

Equities

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Eastern Japan earthquake/Power supply

Power shortfall in the summer looks inevitable

- Industry Overview
- The Japan Earthquake

Takashi Miyazaki

+81-3-6270-4795

takashi.miyazaki@citi.com

- **Can peak demand be met?** — We are being asked a lot whether it will be possible to supply enough electric power if surplus capacity is operated at full tilt. Electric power supply/demand is complicated by the issue of sourcing from other firms as well as from the power company's own facilities. Below we summarize the situation but **we conclude that it will not be easy to get hold of enough power** (Figure 1). Over the long term, the capacity loss could be made up through measures such as the construction of new LNG power stations but we would expect this to take three years or more. Ways of quickly sourcing enough power include the early restart of nuclear plants currently undergoing routine maintenance and manufacturing industry building its own generation facilities, responses we think are probably being looked at.
- **TEPCO's supply options enough?** — Of estimated total capacity of 75mn kW, TEPCO has lost 22mn kW in the earthquake and if we include loss through routine maintenance and low hydro operating rates (21mn kW), then current capacity comes to 33mn kW, or 44% of estimated total capacity. Moving forward, we expect TEPCO to respond by starting back up thermal plants that are undergoing routine maintenance (3.4mn kW), starting back up thermal plants that have been idled long term (mainly oil-fired, 2.8mn kW), and also, as it did in 2007, raising operating rates at plants (3.3mn kW) and buying in surplus power generated privately in-house (700,000 kW). **This, together with current capacity, comes to 43.9mn kW, giving maximum capacity of just over 70% versus peak demand of around 61mn kW.**
- **Tohoku Electric to meet demand?** — We put current capacity at only 48% of estimated total capacity of 21mn kW. We think Tohoku Electric will be able to secure capacity of 11.6mn kW, **just over 80% of peak demand** (see inside).
- **Any fix from other regions, nuclear?** — With TEPCO and Tohoku Electric, who have traditionally worked in tandem, both suffering, supply from western Japan is the only geographical fix, but **only 1mn kW is available**, due to the east/west difference in utility frequencies, and we have already counted this in TEPCO's supply capacity. As for idled nuclear capacity, TEPCO has 3.3mn kW at Kashiwazaki-Kariwa, while Tohoku Electric has 1.1mn kW at Higashidori, which we believe was not affected by the tsunami, and 2.2mn kW at Onagawa, but **restarting these is unlikely to be politically possible before summer.**
- **Demand-side management vital but too complex?** — There are huge fluctuations in power demand in the course of the day, with peak demand coming in early afternoon. From total August electricity demand data, we estimate August average required capacity at TEPCO at 38m kW or so and at Tohoku Electric at 9.8mn kW or so. It is possible that power shortages will not be as severe as capacity shortages, but only if **the government plays the role of coordinator** and forces adjustments on the demand side, such as by concentrating manufacturing production at night, when demand is lower.

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Figure 1. Original supply capacity and post-earthquake supply capacity at TEPCO and Tohoku Electric (mn kW)
Need to find 7.5mn kW of capacity (6.1mn kW at TEPCO) to meet the summer demand spike

	Tokyo Electric Power (9501)					Tohoku Electric Power (9506)					Eastern Japan		
	Capacity	Lost in quake	Routine maintenance	Current capacity	% of capacity	Capacity	Lost in quake	Routine maintenance	Current capacity	% of capacity	Capacity	Current capacity	% of capacity
Nuclear	18.2	10.0	3.9	4.4	24%	3.5	2.4	0.6	0.5	16%	21.7	4.9	23%
Thermal	42.1	12.3	3.4	28.0	67%	13.8	5.1		8.7	63%	55.8	36.7	66%
Hydro	14.6		13.8	0.8	5%	3.7		3.1	0.7	18%	18.4	1.4	8%
Others						0.3			0.3		0.3		
Total	74.9	22.2	21.1	33.2	44%	21.3	7.5	3.6	10.1	48%	96.1	43.3	45%

Note: "Routine maintenance" includes supply capacity not deemed as stable at pump-storage and other hydro facilities. Power supply of 1.6mn kW from Western Japan and Hokkaido is included in TEPCO's current capacity (thermal).

Source: Company data, Citi Investment Research and Analysis estimates.

Figure 2. Supply capacity at TEPCO, Tohoku Electric, and in Eastern Japan (aggregate for the two companies) (mn kW)

Supply	Tokyo Electric Power (9501)	Tohoku Electric Power (9506)	Eastern Japan
Nuclear	18.2	3.5	21.7
Thermal	42.1	13.8	55.8
Hydro	14.6	3.7	18.4
Others	0.0	0.3	0.3
Total	a	74.9	21.3

Earthquake damage (estimated)	Tokyo Electric Power (9501)	Tohoku Electric Power (9506)	Eastern Japan
Nuclear	10.0	2.4	12.4
Fukushima No. 1	4.7	0.0	4.7
Fukushima No. 2	4.4	0.0	4.4
Onagawa		2.2	2.2
Tokai No. 2	0.9	0.2	1.1
Own thermal	10.6	3.4	13.9
Purchased thermal	1.7	1.7	3.4
Total	b	22.2	7.5

Routine maintenance/Idled	Tokyo Electric Power (9501)	Tohoku Electric Power (9506)	Eastern Japan
Kashiwazaki-Kariwa	3.3		3.3
Thermal	3.4		3.4
Nuclear	0.6	0.6	1.1
Total	c	7.3	0.6

Purchased supply	e	1.6	1.0
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Low hydro operating rate	f	13.8	3.1
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Current capacity	g=a-b-c+e-f	33.2	10.1	43.3
Capacity idled long-term	h	2.8		2.8
Other responses	i	7.9	1.5	9.4
Anticipated capacity this summer	j=g+h+i	43.9	11.6	55.4

Peak demand this summer		61.0	14.0	75.0
August average supply (estimated)		38.0	9.8	47.8
Peak demand this week		41.0	9.4	50.4

Note: We assume that the power companies will have responded by summer by restarting thermal plants that have been idled under their long-term plans.

Source: Company data, Citi Investment Research and Analysis estimates.

Addendum

TEPCO — Of the 10.6mn kW in thermal capacity damaged by the earthquake, much is on the Pacific coast in places such as Hirono (Fukushima Prefecture) and Kashima (Ibaraki Prefecture), and it looks as though some of it will take from six months to a year or so to get back up and running. We have factored in our expectation that Higashi Ogishima No. 1 (1mn kW) and Ooi No. 2 (350,000 kW) will be brought back by this summer.

Tohoku Electric — Deducting from estimated total capacity of 21mn kW capacity idled by the earthquake (7.5mn kW) and capacity undergoing routine maintenance and hydro power facilities operating at low rates (3.6mn kW), we estimate that current capacity comes to only 10.1mn kW (48%). We are optimistic that it can increase supply by around 1.5mn kW moving forward by starting up new thermal power capacity and by running existing power stations at high operating rates but at a total of 11.6mn kW, this would be only just over 80% of peak demand (14mn kW).

Appendix A-1

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