Overview of Electricity Markets in Other Economies

Throughout the Hong Kong's electricity market review, we have drawn reference to the relevant experience of other economies. The tables below summarise the key findings of our research studies conducted during 2003-2004 on the main features and recent developments of the electricity markets in the following economies:

- Australia
- Canada
- Germany
- Japan
- Mainland China
- Singapore
- United Kingdom
- United States

Economic Development and Labour Bureau

October 2004

Population	19.8 million (in 2002)
Installed generation capacity	44.8 GW (in 2002)
Generation fuel mix	60.9% coal, 16.5% hydro, 13.3% gas, 3.1% oil, 6.2% others
	(in 2002)
Maximum demand	$33.5 \text{ GW} (\text{in } 2002)^1$
Reserve margin	33.7% (in 2002) ²
Load mix	26.7% residential, 23.8% commercial, 49.5% industrial &
	others (in 2002)
Total electricity consumption	176.3 TWh (in 2002)
Market structure/features	Prior to market reform (before early 90's)
	• dominated by vertically integrated supply authorities,
	gradually corporatised as state-owned utilities
	• prices set by respective state governments on cost plus
	basis
	• only some states were interconnected

Australia

Estimated based on the sum of individual peaks for different States/Territories that occurred at different time of the year Calculated based on the sum of individual peaks for different States/Territories 1

²

Australia (cont'd)

Market structure/features	Major changes since reform/current situation
	• utilities in those states that participated in the National
	Electricity Market (NEM) segregated into generation,
	transmission, distribution and supply companies
	• 2 states (Victoria and South Australia) had privatised their
	electricity supply assets, assets in others still dominated by
	state-owned companies
	• National Electricity Code Administrator and National
	Electricity Management Company Limited established in
	1996 to administer the National Electricity Code and to
	manage NEM
	• wholesale competition under the NEM introduced in 1998
	with mandatory open grid access
	• network business regulated by CPI-X price/revenue cap
	regime
	• retail market liberalised in phases, full competition
	introduced in some states since 2002
	• electricity prices in certain states reported to be reduced by
	some 25% to 30% since reform
	• preparatory works for further reform being carried out
	including establishment of new regulatory bodies

	Canada
Population	32.5 million (in 2003)
Installed generation	Whole country: 111 GW (in 2002)
capacity	Ontario: 30 GW (in 2002)
Generation fuel mix	Whole country: 60% hydro, 30% thermal, 10% nuclear (in 2002)
	Ontario: 26% coal, 12% oil/gas, 36% nuclear, 26% hydro and
	others (in 2002)
Maximum demand	Ontario: 25.4 GW (in 2002)
Reserve margin	Ontario: 18% (in 2002)
Load mix	Ontario: 31% residential, 69% non-residential (in 2002)
Total electricity	Whole country: 487 TWh (in 2002)
consumption	Ontario: 152 TWh (in 2003)
Market structure/features	Electricity market in Canada is under the jurisdiction of each
	province, Alberta and Ontario are the two provinces that
	launched major reform (market development in Ontario outlined
	below).
	Prior to market reform in Ontario (before end 90's)
	• wholesale market dominated by a government-owned
	vertically integrated utility
	• over 300 distribution companies at municipal level
	 power trading with neighbouring provinces/areas
	Major changes since reform/current situation in Ontario
	• business functions segregated into different companies, but
	still under government ownership
	• generation company required to reduce market share gradually
	and de-control part of its generation capacity
	• transmission and distribution sectors regulated by an
	independent authority
	• wholesale and retail competition commenced in May 2002,
	power shortage drove wholesale prices up and caused the
	government to impose retail rate freeze in December 2002

Population	82.5 million (in 2002)
Installed generation capacity	105.9 GW (in 2002)
Generation fuel mix	51% coal, 31% nuclear, 7% gas, 9% renewable & waste, 2%
	oil (in 2002) ³
Maximum demand	79.7 GW (in 2002)
Reserve margin	32.9% (in 2002)
Load mix	27.6% residential, 44.8% industrial, 27.6% commercial &
	others (in 2002)
Total electricity consumption	493 TWh (in 2002)
Market structure/features	Prior to market reform (before mid 90's)
	• mixed ownership – utilities owned by private investors or
	municipalities, or jointly owned by private investors and
	local governments
	• highly fragmented with over 900 electric utilities
	• dominated by 8 supra-regional utilities
	• exclusive franchise rights for utilities to supply
	Major changes since reform/current situation
	• driven by relevant EU directive, market liberalised with
	exclusive franchise rights removed and consumers
	allowed choice of suppliers in 1998
	• still highly fragmented with mixed ownership but
	dominated by 4 supra-regional utilities
	• mandated accounting separation for vertically integrated
	utilities and open grid access
	• grid access through negotiations based on voluntary
	framework set by industry associations, regulatory body to
	regulate open grid access being considered
	• industrial consumers faced lower prices, but average
	household tariff increased due mainly to eco-tax

Germany

³ Calculation based on electrical energy generated

Population	127 million (in 2003)
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Installed generation capacity	237 GW (in 2002)
Generation fuel mix	62% thermal, 19% nuclear, 19% hydro (in 2002)
Maximum demand	176.7 GW (in 2002)
Reserve margin	34% (in 2002)
Load mix	31% residential, 69% non-residential (in 2002)
Total electricity consumption	841.5 TWh (in 2002)
Market structure/features	Prior to market reform (before mid 90's)
	• dominated by 10 investor-owned vertically integrated
	utilities, with mutually exclusive supply areas
	• some generation facilities jointly owned by the utilities
	and the government
	• joint generation development and power exchange
	between some utilities
	Major changes since reform/current situation
	• electric utilities still vertically integrated and
	investor-owned, but required to provide wholesale
	electricity wheeling for other suppliers
	• bidding process for building new generation introduced
	since 1995
	• partial liberalisation of retail market since 2000 to allow
	large consumers to choose suppliers, extended to smaller
	consumers in stages in 2004 and 2005, complete
	liberalisation in 2007 being considered
	Ğ
	• tariff on downward trend since reform by about 11% from
	1997 to 2002
	• market regulated by a rate of return type of regime

Japan

Population	1,287 million (in 2003)
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Installed generation capacity	385 GW (in 2003)
Generation fuel mix	74% thermal, 24% hydro, 2% nuclear (in 2003)
Maximum demand	210 GW for centrally dispatched through major grids only (in
	2002), demand supplied via non-centrally dispatched
	generation not available
Reserve margin	Figures not available
Load mix	12% residential, 88% non-residential (in 2003)
Total electricity consumption	1,620 TWh (in 2002)
Market structure/features	Prior to market reform (before late 2002)
	• dominated by government owned vertically integrated
	State Power Corporation (SPC)
	• consisted of 6 regional power grids with some
	local/regional vertically integrated utilities, mostly
	subsidiaries of SPC except for Guangdong, which was
	under the provincial government's ownership
	 some independent power producers selling power to SPC
	or local/regional utilities
	Major changes since reform/current situation
	• SPC's assets divided into 5 generation group companies
	and 2 power grid companies
	• State Electricity Regulatory Commission formed to take up
	the main regulatory role
	• several regional markets set up for trial wholesale
	competition in 2004/2005
	• National Development and Reform Commission
	formulates pricing policy, while local authorities approve
	local tariff
	• tariff rising due to fuel price and tight demand/supply
	situation

Mainland China

Degulation	4.6 million (in 2002)
Population	4.6 million (in 2003)
Installed generation capacity	8.9 GW (in 2003)
Generation fuel mix	51% oil, 43% natural gas, 6% others $(in 2002)^4$
Maximum demand	5.1 GW (in 2003)
Reserve margin	75% (in 2003)
Load mix	20% residential, 80% non-residential (in 2003)
Total electricity consumption	32 TWh (in 2003)
Market structure/features	Prior to market reform (before mid 90's)
	• government-owned utility provided supply until 1995
	• corporatisation of electricity supply business in 1995,
	with functions segregated into different companies under
	government ownership
	Major changes since reform/current situation
	• majority of supply businesses still under government
	ownership
	• wholesale market in the form of power pool introduced in
	1998
	• independent regulator and system operator established in
	2001 to regulate the market and to operate the power
	system
	• market operator established to operate wholesale market
	in 2003
	• retail market liberalised in phases since 2001 with choice
	for large consumers, further extension to all consumers
	being considered
	• tariff remained stable
	• network business regulated by CPI-X type regime
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Singapore

⁴ Calculation based on electrical energy generated

Population	59.2 million (in 2002)
Installed generation capacity	77 GW (in 2002)
Generation fuel mix	36% coal, 31% gas, 16% nuclear, 5% oil, 6% hydro, 1%
	renewable, 5% others (in 2002)
Maximum demand	59 GW (in 2002) ⁵
Reserve margin	30.5 % (in 2002) ⁶
Load mix	29% domestic, 37% industrial, 34% service/others (in 2003)
Total electricity consumption	343.9 TWh (in 2002)
Market structure/features	Prior to market reform (England & Wales, before late 80's)
	• dominated by the Central Electric Generating Board (CEGB),
	a government utility that owned and operated all generation
	and transmission facilities
	• distribution facilities also owned by government and
	administered by 12 Regional Area Boards
	• some independent generators sold power to CEGB
	Major changes since reform/current situation
	• all utilities privatised except some old nuclear plants
	• all business functions segregated, each company requiring a
	licence to operate
	• mandated to provide grid access, network business regulated
	by RPI-X price cap regime
	• wholesale competition introduced via power pool in 1990,
	replaced by new trading arrangement since 2001
	• retail competition introduced in phases, all consumers allowed
	the free choice of suppliers since 1999
	• typical consumers enjoyed some 30% reduction in electricity
	prices since reform, but recent prices on rising trend
	• integration with the Scotland market being planned

United Kingdom

⁵ Estimated based on the sum of individual peaks for England & Wales, Scotland and Northern Ireland that occurred at different time of the year Calculated based on the sum of individual peaks for England & Wales, Scotland and Northern Ireland

⁶

Population	290 million (in 2003)
Installed generation capacity	905 GW (in 2002)
Generation fuel mix	50% coal, 18% gas, 7% hydro, 20% nuclear, 5% others (in
	2002) 7
Maximum demand	715 GW (in 2002)
Reserve margin	27% (in 2002)
Load mix	37% residential, 63% non-residential (in 2002)
Total electricity consumption	3,463 TWh (in 2002)
Market structure/features	Generally divided into wholesale and retail markets, with the
	Federal Energy Regulatory Commission (FERC) overseeing
	the former, and state regulators overseeing the latter
	Prior to market reform (before mid 90's)
	• mixed ownership - mostly investor-owned utilities, with
	some owned by federal/municipal governments or
	cooperatives
	• each state dominated by a few vertically integrated
	utilities, with some non-utility generators to produce and
	sell power to the utilities
	• some regional municipal/cooperative utilities only owned
	distribution and retail businesses
	• inter-state power trading between utilities with
	interconnections

United States

⁷ Calculation based on electrical energy generated

Market structure/features	Major changes since reform/current situation
	• mixed ownership - still dominated by investor-owned
	utilities, with non-utility generation's share increasing
	• network businesses separated from other businesses,
	mandatory open grid access
	• wholesale competition continued to develop, with
	regional markets emerging/expanding
	• wholesale price fluctuation depending on supply and
	demand, major price fluctuation in California in
	2000/2001 drove some suppliers to brink of bankruptcy
	• retail competition introduced in some states since late
	90's at different pace, with tariff levels varying from state
	to state
	• rate of return regulatory regime commonly adopted,
	performance-based ratemaking regimes adopted in some
	states

United States (cont'd)

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