Strategy of Social Infrastructure Systems Business in India

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OVERVIEW: Hitachi sees social infrastructure systems as lying at the heart of its Social Innovation Business and is actively expanding its operations aimed at building sturdy foundations in the rapidly growing nation of India. India was designated as an independent territory within Hitachi's global business in October 2011, with Hitachi India Pvt. Ltd. taking up a position alongside Japan as one of Hitachi's six international hubs. Hitachi intends to draw on its many years of experience in social infrastructure systems to contribute to the development of India by widely supplying highly efficient, safe, and reliable systems that are conscious of the global environment.

INTRODUCTION

HITACHI'S business activities in India date back to the 1930s. Over that time, its involvement has included equipment supply and construction work on projects associated with the provision of social infrastructure, such as rolling stock, hydroelectric power plants, and thermal power plants. More recently, the scope of Hitachi's business has expanded in step with the development of the Indian economy to the point where 22 group companies now have operations in India, with sites in nine different cities.

Hitachi's social infrastructure business needs to establish a foundation for itself in India with roots in that country, with the sharing of values and other aspects of culture being most important. India faces challenges such as population increase, shortages of energy, and the provision of employment, and Hitachi supplies social infrastructure systems over a wide range of areas to assist with India's ongoing development.

This article gives an overview of the systems for information and telecommunications, electric power generation and transmission, industry, and railways that form part of Hitachi's social infrastructure systems business in India, together with its business strategy for these products.

OVERVIEW OF INDIAN MARKET

Having achieved strong growth in gross domestic product (GDP) of 6.5% in the 2011 fiscal year, and having the advantage of a young population (with an average age of about 25 years), India is forecast to maintain strong GDP growth into the future. It is anticipated that the size of its economy in 2040 will match that of the USA.

Against the background of this ongoing rapid growth, the budget indicating government policy for the 2012 fiscal year was released in March. This budget is particularly significant because it indicates the direction to be taken in the initial year of the Indian government's Twelfth Five Year Plan (2012 to 2017), which will be officially released in September. The Indian government is struggling under difficult financial circumstances, but while the budget's measures included some that detract from industrial development, such as an increase in service taxes, it also provides active support for the provision of social infrastructure, with measures including the ongoing allocation of 10.2 trillion rupees to the information and telecommunications sector and 20 GW/year of additional power generation capacity.

SOCIAL INFRASTRUCTURE SYSTEMS BUSINESS IN INDIA

Information and Telecommunications Network Business

The progress of information and telecommunications in India is evident in the explosive growth in mobile phone subscribers and is anticipated to accelerate further in the future (see Fig. 1). This is seen as being due to ongoing encouragement of the sector, with users predominantly being young people with a high level of education, as indicated by the population structure referred to above.

India is located centrally in a region that extends from Southeast Asia and the Pacific to its east and to the Middle East and Africa to its west, giving it a geopolitically convenient and advantageous location. Also, the fact that English is the nation's common language means that India has numerous

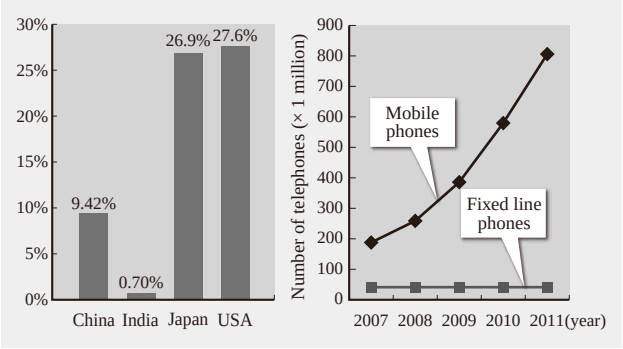


Fig. 1—Broadband Penetration Rates in Different Countries (left) and Number of Telephones (right).
The graphs show the broadband penetration rates in different countries (left) and number of telephones (right).

system integration (SI) vendors that operate globally. However, many of these SI vendors are focused on fields such as software development and outsourcing, and India has made less progress in the development and manufacture of advanced hardware for the information and telecommunications sector. Telecommunication networks are part of the social infrastructure. Compared to other countries, there remains an urgent need for further enhancement of telecommunications networks in their role as part of the social infrastructure, and this has the potential to become an obstacle to the future development of India's information and telecommunications industry.

To overcome this challenge, the Indian government, as part of its national growth strategy, has formulated policies to encourage local development and manufacture of information and telecommunication products, and to promote the provision of communication network infrastructure. In keeping with this strategy, the government published a draft National Telecom Policy in October 2011, 12 years after the previous such policy issued in 1999. This draft policy sought to develop information and telecommunications infrastructure on a national scale and included a target of rolling out a nationwide fiber optic network with a total length of 1,100,000 km. A cabinet decision promptly authorized an initial budget of 200 billion rupees for this project for the 2012 fiscal year. The aim is to connect 175 million broadband subscribers by 2017 and 600 million by 2020 (where broadband is defined as communication speeds of 2 Mbyte/s or more).

In anticipation of rapid demand growth for Big Data processing in India driven by the development of the telecommunications infrastructure, Hitachi established Hitachi Consulting Software Services India Limited (HCSSI) in January 2011 to act as a base for the provision of information technology (IT) consulting services. It is intended that HCSSI will work closely with Hitachi Data Systems India Private Ltd. (HDS), which has been in operation since 2002.

The nature of the construction and deployment of communication network infrastructure is that, rather than acting as its own independent infrastructure, it has a central role to play across the broad range of social infrastructure. This makes it a field that calls on the overall technologies of Hitachi.

Power Generation and Transmission Business

India has suffered from chronic power shortages for many years, a situation that has only become more severe since the turn of the century as the economy has grown rapidly. In response, the Indian government targeted a 78,700-MW increase in power generation capacity in its Eleventh Five Year Plan (2007 to 2012)[3]. Although India had achieved a hundred-fold increase in its power generation capacity in the 60 years from 1947 (installed capacity of 1,360 MW) until 2007 (132,000 MW), this plan had the ambitious target of adding generation equipment with approximately 50% of this capacity over this five year period. Approximately 75% of this increase was to be provided by coal-fired thermal power generation, and the plan encouraged the construction of large supercritical coal-fired power plants with high performance.

As of March 2012, although new power generation capacity equivalent to nearly 80% of this target is anticipated, total generation capacity remains below 200,000 MW, as shown in Fig. 2. Like India, China is experiencing rapid economic growth and has a population of 1.3 billion. As China already has close

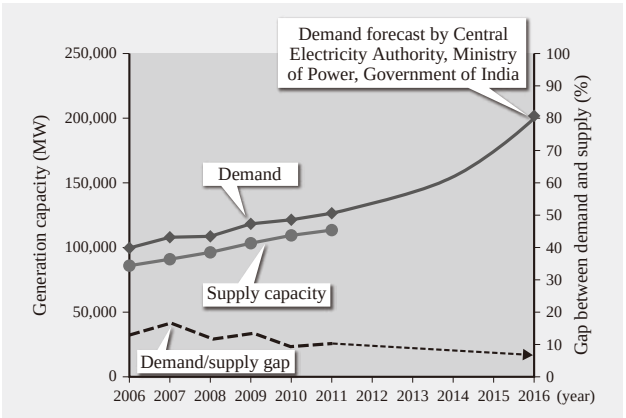


Fig. 2—Yearly Figures and Growth in Power Generation in India.
The graph shows the growth in annual power generation in India.

to 1,000,000 MW of power generation capacity, the Indian government aims to achieve even greater increases in capacity during the term of the next Five Year Plan and beyond, with a long-term objective of reaching 800,000 MW in the early 2030s.

These policies for encouraging the construction of thermal power plants have resulted in the establishment of numerous joint venture companies between Indian and overseas corporations since 2008.

In August 2010, Hitachi established a joint venture company for boilers and turbine-generators with BGR Energy Systems Limited, a large Indian company in the field of thermal power plant construction. The company won its first contract in the 2012 fiscal year for a 660-MW boiler. It also expects to win a contract for an 800-MW turbine for a supercritical coal-fired thermal power plant, with further projects to follow in the future.

Meanwhile, new obstacles have emerged recently, with delays and other slippage in the plans being caused by a number of significant problems, including difficulties in acquiring land and environmental consents, shortages of domestically produced coal, rises in the price of imported coal for power plants, and inadequate transmission line capacity. Increasing the capacity of power generation from nuclear, hydro, and renewable energy is planned for the medium to long term as a way of dealing with global warming, and Hitachi, which has considerable experience in these fields, also intends to cooperate actively on these power plants.

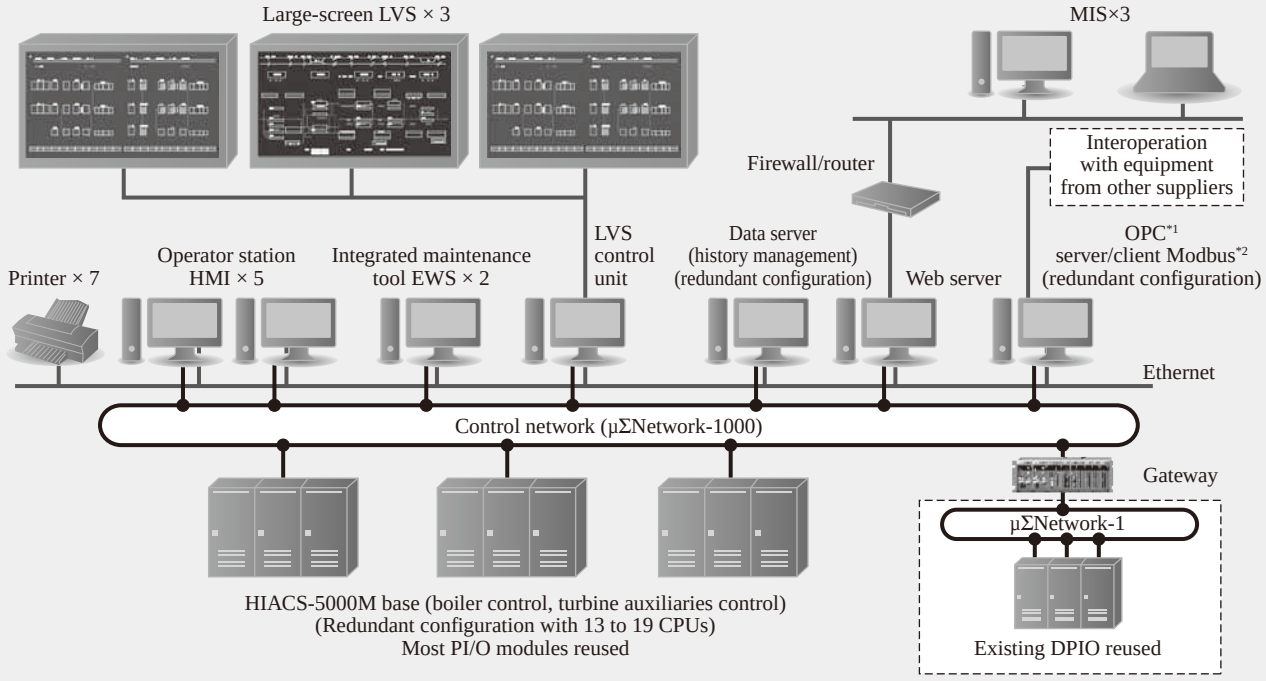
In the field of power transmission, although rapid progress is being made on the construction of new ultra-high-voltage lines (400-kV to 765-kV class) and direct current transmission lines (400-kV to 800-kV class) by the national transmission company, Power Grid Corporation of India Limited (PGCIL), regional electricity authorities, and some private power transmission and distribution companies, this is not enough to keep up with the pace at which additional power generation capacity is being added (as described above). The elimination of transmission and distribution losses of more than 20% is major bottleneck, and there is an urgent need for measures such as investment in the development and deployment of high-performance power distribution equipment and the upgrading of supervisory control systems for electricity supply and distribution.

Recognizing these circumstances for power generation and transmission, Hitachi established Hitachi NeST Control Systems Pvt. Ltd. (headquarters: Bangalore) in October 2011 as a joint venture with SFO Technologies Pvt. Ltd. of India in the field of monitoring and control systems (see Fig. 3). Hitachi NeST Control Systems Pvt. Ltd. is a hub for the design, manufacture, and maintenance of monitoring and control systems for thermal power plants that supplies global-standard systems and delivers value in a form that is tailored to suit the challenges that customers confront as well as their other needs.

Fig. 3—Ceremony Marking Establishment of Hitachi NeST Control Systems Pvt. Ltd.
Hitachi has established a joint venture with SFO Technologies Pvt. Ltd. for the design, manufacture, and maintenance of monitoring and control systems.

Fig. 4 shows an example from a project to upgrade monitoring and control systems for Units 3 and 4 at the Mettur thermal power plant and Unit 5 of the Tuticorin thermal power plant of the Tamil Nadu Electricity Board (TNEB), which completed commissioning in 2011. This project involved upgrading existing Hitachi HIACS-3000 systems to the latest HIACS-5000M systems. The system upgrade approach taken on this project involved keeping control panel enclosures, cabling, and other existing equipment and only replacing units such as controllers or process input/output (PI/O) modules. Using this approach kept the length of the plant shutdown down to only 15 days. By offering energy-efficient inverters, combustion optimization systems, and other enhancements as solutions to the problem of rising prices caused by the coal shortage, Hitachi will also deliver value by using efficiency improvements to reduce fuel costs.

Monitoring and control systems also have a major role to play in reducing losses during power distribution. Optimum grid operating practices built up through Hitachi's past experience, and decision support systems (DSSs) that support grid configuration, are seen as being extremely effective solutions to the problem of distribution losses.



LVS: large visual screen MIS: management information system HMI: human machine interface EWS: engineering workstation
CPU: central processing unit DPIO: digital programmable input/output HIACS: Hitachi integrated autonomic control system
*1 OPC is a product name, trademark or registered trademark of the OPC Foundation.
*2 Modbus is a registered trademark of Schneider Electric USA, Inc.

Fig. 4—Thermal Power Plant Monitoring and Control System Upgrade Supplied to Tamil Nadu Electricity Board.
The system upgrade approach taken on this project involved replacing units such as controllers or process input/output (PI/O) modules.

Industrial Infrastructure Systems Business

To increase national income and reduce the gap between rich and poor by boosting the earnings of people on low incomes, the key pillars of Indian government policy have been: (1) Increase employment through secondary industrial expansion based around manufacturing, (2) Develop India as a development and production hub for manufacturing industry within the South Asian region, and (3) Encourage public and private investment in order to achieve this development.

Hitachi's business strategy is to draw on its extensive experience, not only in Japan but also in various other countries, and to work together to resolve the challenges facing its social infrastructure business in concert with the economic development policies of the Indian government. In October 2011, Hitachi brought Hi-Rel Electronics Ptv. Ltd., a company with strengths in uninterruptible power supplies and industrial drive systems, into the group to establish Hitachi Hi-Rel Power Electronics Pvt. Ltd. (headquarters: Ahmedabad in the state of Gujarat) (see Fig. 5). Hitachi also established an engineering center at Hitachi India Pvt. Ltd. with a total of about 600 employees, including those of Hitachi NeST Control Systems Pvt. Ltd. (referred to above), and created the foundations of its infrastructure systems business by establishing an organizational structure comprising two development and manufacturing centers, sales offices in eight cities, and 30 service centers.

The main focuses of the infrastructure systems business are on solutions for improving the quality of electric power generated from solar energy and control systems for steel plants.

Fig. 5—Ceremony Marking Establishment of Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Hitachi Hi-Rel Power Electronics Pvt. Ltd. was established as a base for design, production, maintenance, and sales of power electronics products.

Solar power generation systems

The Indian government published its policies for encouraging wider adoption of solar power generation in the Jawaharlal Nehru National Solar Mission (JNNSM) in 2010. This document set targets for achieving solar power generation capacity of 20 GW (connected to the commercial power grid) and 2 GW (separate from commercial power grid) by 2022. Other policies included a scheme for the purchase of power from generation operators, industrial development measures including some domestic production of solar panels, supply to areas that currently lack a power supply, the encouragement of education through the supply of computers, and support for the refrigeration of food.

Meanwhile, Hitachi is actively engaged in expanding its solar power related businesses in India, drawing on its experience such as the construction of the Ohgishima Solar Power Plant of The Tokyo Electric Power Co., Inc., which will be one of Japan's largest megasolar power plants (with a maximum output of 13 MW), and the trial of an energy management system that covers a number of sites as well as photovoltaic power generation at Hitachi City in Ibaraki Prefecture. Hitachi is also participating in "The Model Project for a Microgrid System Using Large-scale PV Power Generation and Related Technologies" project of the New Energy and Industrial Technology Development Organization (NEDO) in the state of Rajasthan, with aims that include connection to the commercial power grid and installation of a microgrid control system incorporating solar power generation at an industrial complex. States are also undertaking their own initiatives, including the establishment of a long-term power purchasing scheme in the state of Gujarat and construction of a 590-MW solar park in Charanka, and it is anticipated that investment will expand further as the results of collection and analysis of data on generation efficiency become clear.

Hitachi is taking a lead over its competitors by commencing domestic production of power conditioners for solar power plants (typical specifications include a rating of 500 kW and maximum efficiency of 98.7%) in July 2012 at Hitachi Hi-Rel Power Electronics Pvt. Ltd. (referred to above) (see Fig. 6). In addition to adapting to the Indian market, which is expected to grow rapidly, Hitachi is also supplying solutions to minimize the influence on the grid, which is likely to become a problem in the future.

Fig. 6—Solar Power Inverter.
Production in India commenced from July 2012.

Steel plant control systems

In addition to construction demand, particularly for housing, demand for automobiles is also increasing as economic growth in India accelerates, and therefore it is expected that production of finished steel products will also increase (see Fig. 7). In terms of the number of cars produced annually, India's automotive industry surpassed that of Japan in 2011, and numerous foreign automotive manufacturers are planning the construction of plants in India. As a result, it is anticipated that a large amount of high-grade steel products will be produced, such as thin sheet steel for automotive use and silicon steel for use in electrical equipment. Hitachi supplied India's first continuous pickle line and tandem cold strip mill to Tata Steel Ltd. in 2000, and the plant continues to operate successfully. Hitachi is expanding its business, having won a contract to supply the electrical system for a hot strip mill belonging to the Kalinganagar steel plant in the state of Orissa in 2011.

For the future, Hitachi intends to accelerate its system-wide measures for responding promptly to the needs of customers in India, including everything

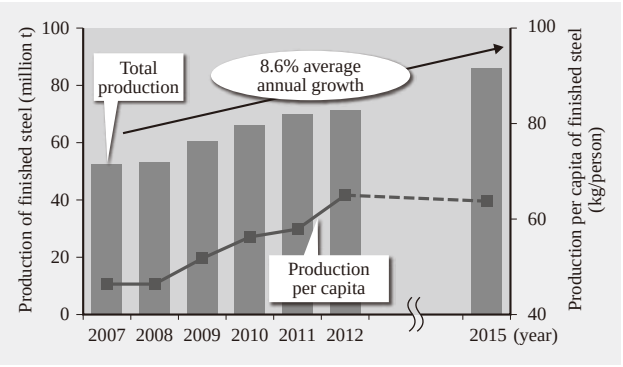


Fig. 7—Total and per Capita Production of Finished Steel.
The graph shows total and per capita production of finished steel in India.

from sales through to design, manufacturing, and maintenance services.

Water business

It is expected that population growth and industrialization will lead to even more severe water shortages in India in the future and growing demand is anticipated for things like seawater desalination in coastal locations and water recycling. Hitachi has already formed a consortium to look at the commercialization of smart communities as part of the 2009 Fiscal Year Ministry of Economy, Trade and Industry Commissioned Project For Studying Promotion of Export of Infrastructure-Related Industries and System, which seeks to construct energy-efficient, low-carbon, smart communities. This project is part of the Delhi-Mumbai Industrial Corridor Project being undertaken jointly by the Japanese and Indian governments to utilize private investment to establish industrial complexes and other facilities along a 1,500-km corridor from Delhi to Mumbai.

Following these investigations, the consortium of Hitachi, Ltd., ITOCHU Corporation, and Hyflux Ltd. signed a joint seawater desalination development contract with Dahej SEZ Ltd. of India on March 22, 2012 (see Fig. 8). This project is intended to overcome a shortage of industrial water by using seawater desalination to supply industrial water to companies with operations in the coastal industrial zone at Dahej in the state of Gujarat. When complete, the project is expected to be the largest seawater desalination project in Asia and it will contribute to the effective use of water resources in India.

Fig. 8—Signing Ceremony for Joint Development Contract. A joint development contract was signed for a seawater desalination project to supply industrial water to a coastal industrial zone at Dahej in the state of Gujarat.

Railway Systems

Safety improvement has become a pressing issue at Indian Railways, the world's fourth largest network with a total of 64,000 km of track, which has been concerned by a growing number of accidents in recent years. It is also seeking to increase the efficiency of goods and passenger transportation to help support economic progress.

In the field of urban transportation services, the Ministry of Urban Development issued a policy in November 2011 stating that all cities with populations of 2 million or more should have commuter transportation systems (metros). Progress is also being made on the introduction of monorails to act as feeder lines to metro systems or as medium capacity transportation systems, and moves to seek out the active use of private investment to complement public investment are accelerating.

Hitachi has maintained a degree of presence in the Indian railway market since first supplying steam locomotives to Indian Railways in 1953. In 1981, Hitachi supplied the main motors for the WAG5-class of electric locomotives in conjunction with a Technical Transfer. Partner companies continue to manufacture products to the present day. Hitachi supplies the latest urban transportation rolling stock, high-speed rolling stock, and electrical equipment for rolling stock in Japan and other parts of the world, and is characterized in particular by its technologies, which include carbody production using aluminum alloy, and variable-voltage, variable-frequency (VVVF) inverters using insulated gate bipolar transistors (IGBTs) that Hitachi was the first company in the world to commercialize. While carbodies made of aluminum alloy are currently only used in the Indian market in a small number of isolated instances where ready-made rolling stock have been imported, Hitachi is promoting their advantages, which include lower maintenance costs due to the use of lighter weight rolling stock, and is taking note of the medium- to long-term progress of plans for high-speed and quasi-high-speed trains that require aluminum carbodies

In the field of railway signaling systems, meanwhile, Hitachi has established a secure place for itself as a leading digital automatic train control (ATC) supplier in the Japanese market. In India, work is underway on modernizing a wide range of different signaling systems.

Hitachi will utilize the experience and know-how it has built up over the past to supply solutions that meet the needs for signaling modernization in India. A number of major projects are planned, including dedicated freight corridor (DFC) and high-speed railway projects, and Hitachi will draw on its overall

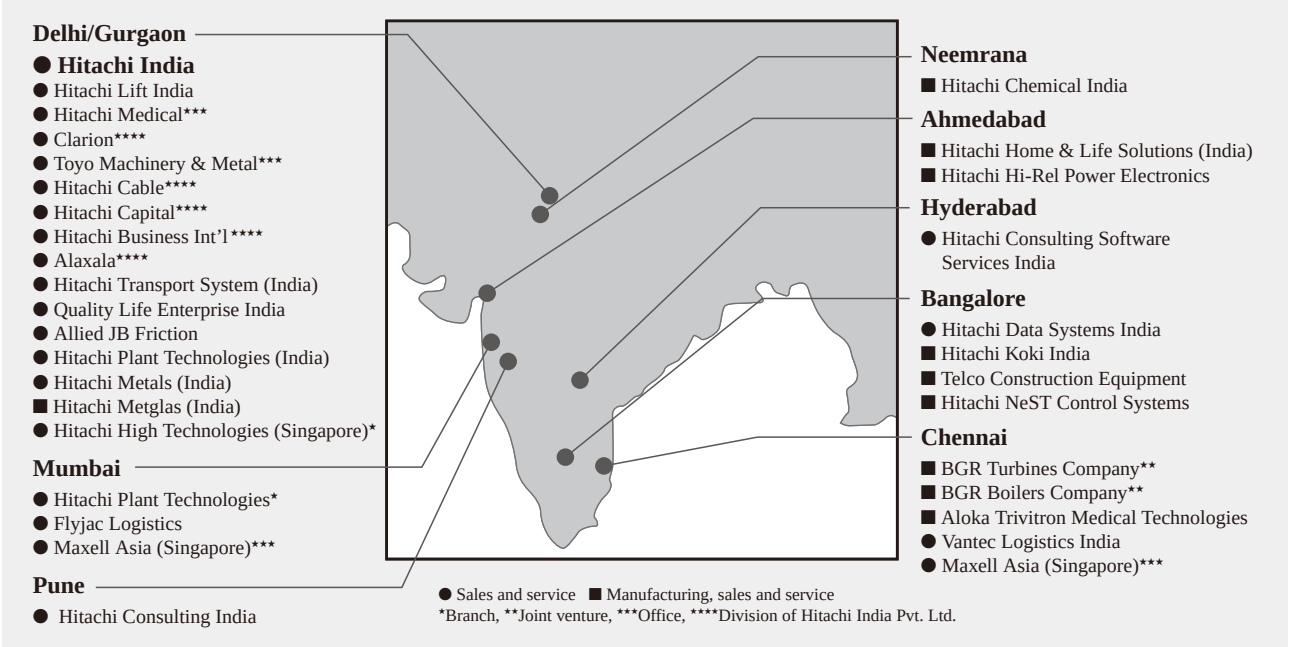


Fig. 9—Hitachi Companies in India.
Hitachi has 22 subsidiaries active in India.

strengths to propose solutions. Hitachi also intends to establish its own arrangements in India to identify customer needs quickly and provide prompt service.

In monorail systems, Hitachi has extensive experience from Japan both in their use for urban transportation and in theme parks. Hitachi has also built up operational experience outside Japan, having completed orders for monorails in Chongqing (China), Sentosa Island (Singapore), and Palm Jumeirah (Dubai). A monorail in Daegu (South Korea) is expected to enter service in the near future.

There is also a high degree of interest in monorail systems in India, and Hitachi is working actively to promote these with work underway on specific projects in large cities such as Chennai, Delhi, and Pune.

HITACHI ACTIVITIES IN INDIA

Hitachi currently has 22 local subsidiaries operating in India (see Fig. 9). To respond more rapidly to customer requirements, Hitachi India Pvt. Ltd. shares its accumulated know-how with other Hitachi subsidiaries to support the smooth operation of these companies' businesses.

For the future, Hitachi intends to expand its business by strengthening this operational structure based around Hitachi India Pvt. Ltd. as described in this article. Consolidated group sales in India reached approximately 90 billion yen in the 2010 fiscal year, and are planned to increase to approximately 200 billion yen within the next few fiscal years.

CONCLUSIONS

This article has given an overview of the systems for information and telecommunications, electric power generation and transmission, industry, and railways that form part of Hitachi's social infrastructure systems business in India, together with its business strategy for these products.

Hitachi intends to continue working actively toward building a sturdy business foundation in India, which represents a typical example of an emerging nation and in which the social infrastructure business is experiencing strong demand. Hitachi also intends to utilize its strengths in advanced IT and social infrastructure to contribute to progress in India through its smart city business.

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