Improve the fuel efficiency & CO2 emissions of your Diesel Generators

Bowman Power Group Ltd
Telephone. +44 (0)23 8023 6700

www.bowmanpower.com

Gensets widely used

And many other fixed or large mobile applications ...

Other Applications

Biomass / Biogas

Feed-in-Tariff Increase

Dredging

Diesel trains

Pumping Stations

Large Irrigation

Diesel expenses

Gensets expenses are in the fuel

Example

Typical Diesel genset 1500kVA / 1200kWe
(CAT 3512B, Cummins KTA-50...)

CAPEX ~ 0.3-0.5 M$

If running continuously @ 80% load with diesel @ 1$/litre

OPEX (fuel): 2M$ / year

At 6-8% typical savings:
120-160k$ / year*

*Fuel efficiency and savings depend on variables such as engine type, application, utilisation and fuel price

Energy losses

Fuel - IN
230l / h

Power Output
960kW

Frictions *13%*

Heat losses *22%*

Exhaust Gas *32%*

Losses
67%

Efficiency = 33%

Typical approximate values, do not reflect any particular diesel engine`

Increased efficiency

BOWMAN ENERGY RECOVERY SYSTEMS

Use less fuel, we keep your power at the same level

Fuel - IN
215l / h
230l /h

900kW

60kW

Power Output
960kW
960kW

Fuel saved
6-8%

Frictions
12% (13%)

Heat losses
20% (22%)

Exhaust Gas
28% (32%)

Losses
60% (67%)

Same Output

Efficiency = 40% (33%)

Typical values, do not reflect any particular diesel engine

Who we are?

- Bowman Power is a British private-owned technology company, based in Southampton (UK)
- Founded in 2004 by Tony Davies OBE, a former technology advisor to Margaret Thatcher
- In-house R&D, design, manufacturing & testing facility
- Demonstrated capabilities of up to 400 systems / year

What can we do for you ?

We use your exhaust gases to increase engine efficiency

6-8% Reduce Fuel Consumption

Payback (12-24 months)

OR

Increase power output *6-8%*

+

Reduce CO2 emissions

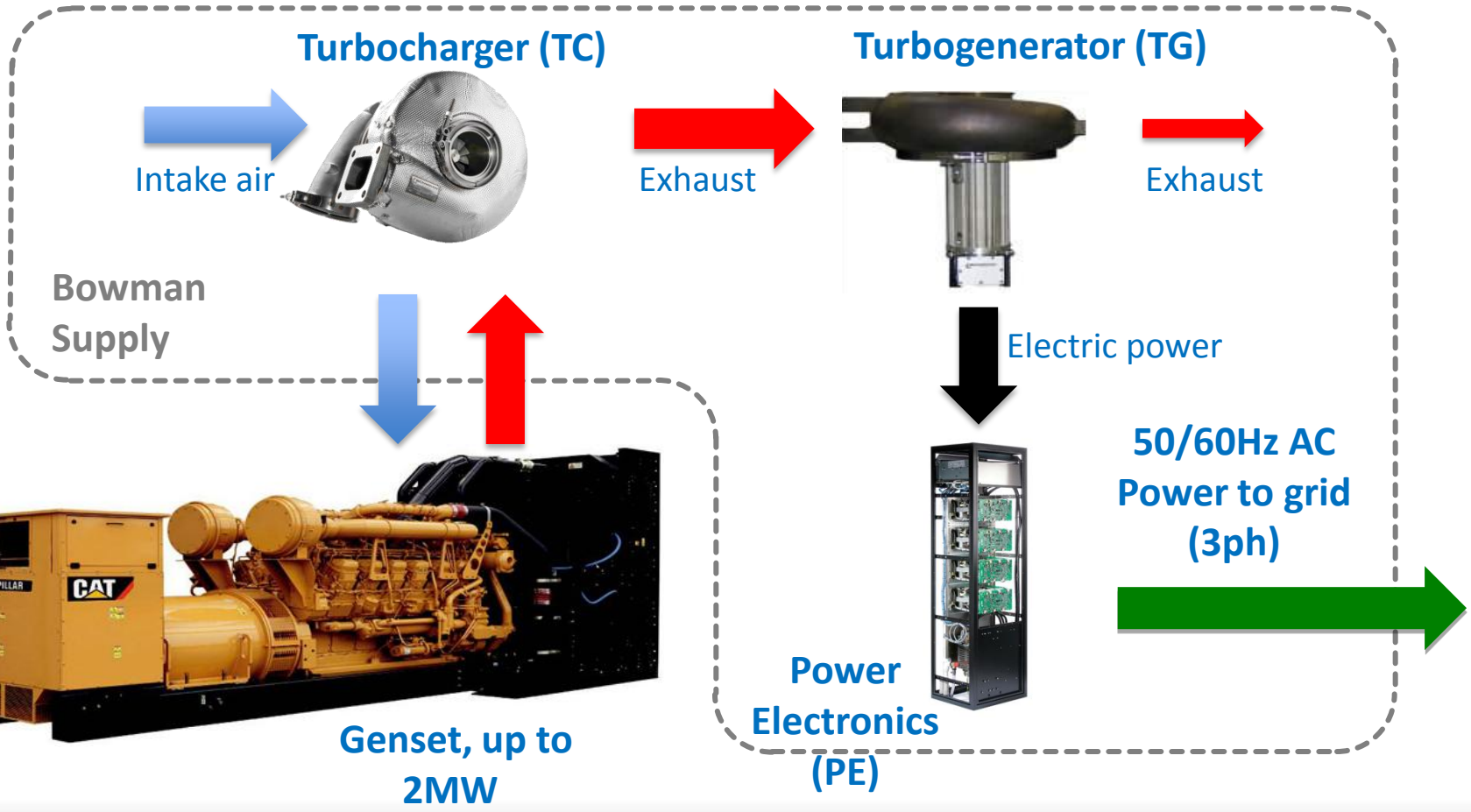
6-8%

No change in your operations

Quick installation, no extra activities

How does it work ?

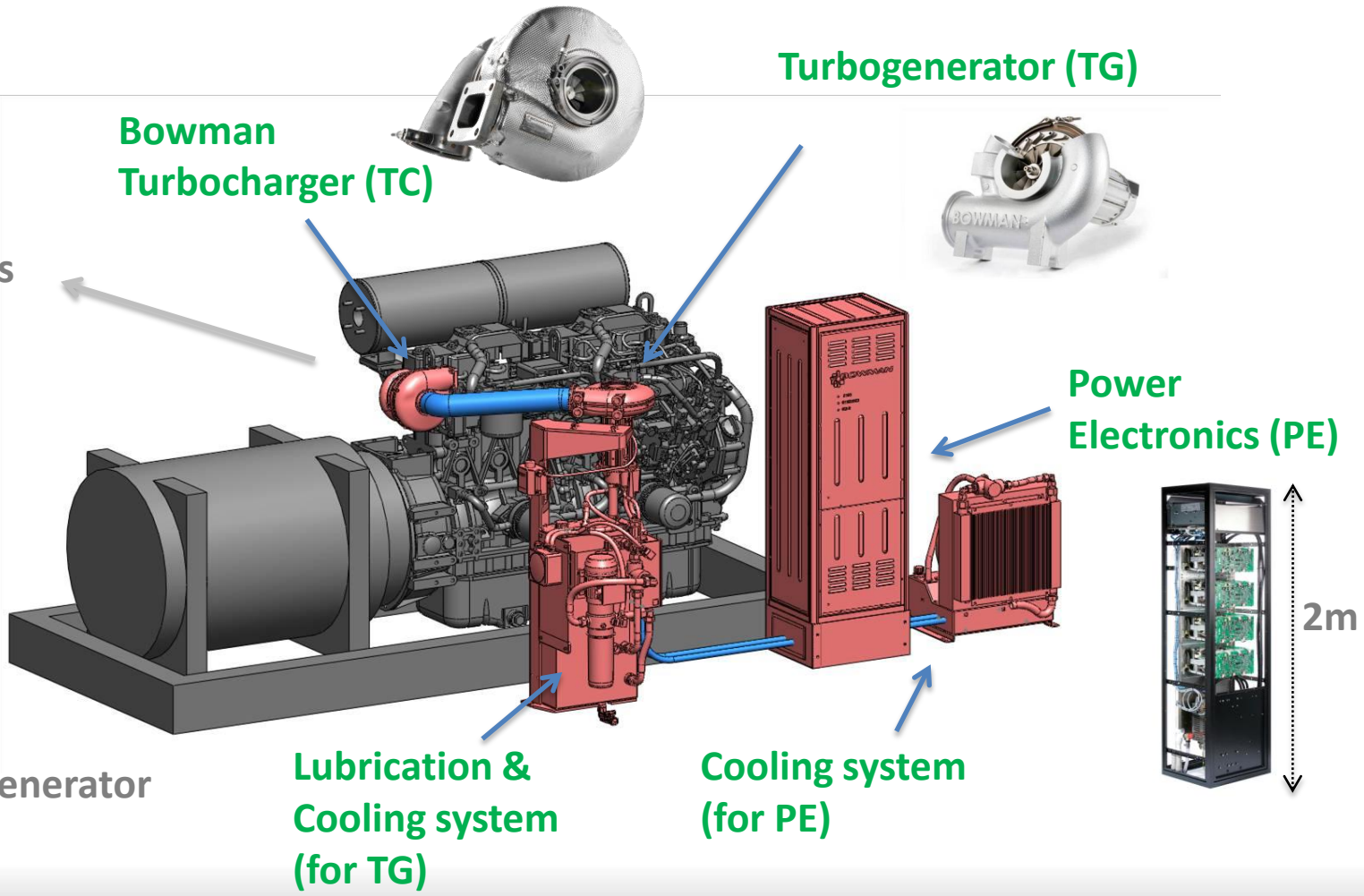
Recover electrical power from your exhaust



Note: We usually replace the existing turbocharger with a Bowman-designed, high efficiency, model, to optimise the match to the engine and turbogenerator

Bowman Equipment (1)

Bowman equipment & main sub-elements (200-700kW genset)



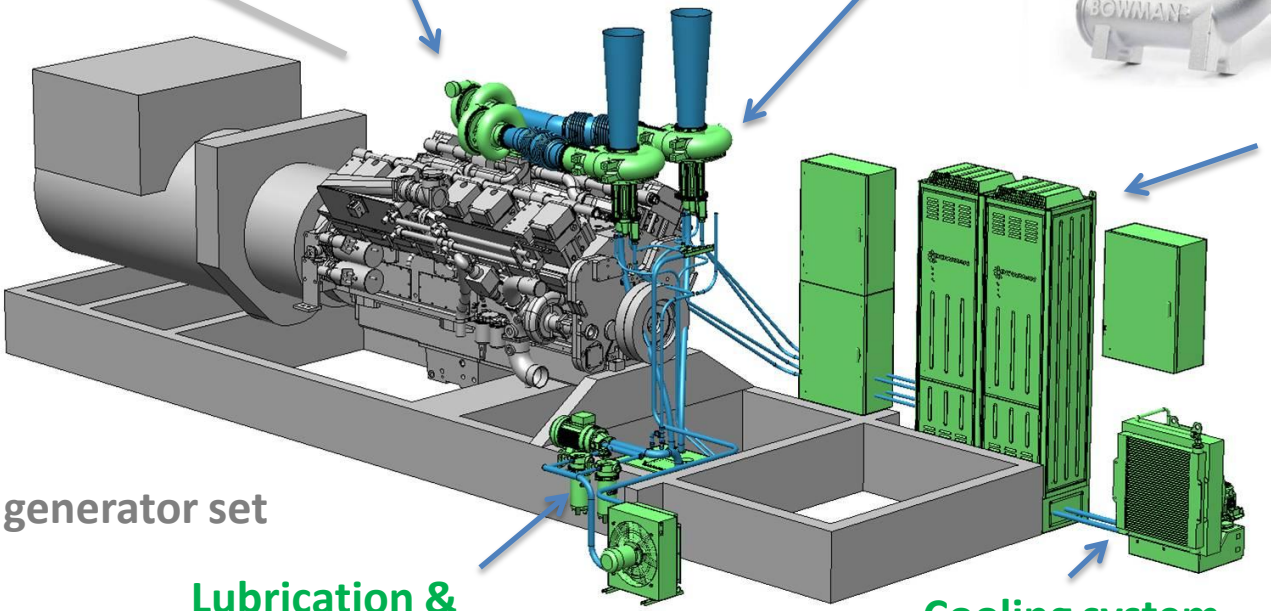
Bowman Equipment (2)

Bowman equipment & main sub-elements (700kW-2MW genset)

Original OEM turbochargers is replaced (2x)

Bowman Turbochargers (TC) (2x)

Turbogenerators (TG) (2x)



Power Electronics (PE) (2x)

Typical 1MW generator set

Lubrication & Cooling system (for TG)

Cooling system (for PE)

Fuel Savings

How do we demonstrate our efficiency ?

1 SAVINGS ESTIMATES

We initially **run a computerized model** based on your engine technical data package → **ANTICIPATED SAVINGS %** → **ROI / NPV** → **Go/ No-Go**

2 BASELINE

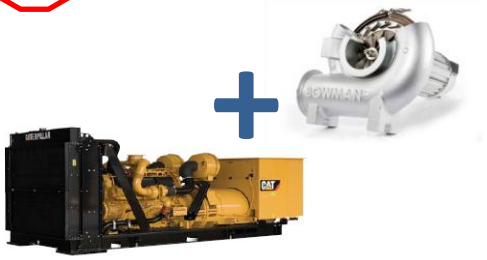
WITH YOU, ON SITE: **Initial** Consumption Assessment

100 lit./h

3 PERF. TESTING

WITH YOU, ON-SITE: **Final** Consumption Assessment

93 lit./h



You can talk to our existing clients

7% Savings !

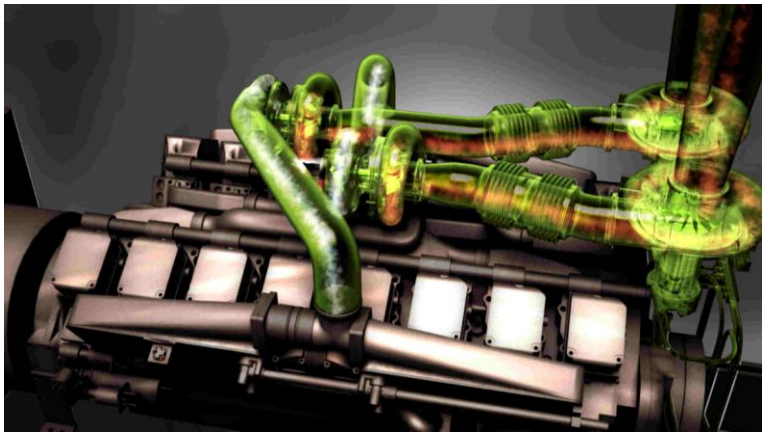
Above fuel consumption are typical and only used to illustrate the technology.

Proven Technology

5 million operating hours (August 2013)

"We are delighted with our partnership with Bowman Power."

Adam Boyd
CEO, Pacific Energy Ltd



"The system hit our fuel economy targets and worked great right out of the box."

John Zagone
Navistar Inc.

Global References

Cummins Power Generation

GE

DAIMLER

LIEBHERR

SCHNELL ZÜNDSTRAHLMOTOREN

broadcrown leading world power

DEUTZ

WÄRTSILÄ

BURKHARDT ENERGIE- UND GEBÄUDETECHNIK

NAVISTAR®

HYUNDAI

VOLVO

JOHN DEERE

FPT POWERTRAIN TECHNOLOGIES

PACIFICENERGY

Case Study – Cummins KTA50

Pacific Energy (Australia) achieves 17 months payback

6.5% Savings !

- Pacific Energy is the **leading Australian contract power supplier** and specializes in off-grid energy solutions for the **mining sector**
- Many of their engines are using **2M$ of fuel per year**
- To date it has **purchased 70 units** and is rolling them out across its power station fleet
- Led to demonstrable competitive advantages when tendering for power contracts – it exceeded its 2012 strategic target

Pacific Energy engines retro-fitted with Bowman TurboGens™

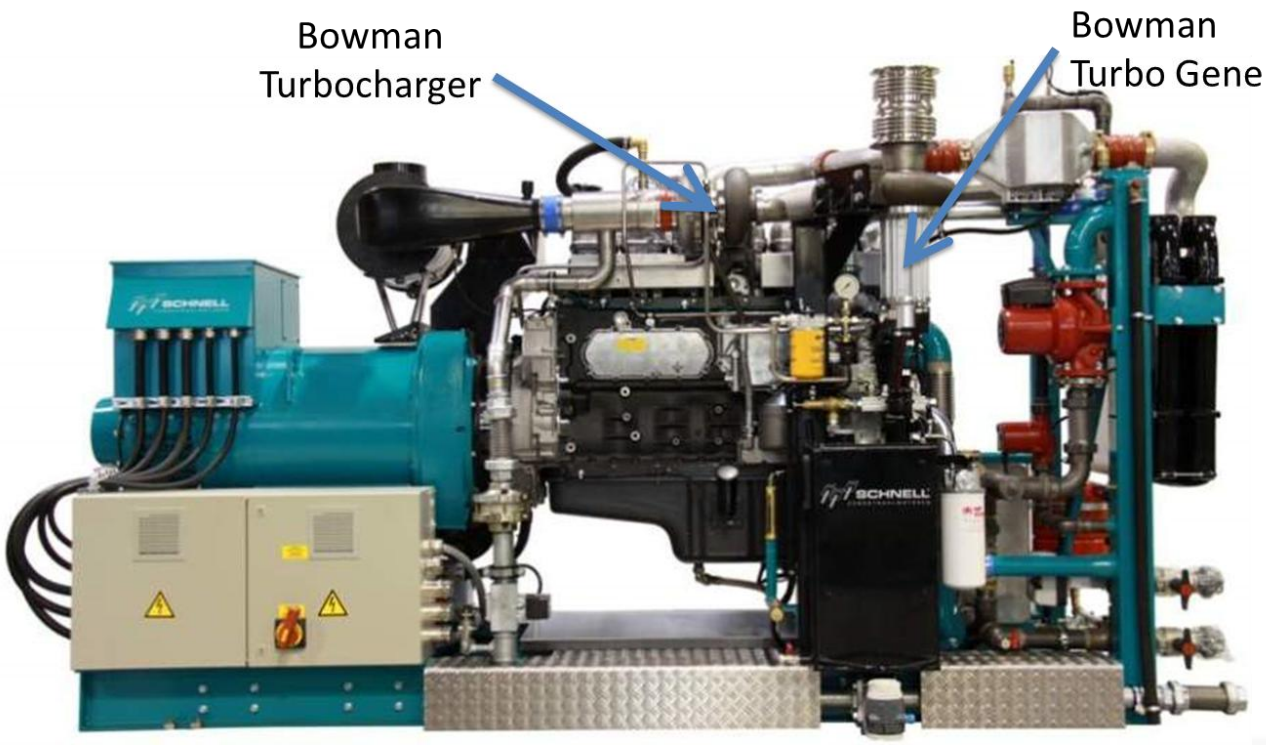
Pacific Energy Plant, Australia

Case Study – Scania DC12

Schnell Motoren AG (Germany) reaches 48.3% efficiency

"Adding the Bowman Turbogenerator to our 6-cylinder dual fuel CHP unit was an important factor that enabled us to achieve market-leading efficiency of 48.3% ."

Hans-Jürgen Schnell
CEO, Schnell Motoren AG

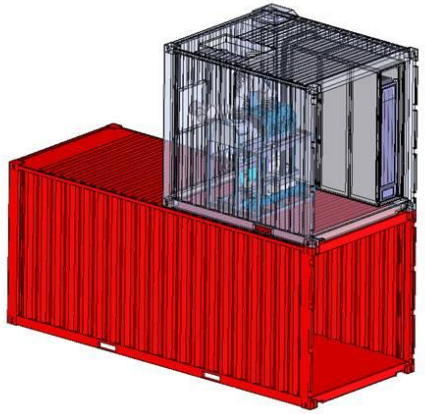


6-7% Extra Output !

Installation

System installed with just 48 hours of downtime*

- Flexible installation solutions to suit every customer site
  - on/around the engine
  - open or containerized gensets
- Installation & commissioning is supervised by a Bowman Service engineer
- Straight-forward connections to the “local” electrical 3ph grid
- Our service experts will train your engineers on commissioning, service & maintenance



Note: 48 hours downtime is an average. 1st installations are typically longer than following installations that can take 24h.

Maintenance

Maintenance Items	Service time				
	Daily	Weekly	Monthly	6 Months	Yearly
Inspection	X				
Check coolant heater	X				
Check coolant level	X				
Check oil level	X				
Check fuel level	X				
Check charge-air piping	X				
Check/clean air cleaner		X			
Check battery charger		X			
Drain fuel filter		X			
Drain water from fuel tank		X			
Check coolant concentration			X		
Check drive belt tension			X		
Drain exhaust condensate			X		
Check starting batteries			X		
Change oil and filter				X	
Change coolant filter				X	
Clean crankcase breather				X	
Change air cleaner element				X	
Check radiator hoses				X	
Change fuel filters				X	
Clean cooling system					X
Recondition Turbocharger unit					(every 2 years)

Typical diesel generator
Maintenance Schedule

Maintenance aligned with schedule from OEM

Same people at the same time !

Drain water from tank

Check Oil
Check coolant system

Inspect & clean turbine
Change oil filters
Clean compressor & power electronics

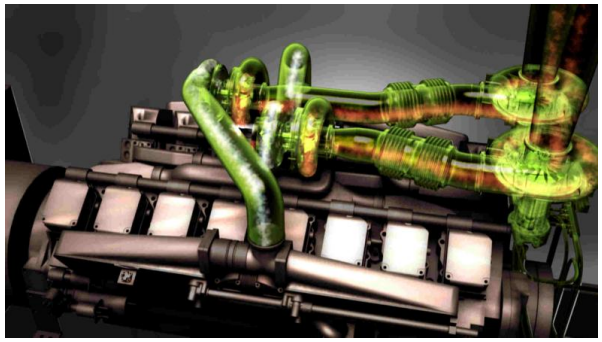
Check of the Turbocharger
Bearing replacement for TG
Coolant change

Remote Monitoring possible

Reliability

5 million hours already logged on 500 units

- Equipment is designed, tested & manufactured for 7 year lifetime
- Over 30,000 running hours (4 years continuous) between faults, on average across fleet



- Built-in fault detection system with remote monitoring capabilities
- By-pass option allows to run the engine as usual in case there is an issue with Bowman's equipment until the problem is fixed.

Conclusion

- Fuel savings 6-8%
- Payback in 12-24 months
- Reduced CO_2 emissions
- Proven, reliable, technology

Do you want to be running the most efficient, lowest-emission gensets ?

sales@bowmanpower.com +44 23 8023 6700

www.bowmanpower.com

Thank you !

Bowman Power is a world leader in advanced exhaust energy recovery technologies. Stationary power applications, running with Bowman TurboGen™ products, benefit from up to an 8.5% fuel saving. Our TurboGen™ technology runs on various engines including: Cummins, Caterpillar, Scania, Volvo and Mitsubishi.

PIONEERS IN EXHAUST ENERGY RECOVERY

BOWMAN
ENERGY RECOVERY SYSTEMS

8.5% NET FUEL SAVING PROVEN ON THE Cummins KTA-50 G3

- Reducing fuel consumption by up to 8.5%
- Reducing carbon emissions by 400 tonnes per year for a 1MW genset
- Increasing reliability and enhancing profitability of the engine
- Increasing engine power
- £ Payback in as little as 12–24 months
- Proven technology with over 5 million running hours already

Want to run one of the cleanest, most efficient, diesel gensets on the planet? Contact us


Customer Power Station


M50 TurboGen™ installed


Power Electronics Module


Customer Power Station


S30 TurboGen™ installed


TurboGen™ systems ready for dispatch

BOWMAN
ENERGY RECOVERY SYSTEMS

Bowman Power Group Ltd
Telephone. +44 (0)23 8023 6700

www.bowmanpower.com