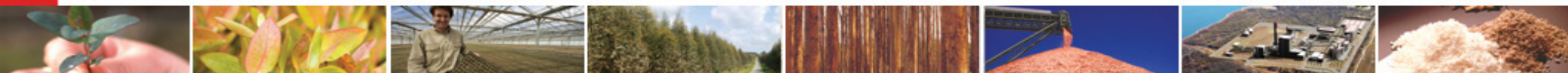
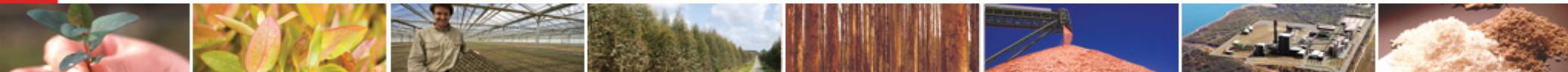


# PROPOSED GENERATOR CONNECTION TO THE TASMANIAN GRID

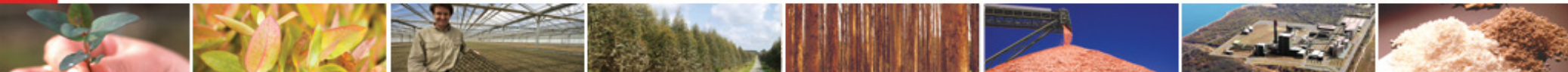


# BACKGROUND

- TASMANIA NEEDS ADDITIONAL GENERATING CAPACITY
- EXTRA CAPACITY WILL MOST LIKELY BE STEAM OR COMBINED CYCLE GAS TURBINES
- WIND GENERATORS DO NOT ADD TO SYSTEM STABILITY – EXTRA WIND CAPACITY WITHOUT ADDITIONAL INERTIA (HYDRO OR STEAM) CAN HAVE THE OPPOSITE EFFECT
- A DECISION TO DEVELOP A GENERATION FACILITY MUST BE BASED ON SOUND COMMERCIAL PRINCIPLES. LARGE BASE-LOAD MACHINES PROVIDE THE BEST EFFICIENCY AND ALLOW POWER TO BE GENERATED AT COMPETITIVE COST

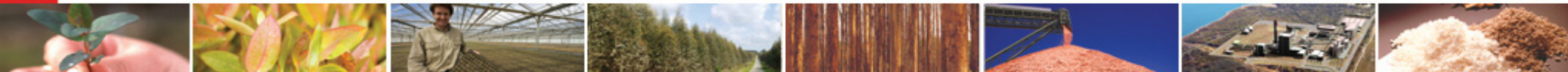


- SMALL GAS AND COMBINED CYCLE TURBINES (<60MW) CAN BE DESIGNED TO MEET THE TASMANIAN FREQUENCY STANDARD, BUT ARE GENERALLY NOT ECONOMICAL OTHER THAN FOR SUPPLYING PEAK LOAD
- LARGE STEAM TURBINES CAN OPERATE OVER A VERY LIMITED FREQUENCY RANGE. DEVIATIONS OUTSIDE THAT RANGE CAUSE FATIGUE OF THE TURBINE BLADES, PARTICULARLY AT THE LARGER, LOW PRESSURE END



# GUNNS' CURRENT POSITION

- ORDERED A 250MVA STEAM TURBINE GENERATOR FROM TOSHIBA
- THIS IS **NOT** A GAS-FIRED PLANT
- GENERATOR WILL RUN ON BIOFUEL
  - MILL RESIDUE (BLACK LIQUOR)
  - WOOD WASTE
- OUTPUT IS LIMITED BY STEAM SUPPLY TO 190MW
- MILL LOAD IS 65MW
- CHEMICAL PLANT LOAD IS 65MW
- PROPOSED CONTRIBUTION TO GRID IS 60MW

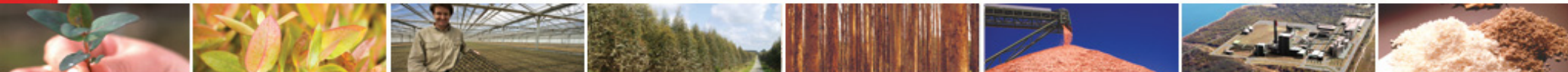


# ADVANTAGES

- ADD INERTIA TO THE SYSTEM (190MW)
- PROVIDE VOLTAGE SUPPORT AT GEORGE TOWN
- PROVIDE ADDITIONAL BASE LOAD CAPACITY (60MW)
- PROVIDE ADDITIONAL RAISE AND LOWER ANCILLARY SERVICES (FCAS)

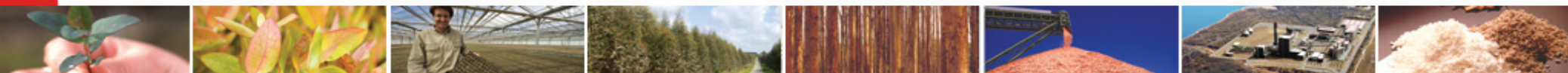
SUBMISSIONS TO THE RELIABILITY PANEL DO NOT APPEAR TO HAVE TAKEN INTO ACCOUNT:

- INCREASED STABILITY UNDER NORMAL OPERATING CONDITIONS
- INTRODUCTION OF FAST FCAS (RAISE AND LOWER)

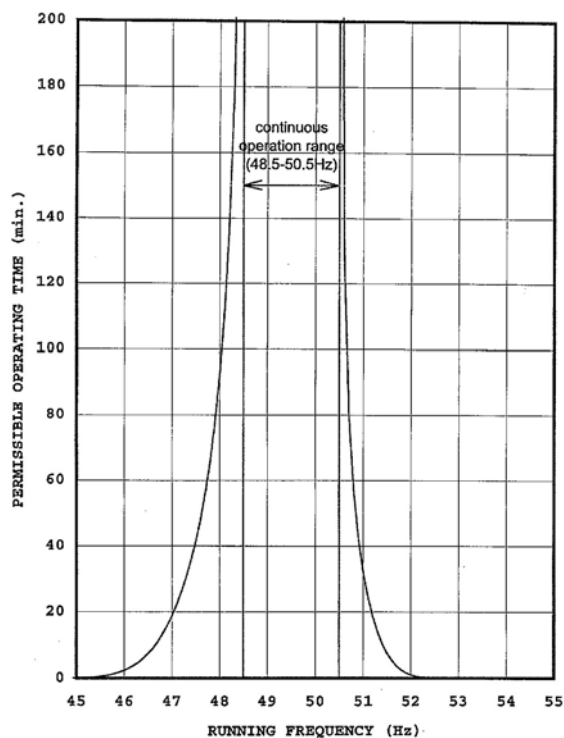


# LIMITATIONS

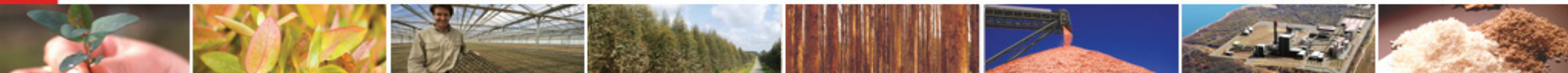
A STEAM TURBINE HAS A VERY LIMITED LIFE AT FREQUENCIES OUTSIDE ITS NORMAL OPERATING RANGE



PERMISSIBLE TIME FOR OFF FREQUENCY OPERATION  
(N42" L-0/L-1 SNE)



- AT 52Hz THE TOTAL MACHINE LIFE IS APPROXIMATELY 10 SECONDS
- GREATER FLEXIBILITY AT LOWER FREQUENCIES
- WE HAVE REQUESTED 51.6Hz AS AN UPPER LIMIT FOR OUR CONNECTION TO ALLOW US A REASONABLE PLANT LIFE



# RESPONSE TO DISTURBANCES

## OVERFREQUENCY (FAST LOWER FCAS)

- CONTROLLED REDUCTION OF GENERATOR OUTPUT BY UP TO 170MW IN LESS THAN 3 SECONDS

## UNDERFREQUENCY (FAST RAISE FCAS)

- INSTANT REDUCTION IN INTERNAL LOAD GIVES AN IMMEDIATE INCREASE IN OUTPUT TO THE GRID OF UP TO 65MW, EVEN WHEN THE GENERATOR IS RUNNING AT MAXIMUM OUTPUT

