Engines Grid Support Control system

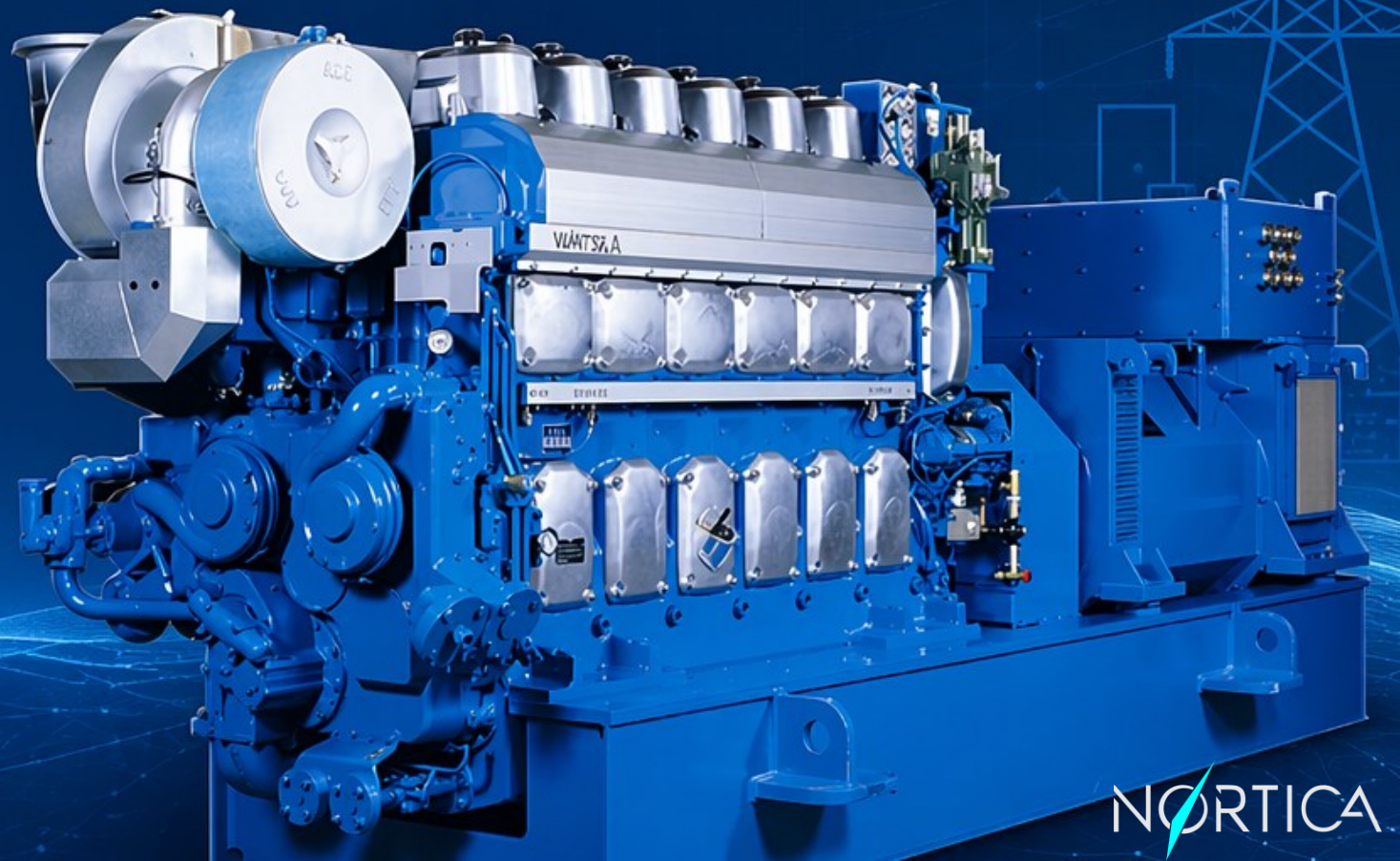
Rev 2.1 / Apr 2026/ Joheves G.
Nórtica Systems

GRID STABILITY

FREQUENCY SUPPORT

VOLTAGE CONTROL

RELIABILITY & SAFETY



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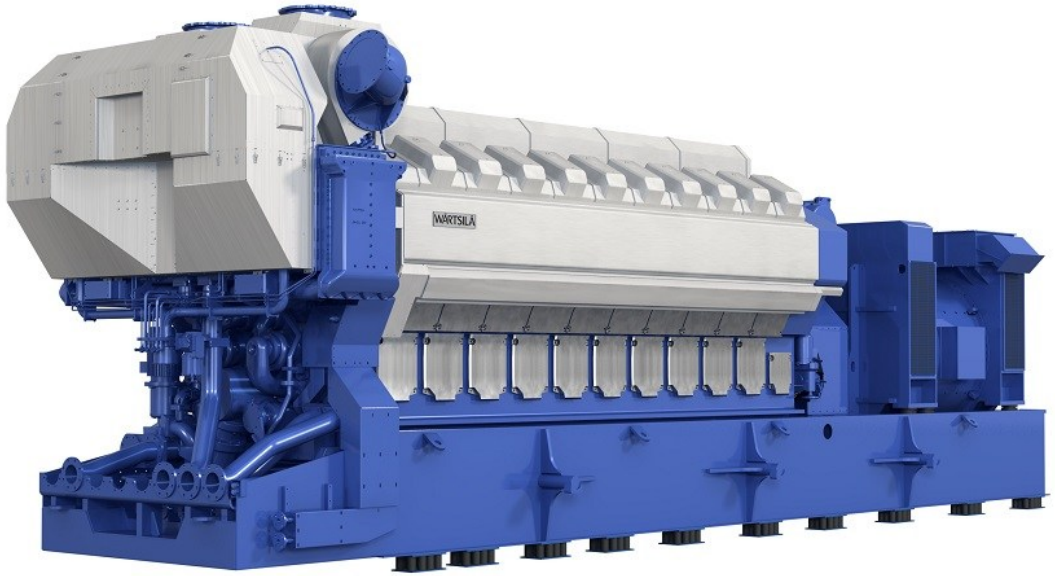
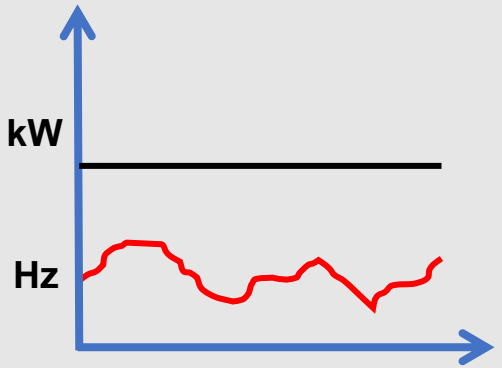
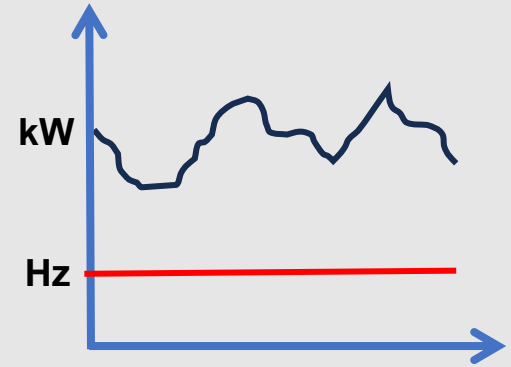
ENGINE CONTROL MODES



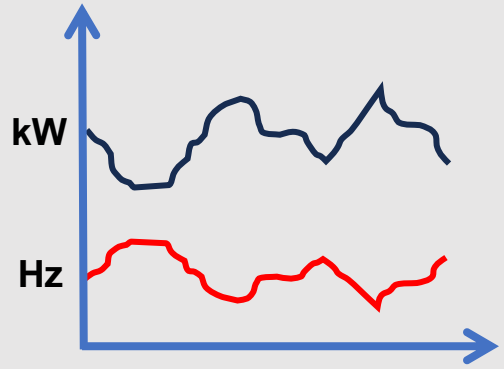
kW (BASE LOAD) MODE



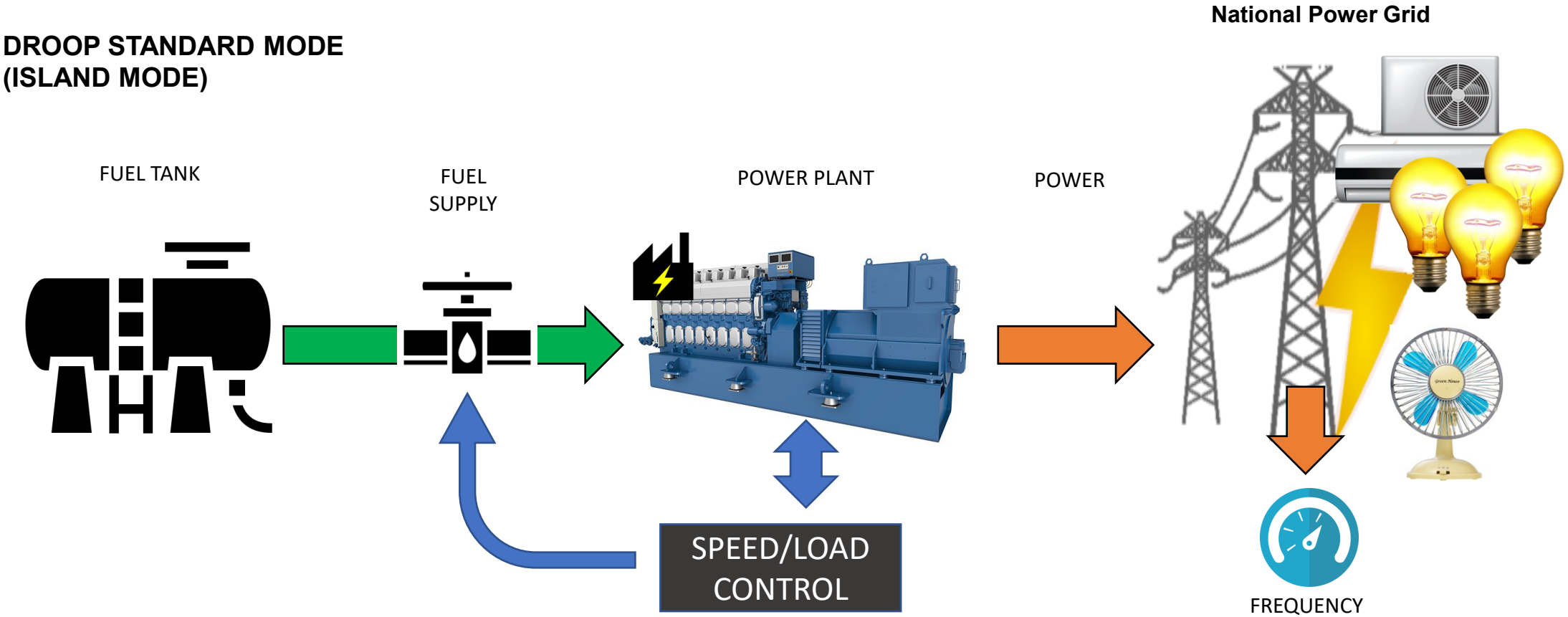
ISOCHRONOUS MODE



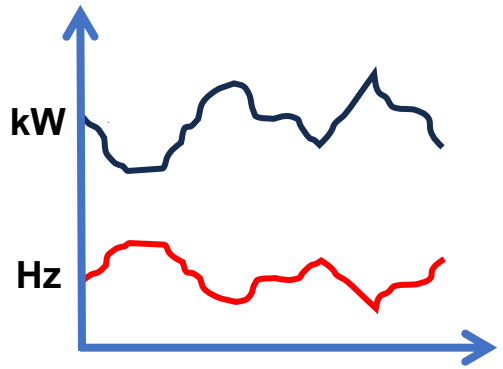
DROOP MODE



DROOP STANDARD MODE (ISLAND MODE)



- High Speed / Faster response (up to 300 kW /sec.).
- No ramp (As fast as possible)
- Difficulty to have load limits



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DROOP EMULATED MODE (PARALEL WITH GRID)

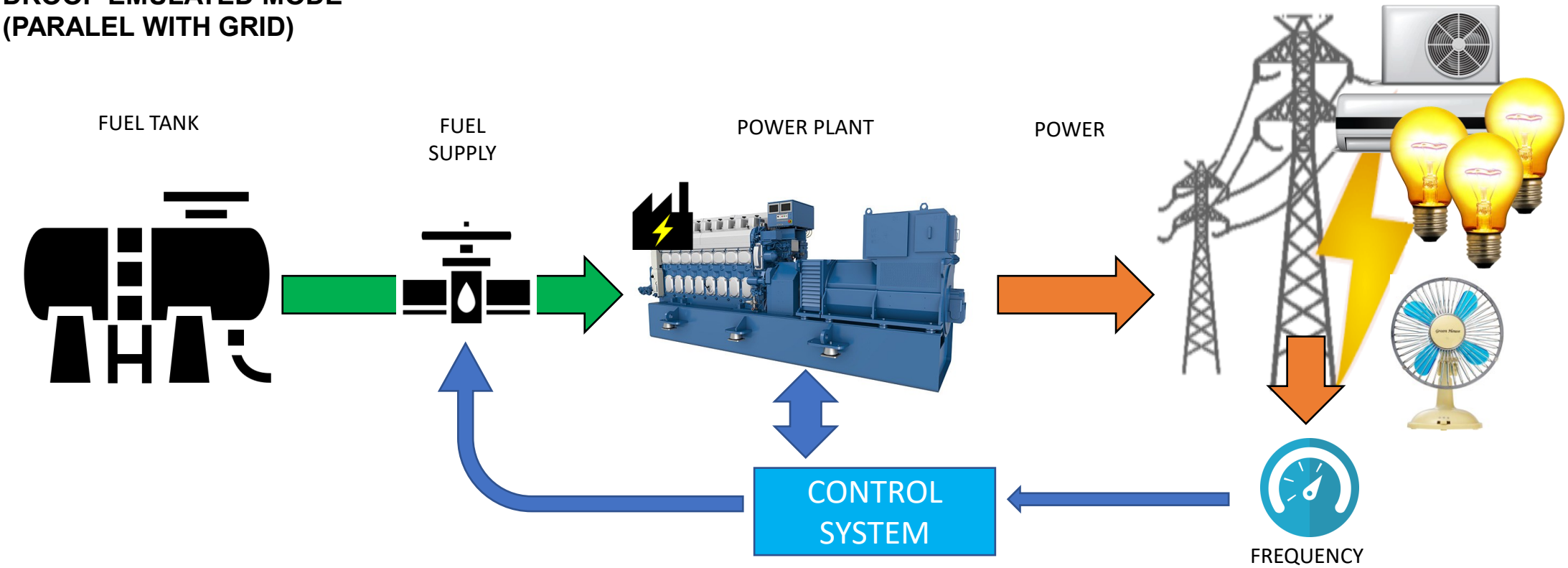
National Power Grid

FUEL TANK

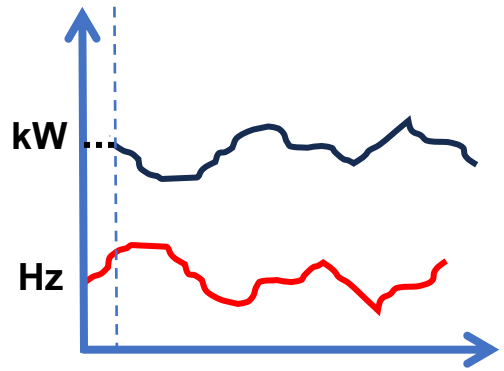
FUEL SUPPLY

POWER PLANT

POWER



- Slow response (30 – 60 kW/sec.)
- Controlled Ramp.
- All protections activated.



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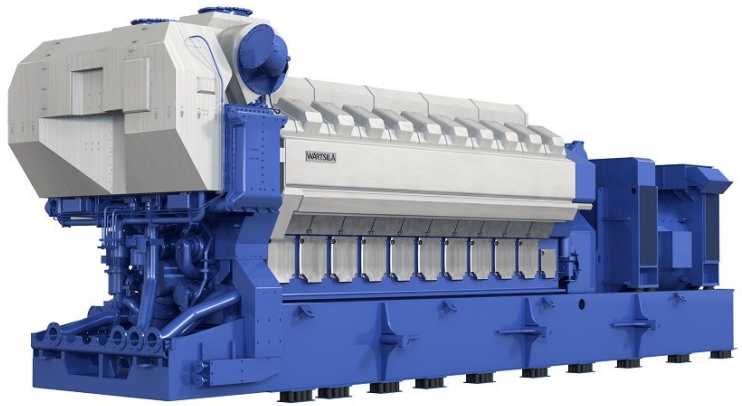
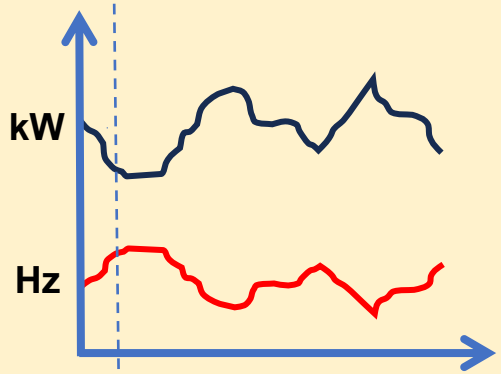
GRID SUPPORT / BETTER MODE ?



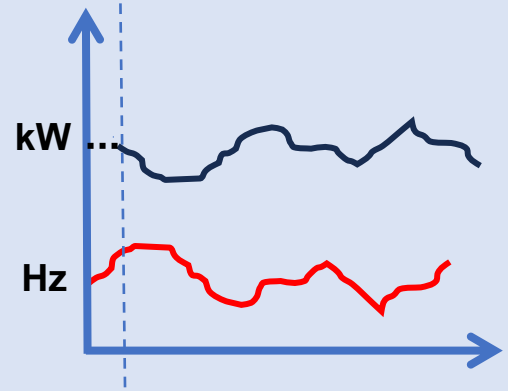
DROOP STANDARD MODE (ISLAND MODE)

- High Speed / Faster response.
- No ramp (As fast as possible)
- Difficulty to have load limits



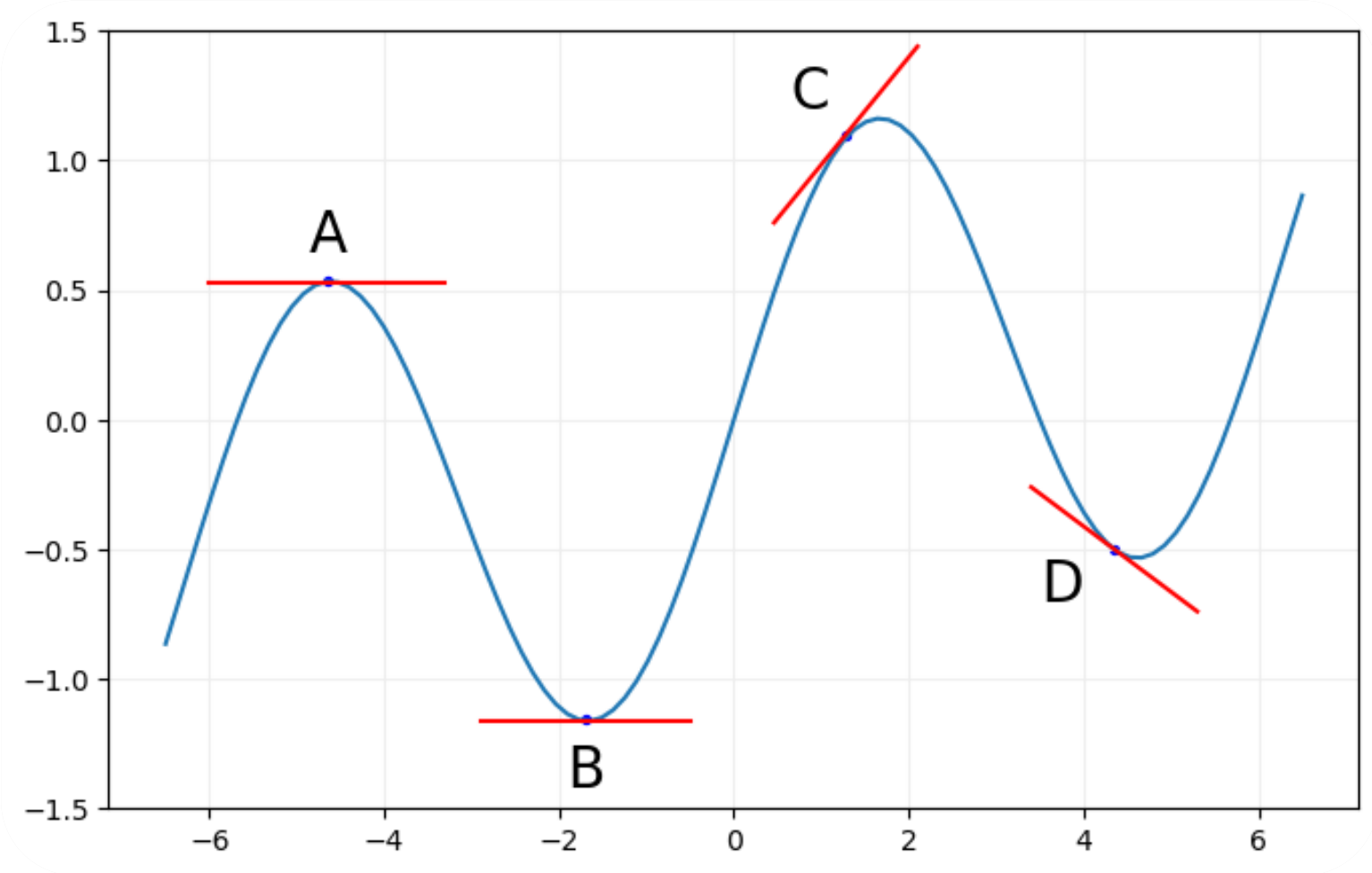
DROOP EMULATED MODE (PARALEL WITH GRID)

- Slow response
- Controlled Ramp.
- All protections activated.



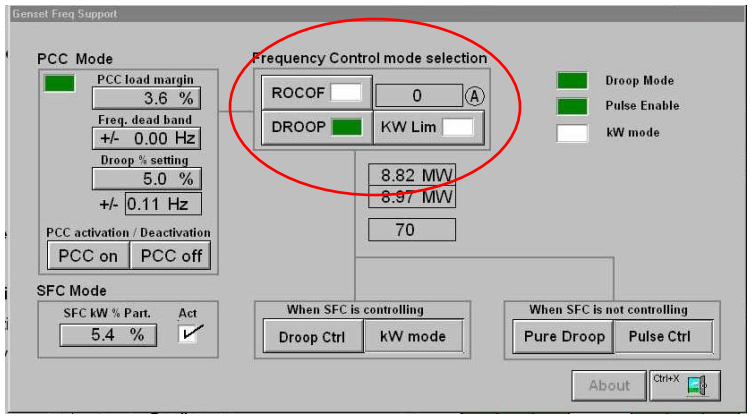
ROCOF – RATE OF CHANGE OF FREQUENCY DERIVATIVE DETECTION

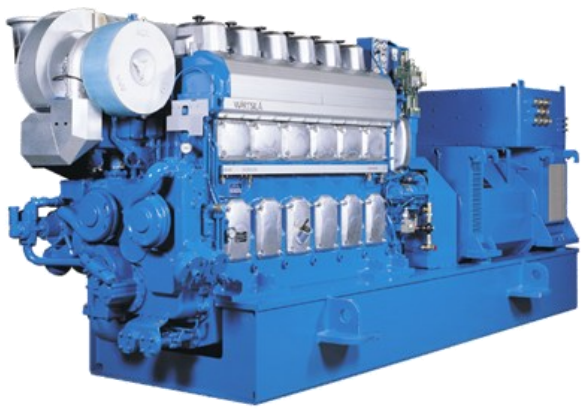
FREQUENCY

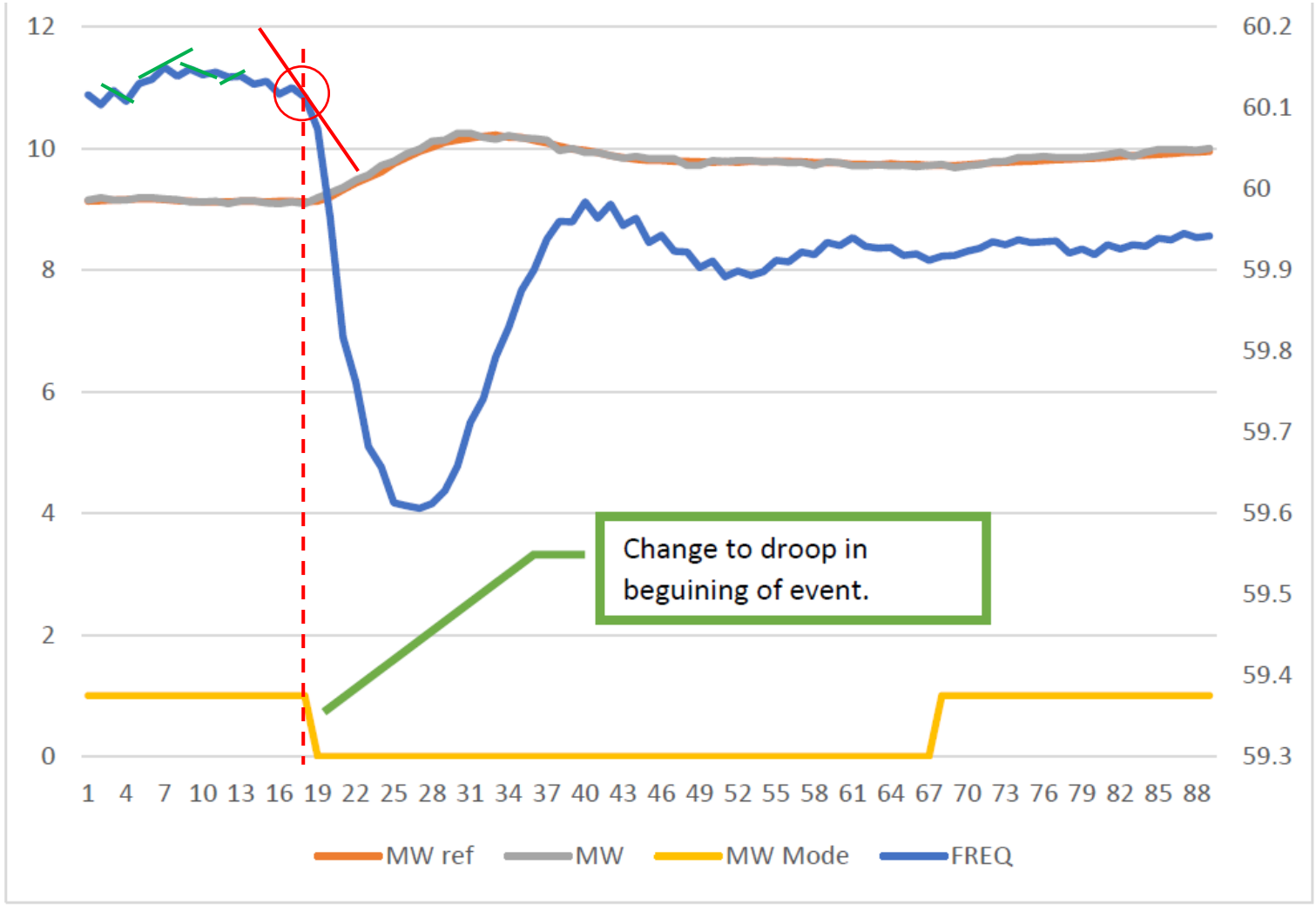


ROCOF Function.

Rate of Change of Frequency.







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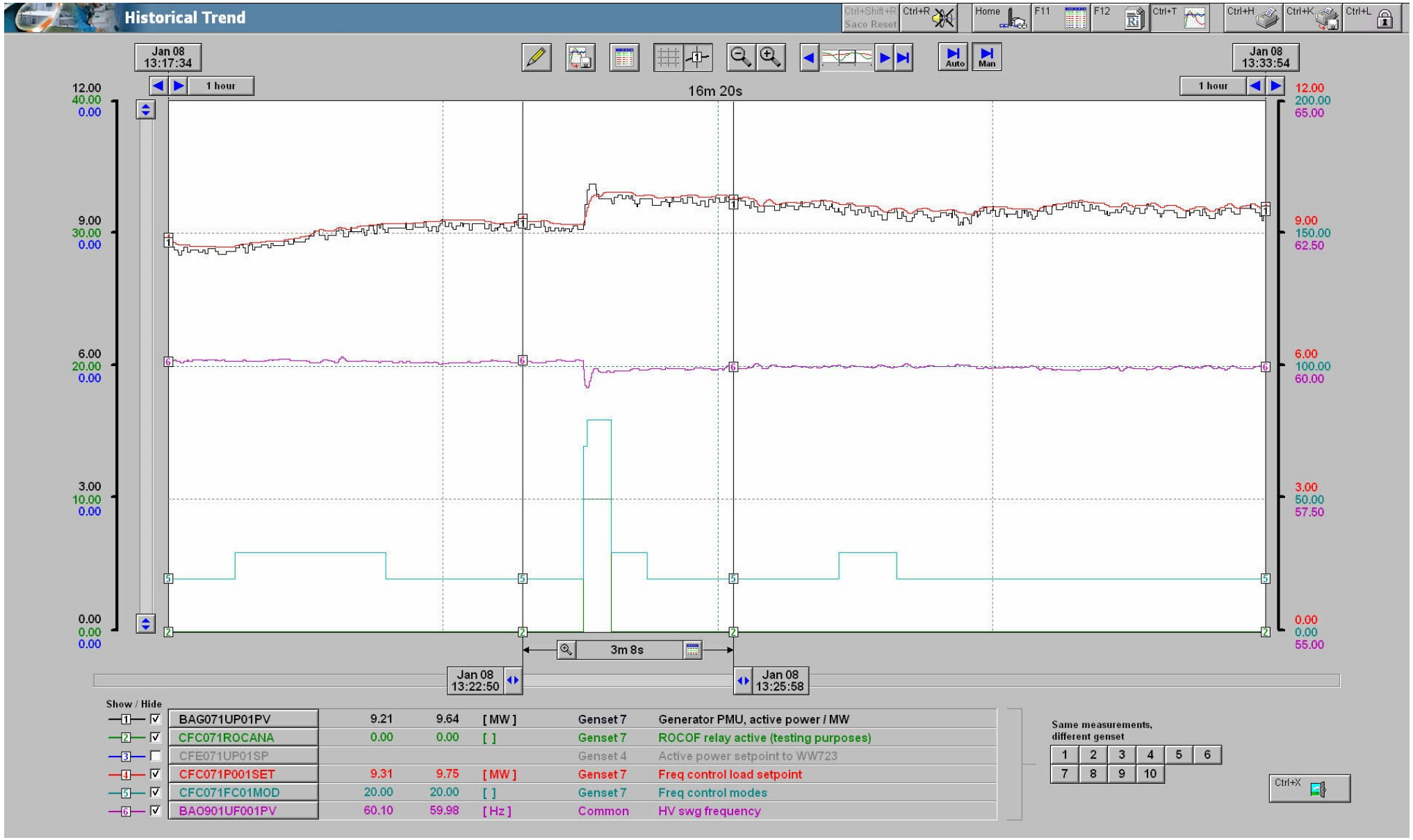
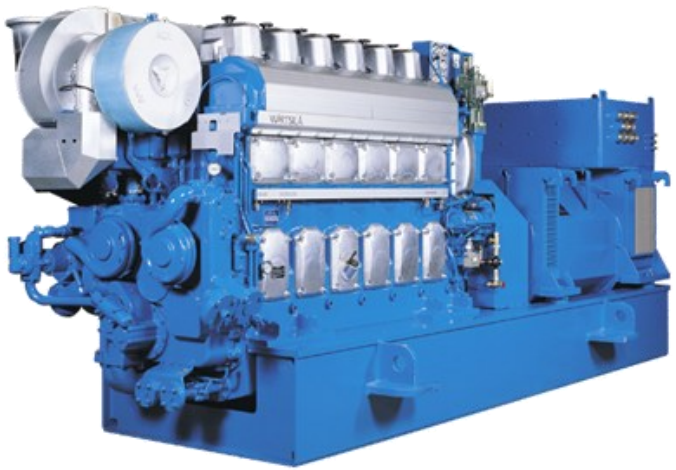
ROCOF Function.



Introduction

Main system purpose is to have engines ready to START and SYNCHRONIZE as soon as possible reducing the current online time (10 – 25 minutes)



Slow Manual Turning (13 Minutes):
- Stop lever to Stop position.
- Open Cilinder valves.
- Turning gear Engage
- Turn Engine with Prelub (10 minutes)

Ready Routine works (3 minutes):
- Visual check. (Leaking, sensors, etc.)
- Engine Manual Blowing.
- Engine Starting conditions.

Start Synchronizing (3 minutes).
- Engine start command
- No load running stabilization.
- Open Synchronizing system
- Engine breaker close.

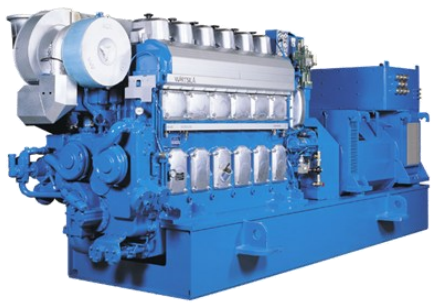
Engine /Generator loading (3 Minutes):
- Load ramp to max power.

STARTING CONDITIONS

- Lube oil pressure > 0.5 bar
- Fuel oil inlet pressure > 2.0 bar
- HT- water temperature > 50 °C
- Starting air pressure > 15 bar
- Control air pressure > 15 bar
- AVR MCB closed
- Turning gear disengaged
- Stop lever in running position
- Breaker conditions
- Engine is not running
- Stop solenoid and autostop inactive
- Engine room emerg. stop inactive
- Control room emerg. stop inactive
- Power plant emerg. stop inactive
- BJA emerg. stop inactive
- Breaker trip alarm inactive
- Engine shutdown alarm inactive
- Start failure inactive

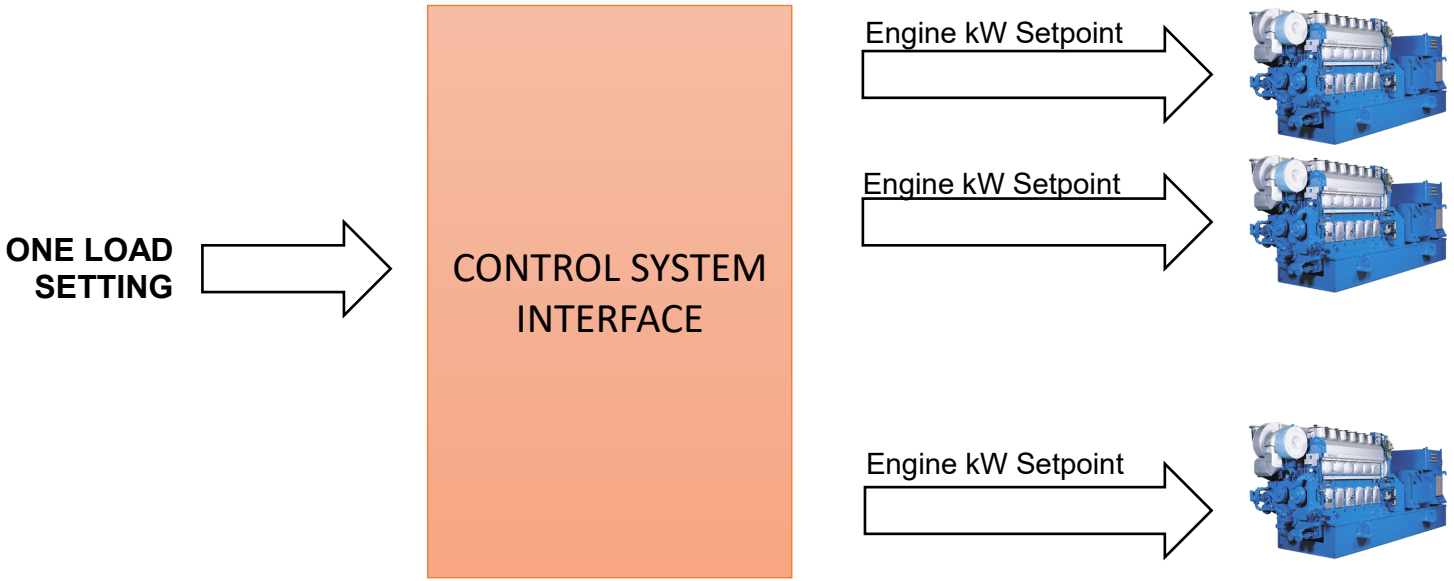
STARTING PROCESS

Engine availability and online mode summary table (LAESA LTD P1):



Activity	Mode	Current time	Update	New Time Theory)	REAL
Slow Manual Turning	MANUAL OPERATOR	0/13	Slow Turning Programable period.	0	0
Ready Routine works	MANUAL CONTROL SYSTEM	4 min	All task programmable period.	0	0
Start & Synchronizing	MANUAL CONTROL SYSTEM	3 min	Auto start by Frequency Conditions.	15 – 60 Sec,	23 – 45 Sec,
Engine /Generator loading	AUTOMATIC CONTROL SYSTEM	3-4 min	New ramp to be update according Engine Water temp.	1 - 2 min (10 - 30 sec. ROCOF)	1 - 2 min (10 - 30 sec. ROCOF)
Totals		**10 – 25 min**		**2 - 3 Min / 1 min ROCOF.**	**2 – 3 min / 45 sec.(ROCOF)**

ONE ENGINE / ONE SEPARATE PLANT.



- Response less than 0.5 secs.
- Calculated proportional values for correct load sharing.
- Make all engines acts as one plant.

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