Renewable Integration Grid Security Project (RIGS) vs Battery Energy Storage Systems (BESS)

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Agenda

- NB Power’s current state
- How the RIGS technology works
- Is this the best solution? Batteries as an alternative

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Current assets on NB grid

Table 8.1: Existing NB Power Generating Capacity and Other Statistics

Generating Capacity Thermal		
Coleson Cove	972	MW
Belledune	467	MW
Bayside	284	MW
Total Thermal	1,723	MW

Generating Capacity Hydro		
Mactaquac	668	MW
Beechwood	112	MW
Grand Falls	66	MW
Tobique	20	MW
Nepisiguit Falls	11	MW
Sisson	9	MW
Milltown	3	MW
Total Hydro	889	MW

Generating Capacity Nuclear		
Point Lepreau	663	MW

Generating Capacity Combustion Turbines		
Millbank	397	MW
Ste. Rose	99	MW
Grand Manan	29	MW
Total Combustion Turbines	525	MW

Total Generating Capacity		
Thermal	1,723	MW
Hydro	889	MW
Nuclear	663	MW
Combustion Turbines	525	MW
Total Generating Capacity	3,800	MW

Power Purchase Agreements (PPAs)		
Kent Hills (Wind)	167	MW
Caribou Mountain (Wind)	99	MW
Lamèque (Wind)	45	MW
Wisokolamson Energy (Wind)	18	MW
Wocawson Energy (Wind)	20	MW
Grandview (Natural Gas)	95	MW
Twin Rivers (Biomass)	39	MW
Irving Pulp & Paper (Biomass)	33	MW
AV Nackawic (Biomass)	26	MW
AV Cell (Biomass)	21	MW
Edmundston Hydro	9	MW
Other Renewable	22	MW
Total Power Purchase Agreements	594	MW

Number of Lines		
Distribution Lines	21,717	km
Transmission Lines	6,868	km

Exporting and Importing Capacity		
Export Capacity	2,538	MW
Import Capacity	2,448	MW

Number of Customers	
Direct Customers	379,148
Indirect Customers	46,365
Total Customers	425,783

NB Power2023 Integrated Resource Plan

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NB Power's Current state and Demand Forecast

- **Total Debt (2025):** ~$5.7 billion
- **Debt-to-Equity Ratio:** 94%

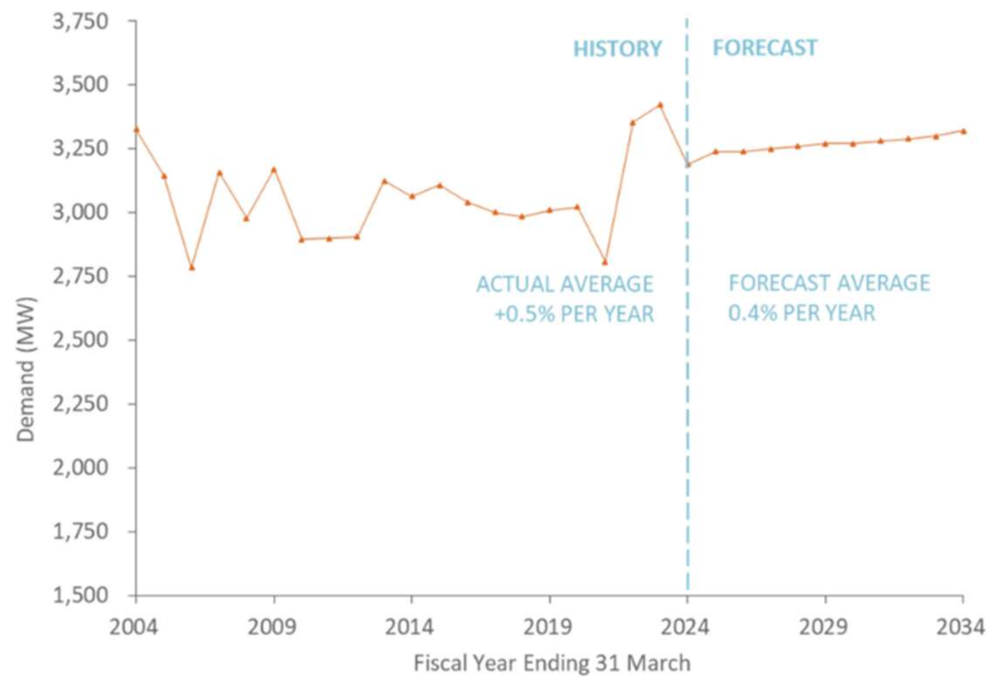
Rate increases:

- April 2023: +4.8 % net (includes a variance-account credit)
- April 2024: +13.2% (includes a variance-account charge)
- April 2025: +9.7 % + VAR (~0.41¢/kWh)
- April 2026: 4.75% proposed

Upcoming big expenses

- $7.5-9 billion for fixing Mactaquac
- $75 million to OPG to help with Lepreau
  - 2024–25 planned outage carried replacement power costs ≈ $1 M/day (operating cost, not capex)
- $$$ Still don't know the price of SMRs
- Belledune conversion from coal to biomass

Figure 2: Annual Demand Forecast



Available on EUB website: LOAD FORECAST 2024–2034 Prepared by NB Power Strategic Planning | November 2023

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What is RIGS? (Renewable Integration & Grid Security)

- **Project Overview:** RIGS = **Renewable Integration and Grid Security** project. A proposed **400–500 MW generating station** near Centre Village (Tantramar).
- **Technology:** It will use **eight to ten aeroderivative gas turbines** (small jet-engine-based generators) with **dual-fuel capability** (natural gas as primary fuel, with diesel as backup).
- **Fast-Start Peaker:** These turbines are "**fast-starting"** (compared to what?) and will operate mainly as **peaking units** – providing power during high demand periods or when other sources (wind/solar) are insufficient.
- **Grid Support:** RIGS also includes **grid-stabilizing synchronous condensers** (explained later, <u>can be built without RIGS</u>) to support voltage and frequency stability.
- **Timeline & Operator:** NB Power has contracted a **U.S. firm**, ProEnergy, to **build, own, and operate** RIGS under a 25-year agreement. Target operation start: **2028**.

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Why is NB Power Proposing RIGS Now?

- **Impending Capacity Shortfall:** NB Power's planning studies identified a **generation capacity gap by 2028** – meaning without new resources, they might not meet peak demand around that time. This is accelerated from earlier forecasts (shortfall originally expected in the 2030s, but demand growth moved it up).

- **Retirement of Coal by 2030:** The 450 MW Belledune coal plant must cease coal burning by 2030 (federal mandate). Switching from coal to a biomass plant.

- **Reliability & "Energy Security":** NB Power stresses the need for **reliable backup power** as it adds intermittent renewables. They cite other grids' issues when "too much renewable" was added without firm backup. RIGS is presented as an "insurance policy" to keep the lights on when wind/solar can't.

- **Replace Aging Oil Units:** NB has some old oil-fired peaker units that are expensive and high-emitting. RIGS's modern turbines would displace heavier GHG generators (NB Power says it will reduce use of older oil units, thus cutting emissions in the short term).

- **Fuel Flexibility & Transition Narrative:** By being dual-fuel (and possibly hydrogen-capable later), NB Power frames RIGS as a "transitional" asset.

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Meeting Demand: Supply vs. Demand Management

- **Supply Management:** Traditional approach – **build more generation** to meet peak demand. Examples: new power plants (gas, nuclear, wind farms) or buying more power from neighbors.

- **Demand Management:** Modern approach – **shape or reduce demand** so it fits existing supply. Examples: energy efficiency (better insulation), demand response (shifting usage to off-peak times), and peak pricing.

- **Peak Demand Challenge:** The grid must be sized for the **highest peak hours** of the year (often a few cold mornings). Supply-side builds (like RIGS) target those peaks, but demand-side solutions can shave peaks too.

- **Balanced Strategy:** Most systems use both approaches. Here we'll weigh NB Power's supply-side proposal (RIGS plant) against demand-side and alternative supply options (batteries, renewables, imports).

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How the Power Grid Works: Baseload and Peaks

- **Baseload Power:** The minimum level of demand that's always there (e.g. overnight). Baseload plants run continuously at steady output. In NB, Point Lepreau nuclear and major hydro dams provide baseload.

- **Peak Power:** Spikes in demand above baseload, usually in the morning or evening. Requires flexible sources that can start up quickly. Historically, met by gas turbines or oil-fired generators that run only during peaks; however, modern technologies are **faster** than these traditional methods.

- **Intermediate Load:** Demand between base and peak. Often met by plants that can adjust output (e.g. gas combined-cycle, imports, or dispatchable hydro).

- NB Power frames RIGS as a **peak and intermediate load plant** – a "load-following" station that ramps up when demand is high or when renewables are low.

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How Does RIGS Work?

- **Aeroderivative Gas Turbines:** Essentially **industrial jet engines** connected to generators. They intake air, mix with fuel, and spin a turbine to produce electricity. Aeroderivative units are compact and can start rapidly (minutes,) compared to large power plants, but faster technologies exist.

- **Dual-Fuel Operation:** RIGS turbines can burn natural gas or switch to diesel oil as needed. In future, NB Power claims they could even use hydrogen or biofuel when/if those become viable, but no cost analysis or viability studies have been done on this.

- **Peaker plant:** The plant will typically be **off-line** in low-demand times, then **fired up** when demand surges or a shortfall occurs.

- **Load-Following:** Unlike steady baseload plants, RIGS can throttle up or down to follow the load. NB Power says it will fill gaps “when the wind isn’t blowing or sun isn’t shining.”

- **Grid Connection:** The chosen site is near existing transmission lines and a gas pipeline, minimizing new infrastructure. This helps RIGS feed power into the grid efficiently and get fuel supply.

RIGS Project Cost Summary

- **Capital Cost (Construction & Equipment):**
  - Estimated at **$230 million to $300 million CAD**
  - Covers the 400–500 MW dual-mode aeroderivative gas turbines and synchronous condenser infrastructure
    - Source: Brattle Report, Amended NB Power Application (2025)
- **Operational Costs (Annual, Ongoing):**
  - Includes staffing, maintenance, insurance, fuel delivery, and auxiliary power needs
  - **Not precisely disclosed** due to confidential tolling agreement terms
  - Fuel costs (natural gas and diesel) will be passed through to NB Power
  - Estimated to be in the **tens of millions CAD annually** over the 25-year contract
- **Tolling Agreement Total Obligation:**
  - NB Power will pay **fixed capacity payments** to RIGS Energy Atlantic LP, whether or not the plant runs
  - Over 25 years, this could total **over $750 million to $1 billion CAD,** depending on annual usage, inflation adjustments, and escalation clauses
  - Exact numbers are **confidential,** but redacted versions confirm it exceeds public ownership cost by up to **$184 million**

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Grid Stability and Inertia: Why Now an Issue?

- **Inertia Basics:** A power grid's frequency (60 Hz**)** is like a spinning flywheel shared by all generators. Traditional plants have large spinning rotors that provide inertia, naturally resisting sudden frequency changes (helping ride through disturbances).
- **Renewables & Inverters:** Wind turbines and solar farms often use power electronics that decouple the mechanical inertia from the grid, or have much less rotating mass. As coal and oil plants retire and more inverter-based resources come online, the grid's total inertia drops.
- **Resulting Concern:** Lower inertia means the grid frequency can change more rapidly after a disturbance, risking blackouts if not corrected quickly. Similarly, maintaining voltage becomes trickier without the reactive power support of big generators.
- **NB's Context:** NB Power anticipates adding lots of **wind power (1,400 MW by 2035)** and possibly retiring its last coal unit.
- **Recent Example:** Regions with very high renewables (e.g. parts of Australia) have seen a need for extra stability measures. Australia found that adding **battery storage and synchronous condensers** could replicate the stabilizing effect of traditional plants.

Grid-forming batteries and multiple SynCon to underpin NSW transition – pv magazine Australia

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What Are Synchronous Condensers?

- **Definition:** A **synchronous condenser** is essentially a **big electric motor/generator** that spins freely without driving a load. It can consume or produce reactive power to control grid voltage, and its spinning mass provides **inertia** to stabilize frequency.
- **Function in Grid:** Synchronous condensers **stabilize the grid** by automatically adjusting voltage (through reactive power) and by resisting rapid frequency changes (the heavy rotor's inertia slows down any frequency swings).
- **Why Needed:** Traditional generators (coal, hydro, etc.) had large rotating masses that naturally stabilized the grid. As we shift to inverter-based sources (wind, solar, batteries), we lose that inherent inertia. Condensers restore stability without burning fuel.
- **RIGS's Condensers:** The RIGS plant will include synchronous condenser units to "balance the volatility" of wind/solar. Even when the gas turbines are off, the **condensers can be kept spinning 24/7**(using a small fraction of power) to provide **voltage support and inertia** to the NB grid.
- **Placement:** Importantly, synchronous condensers can be installed **anywhere on the grid** (e.g., substations). They do **not** require a gas turbine plant – you could add a standalone to boost stability if needed, it's a modular grid support device. So we should weigh ***if*** we need the **gas-burning part** of RIGS, or just the stability part (which could be done separately).

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Criticisms of RIGS

- **"20th Century Technology":** Energy experts argue NB Power is **looking backward**. A 25-year commitment to a new fossil gas plant could become a **stranded asset** as cleaner tech rapidly advances. *"Obsolete before it pays for itself,"* warns Ralph Torrie of Corporate Knights.

- **Fossil Fuel Lock-In:** Critics note that building a gas plant now **locks in carbon emissions** for decades, undermining the push for a net-zero grid. There's skepticism of calling it a "renewable integration" project since fracked gas is neither renewable nor clean (methane leakage is a potent climate issue).

- **Financial Risk:** If industrial carbon pricing rises or regulations tighten, a gas plant might face high operating costs or early shutdown. Meanwhile, costs for renewables and storage are falling every year, potentially making the gas plant uneconomical long before 2050.

- **Underutilization:** RIGS might run only a few hundred hours a year, meaning NB Power would be paying capacity costs year-round for an asset mostly sitting idle. Some argue investing those funds in storage or efficiency could cover peaks without a large idle plant.

- **Local Impacts:** Community and environmental groups worry about **local effects** – the plant would emit air pollutants (NO_x, CO_2) and is sited near wetlands and wildlife corridors. There's also frustration over lack of early consultation with the Tantramar community about the project

[2 energy experts question N.B. Power plans for large gas plant | CBC News]

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Battery Energy Storage Systems (BESS)

- **How Batteries Help:** Utility-scale batteries can **store excess energy** (e.g., wind at night) and release it during peaks. They react in **milliseconds** to grid needs, providing fast frequency response and voltage support.

- **Dispatchability:** Batteries are instantly dispatchable – operators can use them to deliver full power almost immediately, much faster ramping than any turbine. They've been called the **"new baseload"** when paired with renewables, as they can make renewable output available on demand.

- **Duration:** Typical lithium-ion battery projects deliver 1–4 hours of full output. For example, a 100 MW, 400 MWh (4-hour) battery could handle a **4-hour peak period** each day.

- **Projects & Costs:** Costs have fallen dramatically. BloombergNEF estimated a 400 MW, 6-hour (2400 MWh) battery at about **$390 million** in 2025. That's far cheaper per MW than the ~$1.4 billion for RIGS, especially since batteries have no fuel costs.

- Real-world: Ontario's Oneida is a 250 MW / 1,000 MWh battery storage facility deployed ahead of schedule. Ontario committed to nearly 3,000 MW of batteries by 2030; **Maine studied** and found batteries could meet peaks as effectively as gas, at lower cost.

Canada's largest battery storage facility opens ahead of schedule – The Environment Journal

4-hour batteries best replacements for aging Maine peaker plants: study | Utility Dive

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Cost Comparison — RIGS vs BESS

Metric	RIGS (Gas Turbines)	Battery Storage (BESS)
Capital Cost	$230–300M (est.)	~$400–500M (400MW/1600MWh)
Operating Costs	High (fuel + O&M)	Very low
Emissions	Fossil fuel GHGs	None
Start-up Time	~10 minutes	<1 second
Lifespan	25 years	20–25 years
Grid Inertia (resistance to sudden frequency change)	spinning mass → slow mechanical inertia	synthetic inertia via grid-forming inverters
Net-Zero Compliant?	❌	✅

Can This Be Built in Canada, By Canadians?

- **YES: Canadian companies are building BESS today**
- *Hydro-Québec*, *Ontario IESO*, *BC Hydro* are deploying battery storage
- *NRStor*, *Convergent Energy*, *Hydrostor* = Canadian firms
- Construction & integration can be **100% local jobs**
- Canada has EV battery plants → Supply chain is here
- Saint John Energy put in a smaller 1.25 MW / 2.5 MWh battery to help integrate a local wind farm. So, these aren't hypothetical – utilities are deploying them now to replace or avoid peakers.

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[The Tesla Mega Pack - Saint John Energy]

Complementary Alternative: Demand-Side Management (DSM)

- **Peak Shaving via Smart Control:** By slightly adjusting when thousands of devices consume power, we can reduce the peak load without affecting comfort. For example, cycling electric water heaters so they don't all run at peak could save up to 1,000 MW (!) if fully adopted in NB. Even partial participation yields big reductions.

- **Time-of-Use Incentives:** Offering cheaper rates at off-peak times (and higher at peak) encourages consumers to shift discretionary usage. Smart EV chargers can delay charging until overnight; with 3,500 EVs today, that's ~35 MW of peak reduction possible, and could be >500 MW when 10% of vehicles are EVs.

- **Energy Efficiency:** Reducing overall demand through insulation, efficient appliances, etc. While efficiency lowers usage all the time (not just peaks), it especially helps in peak hours (e.g., better-insulated homes draw less heat on cold evenings).

- **Cost-Effectiveness:** DSM measures are often **cheaper per kW** than building new supply. A $150 smart water heater controller can yield a few kW of peak reduction, which on a per-kW basis is far less expensive than a new power plant.

NB Power 2023 Integrated Resource Plan (IRP), Appendix G: *"Toward a Future-Ready Resource Adequacy Framework for New Brunswick Power"* (prepared by E3).

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Conclusion: Making the Smart Choice for Tantramar's Future

Why BESS Is Better Than RIGS

⚡ **Faster**: Batteries respond in milliseconds — gas turbines take minutes

🌱 **Cleaner**: Zero emissions vs. 25+ years of fossil fuel from RIGS

🔁 **Flexible**: Modular, scalable, and relocatable — unlike fixed gas infrastructure

💰 **Cheaper over time**: No fuel costs, low maintenance, and falling battery prices

🧠 **Smarter**: Supports renewables, enables demand response, and grid automation

CA **Canadian-made**: Built by Canadian firms, supporting local jobs and innovation

📈 **Future-proof**: Aligns with NB's net-zero 2035 goal — RIGS locks in fossil dependence until 2050+ and risks $1.4Billion stranded asset risk

Bottom line: Batteries do everything RIGS claims to — but faster, cleaner, and with no long-term climate cost.

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Let's not forget the environmental concerns of RIGS…

Location: Chignecto Isthmus

- Ecologically critical land bridge between Nova Scotia and New Brunswick, serving as a key wildlife corridor.
- Proposed development would fragment habitat and disrupt species migration.

Habitat Loss and Species at Risk:

- Project would destroy **~14 ha (≈50 acres)** of wetlands and Acadian forest, vital carbon sinks and habitats.
- At least **9 bird species at risk** identified, including Common Nighthawk, Olive-sided Flycatcher, Barn Swallow, Bobolink, Bank Swallow, and Rusty Blackbird (Special Concern).
- **Black Ash (Threatened)** trees also present in wetlands.
- Area supports breeding and migration; habitat loss would be severe.
- **Moose Corridor:** Located within a critical moose migration route, adding further habitat disruption.

Water Impacts: Plans to extract **up to 7,000 m³/day** of groundwater—well beyond local use.

Turbine wastewater may alter wetland salinity, harming aquatic life.

Diesel Storage and Spill Risk: On-site storage of **11+ million liters** of diesel poses major fire, explosion, and contamination hazards. No adequate emergency or spill response plan provided.

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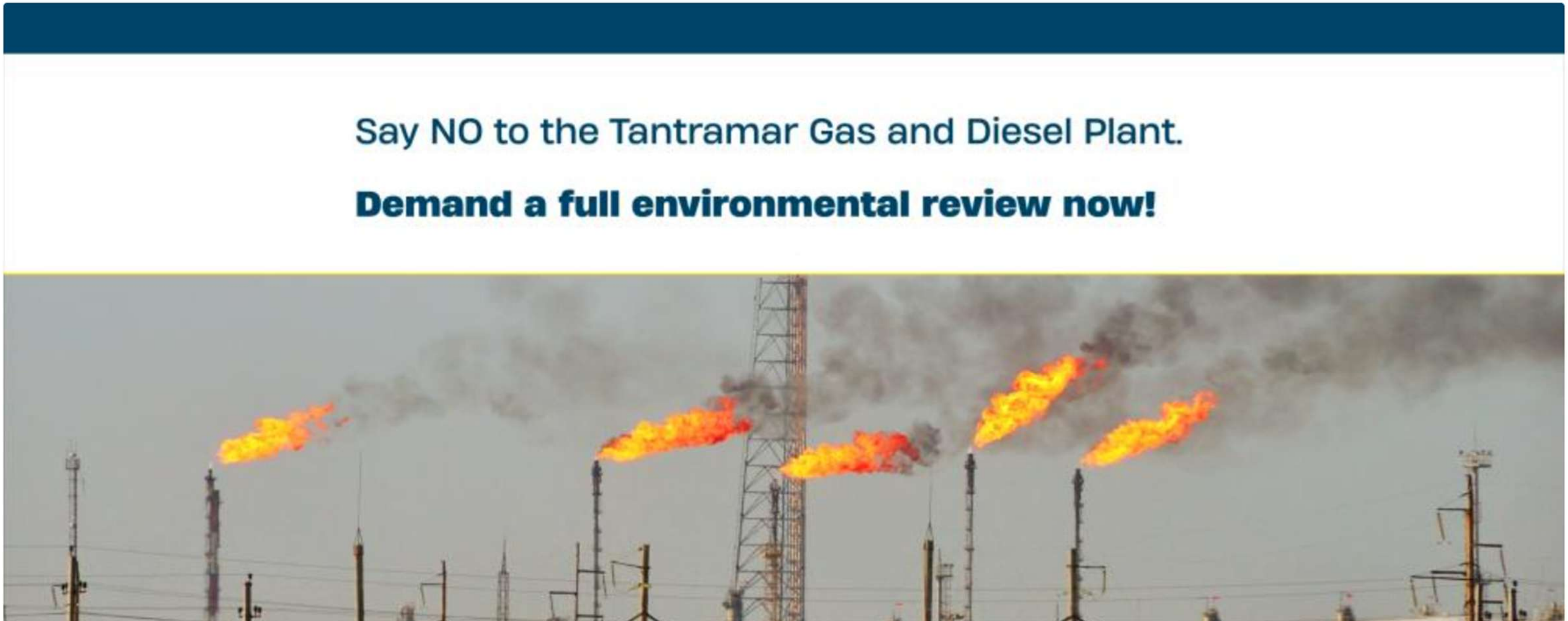
Powering the Future Responsibly - Demand A Full Environmental Review for the Diesel/Gas Power Plant in Tantramar



[Sign-on Letter for a Comprehensive Review of the RIGS plant]

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