HITACHI
Inspire the Next

Hitachi Australia Pty Ltd

Power & Industrial Equipment Group

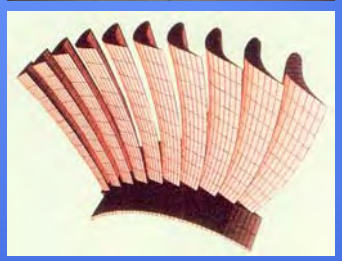













QUALITY
ASSURED
COMPANY
ISO 9001 : 2000

HITACHI
Inspire the Next

"The birth place of Hitachi"

Contents


CERTIFICATE OF REGISTRATION

ISO 9001 : 2000

Hitachi Australia Limited

Since its founding in 1910, Hitachi has acted from a corporate philosophy of contributing to society through technology. In the intervening years, the world and society have changed greatly, but we have never lost our pioneering spirit, based on the principles of harmony and sincerity.
Now, as we embark upon the new century, global change is becoming ever more dynamic. We have adopted the phrase "Inspire the Next" as a declaration of our vow that the Hitachi brand will meet the expectations of our customers and society in this new age. This statement embodies Hitachi's commitment to continue to inspire coming generations with the latest products, systems and services, for a more vibrant society. It is also an expression of our strong commitment to boldly face whatever new challenges the times bring us: whatever comes "Next."


HITACHI
Inspire the Next

MISSION STATEMENT

Our Mission

Our Values

Inspire the Next

Introduction

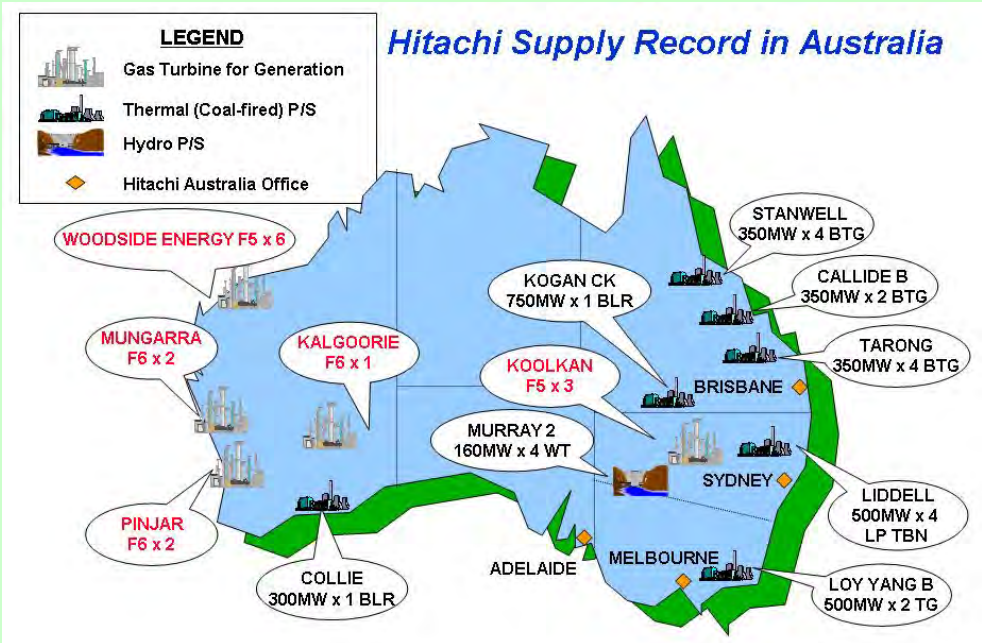
Our Company and Our Business

Hitachi Australia Pty Ltd is a wholly owned subsidiary company of Hitachi Ltd. Japan.

For over 35 years Hitachi has been providing Australian industry and consumers with world class products and services. Hitachi Australia has 4 offices located in Sydney (HO), Brisbane, Melbourne & Adelaide, employing some 100 people. Hitachi Australia incorporates four business groups, Power and Industrial Equipment (PIEG), Consumer Products (CPG), Electronic Components (ECG) & Air Conditioning Systems (ACSG).

The power team of our Power and Industrial Equipment (PIE) group provide services to the Australian electricity industry primarily in the following fields:

- •Steam Turbines & Generators
  - - New Units
  - - Overhaul Services
  - - Technical Advice
  - - Efficiency Upgrades
  - - Spare Parts
- •Gas Turbines
  - - New Units
  - - Overhaul Services
  - - Technical Advice
  - - Spare Parts
- •Transmission and Distribution Equipment
  - - New Equipment
  - - Maintenance Services
  - - Technical Advice
  - - Spare Parts



Hitachi Australia is a quality assured company certified to ISO9001:2000

HITACHI
Inspire the Next

Large Steam Turbine

Tarong Power Station 4 x 350MW

Since 1933 Hitachi has been manufacturing steam turbine generators for the global market, with over 1600 units supplied worldwide totaling more than 90 GW of installed generating capacity.
Hitachi is well regarded as one of the industry leaders in providing high quality and reliable machines for nuclear, coal, gas and hydro applications.

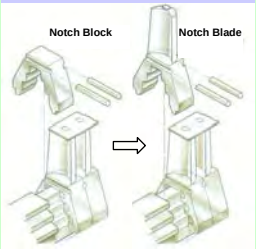
Hitachi has supplied 12 large steam turbine generators for the Australian market. 10 x 350MW units for Tarong, Callide 'B' and Stanwell Power Stations in Queensland and 2 x 500MW units for Loy Yang 'B' Power Station in Victoria. These units have been reliably generating electricity to Australian consumers for the past 20 years forming the backbone of the electricity generating network.

Hitachi has gained a wealth of experience through the many steam turbine units installed worldwide. Hitachi's in-house design group has utilised this experience together with proven leading technology to develop new turbine technologies. These new technologies enhance steam turbine efficiency and improve reliability whilst using the latest material and manufacturing technology.
These advances ensure Hitachi remains a world leader in the design and manufacture of steam turbines.

Turbine Efficiency Upgrading

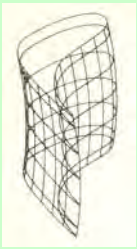
Turbine Upgrade	Turbine Area	Upgrading Benefits		
		Efficiency	Reliability	Material
Advanced Vortex Nozzle (AVN)	HP, IP & LP	Yes	Yes	Yes
Continuous Cover Blade (CCB)	IP & LP	Yes	Yes	Yes
Multiple Sealing Fins	HP, IP & LP	Yes	--	Yes
Notch Block conversion to Notch Blade	HP & IP	Yes	--	--
Hi/Lo Tip Seals for CCB	HP & IP	Yes	--	--

New Notch Blade



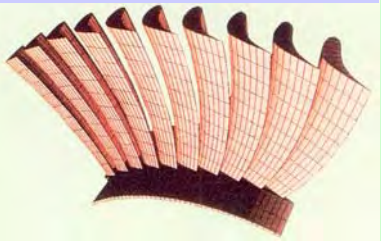
New CCB Tip Seals

New Continuous Cover Blade (CCB)



Hitachi has the technology and experience to upgrade non-Hitachi machines. We have been upgrading non-Hitachi machines including GE, GEC, KWU, BTH, Escher Wyss and AEG since 1981 with capacities ranging from 7.5 to 1000MW.
Hitachi Australia recently completed a contract for the replacement including efficiency improvement of the Liddell P.S. 4 x 500MW LP turbines.

New Advanced Vortex Nozzle (AVN)



Liddell P.S. 500MW LP Turbine Upgrade

Large Steam Turbine

Hitachi Australia provides spare parts, overhaul, inspection, diagnosis and repair services to the Australian electricity generation industry.

Hitachi Australia have ongoing maintenance services with leading Australian electricity generators including, Tarong Energy Corporation Ltd, Stanwell Corporation Ltd, CS Energy Ltd and International Power Mitsui (IPM).

LP Turbine Rotor Non-Destructive Testing

Turbine Maintenance Services

To achieve stable operation in thermal power plants, it is important to reduce the number of unplanned outages of turbines and maintain plant safety. The key to reducing the number of unplanned outages is preventative maintenance.
Hitachi Australia specialise in providing this preventative maintenance service for large steam turbines . Preventative maintenance includes the routine inspection and testing of components to recognise signs of failure at the early stages. Remaining life analysis, repair or replacement is then performed to ensure long term stable operation.
Hitachi Australia provides high quality yet competitive maintenance services through the utilisation of specialists from our factories in Japan and Canada together with local skilled labour.

Turbine Spare Parts

Hitachi Australia provide quality spare parts for turbine and ancillary equipment for Hitachi and non-Hitachi machines from our factories in Japan and Canada.

Quality deterioration due to aging

Causes of efficiency deterioration that lead to increased fuel consumption

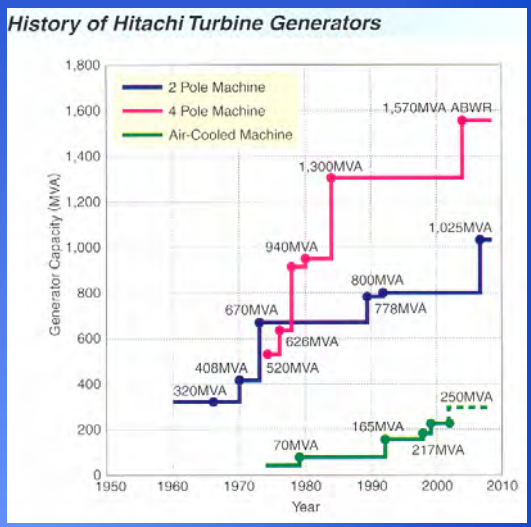
- Buildup of scales → Reduced nozzle area
- Wear → Eroded diaphragm
- Wear → Greater gaps in packing

Causes of strength deterioration that lead to equipment failure

- Corrosion → Defective dovetail on the LP rotor
- Corrosion → Damaged final stage blade and erosion shield
- Corrosion → Defective fork-type dovetail pin
- Corrosion → Damaged bellows on the crossover pipe
- Wear → Eroded main stop valve stem
- Wear → Eroded first stage HP nozzle
- Wear → Eroded first stage of IP bucket
- Wear → Eroded first stage of IP nozzle
- Creep → Damaged bolts
- Creep → Deformed diaphragm
- Creep → Bent rotor
- Fatigue → Damaged bucket
- Fatigue → Fractured CV rod
- Fatigue → Cracked casing
- Fatigue → Cracked rotor
- Fatigue → Damaged nozzle box
- Brittleness → Damaged rotor
- Brittleness → Damaged casing
- Brittleness → Damaged bolt

Large Generator

1,300 MVA Nuclear Turbine Generator, Japan



Hitachi has manufactured over 1,000 generators since 1933 with wide ranging capacities up to 1,600MVA and several types of cooling systems. Hitachi generators feature nuclear, thermal or hydroelectric applications, air, water or hydrogen cooled, high reliability, high efficiency, computerised manufacturing facilities, state-of-the-art technologies, on-going research and development, punctual delivery and after sales maintenance support.

Tarong P.S Unit 2 Generator Stator Rewinding

Generator Upgrading/ Rewinding

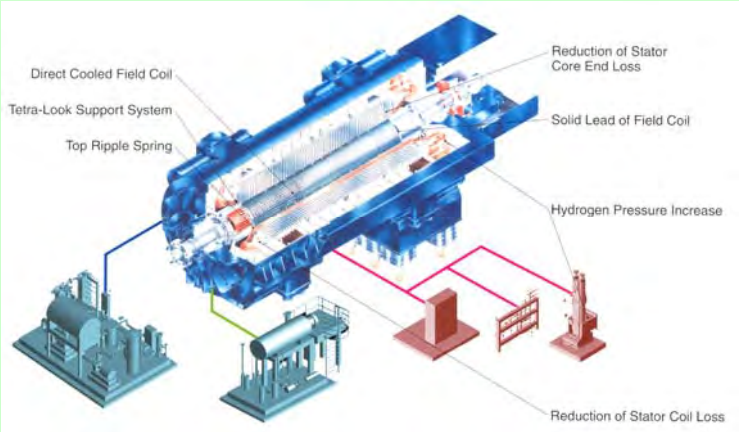
In 2000 Hitachi Australia conducted the emergency rebuilding of Unit 2 500MW generator at Loy Yang 'B' P.S. including core replacement and stator and rotor rewinding. The complete generator rebuild was completed in 3.5 months from generator failure to return to service.

From 2003 to 2006 Hitachi Australia successfully completed the rewinding of the 350MW Units 1 to 4 at Tarong P.S.

Hitachi Australia provides a complete service for generator upgrading/ rewinding including supply of all new components, tools, test equipment and specialist labour . Our rewinding team is generally a combination of specialist winders from our factory in Japan and local skilled Australian labour. This labour combination provides a cost effective, efficient, high quality result for customers.

How to Upgrade/ Uprate?

- Stator rewinding with improved stator coil technology
- Rotor rewinding with field coil direct cooling technology
- By application of solid type field lead for rotor
- By increasing hydrogen gas pressure
- By application of Tetra-Lock support system
- By application of top ripple spring
- By application of improved stator core design to reduce end losses



Rebuilding of 500MW Generator at Loy Yang 'B' Power Station

Large Generator

Loy Yang 'B' Power Station 2 x 500MW

Hitachi Australia provides spare parts, overhaul, inspection, diagnosis and repair services for large generators in Australia.

Hitachi Australia have ongoing maintenance services with leading Australian electricity generators including, Tarong Energy Corporation Ltd, Stanwell Corporation Ltd, CS Energy Ltd and International Power Mitsui (IPM).

Modal Vibration Analysis

Generator Maintenance Services

Hitachi Australia have the capability to provide comprehensive maintenance services for large generators including:

Stator:
- Modal Vibration Analysis
- Capacitance Mapping Testing
- Robotic Capacitance Mapping Testing
- Electrical Core Imperfection Detection (ELCID Testing)
- Core Loop Testing (Flux Test)
- Stator Wedge Testing and Replacement
- Hydraulic Integrity Testing (HIT Skid) of Stator Coils
- Stator Clip Water Leak Repairs
- Stator Core Tightness Testing
- Individual Stator Coil Cooling Water Flow Testing
- High Voltage Bushing Hydrogen Seal Replacement
- High Voltage Electrical Testing
- Spare Parts

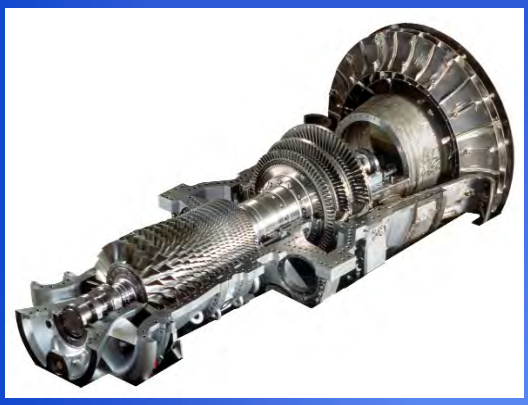
Rotor:
- Terminal Bolt Hydrogen Seal Replacement
- Center Bore Leak Testing
- Retaining Ring NDT and Replacement
- Rotor Wedge NDT and Replacement
- Complete Rotor Body NDT
- Field Winding NDT and Replacement
- Collector Ring Machining and Replacement
- Insulation Replacement
- Turn Short Identification and Repair
- Spare Parts

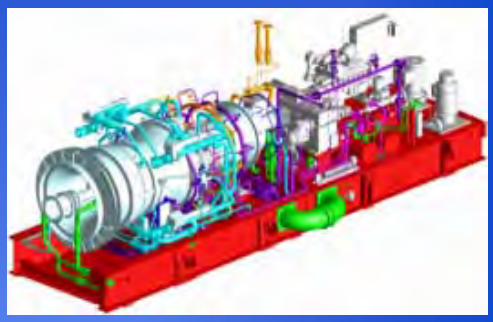
Hydraulic Integrity Test Skid

Benefits of Hitachi Maintenance

- OEM experience and support
- Quick and timely response
- Complete services capability
- Qualified specialists with global experience
- Quality workmanship
- Thorough investigation and reporting
- Local support
- Internet based Technical Answer Service
- 12 month warranty for maintenance work

H-15/H-25 Gas Turbine





Since 1964 Hitachi has been manufacturing high quality gas turbines for the global market. A total of 483 units have been manufactured for mechanical drive and power generation applications with sizes ranging from 3MW to 168MW. 14 Hitachi GTG units have been installed in Australia.

H-15/H-15 Performance

Item	Unit	H-25		H-15	
		Natural Gas	Distillate Oil	Natural Gas	Distillate Oil
Output	kW	27,500	26,300	14,700	14,400
Efficiency	% (LHV)	33.8	32.6	32.2	31.8
Heat Rate	Btu/kWh	10,097	10,469	10,599	10,732
Air Flow	kg/sec	88	88	52	52
Exhaust Temperature	°C	555	555	545	545

ISO Condition: Inlet Pressure Drop : 3.5inchH2O
Exhaust Pressure Drop : 2.5inchH2O

Developed to meet demands in the heavy-duty 25MW class turbine, the H-25 combines high thermal efficiency (LHV 33.8%) with world class reliability, and state-of-the-art material technology.

Operating with fully automated digital control and a modular design for easy installation and maintenance, H-25 turbines have accumulated >1,052,212 operating hours from 66 units since initial commercial operation in November 1988.

Benefits of the H-15/H-25 GTG

•High Efficiency
•World Class Reliability
•Robust Design
•High Fuel Flexibility
•Low NOx
•Fast Delivery
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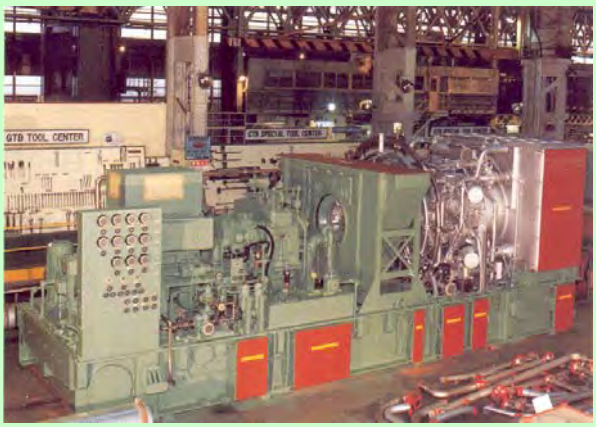

H-15/H-25 Applications

•Simple Cycle
•Combined Cycle
•Cogeneration
•Compressor Drive
•Multi-Energy Systems
•Dual Fuel
•Low Calorific Gas
•Frame 5 Retrofit
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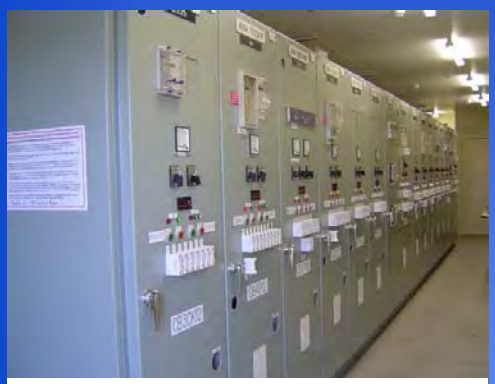
Transmission and Distribution Equipment



36kV Indoor Compact-GIS for Energex Ltd

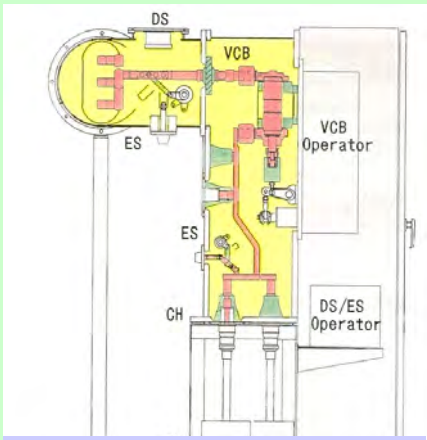
145kV Outdoor GIS for Energex Ltd

In 2001 Hitachi, Fuji and Meidensha merged to form Japan AE Power Systems for the global Transmission and Distribution business. Hitachi Australia represents Japan AE Power Systems for the Australian electricity industry. Hitachi Australia have ongoing business with leading Australian electricity corporations including, Energex Ltd, Western Power Corporation Ltd, Electranet Ltd and PAWA NT.

145kV Outdoor GIS for Energex Ltd

Switchgear Design, Manufacture, Testing, Installation & Commissioning

With over 30 years experience and 14,000 units of 72.5-550kV GIS supplied globally Japan AE Power Systems has established itself as a world leader in Gas Insulated Switchgear.
Hitachi Australia with the support of Japan AE Power Systems has the capability to provide turnkey switchgear solutions for the electricity industry.
Japan AE Power Systems can attribute their success through the world class reliability of the GIS. This high reliability is the result of superior technology and insulating materials, thorough quality control, 30 years of experience, intensive mechanical testing and larger insulation tolerances.

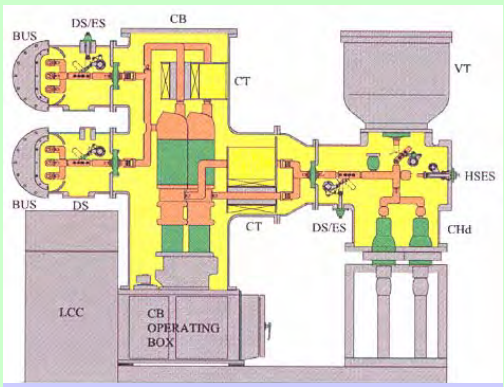


36kV Gas Insulated Switchgear

Hitachi Australia can provide state-of-the-art maintenance services including x-ray, inspection and diagnosis of Gas insulated Switchgear internal faults.

Rated Current \ Breaking Current	25kA	31.5kA	40kA	50kA	63kA
24/36kV	(P1) Motor Spring				
84/145kV		(P1) Motor Spring			
245kV			(P1) Motor Spring		
300/362kV			(P1) Hydraulic		
420kV			(P1) Hydraulic		
550kV			(P1) Hydraulic		

P1 : One (1) Break per Pole



145kV Gas Insulated Switchgear

Transmission and Distribution Equipment

Tarong North Power Station 24kV GMCB

Hitachi has been manufacturing Generator Main Circuit Breakers for more than 20 years. With over 210 units supplied worldwide of various capacities and ratings. These GMCB's are known for their high reliability and low maintenance.

Hitachi Australia has the capability to provide complete GMCB solutions including design, manufacture, testing installation and commissioning. Our GMCB's are capable of interfacing with all types of Isolated Phase Busbar (IPB's) designs.

Generator Main Circuit Breaker Design, Manufacture, Testing, Installation & Commissioning

Why Generator Breaker?

- Eliminates the starting transformer and its associated circuit breakers.
- Simplifies operation, as it eliminates the need for transferring auxiliary power supplies during start-up.
- Isolates the generator if a unit trips or a fault occurs.

GMCB Rating Table

No.	Classification			Cubicle Installation Type					Isolated Phase Bus Direct Connection Type									
									CB/DS Integrated Type					CB/DS Segregated Type				
														Vertical				Hor.
				Type I					Type II					Type III				
				A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
1	Rated Maximum Voltage		kV	27.5					27.5					27.5				
2	Rated Impulse Withstand Voltage		kV	125					125/150					125				
3	Rated Current	Natural Cooling	kA	7.2	8.2	6	6	10	8	8	12	16	22	6	10	16	18	22
		Forced Air Cooling	kA	-					-			32	44	-				44
4	Rated Breaking Current		kA	83		80	80/125		80	80/100	100/125			80/90	80		110	80
5	Rated Short-time Withstand Current		kA	83		125			80	100	125			125				280
6	Arc Extinguishing Method			Single Pressure Puffer Type					Single Pressure Puffer Type					Single Pressure Puffer Type				
7	CB Operating Method	Tripping		Pneumatic			Hydraulic		Pne	Hydraulic				Pneumatic			Hydraulic	
		Closing		Spring			Hydraulic		Spr	Hydraulic				Spring			Hydraulic	
8	Rated Operating Pressure		MPa	1.47			31.5		1.47	31.5				1.47			31.5	

Major Project Experience

Customer	Contract	Location	Unit No.	Year
Turbine: Stanwell Corporation	Turbine Major Overhaul & HIP Upgrade	Stanwell P.S.	1-4	2003-6
Macquarie Generation	LP Turbine Upgrading	Liddell P.S.	2	2003
Macquarie Generation	LP Turbine Upgrading	Liddell P.S.	1	2004
Macquarie Generation	LP Turbine Upgrading	Liddell P.S.	3	2005
Macquarie Generation	LP Turbine Upgrading	Liddell P.S.	4	2005
Edison Mission Energy	Turbine and Generator Major Overhaul	Loy Yang 'B' P.S.	2	2005
Edison Mission Energy	Turbine and Generator Major Overhaul	Loy Yang 'B' P.S.	2	2003
Edison Mission Energy	Turbine and Generator Major Overhaul	Loy Yang 'B' P.S.	1	2001
Generator: Edison Mission Energy	Generator Rebuilding	Loy Yang 'B' P.S.	2	2000
Tarong Energy Corporation	Generator Repairs	Tarong P.S.	2	2002
Stanwell Corporation	Generator Stator & Rotor Modifications	Stanwell P.S.	1-4	2002-5
Tarong Energy Corporation	Generator Stator Modifications	Tarong P.S.	3	2003
Tarong Energy Corporation	Generator Stator Rewinding (430MVA Up-rating)	Tarong P.S.	1-4	2003-6
Tarong Energy Corporation	Generator Rotor Investigation and Repair	Tarong P.S.	2/3	2005/6
Tarong Energy Corporation	Generator Rotor Investigation and Repair	Tarong P.S.	3	2006
Edison Mission Energy	Generator Stator Testing & Modifications	Loy Yang 'B' P.S.	2	2003
Transmission & Distribution: Energex Ltd	36kV Metal Clad Indoor GIS	Burleigh Heads S.S.	-	1999
Energex Ltd	36kV Metal Clad Indoor GIS	Tennyson S.S.	-	2000
Energex Ltd	36kV Metal Clad Indoor GIS	Beaudesert S.S.	-	2000
Pacific Power International	Generator Main Circuit Breaker	Tarong North P.S.	1	2001
Energex Ltd/ Western Power	145kV Outdoor GIS	Cook St S.S.	1	2001
Energex Ltd	123kV Outdoor GIS	Rocky Pt S.S	-	2001
Energex Ltd	36kV Metal Clad Indoor GIS	Brownsplains S.S.	-	2002
Energex Ltd	36kV Metal Clad Indoor GIS	Sunrise Hills S.S.	-	2002
Energex Ltd	123kV Outdoor GIS	West Maroochydore S.S.	-	2002
Energex Ltd	36kV Metal Clad Indoor GIS	Lytton B.S. S.S.	-	2002
Energex Ltd	36kV Metal Clad Indoor GIS	Postmans Ridge S.S.	-	2003
Western Power Corporation	145kV Outdoor GIS	Cook St S.S	2	2003
Energex Ltd	123kV Outdoor GIS	Coomera S.S.	-	2004
Energex Ltd	36kV Metal Clad Indoor GIS	Coomera S.S.	-	2004
Downer Engineering Pty Ltd	Generator Main Circuit Breaker	HuntlyCCGT Power Station	1	2006
Future Projects: Tarong Energy Corporation	Generator Replacement	Tarong P.S.	2	2007
Stanwell Corporation	Turbine/ Generator Upgrade and Overhaul	Stanwell P.S.	1-4	2008-11
International Power Mitsui (IPM)	Turbine Major Overhaul & HIP Rotor Replacement	Loy Yang 'B' P.S.	1	2006

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