,578
2	1,440	2,667	58,412	75,936–116,824
3	2,160	4,000	197,000	256,100–394,000
4	2,880	5,334	467,741	608,063–935,482
5	3,600	6,667	912,037	1,185,648–1,824,074

Summary for stakeholders

- **Target volume:** 10,000,000 km³ over 50 years.
- **Block size:** 0.1 km³ per block (1 km × 0.5 km × 0.2 km).
- **Average cadence required:** 5,475 blocks per day.
- **Turnaround constraint:** 1 block per ship per 30 days.
- **Fleet size estimate:** ~164,250 ships (each delivering one block every 30 days).
- **Tug Vessel Horsepower:** ~250,000 - 400,000. (single-block tow at 3 knots).

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4. Recommendations

Shareholders are advised to investigate all aspects that increase and decrease towing efficiency to implement most time and energy-friendly models to their technology and fleet development process that can complete Ice Removal in 50-100 years.

With regards,

K Pawlak

Piast – Wasa, Dynasties
Founder and Board President of
Eugenix ® Simple Stock Corporation
Tribal and Indigenous Ethnic Minority of
Arcticus Blancus (Latin), Blanków (Polish).

Arctic Men Extinction Noticed.
Arctic Magnetic Earth Naturalist.
Antarctic Mass Excavation Nonetheless.