

National Electricity Market of Singapore

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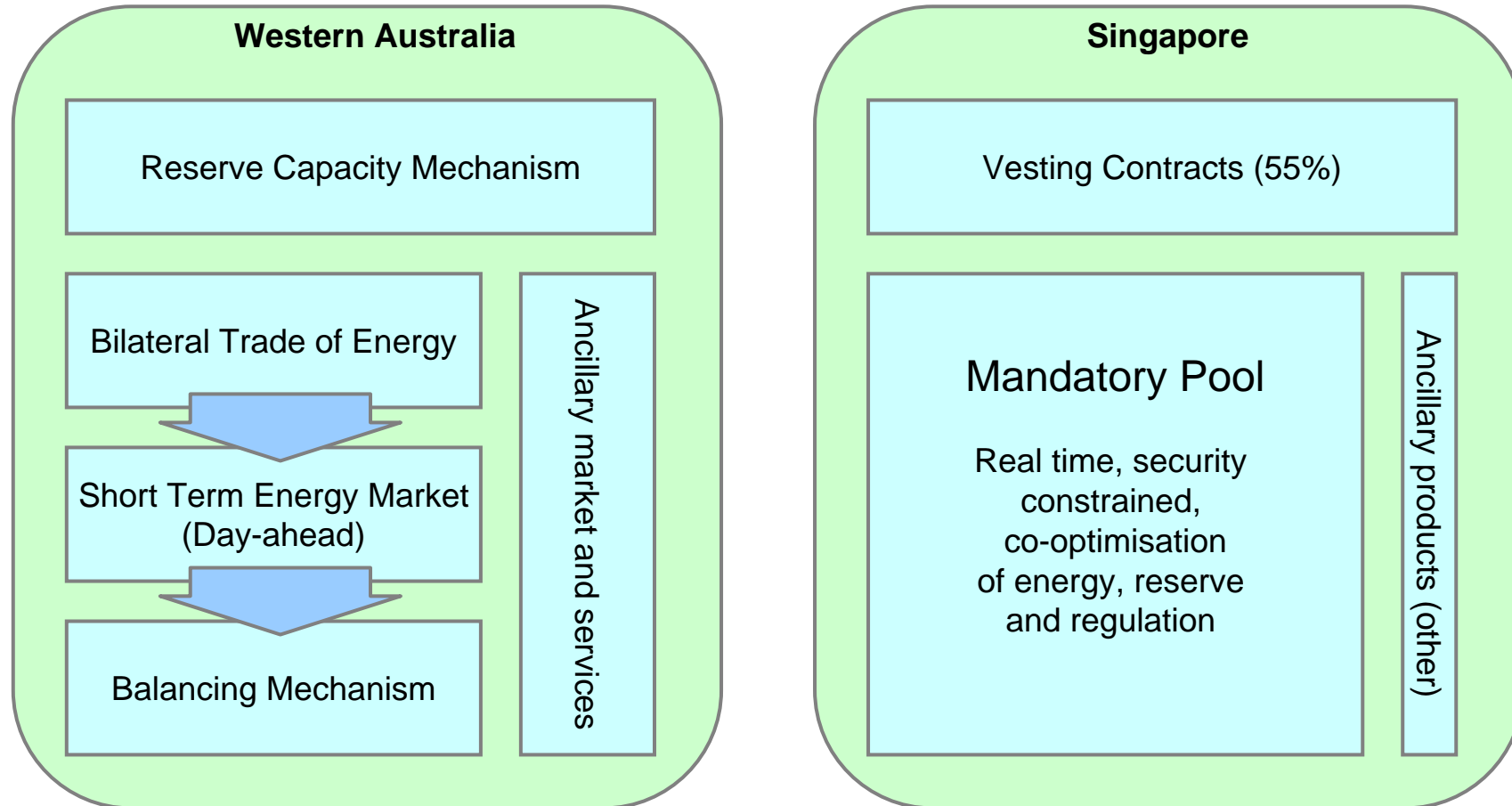
Overview of NEMS (National Electricity Market of Singapore)

Comparing features of NEMS (Singapore) and WEM (WA)

Geography



Different market models



2008 Benchmarking Study



Market design

		Singapore (31/12/08)	Western Australia (31/12/09)
Generation	Total generation	39.1 TWh	16.6 TWh
	Generation Mix	Actual used: 83% gas, 15% oil, 2% other	Installed: 33% gas, 28% coal, 22% dual (gas/liquids), 6% dual (coal/gas), 4% renewable, 7% other
	Installed capacity	10,420 MW	5,096 MW
	Number of generation coys >5% market share	5	4
Retail Competition	Retail Competition	Industrial & commercial 67%	Industrial & commercial 60%
	Load Profiling Used?	x	x
	Churn rate	3.9%	1.3%
	Number of retail coys > 5% market share	6	2

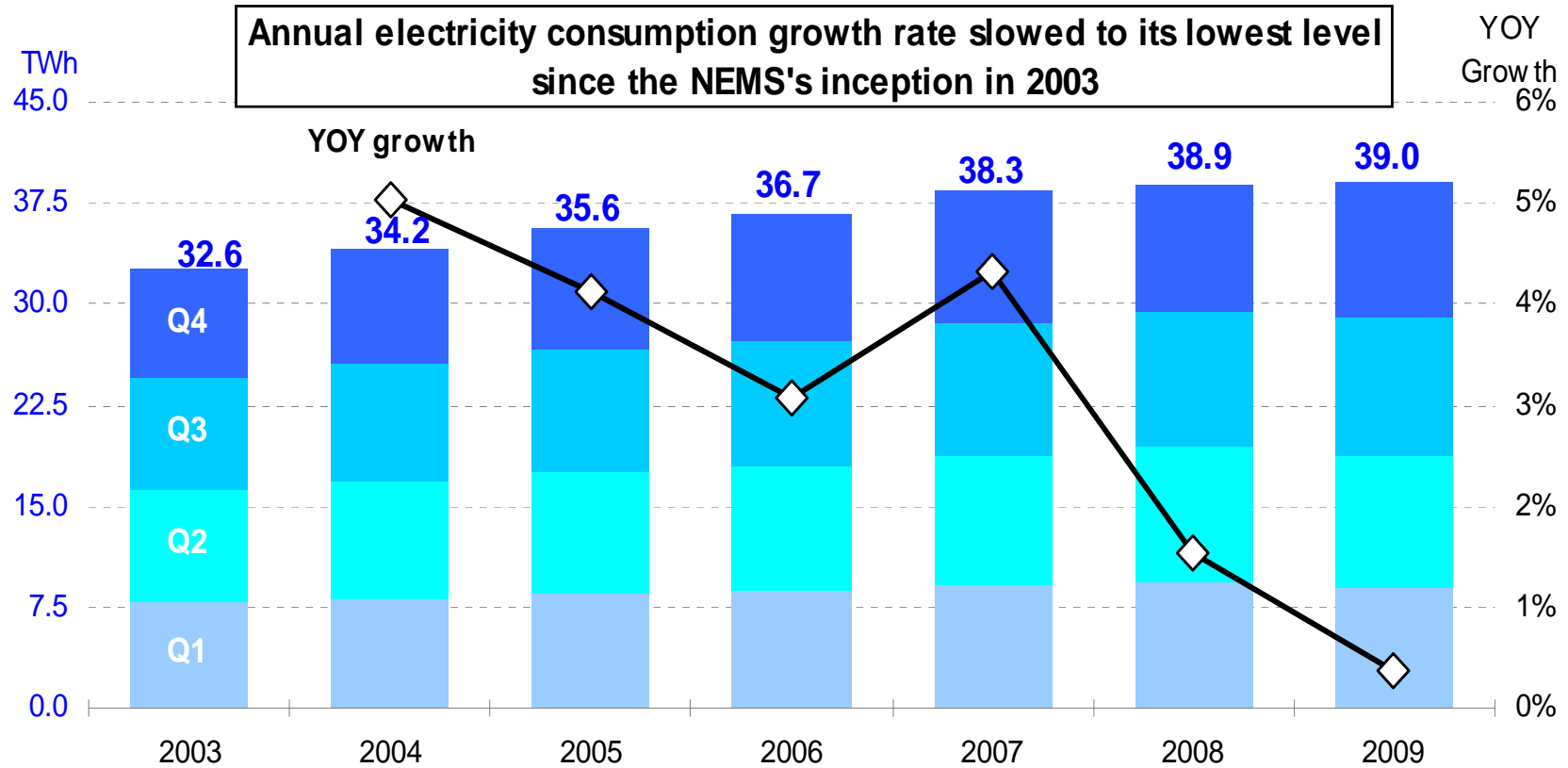
Market design

		Singapore	Western Australia
Market Design	Locational Marginal Pricing	Yes – 653 nodes (averaged for demand side)	No
	Price ceiling for energy	S\$4500/MWh	A\$464/MWh (Liquid) A\$276/MWh (Non-Liquid)
	Trading Period	30 mins	30 mins
	Gate Closure	65 mins	22 - 46 hours
	Capacity Mechanism	✘	✓
Products Traded	Real-time (spot)	Energy, Regulation, Primary Reserve, Secondary Reserve, Contingency Reserve	-
	Day-ahead	-	Energy
	Others	Bilateral contracts: Black-start Vesting Contracts	Capacity: Annual Bilateral contracts: Energy and reserve capacity Balancing: Energy Ancillary services: Spinning reserve, Load following, Black-start, Load rejection reserve, System restart, Dispatch support

Security of fuel supply in NEMS

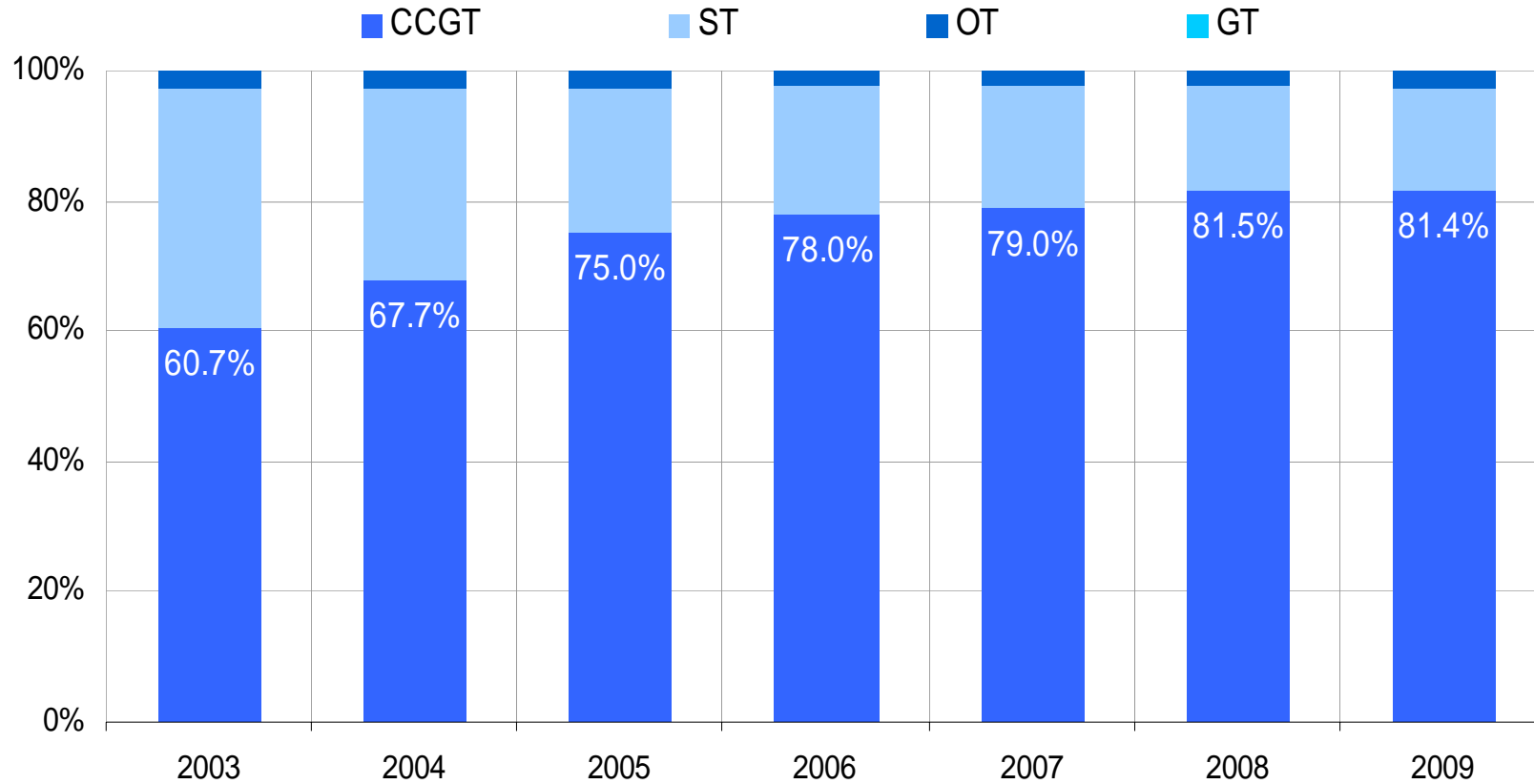
Meeting demand growth

Annual Metered Demand 2003/09



Shift to gas

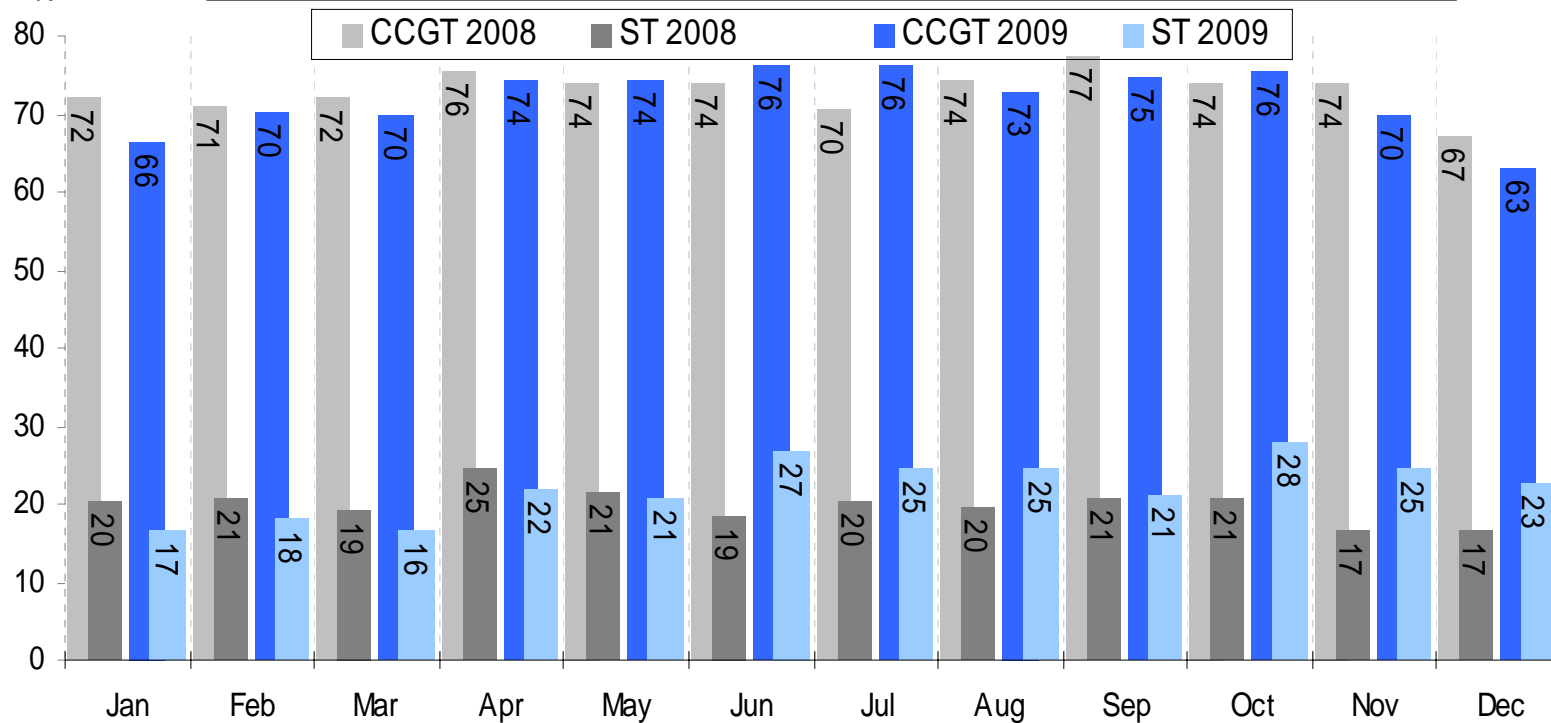
Annual Market Share by Plant Type 2003/09



However also reliant on HSFO

Monthly Utilisation Rate by Plant Type 2008/09

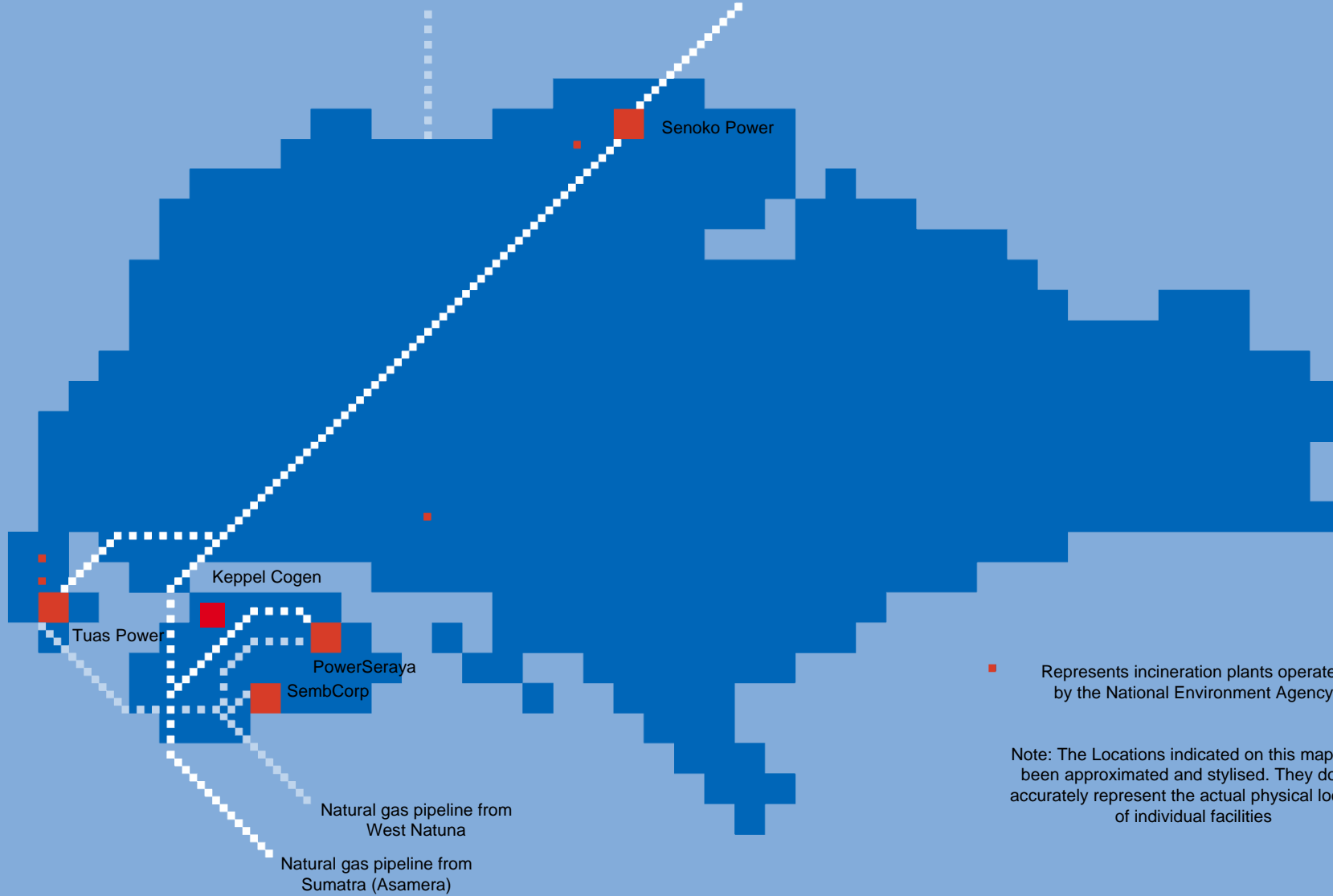
Stronger demand in the second half of 2009 helped support a higher ST utilisation rate, while the CCGT utilisation rate remained steady throughout the year.



Location Map of NEMS Generators

Electricity interconnection
with Malaysia

Natural gas pipeline
from Malaysia



■ Represents incineration plants operated by the National Environment Agency

Note: The Locations indicated on this map have been approximated and stylised. They do not accurately represent the actual physical location of individual facilities

Managing fuel security

- Incident on 29 June 2004 - problem with ORF exacerbated by limited line pack and CCGT hot-switching (only 1 out of 6 units successful)
 - Partial blackout (26% of load, 300,000 consumers) for 1 hr 48 minutes
 - Energy System Review Committee (ESRC) formed, recommended:
 - Move to a fully interconnected, open access gas system with a network code
 - Improved incentives for reliability at ORF (penalties commensurate with impact of failure on Singapore economy)
 - Regulator to produce annual plan to facilitate forward planning by industry
 - Increased regulatory gas expertise
 - Greater clarity of responsibilities between ministry (policy maker) and regulator (policy implementation)
 - Improve reliability of CCGT hot-switching (communication, maintenance, testing)
 - Establish gas system operator (close integration with PSO for risk assessment and planning)
 - Establish a fuel mix and diversification policy
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Managing fuel security

“We remain committed to opening up our electricity and gas markets to competition, and to ensure that the design of the market will support open, competitive access for all players. Our rules and regulations will be strengthened where necessary to provide greater clarity, effectiveness, and accountability”

Lim Hng Kiang, Minister for Trade and Industry, Singapore
1 March 2005

The situation today:

- Three international gas pipes (from Malaysia and Indonesia)
- Dual pipe connections at most generation facilities
- Pressure at receiving stations closely monitored by PSO and Gencos
- Dual firing capability of CCGTs – diesel stored on site as backup
- PSO given responsibilities for monitoring gas network and coordinating industry wide contingency test exercises
- Large generation reserve capacity available from older steam sets (HSFO)
- Decision to build LNG facility
- “Clean” coal project announced

LNG facility being constructed

- LNG terminal originally envisaged as a commercial project, became difficult with economic downturn
- June 2009, the government decided to take over construction of LNG terminal, formed Singapore LNG Corporate (SLNG)
- February 2010, SLNG awarded turnkey contract to Samsung C&T Corporation
- LNG terminal with initially 3.5 million tonnes per annum (Mtpa) to open in 2013
- BG is LNG aggregator – exclusive rights to import 3 Mtpa, currently negotiating agreements with generation companies

Become a Smart Energy Economy

Diversify our energy sources

- Medium term - explore coal and electricity imports
- Long-term - supporting innovation and investment in renewable energy, study the feasibility of nuclear energy

Invest early in critical energy infrastructure

- Establish Intelligent Energy Systems (IES)
- Invest in infrastructure to improve national energy security and efficiency e.g. LNG terminal
- Develop Jurong Island as an energy-optimised industrial cluster

Increase energy efficiency

- Promote energy efficiency for buildings, industry and homes
- Support low-carbon solutions in transportation

Price energy to reflect real costs

- Price of energy to include energy security and environmental sustainability

