

**V10 ELECTRICITY GENERATION PLANT - PRESENTATION**

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## 1 – INTRODUCTION

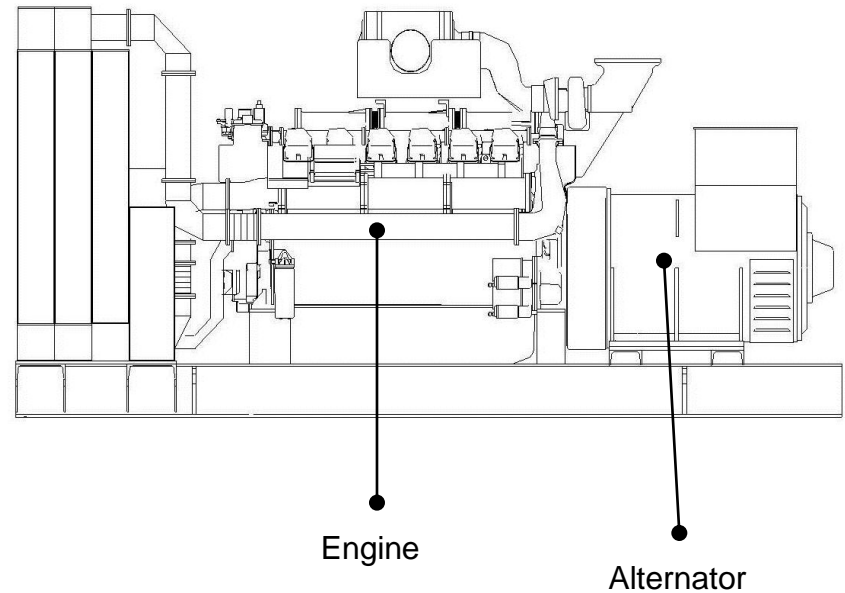
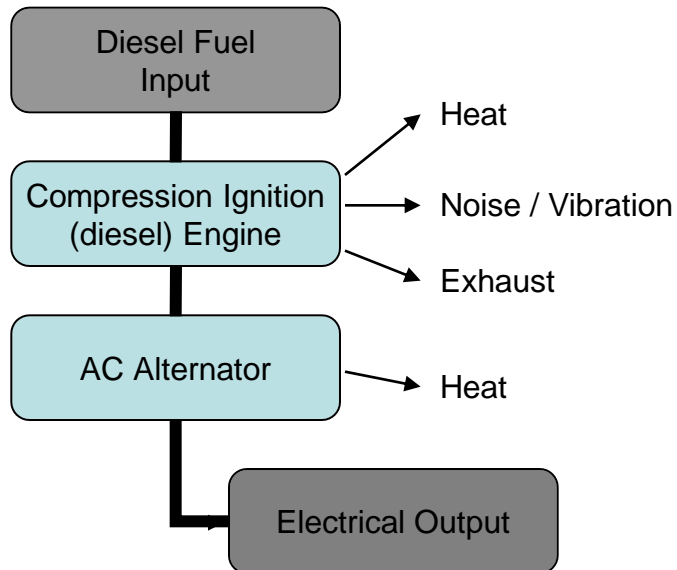
Presentation by – Andrew Williams of Excel Power Ltd

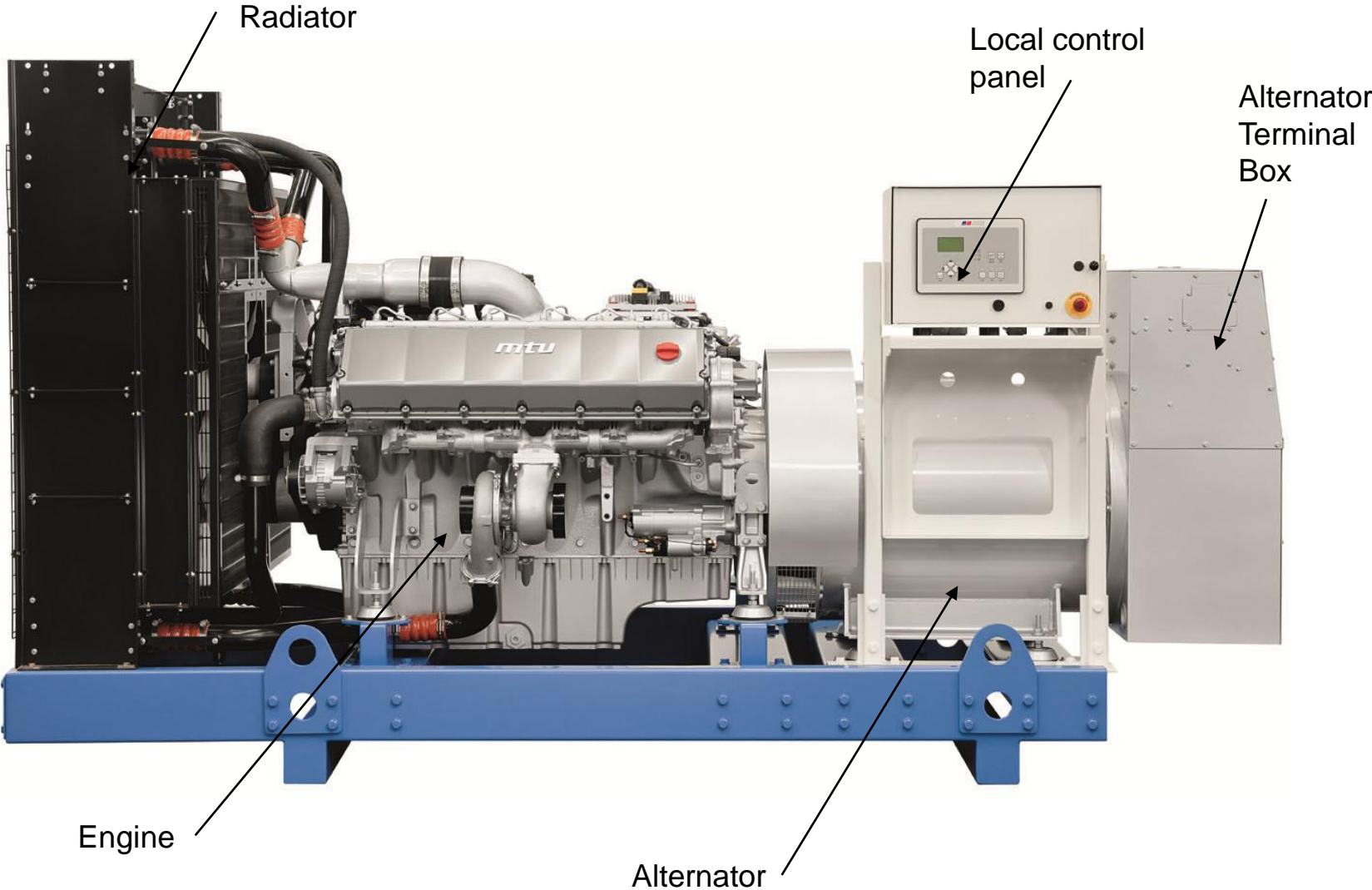
Excel generator range from 22kVA to in excess of 3300kVA



## 2 – GENERATOR BASICS

Generator Definition - Conversion of fossil fuel energy into electrical energy





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## 2000A – GENERATOR BASICS

Application -	Source of standby power in the event of loss of mains power.
Power Output –	kVA / kWe
Voltage Output –	Low, Medium or High Voltage
Duty Rating –	ISO8528-1 Continuous (COP), Prime (PRP) or Standby (LTP) – see next slide
Step Load Restriction -	Turbo-charged engines have limited step load capability. Varies significantly dependant on engine manufacturer. Expect approx 50% on large units.
Load Considerations -	Harmonics – UPS loads, motor starting. Electronic engine speed governing.

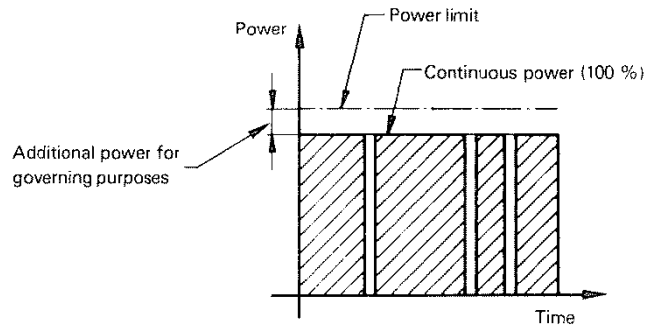


Figure 1 — Illustration of continuous power

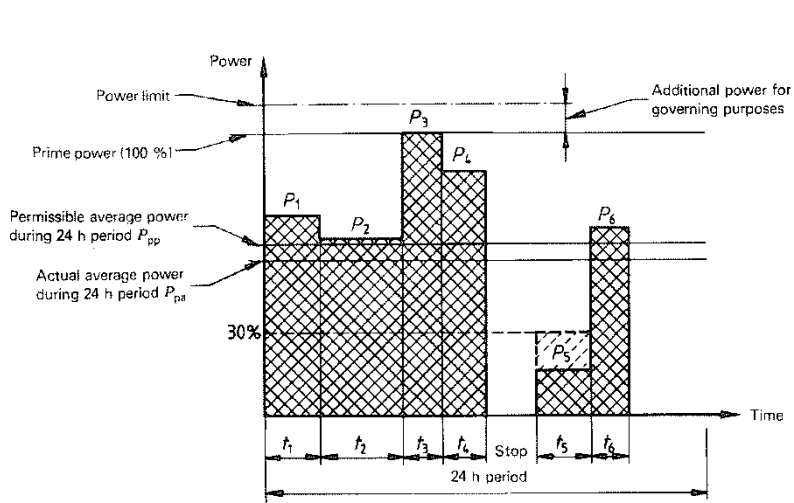


Figure 2 — Illustration of prime power (not to scale)

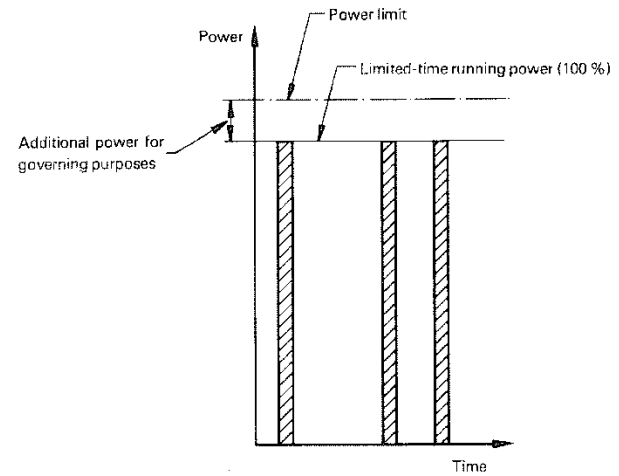


Figure 3 — Illustration of limited-time running power

Extract from ISO8528-1:1993 Section 13 – Power Ratings

**Extract from ISO8528-5 – Performance Class**

<b>Governing Type</b>	Frequency Drop	Freq Recovery Time	Freq Recovery Tolerance	Volts Drop	Volts Recovery Time	Steady State Frequency Band	Steady State Voltage Deviation
<b>G1</b>	-15%	10s	3.5%	-25%	10	2.5%	5%
<b>G2</b>	-10%	5s	2%	-20%	6	1.5%	2.5%
<b>G3</b>	-7%	3s	2%	-15%	4	0.5%	1%

**Important note - Different engines have different load characteristics –**

One 1000kW engine may accept 700kW in a single step and comply with G2

Another will only accept 500kW and still comply with G2

Therefore it is important to state what initial load step is required and what performance is required.

### 3 – INSTALLATION CONSIDERATIONS

- |                       |  |
|-----------------------|--|
| Space Planning -      | Large and heavy mechanical devices.                    |
| Cooling and airflow - | Significant amount of heat is rejected.                |
| Noise / Vibration -   | Unsilenced generator noise range is 85 to 115dB(A)     |
| Exhaust Flue -        | Combustion exhaust at around 500°C with noxious gases. |
| Fuel Supply -         | Local day tanks and bulk storage tanks.                |



## 4 – SPACE PLANNING

Consider -

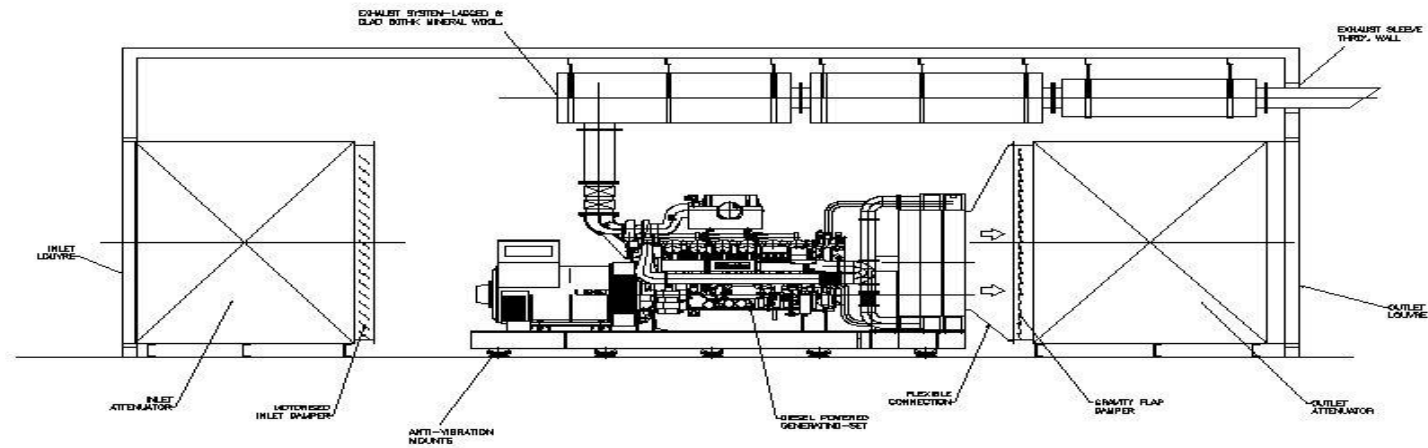
Large and heavy mechanical devices.

Installation route

Plant replacement strategy

Maintenance access

Emergency escape routes



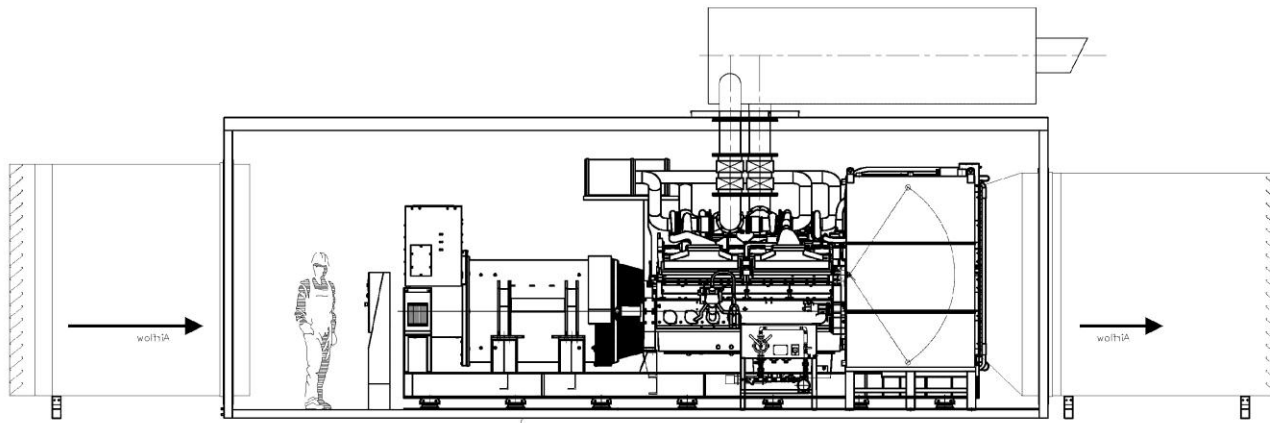
Typical Plant room installation – side elevation

## 4b – SPACE PLANNING Continued...

Space Planning -

Typical sizes – Open generator sets (mm)

100kVA –	2260 L x	850 W x	1560 H –	820kg
500kVA –	3820 L x	1250 W x	2165 H –	5050kg
1000kVA –	4360 L x	1800 W x	2450 H –	8519kg
2000kVA –	6000 L x	2325 W x	3240 H –	13800kg
3300kVA –	6650 L x	2600 W x	3300 H –	21900kg



Typical outdoor canopy / container type installation – side elevation

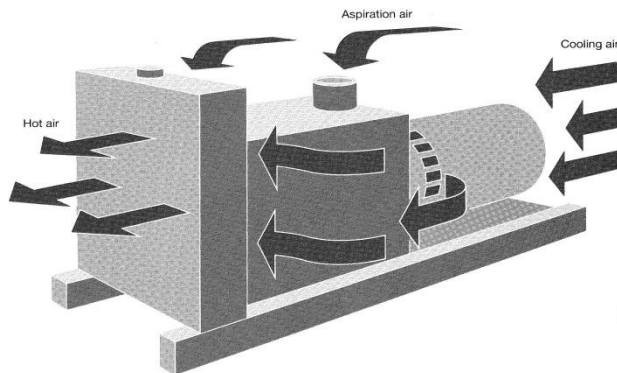
## 5 – Cooling and Airflow

Cooling - Engine jacket water removes some heat from the engine and is rejected by the radiator with an engine driven fan.

This also collects the radiated heat from the engine and alternator and discharges it through the radiator.

*Alternatively* - Remote radiator cooling – 65% of the full airflow is typically still required to deal with the radiated heat from the engine.

Aspiration air - The engine also uses air in the combustion process. This is then discharged at high temperature via the exhaust flue.



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## 6 – Noise and Vibration

- Noise - Difficulty in reducing noise levels while maintaining adequate airflow to prevent overheating.
- 80 to 85dB(A) at 1m – standard ‘export’ type unit  
75dB(A) at 1m – standard ‘UK’ type unit  
55 – 65dB(A) at 1m – City centre / sensitive installations
- Plant Room – Installations designs – The building structure itself must be of sufficient integrity. Various types of acoustic louvres and splitter attenuators are used to reduce the external noise to acceptable levels. Room within a room may be necessary for very low noise levels.
- External – Outdoor enclosed generators have similar requirements but the structure of the enclosure is designed and supplied by Excel Power.
- Vibration - Reciprocating engines vibrate and care must be taken to avoid rigid links between the set and the building or enclosure structure.

# ELECTRICAL GRADUATE ENGINEERS' TRAINING DAY

PREPARED AND PRESENTED BY ANDREW WILLIAMS



## 7 – Exhaust Flue

### Flexible Bellows -

Prevents vibration from the engine being transmitted into the flue and building structure.

### Silencers -

Fitted into exhaust run to prevent noise breakout at flue termination. Most load dependant noise difference.

### Flue Route -

Double skinned stainless steel tube normally installed within a building riser or on an external face of the building, if planning allows.

### Flue Termination -

Dependant on local planners but normally above roof line.





## 8 – Fuel Supply

Fuel Consumption - Approximately 200litres/hour per 1000kVA but is non-linear on part loads.

Local Daytank - 4 to 8 hours depending on set size with pumps to automatically refill.

Bulk Storage Tanks - No maximum capacity limit – depends on the criticality of the installation.



## 9 – Control Systems

2 Wire Start -

The Excel Generator starts on receipt of a signal.



Automatic Mains -

Excel Equipment monitors the mains and responds accordingly.



Synchronising -

Between various generators or with mains power (no-break return).



Changeover Panel -

ATS. Contactors, MCCB's or ACBs to change between mains and generator supply.



## 10 – OTHER ITEMS

Engine Availability - Engine heaters, regular servicing, maintenance.

Civil and Structural - Load bearing floors, builders' work.

Craneage / Installation - Roof installations – Basement installations.

Building Integration - Link with BMS systems, Modbus protocols.

