

Taking Stock

Adding Sustainability Variables to Asian Sectoral Analysis

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Sustainability

Sustainability is a systemic concept, relating to the continuity of economic, social, institutional and environmental aspects of development. In the terms of the 1987 Brundtland Report of the UN's World Commission on Environment and Development, sustainability is: "Meeting the needs of the present generation without compromising the ability of future generations to meet their needs." The key concept for investors is the need to address a range of environmental, social, and governance (ESG) factors which will inevitably shape long-term returns as markets respond to changing resource requirements and public priorities.

INTRODUCTION

Few sectors offer an Asian investor better insights into a country's ability to focus on long-term sustainability issues than the utility sector. This is a sector where the environmental and social impacts are significant, the capital costs for companies are immense relative to local capital markets, and the fuel decisions frequently touch on a country's most strategic foreign policy choices. As a result, the Asian power sector poses a broad array of investment questions which have the potential to change the risk-reward profile for investors and for Asian societies for years to come.

Few sectors offer an Asian investor better insights into a country's ability to focus on long-term sustainability issues than the utility sector

The Asian power sector has been shaped by two over-riding imperatives: the need to satisfy extremely rapid growth in demand for electricity and the need to create market-oriented power companies which can compete in more liquid global capital markets for the funding needed to meet Asia's electric power needs. Most of the companies represented in the listed equity universe have been players in a crucial period of modernization and economic growth. In an effort to reshape a largely government owned and controlled sector, there have been a range of experiments in power sector restructuring and privatization. Most are Asian blue chips with large asset bases and relatively stable earnings. Unlike their developed market counterparts, however, most lack both a competitive market orientation as well as a developed sustainability profile. This makes it difficult to simply map developed market sustainability issues to Asia's less diverse power sector landscape.

This combination of rapid demand growth and limited strategic flexibility which shapes the power sector in Asia results in a broader based set of sustainability questions than would be the case in developed markets where companies are building clear technical expertise against a backdrop of active government policy formation. As a result, over the medium-term, we see a scenario where investors assessing sustainability variables will need to focus on the better capitalized traditional power companies with the resources to pursue newer, more energy efficient technologies. It will also be crucial to evaluate which Asian governments have the ability to implement more forward-looking power sector policies which take into account a growing constellation of environmental and social risks. Over the longer-term, we expect to see a range of new entrants with business models more focused on specific opportunities in renewables and cleantech services.

In this report, we assess these issues in the context of Asia's most broadly held large- and mid-capitalization listed power companies. We believe that the most important sustainability themes for investors in Asian power companies will be:

- **Thermal efficiency** Primary energy efficiency — the ability of a power plant to convert fuel into electricity — is a powerful proxy for sustainability which highlights the operating skills of different operators
- **Regulatory risk** Regulatory structures shaping the Asian power sector are in the midst of change, reflecting emerging environmental and social impacts, and a web of complex policy choices

- **Making progress on cleaner fuels** Most Asian governments and power companies would like to move toward cleaner fuels, but the financial impact of switching to cleaner fuels will be high
- **Pricing in the environmental risks** Over the longer term, the management of environmental risks and opportunities will emerge as the key differentiator and promises to create opportunities for a new set of sector players

COUNTRY AND SECTOR DYNAMICS

What the sector looks like today

The largest listed Asian power companies tend to come from the more developed Asian countries which have large privatized government power companies. The size and composition of the listed universe is also a reflection of policy decisions concerning the structure of the industry. The sector features a mix of:

- traditional vertically integrated power companies with generation, transmission, and distribution assets
- unbundled power companies which specialize in generation
- unbundled power companies which specialize in transmission and distribution (T&D)

For example, the largest listed Asian power company by market capitalization — Korea Electric Power Company or KEPCO — is a vertically integrated power company which accounts for roughly 96% of all generation and which also controls the electricity grid, which handles transmission and distribution. Elsewhere in the region, Tenaga Nasional remains government controlled and has a similar profile to KEPCO with exposure to generation, transmission, and distribution.

Figure 1 Larger Regional Listed Power Companies

Market	Company	Market Cap* (US\$mm)
China	Huaneng Power	8,501
	Datang	3,796
	China Power International	1,031
Hong Kong	CLP	13,978
	HKE	10,571
India	Tata Power	1,914
Korea	Kepeco	24,191
Malaysia	Tenaga Nasional	8,463
	YTL	3,039
Philippines	Meralco	327
Thailand	Ratchaburi	1,454
	ECGO	1,043

* As at 30 December 2005, or last official day of trading

Source: Bloomberg, December 2005

While government control is the norm, Hong Kong's two vertically integrated power companies, CLP Holdings and Hong Kong Electric, are unique within the Asian power sector due to their history of private ownership and a growing focus on power projects outside of their home market. The independent power producer market in Asia is still limited in scope with Thailand's EGCO, Ratchaburi, and Malaysia's YTL as the most prominent listed company examples. India's power sector is still largely in government hands although Tata Power and the energy and power conglomerate Reliance Energy are beginning to emerge as more dynamic players with a strong private sector orientation.

The independent power producer market in Asia is still limited in scope

Across the region, there are also differences in the nature and extent of government ownership, with government shareholders ranging from policy-oriented development banks to more local, passive arms of the government. In the Chinese power sector, for example, government shareholdings dominate the ownership structure, but ownership tends to reflect a more diverse range of government-linked entities, some of which operate at the provincial level. This is also true in India where the state electricity boards traditionally owned the transmission and distribution infrastructure. The three most prominent pending privatizations — Singapore Power, TaiPower (Taiwan), and Electricity Generating Authority of Thailand (EGAT) — are all fully integrated power companies with ownership concentrated in the hands of the central government. In all three markets, however, there have been experiments in market liberalization, especially in the generating sector, which has resulted in significant independent power producer (IPP) investments. Nonetheless, strategic and market considerations have delayed proposed listings as governments have worked to address questions concerning market structure and also public expectations concerning future tariffs and arrangements covering current employees.

Cross-cutting issues

Any analysis of the Asian power sector must take into account three cross-cutting issues which have shaped the sector and promise to influence the impact of sustainability themes.

High demand growth Sustainability issues associated with the power sector — especially the focus on cleaner fuels and renewable energy — have grown in importance for developed market investors, especially with the launching of the EU Emissions Trading Scheme in January 2005. This provides companies in EU member countries with a market for buying and selling carbon emissions credits. In Asia, however, the debate over carbon policy issues is only slowly gathering momentum and the over-riding policy question remains the focus on access to electricity and reliability of supply. For example, in India today it is commonly estimated that as much as half of the population has no access to electricity. Elsewhere in the region, the rapid economic growth of the 1990's resulted in constant challenges for Asian policymakers as they raced to meet rising public expectations for jobs and for energy hungry amenities like air conditioning. With electricity demand growth averaging 5-10% annually through the 1990's, Asian power companies and bureaucrats have concentrated their focus on upgrading generation capacity to larger, more efficient units and improving grid operations. Indeed, efforts to fund this growth lay behind the privatization efforts which are shaping the Asian listed power sector today.

In Asia, however, the over-riding policy question remains the focus on access to electricity and reliability of supply

Figure 2 Asian Power Demand Growth: Fast and Faster

	Average Annual Growth 1990-2002 (%)	Highest Growth (%)	Installed Capacity (GW)
Bangladesh	6.8	12.1	3.4
China	8.3	11.9	338.3
Hong Kong	4.4	13.5	11.6
India	6.1	9.1	120.3
Indonesia	7.8	13.7	25.6
Japan	2.4	6.7	237.9
Malaysia	9.6	16.2	13.8
Pakistan	4.5	10.7	12.5
Philippines	5.1	10.0	13.4
Singapore	7.1	11.6	7.7
South Korea	9.8	11.7	54.5
Sri Lanka	7.2	13.3	1.0
Taiwan	5.4	9.1	30.1
Thailand	8.2	13.3	23.2
Vietnam	12.5	19.3	4.2

Source: Energy Information Administration (EIA), 2002

The most striking governance aspect of the Asian listed power sector is the fact that the controlling shareholder is, in most instances, the government

Government ownership The most striking governance aspect of the Asian listed power sector is the fact that the controlling shareholder is, in most instances, the government. Government control over the competitive landscape forces the sustainability analyst to draw a careful distinction between the strategic and operational choices which are the province of management and those which are controlled by the government. This is a crucial point because most Asian power companies are strategy takers — they respond to opportunities provided by governments but often have little discretion to shape them. In practical terms, this means that they rarely control fuel choices, technology options, or distribution strategies. As a result, many of the bedrock sustainability issues are hard to analyze accurately in Asia without first understanding the policy stance of different Asian governments, which generally remain very focused on efforts to plan and fund significant system growth in conventional fuels.

Figure 3 Government Shareholding of Asian Power Companies

		Government Ownership (%)	Market Value (US\$ bn)	Yield (%)
CLP Holdings	HK	0	13.8	4.8
Datong Power International	China	> 50	4.3	3.6
EGCO	Thailand	25	0.9	4.3
Hongkong Electric	HK	0	9.5	4.9
Huaneng Power International	China	>50%	11	3.9
KEPCO	Korea	54	15.1	4.5
Ratchaburi	Thailand	45	1.4	4.5
Tenaga	Malaysia	70	9.5	1.6

Source: analyst reports

Limited disclosure Investors in the Asian power sector face meaningful challenges in assembling a complete picture of government and corporate policies related to the power sector. While discussions of operating strategy and strategic risks, which touch on generation mix, thermal efficiency and environmental and social impact, are relatively common in developed markets, most Asian companies do not address these issues in even forward looking public disclosures. Asian power companies are beginning to make a more diligent effort to highlight their activities in the environmental arena. However, many of these disclosures are incomplete and most fail to outline financial impacts, potential new requirements, or development options. In general, the discussion is limited to compliance issues, not strategic or business considerations. Government disclosure of key regulations and sector policies is frequently limited as well, making it difficult for the public and outside investors to assess policy implementation.

Long-term sector outlook

Several distinctive trends will come into play over the next five to ten years. The first is greater diversity. The Asian listed power sector is currently dominated by government-linked power utilities which are in various stages of privatization. Moving forward, we expect more and more diverse players in the listed universe. This trend is already evident in high growth markets like India where non-traditional, but well established, companies are beginning to enter the power sector. Indeed, companies like Reliance Energy, while broadly exposed to energy and power, bring related sector experience without the limitations of links to the legacy regulated sector. In China, we are also seeing energy companies such as China National Offshore Oil (CNOOC) move into the power sector to capture downstream markets.

Moving forward, we expect more and more diverse players in the listed universe

In the meantime, we expect the heavily regulated markets with cautious competition to permit new entrants in the generation segment, but only if market conditions are relatively stable. Asian policymakers were careful observers of the turbulent U.S. market deregulation experiment, especially the California debacle, and remain comfortable in taking only limited steps toward market-based mechanisms which could increase efficiency but introduce price volatility. Finally, we believe that new opportunities, especially in the renewable energy, distribution and services realm look promising. Depending upon the pace of market development, the Asian power market could support the emergence of a range of innovative service providers in areas ranging from demand-side management to emissions trading. Supporting this trend will be growing policy support for market-based tools, which will force both producers and consumers to bear more of the long-term cost of energy and power sector environmental impacts.

ENERGY EFFICIENCY — A PROXY FOR SUSTAINABILITY

Given the different strategic context for listed Asian power companies, investors evaluating sustainability variables must re-cast the developed market list of issues to define themes which have the potential to drive valuations in Asian markets. Indeed, given Asian governments' high level of control over the power sector's commercial and strategic options, it is crucial for investors to identify those areas where management can act autonomously to implement strategy. With fuel and generation mix decisions largely fixed over the medium term, the focus must shift to operational decisions which are within management's control. These focus on questions of capital spending and equipment choice, operations and maintenance, and demand management. In addition, there are important operational variables such as system design, maintenance cycles, and workforce issues, especially for vertically integrated power companies involved in transmission and distribution.

From a sustainability perspective, perhaps the highest impact operating issue is thermal efficiency

From a sustainability perspective, perhaps the highest impact operating issue is thermal efficiency. While global sustainability-oriented investors tend to focus on power companies which have the most environmentally friendly generating strategies, the challenge in Asia is more basic. It must be to identify those companies which do a good job of operating the asset mix which they have, regardless of whether it meets the developed market ideal, and to identify those companies which have the ability to work toward a higher efficiency generation mix. This basic conservation strategy delivers a broad range of economic and environmental benefits. Indeed, thermal efficiency looks at the most basic issue in the electricity industry — how efficiently a power plant converts primary fuel sources, such as gas or coal, into electricity. It is, therefore, a fundamental measure of environmental efficiency. The less efficient the generator, the more fuel which must be burned, thereby raising resource needs and costs. Crucially, a cleaner, more efficient, "burn" typically results in lower emissions of critical pollutants such as greenhouse gases, sulphur dioxide (SO₂), nitrous oxide (NO_x), and particulates.

Figure 4 Thermal Efficiency Norms — Getting Better?

Generator type	Thermal Efficiency	Key Technologies
Coal-fired	30-40%	Clean coal technologies, flue gas desulphurization
Single-cycle gas	30%	Lacks the steam cycle
Combined-cycle gas	40-55%	Rated efficiency approaching 60%

Source: ASrIA, 2005

The key variables for thermal efficiency

The key variables for thermal efficiency are determined by fuel type, technology, and operation and maintenance standards. Combined-cycle gas units, which can burn either piped gas or reconstituted LNG, can achieve the highest thermal efficiency. These units use gas combustion to drive jet engine-style turbines. By capturing high temperature waste gases from the first combustion cycle,

combined cycle units then run a second cycle using the heat which is retained from the first cycle. With a multi-utility or co-generation strategy, other efficiencies can be realized and process outputs such as steam and purified water can be sold.

There have also been significant efforts to improve the thermal efficiency of coal generating technology in recent years. Meaningful improvements result from new strategies in fuel management such as fluidized bed systems, pulverizing and washing the coal. Supercritical steam systems are now coming into use in Asia and permit the steam to be heated to much higher temperatures which can result in efficiency gains. These units deliver significantly higher thermal efficiency and have the potential to deliver operational savings due to more efficient fuel usage patterns. Another technology which is in the advanced development stage but may become economically viable for coal-rich countries like China is integrated coal gasification (IGCC) which can be used to convert coal to a gas which can fuel combined cycle turbines. At the other end of the process, there are also well-established technologies for controlling emissions, such as flue gas desulphurization, which are only beginning to be standard for large units in China, thanks to tougher standards for new facilities.

Figure 5 Commitments to More Efficient Capacity

Datang:	Investing in supercritical coal-fired units
HPI:	Proposed combined cycle gas units; using fluidized bed technology; supercritical coal-fired units
CLP:	Expanding its existing combined cycle gas facility at Black Point; evaluating commitments to LNG; monitoring IGCC for use in Australia
HKE:	New commitment to LNG and combined cycle gas technology
KEP:	More combined cycle LNG units

Source: Company reports

The challenge for a good power company, however, is to improve thermal efficiency over time, taking into account potential technological improvements, the impact of changing fuel types, and obsolescence of the equipment. Obviously, the most important strategy for many companies will be to make key investments in new, more thermally efficient facilities as they increase their installed capacity. Cost-benefit trade-offs are inevitably a factor in these business decisions, as well as prevailing cost recovery schemes, which determine how a utility is paid for its investments and services.

Investors can draw material conclusions about management's ability to anticipate regulatory trends and implement efficiency strategies based upon choices about new technologies. This is also a factor when evaluating corporate policies toward retro-fitting older and existing facilities. Indeed, older units, especially coal-fired plants, typically have the worst thermal efficiency and are most likely to be the most polluting plants in a company's generation mix. If the facility represents an important share of baseload generation, however, it may be in service for a number of years if well maintained. Rather than milking an older, fully depreciated but inefficient plant, forward-looking operators are increasingly looking at strategies which can raise thermal efficiency and reduce air pollution to extend a key facility's useful life.

Figure 6 Thermal Efficiency: Coal at the Low End, Gas at the High End

CLP	
CLP Power Hong Kong (CCGT + coal)	39%
GPEC India (CCGT)	49%
Ho-Ping Taiwan (coal)	39%
Hongkong Electric	35%
China--Coal Fired Units	
Large units (600MW)	40%
Medium units (300MW)	35%
Small units (135MW)	30%

Source: Company reports, analyst estimates

Continual investment in maintenance strategies for existing facilities, as well as process improvements which can be used to improve fuel handling and reduce downtime, are crucial. Indeed, good operations and maintenance strategies can ensure that a competitive facility is more efficient overall and has a high availability rating, permitting the unit to take advantage of favorable demand conditions. In addition to assessing a plant's thermal efficiency, it is also possible to look at how much electricity the power plant itself consumes. This "self-use" can vary considerably between facilities and reflects the difference between gross and net generation. For example, it ranges from 3.4% to 8.5% for the coal-fired plants operated by newly listed China Power International.

High utilization rates can also be a huge challenge for operators in markets where demand growth is outpacing the growth of newly installed capacity. In China, in particular, high capacity factors, signalling heavy, extended output from key facilities is the norm in many areas. Not only does this result in deferred maintenance, but it can also result in early degradation of facilities and less efficient thermal conversion.

The next efficiency target for power companies is to raise standards for transmission and distribution systems

The next efficiency target for power companies is to raise standards for transmission and distribution systems. These backbones to the power system — high voltage transmission systems paired with lower voltage local distribution systems — are responsible for significant thermal losses as power is delivered to consumers. The losses can range from less than 5% in a well-functioning system to more than 10% if a system has been permitted to degrade and pilferage is also common. Good design, as well as careful maintenance and regular upgrades, are the key to lower transmission and distribution losses.

Cost-effective strategies for shaping demand

A third strategy which is important for monitoring a vertically integrated power company's commitment to efficient and cost effective resource usage is demand-side management. This is a strategy for shaping consumer demand patterns so that the system caters to a more efficient demand profile. The key issue for power system designers is to be able to meet peak demand — the

largest amount of power demanded at any given time. Needless to say, depending upon prevailing weather or industrial production cycles, peak demand may be significantly higher than average demand. As a result, good system planning often uses pricing incentives to dampen peak demand trends, especially in countries where peak demand comes in the early evening when factories are still operating and residential users go home and turn on their air conditioning units.

Figure 7 KEPCO on Demand Management

Principal measures are time-of use rate schedules, mostly for large-scale customers, and a progressive rate structure for residential use of electricity. Other measures include incentives from a public benefit fund for peak load reduction by adjusting vacation or repair schedules and for average load reduction during summer peak hours as well as Government encouragement of measures in building construction (such as use of ice-storage air conditioners) to reduce electricity use and the provision of loans on favorable terms by Government-controlled financial institutions for energy conservation projects with recommendations of the Korea Energy Management Corporation.

Source: KEPCO 20-F SEC filing, 2003

There are a range of very cost-effective strategies which can be used to influence consumption patterns and reduce capacity and capital spending requirements. These include peak demand pricing penalties and discounted tariffs for interruptible supply, which gives the system operator the right to cut power to certain users. By working with consumers, power companies can ensure that existing capacity is used in the most efficient possible way so that marginal new units are not added to the system simply to service unusual, low frequency demand spikes.

Figure 8 Demand Mix

	Industrial	Commercial	Residential	Transport & Infrastructure
CLP	10%	39%	25%	26%
HKE	5%	74%	22%	
KEPCO	51%	34%	15%	
Meralco	29%	36%	34%	1%
Tenaga (approximate)	50%	30%	20%	

Source: Company reports

There is significant variation amongst Asian listed power companies in terms of customer mix. This can determine the range of options a power company has in terms of improving efficiency and implementing innovative demand-side policies. For example, industrial consumers are typically quite responsive to price-based signals and can often adjust production schedules to meet alternative supply-demand constraints. For residential consumers, adjusting to new supply scenarios is often dependent upon the energy efficiency standards of the base housing stock and for common household appliances.

There is significant variation amongst Asian listed power companies in terms of customer mix

Figure 9 Lighting: a Case Study in Energy Savings

The amount of energy used from lighting varies from industry to industry, but typically, lighting accounts for approximately 15% of the electrical load in industry. In offices, the lighting may account for 50% of the electrical load. By having an understanding of the lamps, ballasts, luminaires and control options available today as well as the techniques used to develop efficient lighting, lighting can be produced that is energy efficient, cost effective and yields a higher quality of light.

Source: Brian Cook, originally published in *Power Engineering Journal*, IEE, October 1998

For investors looking at Asia's power sector, the issue of thermal efficiency and energy efficiency more broadly is a crucial long-term issue which has the potential to become even more significant as Asian governments develop policies to limit carbon emissions and address higher energy costs. Currently, CLP Holdings is the only Asian power company which has publicly outlined a competitive rationale for developing a more energy efficient asset mix, although it is clear that other companies are beginning to take similar, but less well articulated steps. On a medium-term view, investors will find companies coming under pressure to do a better job of addressing both potential policy changes and margin pressures due to less favorable energy pricing. This should have the effect of making thermal efficiency a more strategic consideration than was the case in the past.

To address this scenario, investors can consider several strategies:

- Look for those companies which have an installed capacity base with meaningful, near-term potential for improved thermal efficiency. This can provide a hedge against volatile fuel prices and potentially stricter policies on emissions
- Identify those Asian power companies which have country-appropriate experience in newer technologies. Most operators will face higher capital costs as they invest in more efficient plant and equipment. Indeed, scaling up these new technologies is difficult and the more sophisticated players may have a competitive advantage
- Be cautious about companies which do not display a commitment to high quality operations and maintenance norms. New, more efficient technologies generally require new technical capabilities. Without this, efficiency gains can prove elusive

REGULATORY RISK — WILL ASIAN GOVERNMENTS PROVIDE INCENTIVES FOR CHANGE?

Over much of the past ten years, investors in the global and Asian power sectors have learned to place a high priority on the regulatory outlook. Indeed, sector performance has often been dictated at the country level, with regulatory changes serving as the key driver for performance. We expect this trend to persist over the medium-and longer term. As a result, for investors, it will be crucial not just to assess company level variables, but also the country policy context which will shape new opportunities and, quite crucially, returns for listed power companies.

Sector performance has often been dictated at the country level with regulatory changes serving as the key driver for performance

We believe that the crucial medium-term regulatory policy issues shaping impacts on social, environmental, and governance risks will be:

- New tariff and rate of return structures
- Grid development
- Public dialogue about policy choices

These issues are all firmly rooted in any conventional analysis of the sector, and given the stage of development of Asian power markets will play a crucial role in determining the ability of Asian power companies to respond to sustainability challenges. Indeed, without clarity on market structures and rate of return parameters, companies have strong incentives to delay efforts to move toward more fuel efficient but potentially higher cost technologies. Long-term plans on grid structures are also crucial, especially as companies consider smaller scale and renewable technologies. And finally, stakeholder participation in key policy decisions is a crucial variable, especially where public support for the power sector has flagged due either to service problems or social and environmental impacts.

A dominating country-level variable

Compared to power markets in North America or Europe, Asian power markets remain tightly regulated and offer few explicit incentives for more fuel efficient or renewable technologies. Although there have been limited experiments with competitive bidding by independent power producers and power pools, prices are generally regulated with reference to a target price level or rate of return on assets. Despite this, Asian power companies do experience pricing pressure and, in some markets, de facto price competition, but it is typically filtered through a layer of government or regulatory control.

Figure 10 Asset-Based Returns and Little Competition

	Tariff Structure		Competition	Structure
China	Cost plus	medium	limited	Only generators are listed. 5 large gencos. 2 large grids.
Hong Kong	Asset-based	high	no	CLP and HKE are vertically integrated. Scheme of Control review pending. Expect lower RORB.
Korea	Asset-based	medium	no	KEPCO is vertically integrated. Gencos have been corporatized. Wholesale power market and IPPs. Deregulation on hold.
Malaysia	Asset-based	medium	no	IPPs control 40% of generation market. Tenaga is vertically integrated.
Philippines	Asset-based	low	no	Napocor (generation) is unlisted. Meralco business is distribution. Some IPPs.
Thailand	Asset-based	high	limited	2 listed IPPs. EGAT is vertically integrated. Some reform plans in process.

Source: ASRIA, 2005

Over the medium-term, investors should expect more regulatory volatility than we have seen over the past five years

Over the medium-term, investors should expect more regulatory volatility than we have seen over the past five years. While fundamental regulatory changes are still pending in India and the Philippines, crucial revisions in existing norms are pending in Hong Kong, China, and Malaysia. The Chinese power sector continues to move toward a more formal and transparent regulatory structure. The weak link has been reconciling the government's priority on low cost power with a system which still struggles to mobilize scarce resources toward meeting rapid demand growth. Indeed, rates of return across the sector are low by global standards and there are often significant lags between fuel price moves and subsequent tariff adjustments. Nonetheless, China is supporting the development of gas for the power sector both through the West-East pipeline and the importation of LNG. Leading companies such as Huaneng Power and Datang have formal plans to develop gas-fired units. What is somewhat less clear, however, is how these higher variable cost units will be treated under current tariff regulations.

By contrast, Hong Kong, which has long enjoyed generous reserve margins and highly reliable service, is reviewing its return structure. Hong Kong's privately owned sector has benefited from the region's most stable and profitable regulatory environment. As a result, it will be important to watch regulatory developments in 2006 as the Hong Kong government finalizes its review of the Scheme of Control for implementation in 2008. Both CLP Holdings and Hongkong Electric are technically sophisticated players and have increased their exposure to clean piped gas and LNG combined cycle units. In addition, both companies have announced plans to install wind turbines while CLP has made a formal commitment to increase renewable power to account for 5% of total generating capacity by 2010.

In Malaysia, investors have an unusual opportunity to observe efforts to improve what has been an ineffective regulatory structure. Tenaga Nasional has historically carried a range of public and private sector obligations, linked to providing employment and subsidizing power, which hurt efficiency and made it difficult to gain public support for needed tariff increases. Over the past year,

however, Khazanah Nasional, which holds 38% of Tenaga's stock on behalf of the government, has implemented a series of key performance indicators which have the potential to drive performance improvements.

While investors are well-positioned to assess changes in policy and regulatory regimes, it is also important to keep a careful eye on developments affecting the operation of transmission and distribution grids. This has historically been a harder area for the investment community to track due to the lower level of transparency and often complex technical issues. Nonetheless, grid constraints often shape longer term policy options, such as the ability of power rich regions to transfer or trade power with other areas with different time of use or seasonal demand patterns. Underdeveloped grids can also be a barrier to renewable sources, undermining the economics of potential projects because they are not capable of efficiently dispatching small power providers with irregular availability. Finally, grid development and sophisticated transmission and distribution schemes are essential when implementing demand-side pricing strategies.

Underdeveloped grids can also be a barrier to renewable sources, undermining the economics of potential projects

Stakeholders have been missing from the regulatory equation

The final crucial element of assessing regulatory outcomes is stakeholder involvement. This is often the least well-analyzed element of the regulatory equation in Asia, as public opinion is increasingly fluid and conventional investment logic does not always highlight latent risks. Across Asia, as development has transformed the economic landscape, governments are facing growing opposition to polluting power plants, a range of complex labor disputes involving workers at large government-owned companies, and recurrent questions about the service standards of key power utilities. In the past, governments and their power companies were able to dodge questions of how they were operating as long as power was provided and tariffs were manageable. Moving forward, it is obvious that boards of directors, company management, and their government counterparts will find it harder to shed responsibility, especially for companies whose global peers have demonstrated a broader range of business models.

Figure 11 New Strategies from NGOs Will Push the Debate

One of the key concerns with utilities in many countries has been poor financial and technical operating performance and bad service. In most electricity systems this is paralleled with a major disconnect between the utility and the consumers they serve. When utilities are made accountable to their customers, for example by transparently setting and reporting standards on issues such as transmission losses, theft, quality of service and reliability, and when they face penalties for failing to deliver, the financial and technical operating performance can be expected to improve, irrespective of ownership.

Source: WWF From Free Markets to "Our Power", The Jakarta Post, December, 2004

Across the region, coal-fired power plants have frequently been a target for protests due to higher environmental and community impacts

There have been numerous examples of public opposition to new power plants in Asia and to changes affecting tariffs and service, especially for consumers. For example, proposed privatization exercises in Korea and Thailand have faced significant opposition from labor groups concerned about job cuts and by consumer groups focused on potential tariff hikes. In Hong Kong, worsening air pollution triggered a range of public protests in 2004-2005 as public groups pushed for cleaner power technologies. Across the region, coal-fired power plants have frequently been a target for protests due to higher environmental and community impacts. Protests against nuclear facilities have been somewhat less common, although opposition is well-established in Korea where nuclear power plays a significant role in the installed capacity mix.

Due to the twin risks of rising air pollution and carbon emissions, we believe that Asian governments and regulatory authorities will come under greater pressure over the medium-term to demonstrate more appropriate regulatory responses. In general, it would appear that the risk is on the downside for those power companies which have not been pro-active in addressing the implications of their environmental and social impacts. By contrast, in markets like Malaysia, where the government is working with Tenaga to improve performance and public recognition, regulatory risk has the potential to fall.

CLEANER FUELS — WHO HAS FLEXIBILITY?

Fuel diversification has long been a hallmark of good power sector policy. This lesson has been painfully learned in Asia where a number of countries, especially in North Asia, lack affordable sources of domestic fuel. With the advent of high oil prices and a global re-assessment of energy markets in response to the developing world's growing demand, the question of fuel mix — whether at the country or company level — has become much more central to the investment equation. Indeed, over the next two years, a number of Asian power companies will face the challenge of diversifying into new fuel and generation technologies.

Increasing the mix of clean fuels will inevitably tilt both the country and company risk-reward profile

For investors in Asian power companies, increasing the mix of clean fuels will inevitably tilt both the country and company risk-reward profile depending upon the following variables:

- Domestic fuel options
- Ability to implement high capital cost alternatives — LNG and nuclear
- Do power companies have the resources to take on the cost of developing energy infrastructure

Access to cleaner fuels will shape competition

For investors, domestic resource endowments continue to shape the winners and losers in the energy and power sectors. For example, Thailand and Malaysia have benefited from the development of offshore natural gas reserves in the Joint Development Area. In China, large coal reserves and a commitment to large scale hydro programs has shaped the power sector. By contrast, Hong Kong, South Korea, and Taiwan have limited domestic resources, forcing them to rely on a diversified mix of relatively high cost power sources including nuclear and LNG.

Figure 12 Country Fuel Mix — Nuclear and Renewables

	Conventional Thermal	Hydroelectric	Nuclear	Non-hydro Renewables
	(%)	(%)	(%)	(%)
Bangladesh	94	6	0	0
China	75	25	1	0
Hong Kong	100	0	0	0
India	75	21	2	1
Indonesia	81	17	0	2
Japan	71	9	19	0
South Korea	71	3	25	1
Laos	3	97	0	0
Malaysia	85	15	0	0
Pakistan	70	28	3	0
Philippines	67	19	0	14
Singapore	100	0	0	0
Sri Lanka	45	55	0	0
Taiwan	68	15	17	0
Thailand	87	13	0	0
Vietnam	50	50	0	0

Source: EIA data, 2005.

Non-hydro renewables includes geothermal, solar, wind, wood, and waste. Hong Kong data does not reflect nuclear power produced in China for Hong Kong use.

Another aspect of the domestic resource mix which must be addressed in looking at country resource endowments is the country's ability to manage the trade and foreign exchange impact of long-term dependence upon imported hard currency fuels. For some of the most import-dependent countries, such as South Korea, this has reinforced the power sector's already centralized regulatory structure. Similarly in China, Malaysia, and Thailand, the need to allocate valuable domestic resources has given government-controlled energy companies a significant say in the development of the power sector. This introduces a layer of risk for power sector investors as companies are often constrained in looking at the most cost-effective or sustainable generation options.

In China, Malaysia, and Thailand, the need to allocate valuable domestic resources has given government-controlled energy companies a significant say in the development of the power sector

Figure 13 Country Thermal Fuel Mix

	Coal	Gas	LNG	Diesel
China	✓✓	✓	planned	✓
Hong Kong	✓	✓	planned	✓
India	✓	✓	✓	✓
Korea	✓		✓	✓
Malaysia	✓	✓✓		✓
Philippines	✓	✓		✓
Singapore	✓	✓		✓
Taiwan	✓		✓	✓
Thailand	✓	✓		✓

Note: EIA data 2005, ✓✓ indicate dominant fuel; diesel units are typically older, peaking units

Perhaps the most important fuel choice strategy which is beginning to shape power company investment choices in Asia revolves around LNG and nuclear. Following Japan's lead in the 1980s, both South Korea and Taiwan moved to diversify away from oil-fired generation and into LNG and nuclear. China and India have followed more recently, taking advantage of new LNG projects and a desire to introduce alternative, and less polluting, fuels. While increased commitments to nuclear have been strategic national choices, it is clear that they will also be characterized — with some controversy — as responsible efforts to minimize carbon emissions.

Decisions to commit to nuclear and LNG have had huge implications for long-term infrastructure investments which, due to the high cost, must often be shared by government and private sector companies in both the energy and power sector. In addition, introducing these two fuels and their respective technologies into the generation mix can fundamentally restructure power market dynamics and pricing for consumers.

For example, nuclear power plants, although very costly to build and de-commission, have low variable operating costs and are typically dispatched whenever available, forming a key element of a country's baseload supply. By contrast, LNG is generally viewed as the best way to work a low pollution fuel into the Asian fuel mix for countries without local access to piped gas. Committing to LNG is a costly proposition, however, because of the significant amount of infrastructure — receiving terminals, pipelines, transportation — which is required. In order to use LNG economically, it is often necessary to pair the needs of the power sector with a long-term plan to provide gas to industry and to households in order to smooth out seasonal demand. In markets like Korea, household electricity consumers effectively cross-subsidized the build out of Korea's household gas network by paying high prices for power generated by the country's LNG-fired capacity.

The example of Korea's decision to commit to LNG is a useful one because it underscores the potentially significant impact that these decisions can have on consumers and other stakeholders. Unfortunately, one consequence of government control and the lack of transparent regulation is that the Asian public has often been excluded from policy discussions touching on these

issues. At the same time, power company management, employees, and customers have often struggled to find appropriate forums for resolving disputes. On balance, this can result in added risk to sector investors as we enter a period of flux in assessing new fuel choices. The matter is further complicated by developments in renewable and clean technology use, which suggest that economic assumptions in favour of building nuclear and LNG infrastructure could be vulnerable to a range of new cost dynamics.

Expect more convergence between energy and power companies

Investors tracking these issues will need to factor-in one additional aspect of the move away from low cost thermal fuels. As noted above, the energy acquisition and infrastructure issues linked to LNG and nuclear frequently complicate the traditional private sector power model preferred by some investors where companies can bargain for cost competitive fuel contracts. Given the scale of necessary investments in the energy and power sector over the next five years in Asia, we believe that investors will see greater convergence between the power and energy sectors.

To some extent, this is already evident in CLP Holdings' recent decision to propose a new LNG terminal for Hong Kong, to supply its combined cycle gas units. In China, key energy sector sponsors of LNG terminals are proposing their own power projects to create demand for imported LNG. At the same time, the leading conventional power players in China are investing in gas-fired projects, despite the fact that gas pricing and related power tariffs are still unclear. In India, investors face a different and more positive scenario, where the ability to shift away from high cost naphtha to LNG promises to significantly improve the economics of a number of power projects.

In China, key energy sector sponsors of LNG terminals are proposing their own power projects

For investors, the market dynamics in favor of new and cleaner fuels has the potential to sharpen the differences between state-controlled power companies and private sector players. Near-term the risk will be higher in markets where the pricing dynamics of fuels such as LNG are not yet clear. There will be an opportunity, however, for those power companies which can use the financial and technical resources to gain a first-mover advantage on cost competitive, clean fuels. At the same time, investors will need to assess the quality of government policy moves carefully. Indeed the perceived cost of fuel choices typically includes only hard capital costs, not the type of policy initiatives which emerge as governments begin to price in the impact of air pollution or carbon emissions.

THE LONGER TERM: NEW OPPORTUNITIES AS ENVIRONMENTAL RISKS ARE PRICED IN

As we shift the investment analysis to a longer-term time frame, a number of sustainability issues loom much larger for investors in the Asian power sector. Indeed, the question shifts from a consideration of a country's or company's ability to improve efficiency or make incremental shifts toward cleaner fuels to a debate about the ability of governments to embrace new environmental policy strategies. For investors, it naturally becomes a question of which incumbents have the ability to capitalize on new opportunities, or whether new entrants, unburdened by legacy assets, will enjoy better opportunities.

Environmental strategies will be a key long-term differentiator

On a ten-year view, we see strategies linked to environmental variables as a key differentiator at both the country and company level. The critical issue at the country level will be the ability of Asian governments to provide incentives for cleaner fuels, new technologies, and new consumption patterns. There are risks for incumbent players in the Asian power sector which fail to anticipate policy shifts and for new entrants who underestimate both the time and costs associated with switching. This dynamic creates an important role for financial tools such as emissions trading, which can help price in environmental impacts, giving market participants more accurate incentives for adjustment.

We believe that the key drivers for long-term sustainability-oriented investment options will be:

- The development of a new global and regional consensus which addresses Asia's growing environmental impacts, especially carbon emissions
- A resolution of the debate about the ability of new nuclear and large scale hydro units to provide an alternative to thermal technologies
- The emergence of market-based solutions tailored for the Asian electricity sector
- The commercialization of renewable and demand-side management technologies which can leverage off of Asia's demand dynamics

Without doubt, the most pressing environmental issue for sustainability investors is the global impact of rising carbon emissions. To date, Asian governments, outside of Japan, have taken only modest steps to address the potential impact of the region's growing carbon emissions. This reflects the fact that only three Asia-Pacific countries, Japan, Australia, and New Zealand, are covered

by the Kyoto Protocol carbon emissions targets which came into force on February 16, 2005. Of the three Asia Pacific Annex 1 countries, only Japan faces an obligation to reduce carbon emissions. New Zealand is expected to meet a flat target and Australia, which has not ratified the protocol, would be entitled to let emissions rise by 8%.

Figure 14 Kyoto Protocol: The Basics

The Kyoto Protocol is essentially the rulebook for the United Nations Framework on Climate Change which was initiated in 1992 with the backing of 166 signatories. Annex 1 parties accounted for 55% of carbon emissions in 1990 and many will now be asked to reduce emissions to meet 1990 levels.

The Kyoto Protocol is a legally binding agreement under which industrialized countries will reduce their collective emissions of greenhouse gases by 5.2% compared to the year 1990 (but note that, compared to the emissions levels that would be expected by 2010 without the Protocol, this target represents a 29% cut). The goal is to lower overall emissions from six greenhouse gases — carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs) — calculated as an average over the five-year period of 2008-12. National targets range from 8% reductions for the European Union and some others to 7% for the US, 6% for Japan, 0% for Russia, and permitted increases of 8% for Australia and 10% for Iceland.

Source: UNEP, 2005

Over the next few years, however, we believe that Asian investors will face a changing landscape as Asia's surging carbon emissions become an issue of concern as the policy world begins to focus on policies which can build on the Kyoto Protocol's initial reach. This is a discussion which will inevitably center on policy developments in China and India, both of which are forecast to record sizeable increases in their shares of estimated carbon emissions by 2025. For China, this is a simple reflection of the size and rapid growth of China's power sector and the negative consequences of the coal-heavy generation mix. Currently it appears that the Chinese government is taking preparatory steps by raising emission standards and technical specifications for new, large-scale coal-fired power plants built by the better capitalized power groups.

Asian investors will face a changing landscape as Asia's surging carbon emissions become an issue of concern

Figure 15 World Carbon Dioxide Emissions by Region, Reference Case 1990-2025

	2001	2001 % of Total	Projection 2025	2025 % of Total	Avg. Annual % Change 2001-2025
<u>North America</u>	6,613	27.7	9,659	26.0	1.6
<u>Western Europe</u>	3,465	14.5	4,022	10.8	0.6
<u>Industrialised Asia</u>	1,556	6.5	1,962	5.3	1.0
• Japan	1,158	4.%	1,356	3.7	0.7
• Australia/New Zealand	398	1.7	605	1.6	1.8
<u>Former Soviet Union</u>	2,399	10.0	3,393	9.1	1.5
<u>Eastern Europe</u>	748	3.1	920	2.5	0.9
<u>Developing Asia</u>	6,012	25.2	11,801	31.8	2.9
• China	3,050	12.8	6,666	18.0	3.3
• India	917	3.8	1,834	4.9	2.9
• South Korea	443	1.9	720	1.9	2.0
• Other Asia	1,602	6.7	2,581	7.0	2.0

Source: EIA, 2005

The first step for greater action on carbon and other emissions in Asia is undoubtedly the establishment of a new global compact on carbon emissions which addresses the carbon emissions of fast-growing countries such as China and India. The second step will be greater clarity on whether nuclear power and large scale hydro will be viewed by the Asian public and capital markets as safe and fundable responses to the demand for emissions reductions. While India is focusing on increased investment in gas-fired capacity, the Chinese government is proposing a multi-pronged strategy which includes large increases in LNG-fired, nuclear technology, and hydro. Indeed a significant reinvigoration of China's nuclear power program is taking place. This is obviously a strategy which will evoke a mixed response from some camps, given that China has yet to establish policies for disposal of nuclear waste.

Policies toward nuclear and large-scale hydro will shape opportunities for renewables

This renewed focus on nuclear power is not just a Chinese phenomenon. Similar policy discussions are taking place in Japan and Korea. What has been missing from the discussion so far is any indication of whether policymakers are motivated to develop strategies for stakeholder consultation and alternative energy scenario analysis. Without public dialogue, it remains uncertain whether nuclear power can win broad-based support as an acceptable long-term technology fix. Policy consensus on this issue will be important to monitor. There is inevitably a risk that, to the extent that large scale responses to the carbon challenge win favor, incentives for distributed solutions and renewable projects may remain peripheral in as much as the scale of the typical nuclear facility is larger than even a large-scale wind farm by as much as a factor of 10.

Without public dialogue, it remains uncertain whether nuclear power can win broad-based support

Similar questions have been asked about the role of large scale hydro as a factor in country level renewables commitments. This is material because large scale hydro, such as the 18.2 GW Three Gorges Dam, has attracted criticism from a number of quarters. There remains broad-based interest in smaller scale hydro, especially run-of-river strategies, but there is considerable debate about whether large scale hydro can deliver long-term social benefits. Indeed, the high capital costs, technical challenges, environmental impacts, and resettlement issues can often undermine the other apparent advantages of hydro power.

Against this background of policy development and debate about capacity options, it seems obvious that the first new investment catalyst for investors looking at longer term developments will be opportunities to work with market-based policy tools such as Clean Development Mechanism (CDM) credits, emissions trading, and clean-tech business strategies. The Kyoto Protocol is already resulting in funding for projects which have the potential to generate credits under the CDM. The CDM is a financial tool which will give countries facing emission reduction targets an opportunity to buy credits earned from projects in developing countries which promise to cut emissions below an identified baseline, thereby representing greenhouse gas savings. The Development Bank of Japan and the Japanese Bank for International Cooperation have been active in this area with a pioneering Asian Carbon Fund which will buy CDM credits to help Japan meet its Kyoto targets. A broad range of other groups have launched carbon funds which will provide capital for projects which qualify for CDM certification.

Figure 16 Examples of Asian CDM Projects

- A coal mine/coal bed methane utilization project in Northeastern China which is expected to reduce carbon emissions by capturing and using methane which would otherwise be released in the mining process
- A 6.5 MW biomass based power generation project in India which would use rice husks as a source fuel
- An 11.2 MW waste heat recovery boiler at an India copper smelter owned by Sterlite Industries
- The Khorat Waste To Energy Project in Thailand which will utilize waste biogas methane produced at the largest Thai starch production facility
- A 32 MW small hydro project in Maguan Daliangzi in Yunnan in southern China which will substitute for coal-fired generating capacity
- A demand-side program which will improve the energy efficiency of the humidification towers at Jaya Shree Textiles in India
- An applied biogas technology project in Chumporn, Thailand for advanced waste water management which will shift treatment from open air methane release to a closed biogas digester system
- The 250 MW Sihwa Tidal Power Plant in South Korea

Source: UNFCCC, ADB, 2005

In addition to CDM —which creates clear financial incentives for energy saving projects — we expect to see a number of countries in Asia experiment with a combination of tougher regulations on carbon emissions, energy efficiency, and air and water pollutants. In many instances these tighter standards will be reinforced by the implementation of better enforced "polluter pays" strategies for fees. For investors in some markets, this process will be easy to track depending upon the level of financial disclosure. For example, the Chinese power companies now regularly disclose fines paid for breaching government targets.

*Watch for
experimental cap
and trade*

On a five year view, we expect better enforced regulatory mechanisms to be augmented by a series of experimental cap and trade arrangements and eventually more formal emissions trading markets. Cap and trade systems combine a formal "cap" which limits emissions with a trading system which permits companies which cannot meet the target to purchase credits or allowances from those companies which can beat their targets. There are, of course, a number of uncertainties about the shape and potential for success of these emerging marketplaces. Nonetheless, the policy debate is now maturing and there is a clear recognition that emissions trading markets offer an effective strategy for pricing in the impact of carbon, SO_x, and NO_x emissions.

Figure 17 Conditions for Successful SO₂ Trading Schemes

- 1) marginal SO₂ abatement costs differ among emissions sources;
- 2) the problem is regional or global in scope;
- 3) emissions can be accurately and consistently measured;
- 4) there is a strong legal basis for emissions trading; and
- 5) administrative institutions have sufficient capacity to administer the program

Source: Jintian Yang and Jeremy Schreifels, OECD Paper, 2003

Figure 18 Renewables Targets Identified

	Target	Implementing Laws	Distinctive Technologies
China	10% of installed capacity by 2010	Law passed in 2005; feed-in tariff; regulations under development	Large hydro
India	10% of new capacity through 2012	Feed in tariffs at state level; Ministry policies and financial incentives	Wind
Indonesia	Not determined	Feed-in tariff passed in 2002 for small producers	
Japan	1.4% of generation by 2010	Laws in place since 1980; renewable obligation certificates	
Korea	7% of generation by 2010	Law passed in 1987; feed in tariff, tax incentives and support funds	Waste to energy
Malaysia	5% of generation by 2005		
Philippine	Double capacity to 4.7 GW by 2013	Some financial incentives	Geothermal
Singapore	35MW of solar by 2012		Solar
Thailand	8% of primary energy by 2011	Renewable funding through small power producer program	Biomass

Source: "Renewables 2005: Global Status Report", REN21

The combination of more balanced power sector policies and new tools creating tangible financial incentives for cleaner power will create a more favorable environment for a range of new power sector investment opportunities outside of traditional investments in power stations or distribution grids. A number of Asian governments have now passed framework legislation supporting emerging renewable energy technologies. Here we see a mix of strategies with some countries articulating fixed targets for renewables, as a percentage of total installed capacity or as a percentage of generation. The effectiveness of implementing legislation remains a key question, however, as governments have opted for a range of strategies with incentives channelled by feed-in tariffs, renewable obligations, and by subsidized funding.

Although there are still significant challenges for alternative energy project developers, a combination of lower cost technology, better project design, and CDM credits has significantly improved the outlook for the sector. At the

same time, specialized investors in the sustainable private equity sector and better targeted loan funds are providing a new infusion of capital with a better understanding of the financial dynamics of the Asian power sector. As a result, we see a range of new opportunities developing in the following areas:

- **Renewable energy projects** ranging from wind power, biogas, biomass, and solar to small run-of-river hydro projects. Wind and small-hydro projects appear to be garnering particular interest near-term in countries with the right mix of weather and hydrology. Thailand has attracted interest in biomass projects, which may provide best-practice examples for projects which can be pursued elsewhere. Solar technologies continue to have applications in rural areas for off-grid applications and continued innovation may result in scalable applications
- Potentially **innovative large scale technologies** such as more fuel efficient technologies such as IGCC, low cost fuel cells, and clean coal technologies. Given Asia's existing energy resource mix, technologies which can increase efficiency or mitigate impacts will continue to attract attention, especially as conventional power companies are drawn into the effort to reduce emissions
- Watch for **public-private partnerships** as innovative technologies which can be manufactured locally make their way into pilot applications
- **Cleantech solutions** offering more energy efficient products and processes. Cleantech encompasses a range of demand and supply-side solutions which reduce environmental impacts in agriculture, energy, manufacturing, transportation, and water. This has the potential to be a particularly fast-growing market segment, especially if Asian governments begin to price in environmental impacts. More energy-efficient industrial processes, benefiting from new materials and technologies, will be a key opportunity in Asia as global supply chains extend the demand for Asian manufactured products
- **Demand-side applications** which have the potential to reduce demand by cutting energy requirements for power intensive industrial, commercial, and residential applications. More sophisticated energy management systems, new building materials, and more energy efficient white goods have been a traditional focus in this area. In some countries, governments have created incentives for power companies to pursue strategies for "avoided" power which is often more economic than the construction of new baseload capacity

The most interesting opportunity for conventional Asian equity investors will be to identify those technologies which have the potential to be scaled up for application in both regional and global markets. Given the size and income dynamics of Asian consumer markets, the concept of a breakthrough technology or service which can leverage off of the Asian demand base and make previously high cost technologies affordable for the mass market has long been the investment ideal. With more favorable regulatory and market dynamics now in the offing, we see better odds for sustainability-oriented investors in this sector.

INVESTOR QUESTIONS FOR COMPANIES

Internal policies and targets

- What are your current efficiency levels for your largest facilities by fuel type?
- Is the trend expected to improve and by how much over the next five years?
- What are the target thermal efficiency standards of new facilities which you intend to complete over the next five years?
- Who is responsible for setting policy for fuel choice and generation mix?
- If you have T&D assets, do you have a strategy for reducing system losses?
- Do you use demand-side management tools to shape peak demand trends?
- Does your board of directors review the company's environmental performance on a regular basis?
- How much do you spend on R&D?

External policies, dialogue and disclosure

- Are there provisions for public dialogue about power sector investment?
- Has the tariff structure been reviewed to determine if there are cross-subsidies built into the current tariff structure?
- Do you have discretion to make the investments needed to retro-fit existing assets, or do you have to seek regulatory approval for additional investments?
- What triggers will be necessary for increased environmental disclosure: government or stock exchange requirements?
- If public concerns about air pollution were to become more serious, how would your company respond?
- Does your company participate in international electricity sector forums to follow trends in equipment and technology?
- Does your company's senior management participate in a regular policy dialogue with the government?

Policy on KPIs

- Do you have any plan to adopt publicly disclosed KPIs?
- Does the government or your regulator use KPIs to monitor your performance?

Policy on LNG

- If your company uses LNG, what are the terms of the off take agreement?
- Are there any provisions which would permit your company to "bank" LNG if the demand environment changed and you could not take planned off-take?

Policy on nuclear fuel

- What plans does your company have for disposal of spent nuclear waste?
- How do you account for decommissioning expenses related to any nuclear facilities and how often are these accounting standards reviewed?
- Are your nuclear facilities insured in the event of an accident or leakage at the plant?

RESOURCES

Company websites

- | | |
|---------------------|--|
| • CLP Holdings | www.clpgroup.com |
| • Datang | www.dtpower.com |
| • EGCO | www.egco.com |
| • Hongkong Electric | www.hec.com.hk |
| • HPI | www.hpi.com.cn |
| • KEPCO | www.kepco.co.kr |
| • Ratchaburi | www.ratch.co.th |
| • Tenaga | www.tnb.com.my |

Useful web-based resources

- | | |
|---|--|
| • Carbon Disclosure Project | www.cdproject.net |
| • Cleantech Venture Network | www.cleantech.com |
| • International Finance Corporation | www.ifc.org/sustainability |
| • The Katoomba Group | www.ecosystemmarketplace.net |
| • UN Framework Convention on Climate Change | www.unfccc.int |

Papers & further reading

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The Association for Sustainable & Responsible Investment in Asia

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ASrIA is a not for profit, membership association dedicated to promoting corporate responsibility and sustainable investment practice in the Asia Pacific region. ASrIA's members include investment institutions managing over US\$4 trillion in assets, however membership is open to any organisation which has an interest in sustainable investment.

ASrIA has taken a leadership role in promoting sustainable investment in Asia since our founding in 2001. ASrIA has run conferences, seminars and workshops, and published wide-ranging research on SRI issues. ASrIA has also created a very wide network of organizations and individuals interested in the broad range of policy issues and investment strategies which are essential to the implementation of SRI in Asia. ASrIA's website, www.asria.org, is the primary resource for SRI in Asia, attracting over 4,000 page views per day and over 5,000 subscribers to our regular e-bulletin.

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