

How Can Mines Displace Diesel Today?

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intelline

Introduction

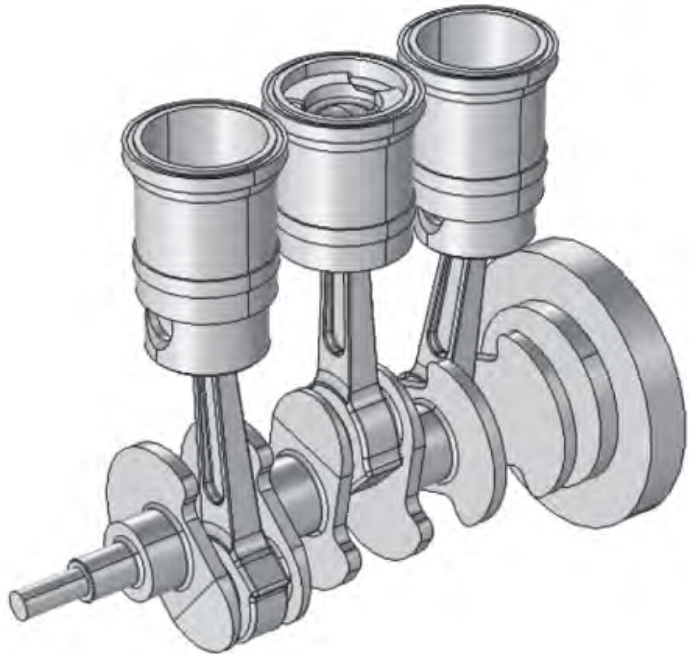


- Industrial Generators and Mines Today
- Intelline Modular Linear Generator
- Fuel Savings Example Comparison Case
- Future Generator Fuels and Usage

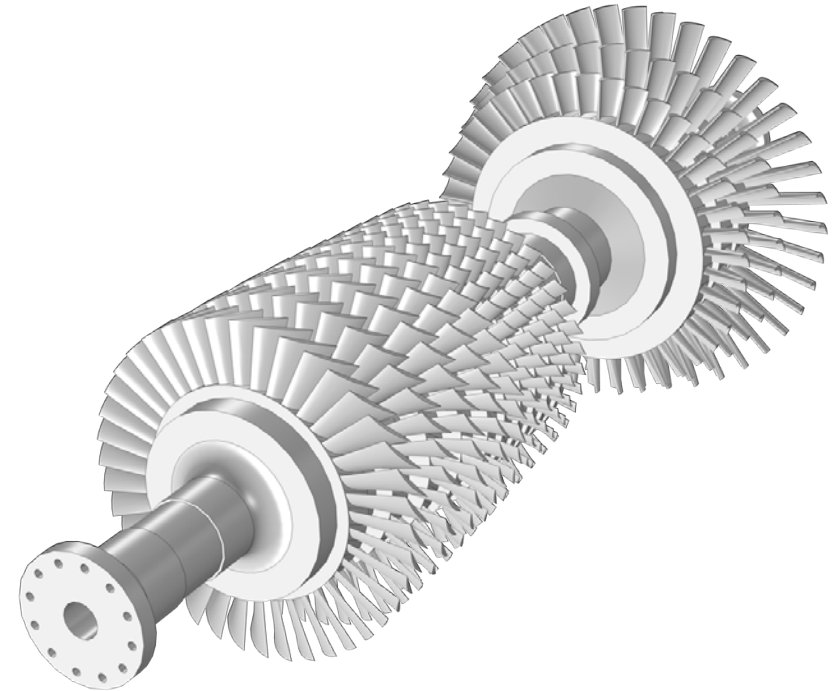
Industrial Generators and Mines Today



Piston Generators



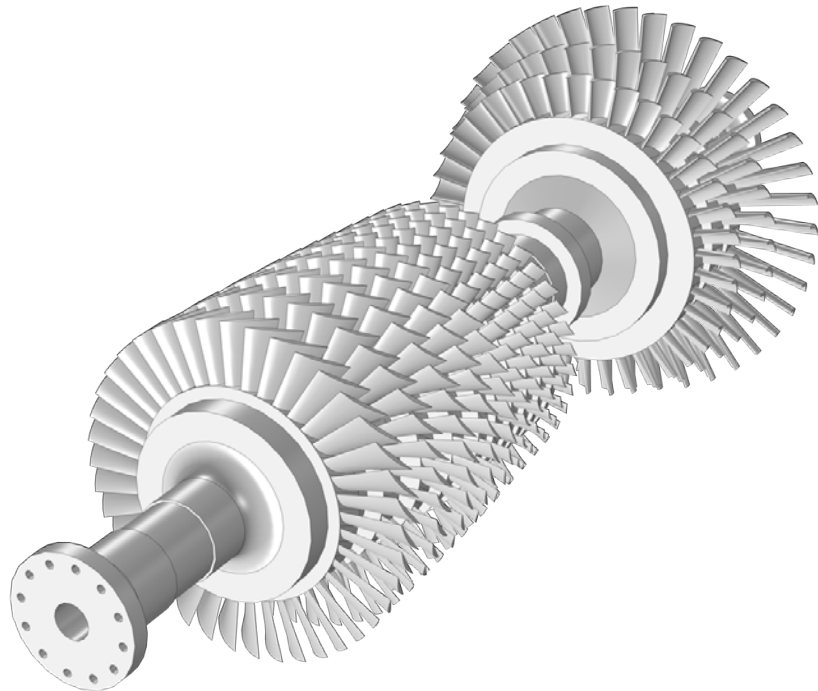
Turbine Generators



Piston Generators

- Relatively Simple
- Good for wide range of power demand
- Common maintenance
- ~30-35% efficient
- Many moving parts, frequent maintenance
- Poor load matching

Industrial Generators and Mines Today



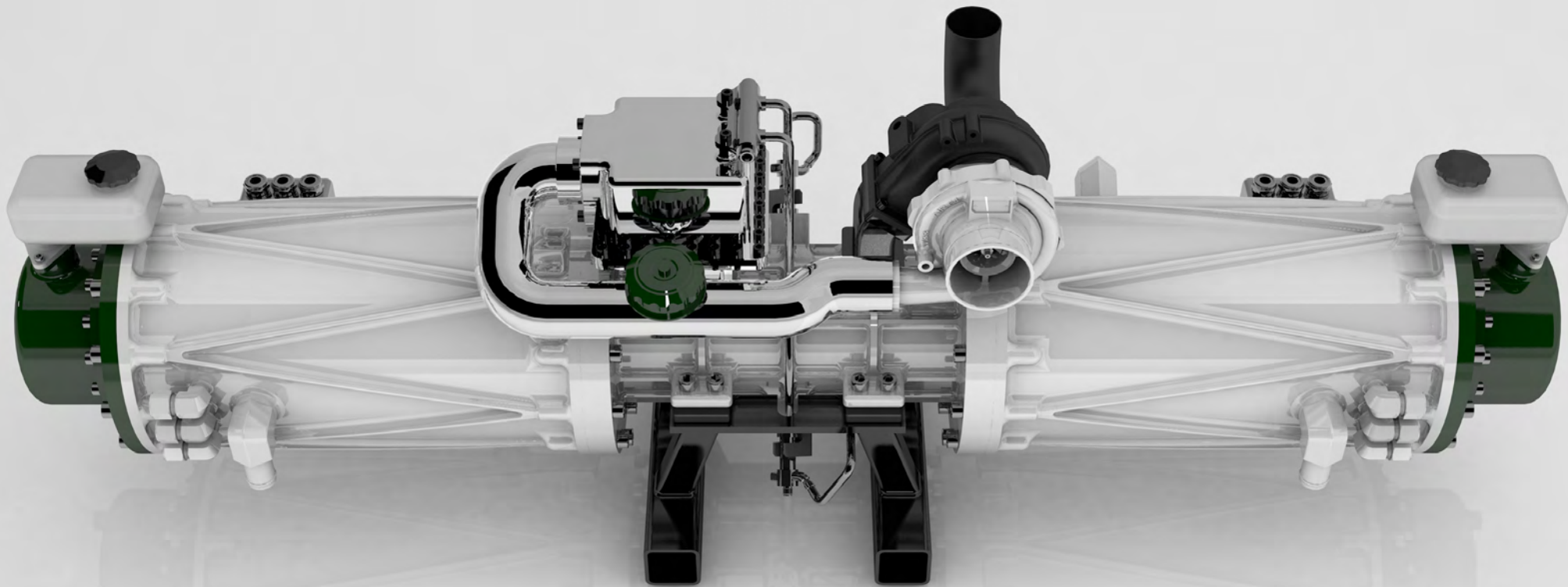
Turbine Generators

- Complex
- Good for very high power demands
- 30-40% efficient

Intelline MLG



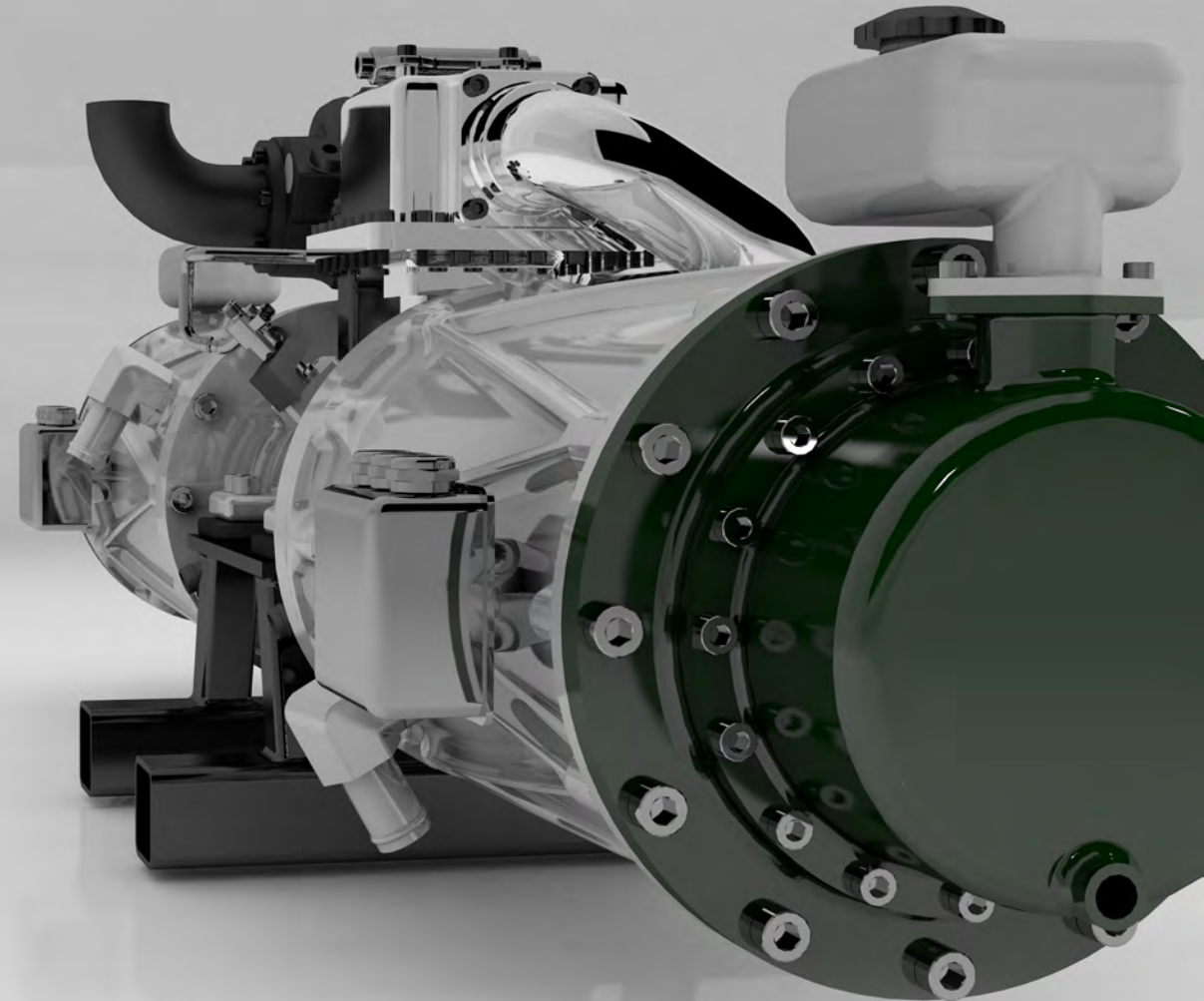
Modular Linear Generator (MLG)



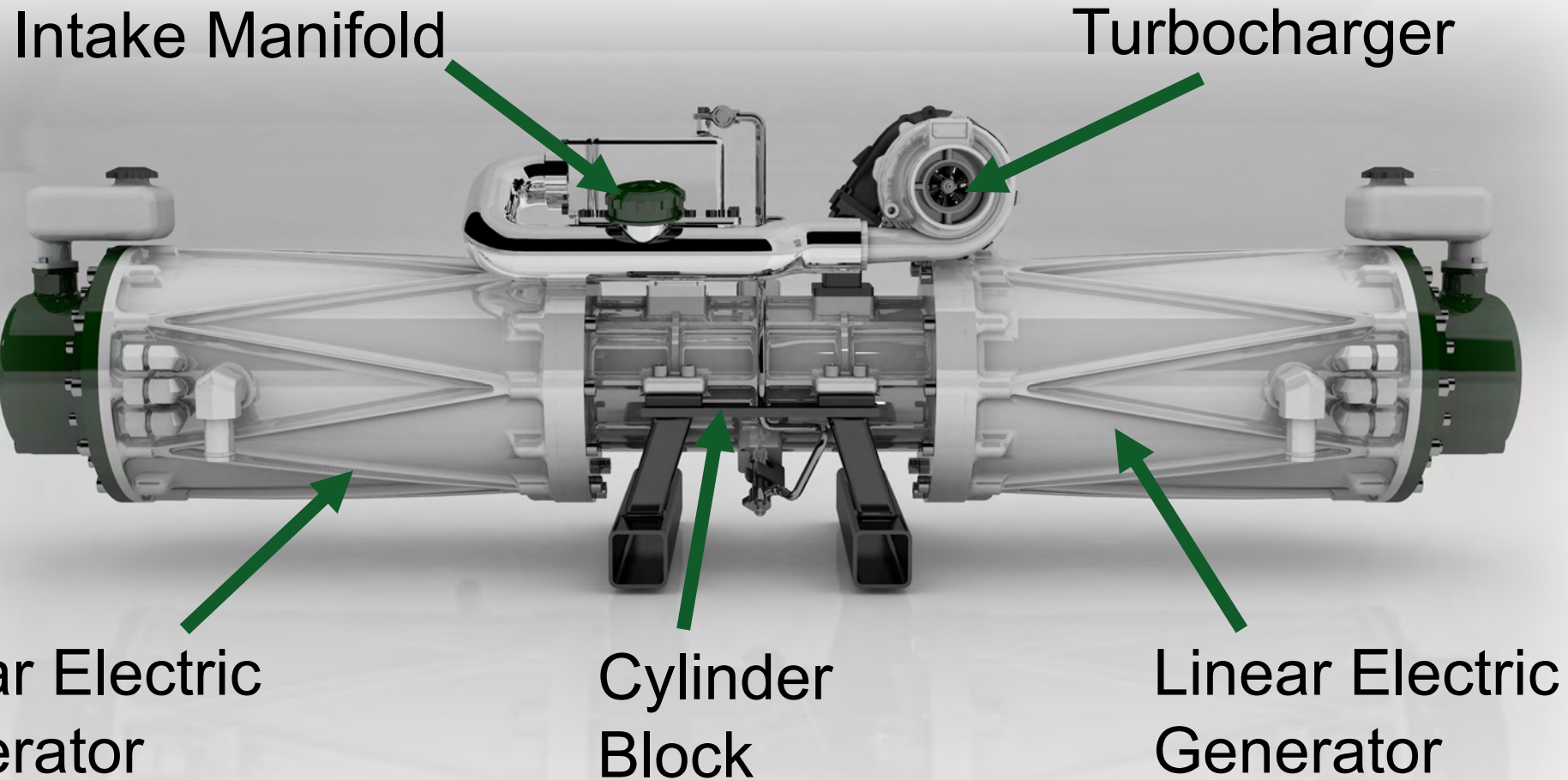
Intelline MLG



- Simple Piston Engine,
Few moving parts
- 50% efficient
- Excellent Load
Matching



Intelline MLG



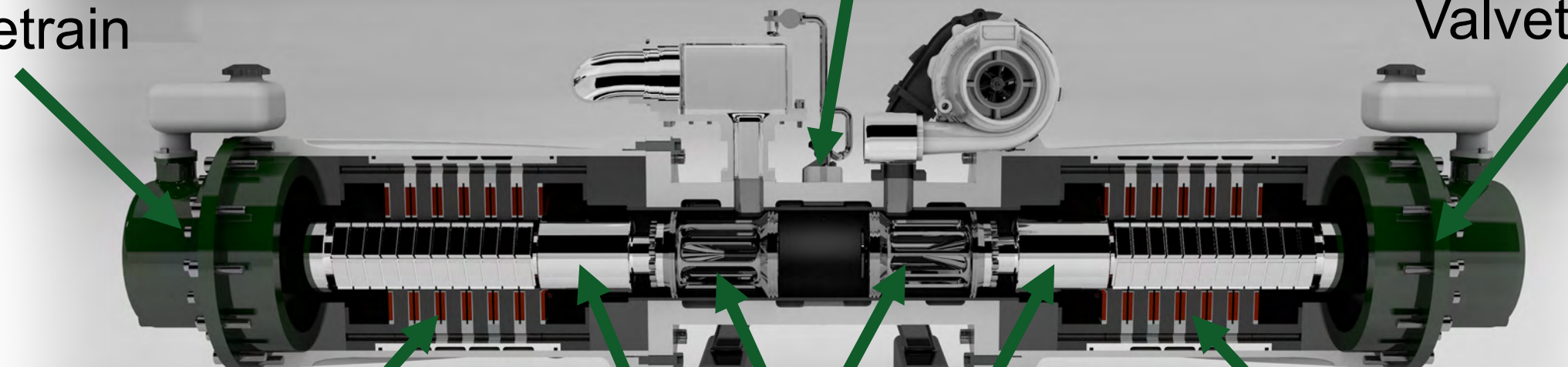
Intelline MLG



Hydraulically Actuated Valvetrain

Fuel Injector

Hydraulically Actuated Valvetrain



Linear Electric Generator

Pistons

Linear Electric Generator

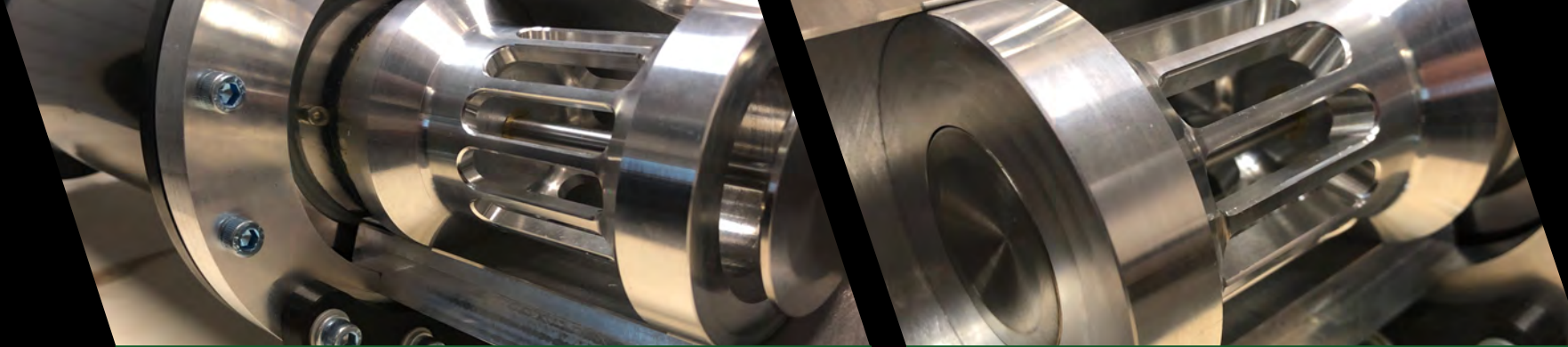
Movers



4 proven strategies to eliminate loss

Unprecedented Variability

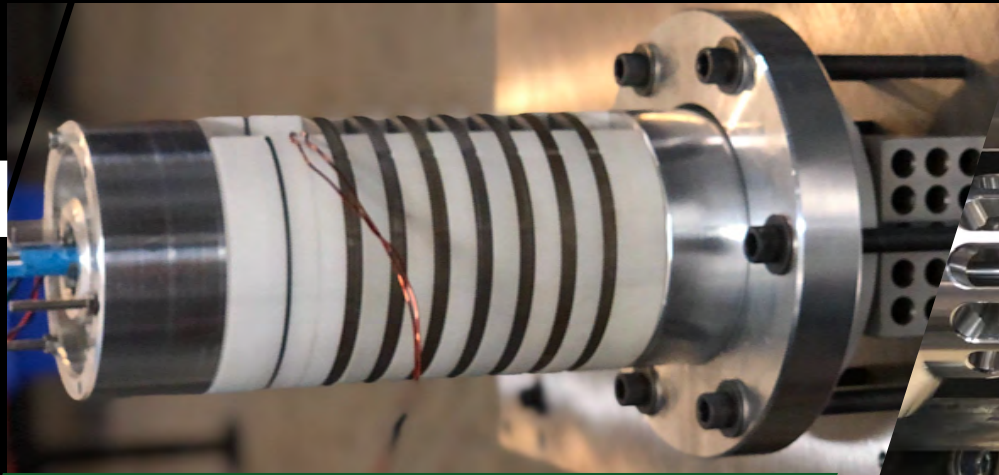
- Adapts to changing conditions



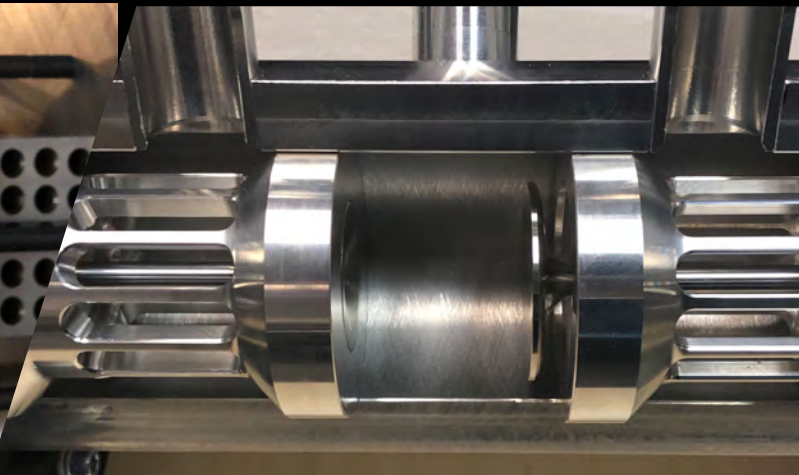
Variable 4-stroke valve control (10%)



Variable displacement (10%)



Linear engine (8%)



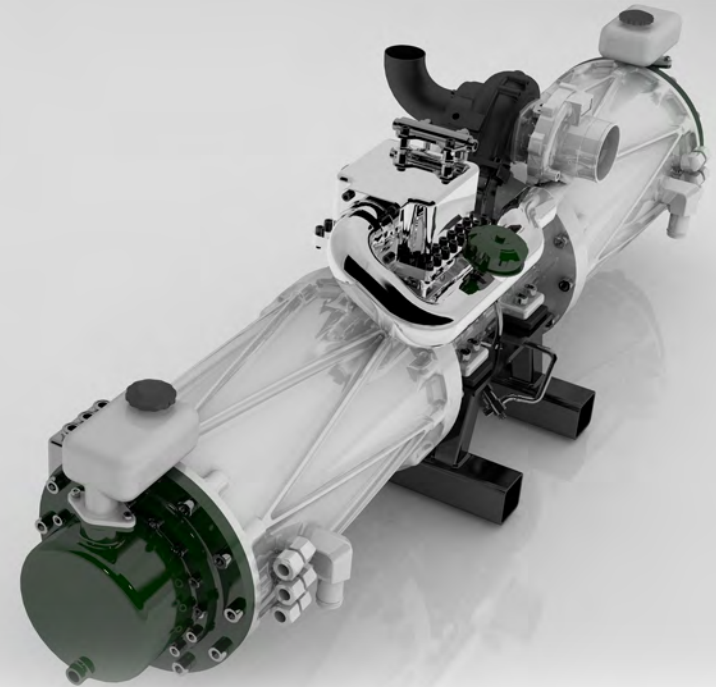
Opposed piston layout (12%)

Intelline MLG



1

**Module
Generator
(50kW)**

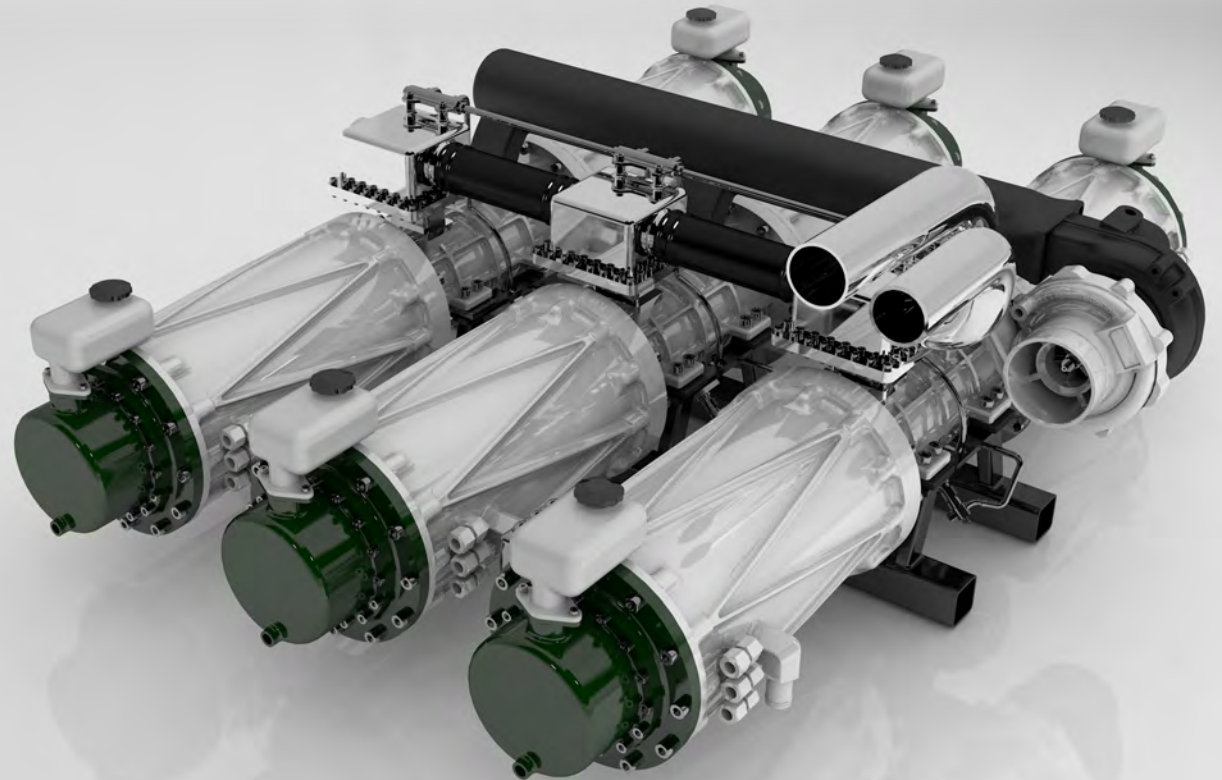


Intelline MLG



3

**Module
Generator
(150kW)**



Fuel Savings Comparison Case



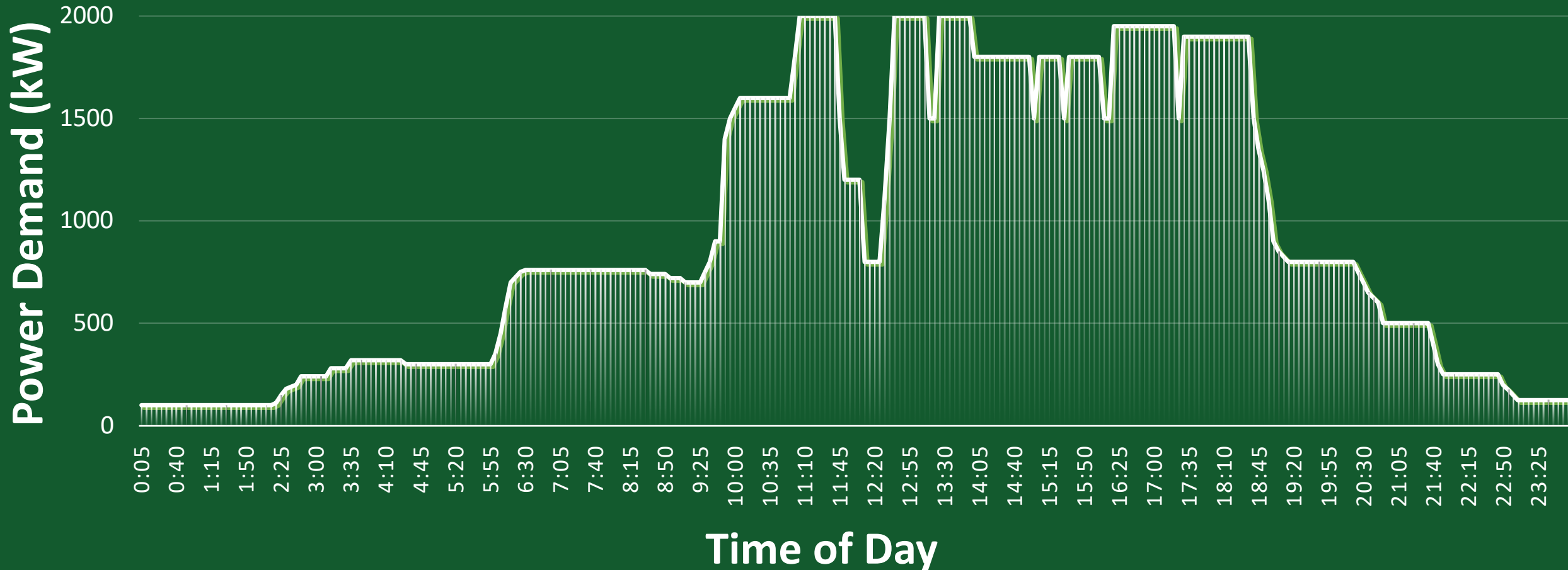
Example Case

- Example load curve for 24h
- \$0.40/L Used as price for diesel fuel
- Modern 2MW Prime use Industrial Generator used for comparison
- 1 year considers 365 days of operation

Fuel Savings Comparison Case



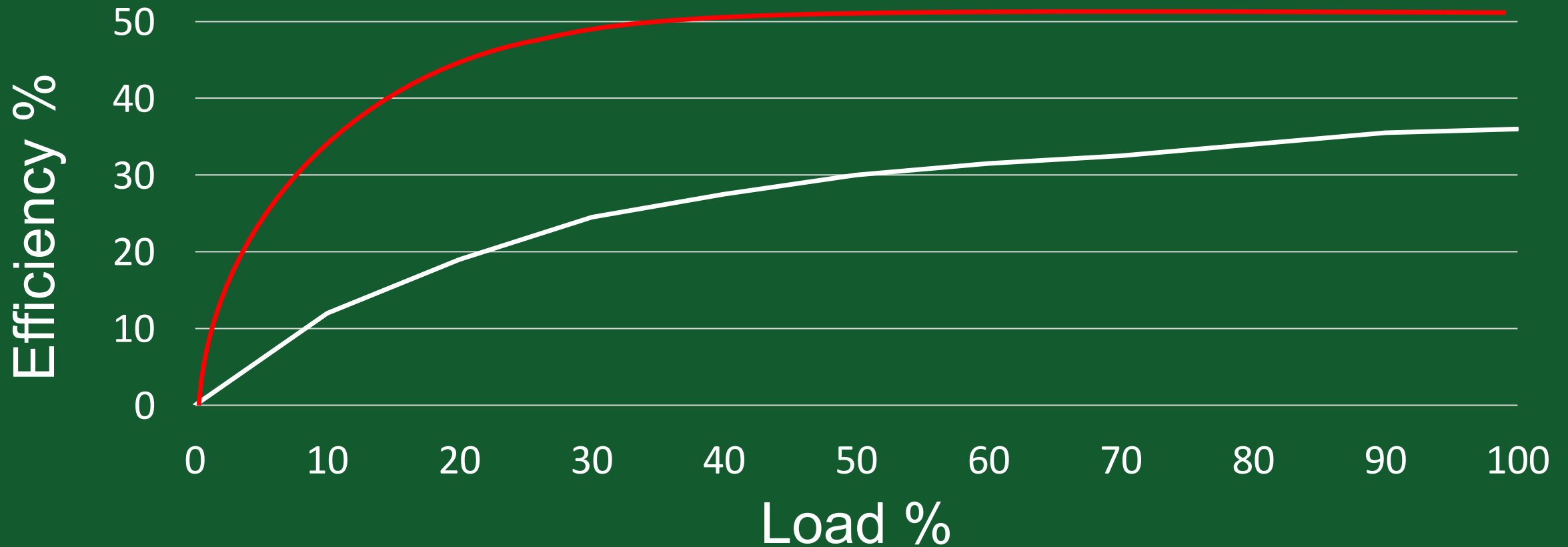
2MW GENERATOR 24H LOAD CURVE



Fuel Savings Comparison Case



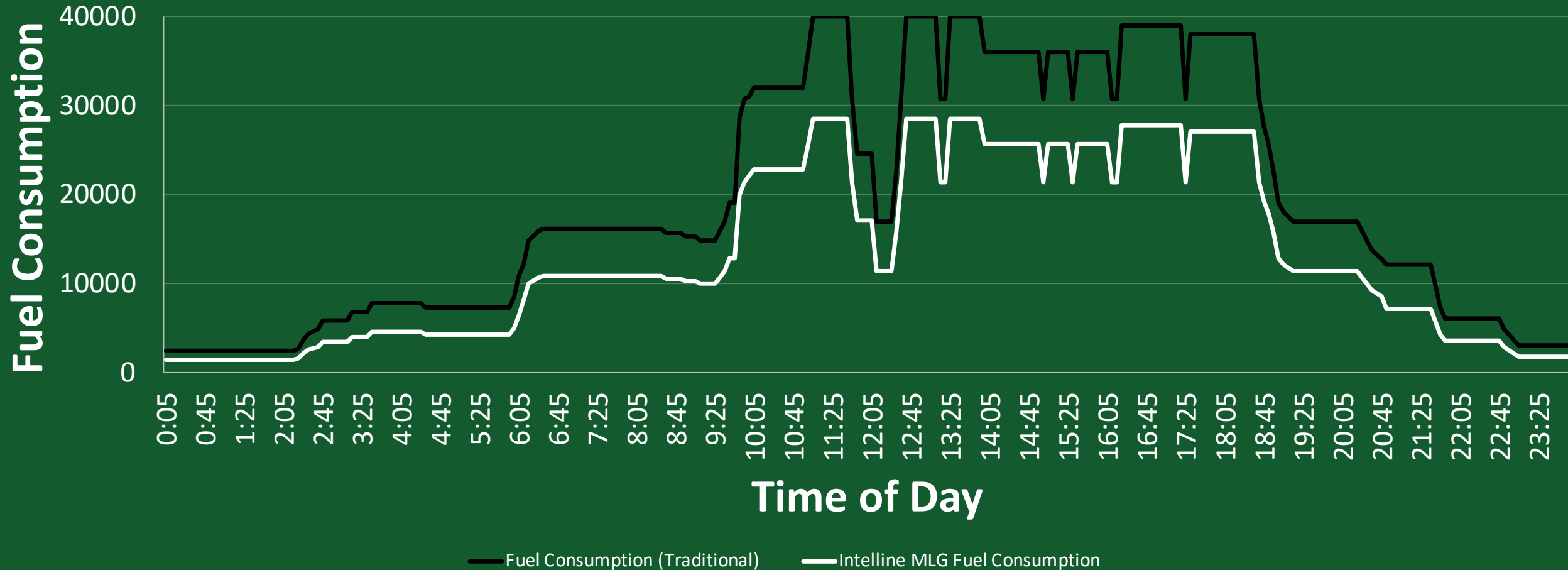
Efficiency Curve of a Diesel Generator



Fuel Savings Comparison Case



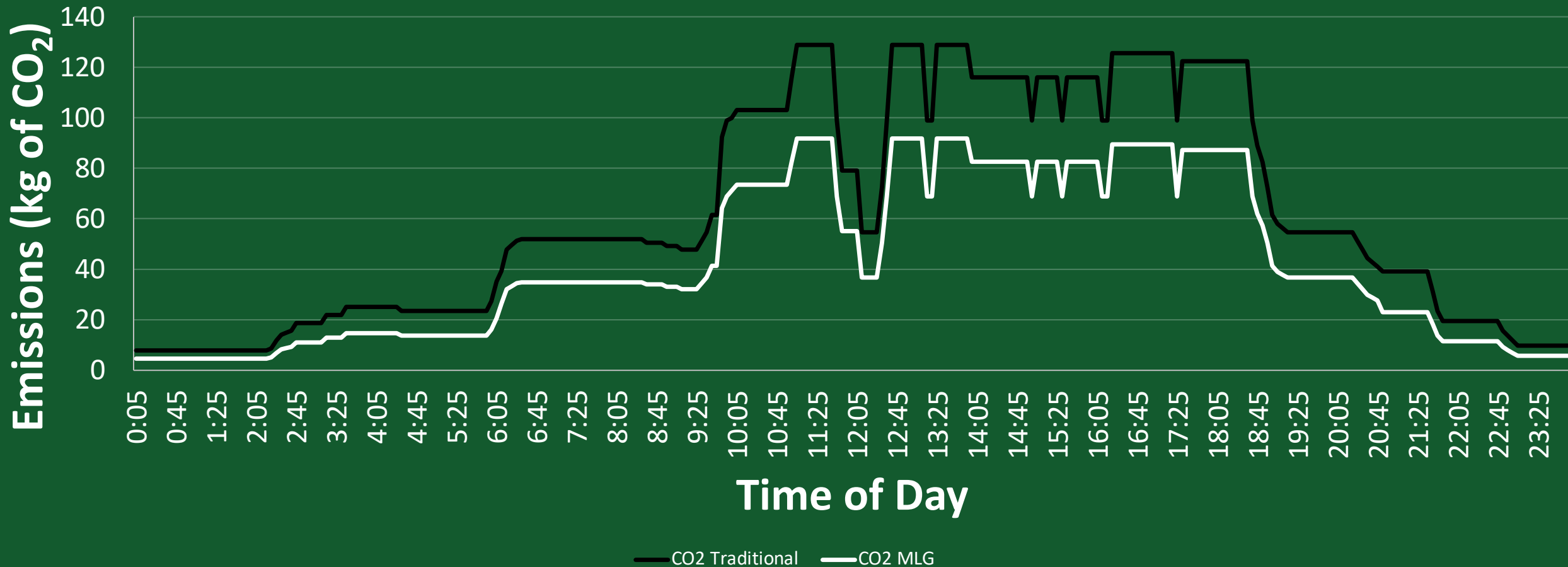
FUEL CONSUMPTION COMPARISON



Fuel Savings Comparison Case



CO₂ EMISSIONS COMPARISON



Fuel Savings Comparison Case



Period	Fuel Consumed (Traditional)	Fuel Consumed (Intelline MLG)
24h Volume	6654 (L)	4578 (L)
24h Cost	\$2,661.68	\$1,831.47
1 Year Cost	\$971,512.28	\$668,485.66

Difference: \$303,026.62 / year

Fuel Savings Comparison Case



Final Notes

- \$303,026 of fuel saved/ year in this case
- **Less than 3-year payback** period on new Intelline MLG System
- **2,030 Tonnes lower CO₂** emissions per year with diesel fuel (2.68kg CO₂/L)
- NO_x and PM emissions also lower than traditional generators due to better control over combustion process

Transitioning Away from Diesel

- MLG adaptive hardware makes it easy to tune for a wide range of fuel types (Diesel, natural gas, gasoline, propane, ethanol, etc.)
- Architecture well suited to multi-fuel systems and future retrofits (switch fuel types at any time)
- Biofuels and synthetic fuels involve carbon/GHG capture to create
- Transitioning to these fuels results in an energy solution closer to carbon neutral

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