



**Energy Efficiency in**

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**Indian Data Centers**

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**Present Trends &**

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**Future Opportunities**

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**June 2013**

***Disclaimer***

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This report is part of Confederation of Indian Industry, CII – Godrej GBC's effort to assess Indian data center industry in terms of energy efficiency, market trends, growth opportunities and the challenges that the industry is facing.

The views expressed in this document do not necessarily reflect the view of CII – Godrej GBC. While every care has been taken in compiling this report, CII-Godrej GBC accept no claim for any kind of compensation, if any entry is wrong, abbreviated, omitted or inserted incorrectly either as to the wording space or position in the report. The report is only an attempt to highlight the present status of Indian data centers in terms of energy efficiency, market trends and growth opportunities.

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## **Executive Summary**

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Long gone are the days when Indian economy was contingent on the growth of traditional sectors like textile, manufacturing & agriculture. Information technology (IT) and IT related services have dawned to become a significant contributor to India's GDP. This sector since the liberalization in the 90s has been focused as one of the prime sectors which would contribute to the "development journey" of the country.

To cater to the digital needs of a huge population and to sustain the growth of ever growing sectors of IT, telecom & banking, the support infrastructure also needs to be in place. Data center, a critical support infrastructure, has been the focal point of this development phase.

Influx of IT activities, growing internet population<sup>1</sup>, second largest wireless network<sup>2</sup>, renewed banking sector have all aided to the cause of data explosion and thus flaring the need for data centers.

A growing market like data center is always a preferred destination for manufacturers, suppliers, consultants and others with vested interests. On the other side, it also attracts attention from Government agencies in the context of energy, environment and sustainable development discussions as data centers are energy intensive.

With this background, CII – Sohrabji Godrej Green Business Centre (CII - Godrej GBC) with the help of data center industry stake holders have come up with this report. This report, "Energy Efficiency in Indian Data Centers – Present Trends & Future Opportunities" is a small step to assess Indian data center industry in terms of energy efficiency, market trends, growth opportunities and the challenges that the industry is facing.

Apart from secondary research, a survey was conducted on energy efficiency, market trends and growth opportunities as a part of this project to understand the Indian data centers in detail. This report is expected to assist:

- ❖ Data center operators to understand energy efficiency levels of the industry
- ❖ Manufacturers and suppliers to understand the growth opportunities and current trends

Some of the key findings of the report are:

- ❖ Data center market in India is expected to grow at a rapid pace in the years to come
- ❖ Both captive and hosted data center space is expected to increase their foot hold
- ❖ Banking, Financial Sector & Insurance (BFSI), IT & ITeS, telecom and social media are the major contributors to the growth of data centers
- ❖ Aggressive Government policies to increase on digitalization of records have also aided the growth
- ❖ Availability of power remains the biggest challenge for the growth of data centers

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<sup>1</sup> Global Online Population Forecast, 2008 to 2013, Forrester Research

<sup>2</sup> Department of Telecommunications, India

- ❖ Power Usage Effectiveness (PUE) range of Indian data centers: 1.4 – 3.
- ❖ Awareness level of data center operators on energy efficiency is high
- ❖ Energy efficiency by design is one of the major parameters for the data centers coming up in recent years
- ❖ Energy efficiency is driven by both data center operators and data center equipment suppliers
- ❖ Since the awareness level of the data centre operators on energy efficiency is high, there is demand for energy efficient products. This has changed the market scenario driving suppliers to supply energy efficient products
- ❖ Suppliers in their part have also contributed by creating awareness on energy efficiency among the data center operators by publishing white papers and sharing best available technology thus creating a market for energy efficiency

## ***Methodology***

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### ***Secondary Research***

Secondary Research formed an important activity in this project. Secondary research was conducted for the identification of the growth trend in the past and the new market trends which would aid the growth of IT and data center market.

Certain authenticated data sources such as the Annual report of Ministry of Communications and Information Technology, technology researches and press releases from Gartner Inc. and also some dedicated bodies in IT sector in India like National Association of Software and Services Companies (NASSCOM) were referred for the secondary research.

### ***Market Survey***

#### ***a. Questionnaire Preparation***

A detailed questionnaire was prepared covering all areas of a data center which included the IT equipment, the cooling equipment, electrical systems, the operating data and the critical operating parameters like the PUE and the percentage availability of the data center apart from the general information like the certifications obtained, the tier level of the data center etc.

Around 45 questionnaires along with a covering letter detailing about the project were sent to the identified data centers which were predominantly above 8000 sq ft.

#### ***b. Data Centre Visits:***

Select data centers across the country were targeted and were visited for further consultation on the inputs for the project, specifications, the energy efficient practices and the areas of further improvement.

A total of 12 such data centers were visited mainly located in IT hubs like Chennai, Bangalore, Mumbai and Hyderabad.

#### ***c. Telephonic Interviews***

For certain select data centers which were spread in different locations, telephonic interviews were conducted for data collection.

### ***Stakeholder Interactions***

During the visits to the select data centers, stakeholder interactions were held on various aspects like future growth opportunities, sector wise growth rate, latest technologies adopted, and policies favoring the growth of data centers.

As part of the stakeholder interaction, the authenticity of the collected secondary data was also discussed and verified.

### ***Review and Analysis***

All the information derived from the secondary research and stakeholder consultation were studied and analyzed. The analyzed data was incorporated in the report.

## 1.0 Indian data centers & Information Technology (IT) industry

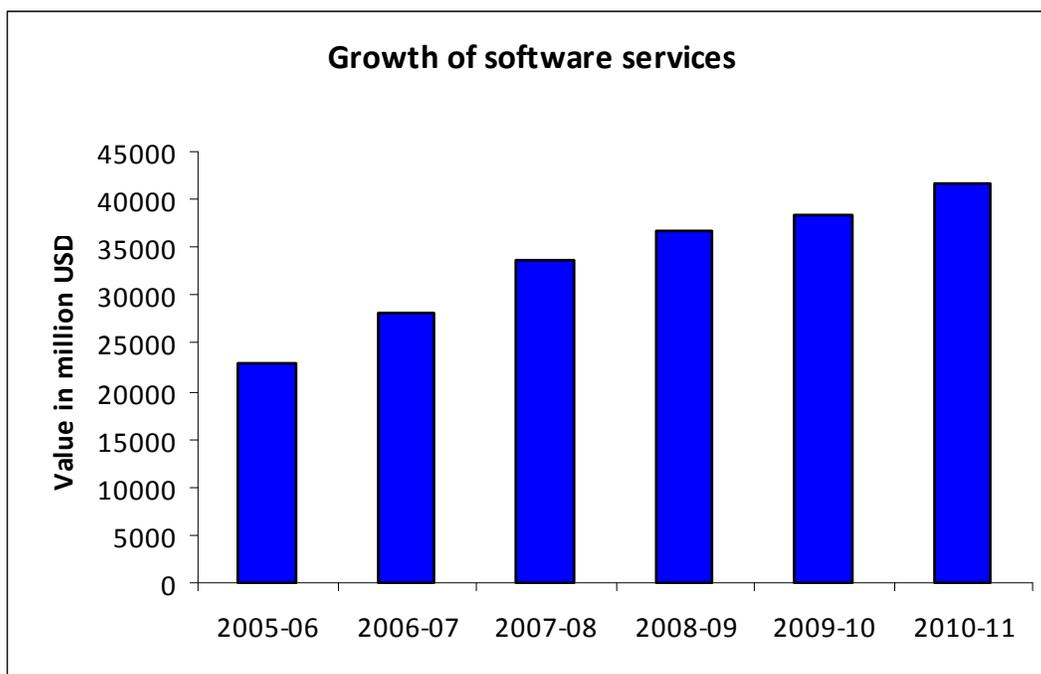
India is bound to witness a growth in data center operations owing to the strong demand for IT services both from domestic and international market. The Indian IT industry has made significant progress in recent years backed by strong fundamentals. Even during the economic slowdown, the industry succeeded in sustaining positive growth, driven by strong national and international demand for IT services.

The Indian software & services industry has grown at a remarkable pace since 2001-02. The Indian IT industry has been the great success story of India's liberalization. From a modest start in the 1990s, the IT industry has grown to be a global leader. The initial growth phase can be attributed to an increased spending on IT from the US followed by the Y2K phenomenon. The next phase of the growth was due to strong domestic demand and this made the IT industry more robust and resilient.

IT industry contributes around significantly to India's GDP and has been growing at a rapid pace of CAGR 10.5% for the last 5 years. The growth of IT industry is shown below:

**Table 1: Growth of software services**

Year	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Value in Million USD	22918.8	28087.7	33709.0	36798.1	38299.8	41609.0



**Figure 1: Growth of software services<sup>3</sup>**

<sup>3</sup> Planning Commission of India report

### 1.1 CII Godrej GBC growth projection for IT services

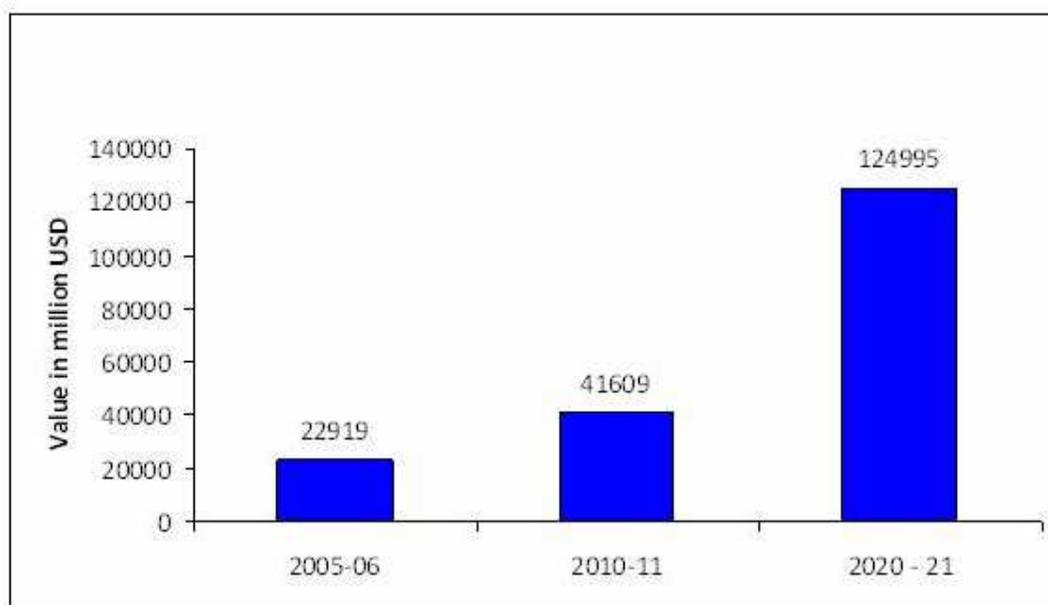
The IT services have been growing at a CAGR of 10.5% for the last 5 years. In the same period, India's gross domestic product (GDP) has been growing at average CAGR of 5.4%.

Comparing the IT services growth vis-a-vis the GDP growth, we have considered an elasticity factor of 5% (for GDP to grow at 5%, IT has to grow at 10%).

GDP is expected to grow at a constant rate of 6%<sup>4</sup> till 2020, therefore considering the elasticity factor, the growth projections for IT services is given below:

**Table 2: Growth of software services- projected**

Year	2005-06	2010 - 2011	2020 - 2021
Value in Million USD	22918.8	41609.0	124995



**Figure 2 Growth projections for IT services growth**

<sup>4</sup> Growth projections, World Bank

### ***CII Godrej GBC survey results (On Growth)***

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CII Godrej GBC in its survey has specifically asked data centers managers about their thoughts on data centers growth in India. All the respondents have responded positively on the growth aspects of the data centers.

Both captive and hosted data centers see an increased activity in their data center space in terms of IT spending and capacity utilization.

#### ***Captive data centers***

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The capacity utilization in the captive data centers is around 60% – 70%. The data center managers believe that the utilization will increase to 80% – 90% in the next 1 – 1.5 years. Historically, existing captive data centers have witnessed a growth of 7% - 8% in their capacity utilization owing to factors like increased employee intake to company due to expansion in their business activities and increase in their service offerings.

#### ***Key highlights***

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- ❖ Capacity utilization 60% - 70%
- ❖ To increase to 80% - 90% in 1 – 1.5 years
- ❖ Witnessed growth of 7% - 8%

#### ***Hosted data centers or Third party data centers***

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Third party data centers, similar to captive data centers are in the growing phase. Though the capacity utilization is around (on an average) 70%, data center managers strongly feel that their data center space will be fully occupied in 2 – 3 years.

Most of the third party data centers surveyed is in the expansion phase. Data centers like Ctrl S, Net magic & Tulip have recently expanded their operations by constructing new data centers.

Third party data centers are witnessing demand from Banking, Financial Services and Insurance (BFSI) sectors. Apart from these traditionally contributing sectors, third party data centers are also witnessing demands from Government projects like Unique Identification (UID), digitalization of Government process etc. In the surveyed data centers, major portion of the data center space is occupied by BFSI. This is closely followed by collocation space for international IT majors and telecoms.

#### ***Key highlights***

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- ❖ Has been growing at CAGR of 30%
- ❖ Capacity utilization is around 70%
  - New data centers (less than 1 year of operation) has capacity utilization less than 50%
- ❖ Believe to fully utilize the capacity in another 2 years
- ❖ Major customers : BFSI, collocation space for international IT majors and telecoms

#### ***Growth projections from other agencies***

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### ***Gartner Growth Projections***

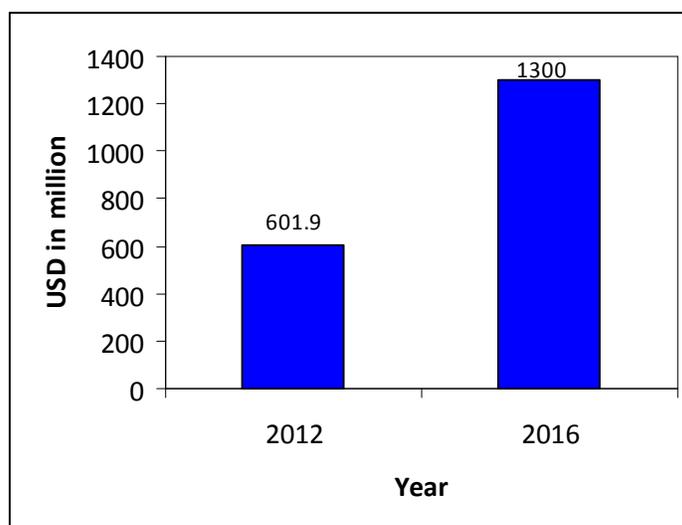
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Gartner had projected the growth of data center market in India in terms of colocation & hosting market, data centre capacity and IT infrastructure revenue.

#### ***a. Colocation and hosting market***

According to Gartner, the data center colocation and hosting market in India is estimated to reach \$609.1 million in 2012. Gartner expects that colocation and hosting would experience a consistent growth through 2016 and would grow to \$1.3 billion, with a Compounded Annual Growth Rate (CAGR) of 21.23%<sup>5</sup>.

Gartner studies indicate a general increase in interest by the investor community around data centers in India. There will be an increased outsourcing of data centre requirements in the forecast period because of the big data users, such as banks and government.



**Figure 3: Growth Projection of Data Center Colocation and hosting market. (Source: Gartner)**

#### ***b. Data Center Capacity***

Gartner expects that the Indian data center capacity, which was about 1.3 million sq. feet in the year 2007, would reach 6.6 million sq. feet in 2016<sup>6</sup>, with service providers driving majority of the growth. This corresponds to a CAGR of 19.8%. This figure did not include data centers in less than 1000 square feet area which were numerous as well.

Data center growth will be driven by increasing domestic requirements from sectors such as financial institutions, telecom operators, manufacturing and services. While large financial institutions and telecom companies are likely to build data centers for hosting their growing data storage needs, data center hosting providers will also put significant investments into growing their capacities to fulfill demand arising from small and midsize users.

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<sup>5</sup> Gartner 2011

<sup>6</sup> Gartner 2011

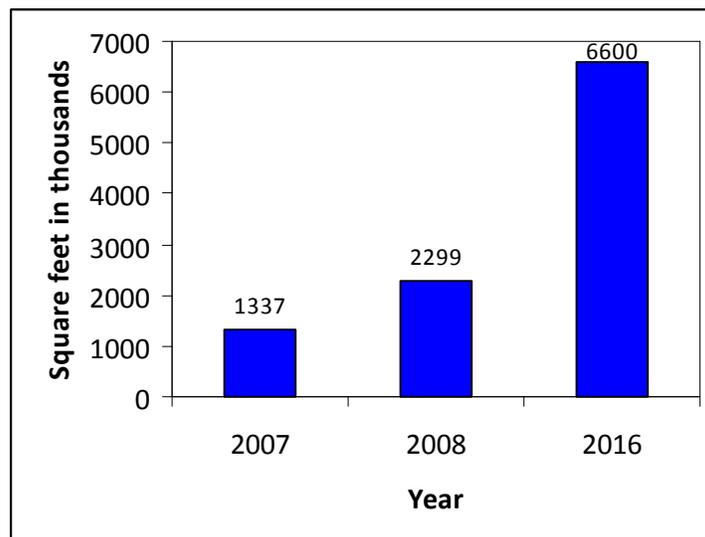


Figure 4: Growth Projection of million square feet of data centers (Source: Gartner)

c. IT infrastructure Market

The Indian IT infrastructure market comprising of servers, storage and networking equipment stood at \$1.86 billion in the year 2011. Gartner anticipates the market growth to reach to US\$ 2.05 billion in 2012<sup>7</sup>, a 10.3 percent increase over 2011. Gartner also expects that the IT infrastructure market would reach \$3.01 billion by 2016<sup>8</sup>, with a CAGR of 10.1%.

The findings further indicate that storage which was US\$ 354.4 million in 2011 would reach US\$ 842.4 million with a CAGR of 18.9%. The primary reasons for this growth could be attributed to the fact that enterprise storage requirements were on the rise and that storage capacities were expected to grow by 60-70% in the next five years.

Table 3: Indian IT Infrastructure Revenue By Technology (Millions of U.S. Dollars)

Equipment	2011	2012	2016	2011-2016 CAGR (%)
Servers	728.6	754.5	967.2	5.8
Storage	354.4	439.4	842.4	18.9
Enterprise LAN Equipment	509.3	575.1	807.0	9.6
Enterprise WAN Equipment	270.9	285.8	390.9	7.6
Total	1,863.2	2,054.7	3,007.5	10.1

<sup>7</sup> Gartner May 2012

<sup>8</sup> Gartner May 2012

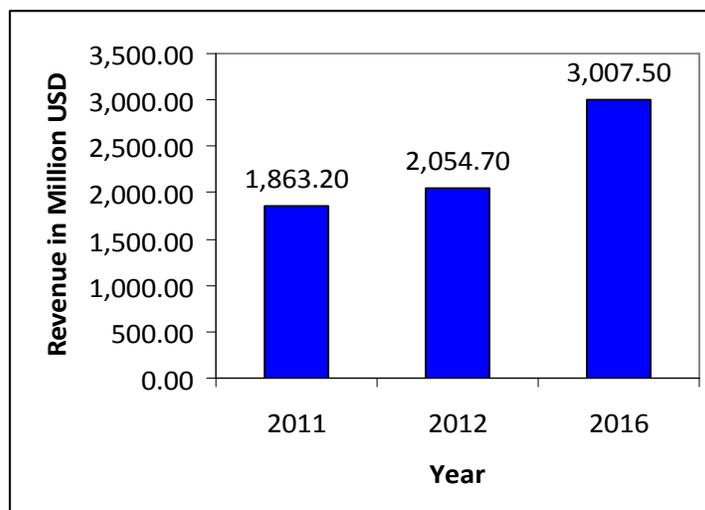


Figure 5: Growth Projection of IT infrastructure revenue (Source: Gartner May 2012)

### ***International Data Corporation (IDC) projections***

#### ***a. Big Data<sup>9</sup> solutions market***

The Big Data solutions market stood at US\$ 58.4 million in 2011, with IT Services and Software contributing to the major share of the overall market. IDC projects that the Big Data solutions market in India would grow to \$153.1 million<sup>10</sup> in 2014. This represents CAGR of 37.8% for the period 2011-2014.

IDC expects that the storage would command the fastest CAGR growth (67.1% CAGR)<sup>2</sup> as compared to other segments for the period 2011-2014.

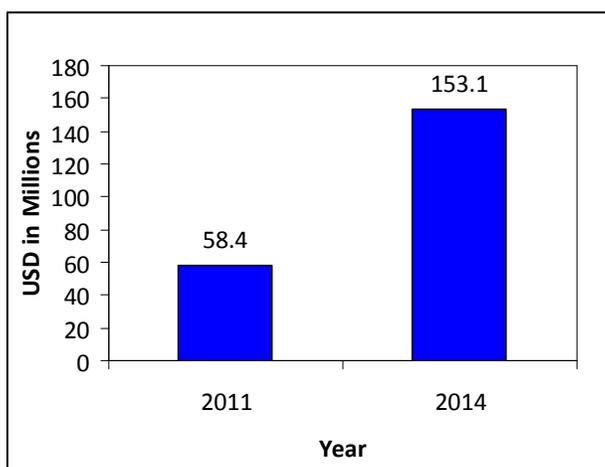


Figure 6: Growth projections of Big Data Solutions Market (Source: IDC 2012)

<sup>9</sup> IDC defines Big Data technologies as a new generation of technologies and architectures designed to extract value economically from very large volumes of a wide variety of data by enabling high-velocity capture, discovery, and/or analysis.

<sup>10</sup> IDC report "Here comes Big Data: Perspectives from Indian Enterprises"

*b. Third party Data Centre Space*

The third party data center space stood at 2 million sq. ft. in the year 2009. According to IDC, it is estimated to reach 9 million sq. feet by 2014<sup>11</sup> with a CAGR of over 30%.

Third party data center services are gaining traction with enterprise customers due to the lack of in-house skills, high investments and long gestation period that a data center calls for.

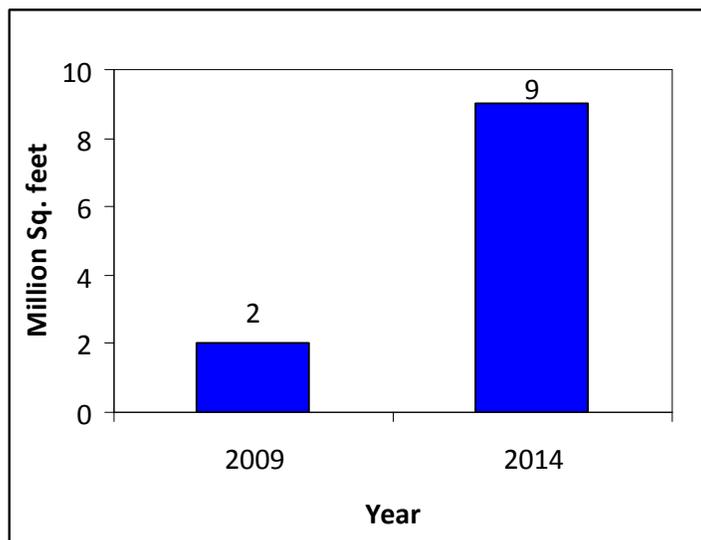


Figure 7: Growth Projections of Third Party Data Centre Space (Source: IDC 2011)

***Zinnov Growth Projections***

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Zinnov has projected the growth of total cloud market, public cloud market and private cloud market in India.

*a. Total Cloud Market*

The total cloud market in India was around \$400 million in the year 2011. Zinnov estimates that the market value would reach \$4.5 billion by 2015<sup>12</sup>.

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<sup>11</sup> IDC 2011

<sup>12</sup> Zinnov 2011

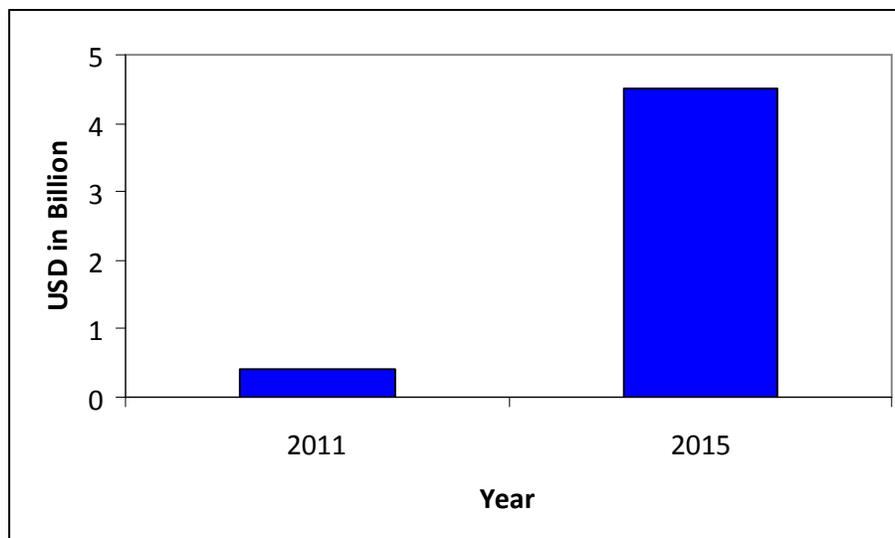


Figure 8: Growth Projections of Total Cloud Market in India (Source: Zinnov 2011)

Zinnov also expects that the private cloud adoption would dominate and account for \$3.5 billion in revenues by 2015, growing at over 60%.

*b. Public Cloud Market*

The Public cloud market in India was worth \$160-192 million in the year 2011. Zinnov expects the market to reach \$685 million by 2014<sup>13</sup>. Public Cloud comprises of 20-22% of the total cloud computing market in India. Zinnov also projects that the Indian Software-as-a-Service (SaaS) market which stands at USD 120-143 million, would reach USD 410 million by 2014.

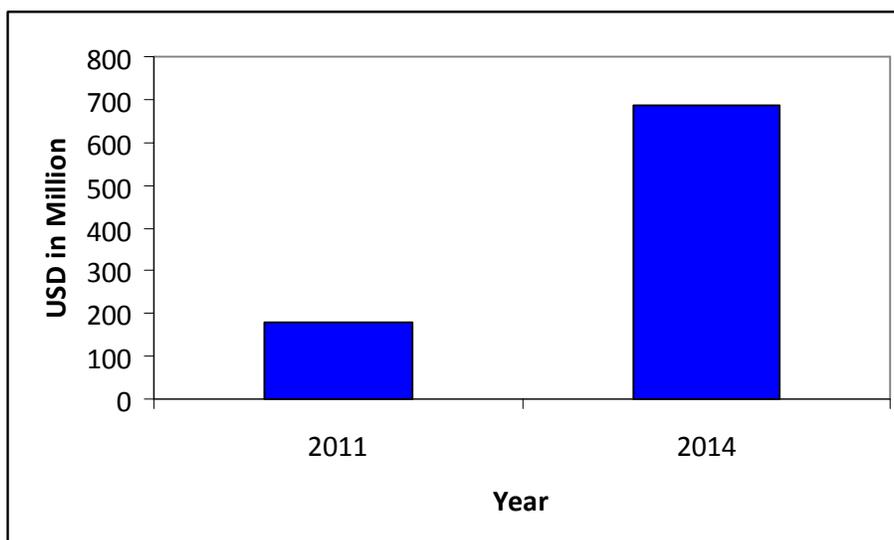


Figure 9: Growth Projections of Public Cloud Market in India (Source: Zinnov 2012)

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<sup>13</sup> Zinnov 2012

### ***Other Projections***

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- ❖ McKinsey expects that the third party outsourced data centre market in India would grow to USD 1.01 billion by the year 2017, at a CAGR of 32%. The verticals such as banking and financial services, media and entertainment service, manufacturing, international telecom providers and retail, accounts for 70% of this growth.
- ❖ TechNavio's Analysts anticipates the data center equipment market in India to grow at a CAGR of 10.4% over the period 2011-2015.
- ❖ According to a study by NASSCOM and Deloitte, the Indian cloud computing market would reach \$16 billion by 2020.
- ❖ As per Dimension Data, the data centre market in India is growing at a CAGR of 22% and will touch USD 1.2 billion by the year 2016.

#### **1.2 Factors favoring the growth of data centers**

The Indian data center industry has been growing rapidly in the last five years. Even during the economic slowdown, the data center market was in the growth path. The major sectors influencing the growth of data centers are:

- a) BFSI
- b) Telecom
- c) Information technology (IT)
- d) Social media

Apart from the sectoral influences on the growth of data centers, there are several other factors which have an impact on the development aspects:

- a) Indian Government e-governance policy
  - I. Creation of state wide area networks (SWAN)
  - II. National informatics centre (NIC)
  - III. State data centre (SDC)
- b) Reduction in bandwidth cost

#### ***Banking, Financial Services & Insurance (BFSI)***

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BFSI is one of the major users of data center services. Any development in these sectors will have a direct impact of the growth of data centers.

The Indian banking industry is a key driving force of the Indian economy and the most dominant segment of the financial sector. Financial sector reforms since the early 1990s have resulted in a competitive, healthy and resilient banking system.

The banking sector has been growing at a CAGR of 14.2% and the growth is expected to be exponential in the years to come. The main reason cited for the positive projection is that only

40%<sup>14</sup> of India's population has a bank account. Therefore the opportunity for banking sector to grow is extremely high.

#### Key highlights

- ❖ Reserve Bank of India (RBI) policy on 'financial inclusion' is expected to drive the banking sector growth. RBI is focusing to extend banking facilities to 100,000 villages. This calls for a large IT infrastructure set up in banking sector. This step is set to boost banking sector's growth and in turn the growth of support systems like data centers
- ❖ Mobile banking has become a priority for commercial banks. 70%<sup>15</sup> of India's population has mobile connection where as only 40% has bank accounts. Mobile banking can attract the other set of population to avail banking facilities. Mobile banking also calls for an IT infrastructure set up and this would drive the growth of data centers in India
- ❖ India is in the process of setting up its own payment gateway, RuPay. This initiative is expected to increase electronic payments and thus the need for IT infrastructure
- ❖ With RBI easing up regulations in banking sector, foreign banks are expected to set up their operations in India

#### Telecom

The telecom sector has played a critical role in the socioeconomic development of India. It also plays a pivotal role in growth and modernization of various sectors of the economy.

The sector has witnessed a commendable growth over the decade. India has grown to become the second largest wireless network in the world after China. With an overall subscriber base of 914.60 million (2011)<sup>16</sup> and a teledensity of 76.03%<sup>17</sup>, the sector continues to grow from strength to strength.

#### Key highlights

- ❖ India, with its huge population and almost 30% of its population yet to use telecom services , is a favorable destination for telecom operators to expand their business
- ❖ The telecom regulatory body, having eased up the process of licensing, have attracted lot of players in to this market
- ❖ Allotment of 3G spectrum and commercial launch of 3G telecom services have triggered the next wave of telecom industry development
- ❖ Telecom industry, apart from building their own data centers, is one of the largest users of third party data centers

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<sup>14</sup> Doing business in India – Ernest & Young report 2011

<sup>15</sup> Doing business in India – Ernest & Young report 2011

<sup>16</sup> Department of telecommunication, India

<sup>17</sup> Department of telecommunication, India

- ❖ With the sector growing leaps and bounds, the data center market is also poised to grow to support the infrastructure needs of the industry

### **Information technology**

The Indian information & technology industry, one of the major contributors to the growth of data centers, has been growing at a rapid pace. What started as an outsourcing activity in the 90s has grown to become a complete knowledge center for the world.

India has become a favorable destination for IT & IT related activities, not only for the lower cost of delivery of the software products but also for the expertise that the industry holds. When the world was reeling under the economic crisis, IT industries elsewhere were badly hit. However, Indian IT industry not just sailed past the crisis but did that with a remarkable growth.

### **Social media**

India, the second populous country in the world, has in all ways offered opportunities for data explosion. India has become one of the leading regions for generation of personal location data. With an overall mobile subscriber base of 914.60 million (2011)<sup>18</sup>, the generation of personal location data is at its peak. The penetration of smart phones has also helped the case.

Apart from mobile phones and smart phones, penetration of social networking is also in the rise. Facebook, the largest online social network in the world, has about 1 billion users<sup>19</sup> out of which about 65 million users are from India, making India the second largest country on Facebook. India, with an internet population of 120 million<sup>20</sup>, has 50% of its population as active social network users and it is expected to grow further.

According to Forrester Research, India will be the third largest internet user base by 2013 with China and the US taking the first two spots, respectively<sup>21</sup>. The internet population is expected to grow by 10 – 20%<sup>22</sup> annually for the next two years. With a growing internet population and increase penetration of smart phones, the data to be handled is expected to grow exponentially. Infrastructure needs to support this kind of growth is also expected to grow thereby leaving a strong forecast for the data center market.

### **Indian Government e-governance policy**

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E-governance is one of the major initiatives of the Government to computerize public services. The objective of this is to transform traditional processes and service delivery mechanisms and thereby making services simpler and accessible to all.

<sup>18</sup> Department of telecommunication, India

<sup>19</sup> Facebook, October 2012

<sup>20</sup> Facebook, October 2012

<sup>21</sup> Global Online Population Forecast, 2008 to 2013, Forrester Research

<sup>22</sup> Global Online Population Forecast, 2008 to 2013, Forrester Research

### ***E-governance infrastructure:***

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#### ***a. State Wide Area Network (SWAN)***

SWAN is an advanced telecommunication infrastructure, which is used for exchange of data and other types of information between two or more locations, separated by significant geographical distances. SWAN is envisaged to create connectivity in each State, to bring speed, efficiency, reliability and accountability in overall system of Government-to-Government functioning. When fully implemented, SWAN would work as a converged backbone network for voice, video and data communications across each State. To develop a network of this size, support infrastructures like data centers should also be developed. Wide area network is being currently established in 27 states.

#### ***b. State Data Center (SDC)***

State Data Centre (SDC) has been identified as one of the important element of the core infrastructure for supporting e-Governance initiatives. Under eGovernance scheme, it is proposed to create SDCs for the States to consolidate services, applications and infrastructure to provide efficient electronic delivery. These services can be rendered by the States through common delivery platform supported by core connectivity infrastructure such as State Wide Area Network (SWAN). Some of the key functionalities are central repository of the state, secure data storage, online delivery of services, disaster recovery, remote management and service integration etc. SDCs are to be built in 31 states in India.

#### ***c. National Informatics Center(NIC)***

One of the main objectives of NIC is to set up data centers. Data centers have been set up in New Delhi, Pune & Hyderabad for shared hosting & collocation facilities for Government departments, disaster recovery and storage. Similar data centers are to be set up in other locations also.

### ***Reduction in bandwidth cost***

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The cost of operation of data centers have gone down in terms of the bandwidth cost. Several telecom companies have been awarded license to operate additional bandwidths by Government of India. This has lead to a price competition between the telecom operators. Telecom operators have reduced the bandwidth cost drastically in order to attract customers thereby making data center operators avail bandwidths at a very low cost.

### ***1.3 Challenges faced by the data center managers***

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The growth opportunities for Indian data centers are well known and well documented. However, on the flip side, there exist certain threats that might derail the growth progress.

The data centre market in India, as mentioned earlier, is due to grow rapidly over the next 5 years. However power security remains a significant risk stemming from the lack of diversity of energy imports and increasing reliance on thermal power and oil import.

### ***Power availability and reliability***

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The prime reason for data centers to be under the scrutiny from energy agencies is because they are extremely energy intensive. The IT equipment consumes the major share of energy in a data center followed by special air conditioning needs.

Apart from catering the energy intensive equipments, availability of a data center calls for continuous and reliable power supply. Availability is one of the major attracting points of data center. A data center with higher availability is always a favored destination for clients to have their servers.

Therefore, power availability is the deciding factor for a successful operation of a data center. In India, the data centers are normally concentrated in Tier 1 cities like Chennai (Tamil Nadu), Bangalore (Karnataka), Hyderabad (Andhra Pradesh), Mumbai (Maharashtra) and New Delhi.

Except for Maharashtra & New Delhi, power crisis exists in other states. Data centers face 2 – 3 hours of power shut down per day. Due to this, data centers are forced to look for alternate means of energy.

Apart from the availability of power, reliability also is a major concern for the data center operators. Frequent tripping from the grid side, voltage dip are some of the issues that a data center face.

Power availability and reliability is one major factor which if left unattended, will lead to disastrous result for data centers and its growth. The off shoots of power availability are:

- ❖ Increased cost of operation
- ❖ Difficulties in expansion of operations
- ❖ Increased capital cost

#### Increased cost of operation

Data centers face power outages every day and are forced to look for other means of power. Diesel generators are the most favored option for in house power generation. With increasing oil price, the cost of running a data center with diesel generator has increased exponentially.

Electricity cost from grid is, on an average, is about Rs 5/kwh, whereas cost of energy from diesel generator is about Rs 14/kwh. Due to power outage, the energy intensive data center is forced to operate on expensive power produced from diesel generator for 2 – 3 hours a day.

In cases where the company gets restricted power, the situation is still worse. Restricted power is that the company will be allowed to use only, for instance, 70 – 80% of their contract demand. For example, if a company's contract demand is 1000 KVA, only 800 KVA can be drawn from the grid. To compensate for the restricted power, the data centers are forced to operate their diesel generators throughout the day (24 hrs). Since energy is one of the major cost heads, the profitability of the company goes for a toss.

#### Difficulties in expansion of operation

Most of the data centers in India start their operation even before the completion of construction of the whole building. They operate only a part of their data center space with capacity utilization being only 30% - 40%. Their contract power demand would be based only on their part operation.

During the course of time, as they complete the construction activities and as their data center space gets filled up, energy demand goes high to cater to the new space. The expansion activity calls for a higher contract demand. However, due to issues in power availability, the electricity board often doesn't encourage an increase in contract demand.

Due of this, expansion activities of data centers are put on hold. The process of getting approval for increasing the contact demand is time consuming. Therefore, expansion activities of the data centers get delayed by 8 – 9 months.

#### Increased capital cost

Availability is a major concern for any data center operator. Due to power issues, data center operators had to install additional equipments to maintain reliability. Most of the data centers operate with two or three sets of UPS systems. The main reason for installing more than two sets of UPS systems is the concern over power availability. If the power from grid is reliable, one set of UPS system can be avoided there by reducing the capital investment. The same holds good for diesel generators and other back up system.

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## **2.0 Energy Consumption in Indian Data Centers**

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Datacenters are highly energy intensive which implies high cost on the organization for its operation. Increasing energy cost imposes tremendous pressure on the developers to design energy efficient datacenters.

Energy consumption in data centers is increasing at very rapid pace. India's sustainable growth is being challenged by the increased energy consumption of the data centers. With the IT activities bound to grow in India, energy challenges to data centers is also bound to increase.

### **2.1 Survey results on energy efficiency**

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The following are the survey results for energy efficiency in Indian data centers:

#### ***Awareness level on energy efficiency***

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- ❖ Almost all the operators responded positively when asked about the importance of energy efficiency in data centers
- ❖ Operators understand that the energy efficiency is a very important part of their operations
- ❖ Operators believe that cost of operation can be brought down through energy efficiency measures
- ❖ Many operators responded that saving energy is their main priority
- ❖ After energy, water remains to be the top priority. Water scarcity in the metros have forced data center operators to reduce their water foot print
- ❖ Data center operators are aware of the Power Usage Effectiveness (PUE) levels of the data centers in their regions and work to achieve the best possible PUE
- ❖ All the operators believe that any efficiency improvement in air conditioning system would yield the highest possible energy savings

#### ***Power Usage Effectiveness (PUE)***

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PUE is the most commonly used metric to assess the energy performance of a data center. PUE is calculated as the ratio of total power to IT power. Lower the value of PUE, higher is the energy performance of the data center.

For example, if a PUE is determined to be 2.0, this indicates that the datacenter demand is two times greater than the energy necessary to power the IT equipment. In addition, the ratio can be used as a multiplier for calculating the real impact of the system power demand.

If a server demands 400 watts and the PUE for the datacenter is 2.0, then the power from the utility grid needed to operate 400 watts server is 800 watts.

- ❖ PUE varies from 1.4 – 3 in the surveyed data centers

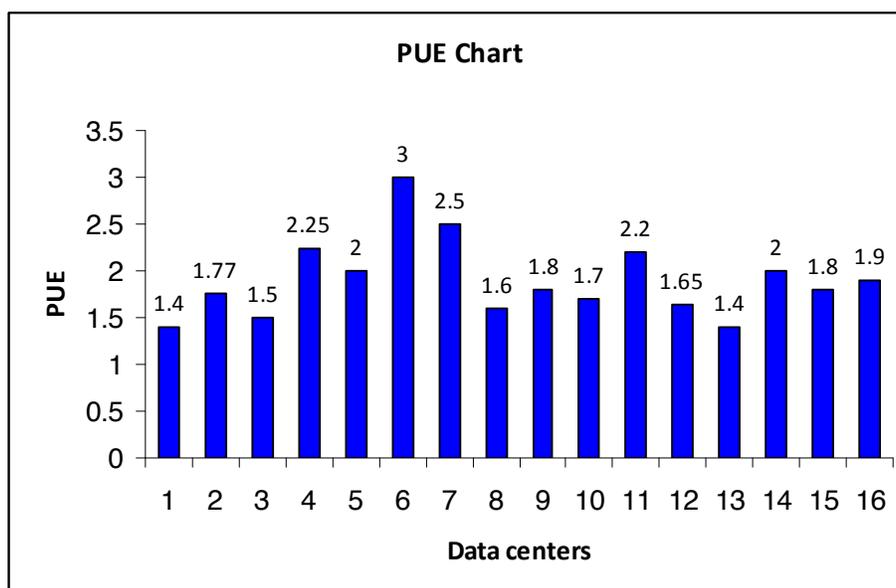


Figure 10: PUE chart of surveyed data centers

- ❖ PUE is measured in category 2<sup>23</sup>:
  - PUE category 1: IT load measured at UPS output
  - PUE category 2: IT load measured at PDU output
  - PUE category 3: IT load measured at point of connection to IT load
- ❖ Data centers housed in a shared facility find it difficult to segregate power taken by whole of facility and data center. This leads to an incorrect calculation of PUE

### ***Factors affecting PUE***

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- ❖ Power issues
- ❖ Inability to reduce air conditioning set point
- ❖ Overdesign
  - Overdesign by consultants & operators
  - Unpredictable IT load
- ❖ Technical knowledge of the supplier
- ❖ Technical knowledge of the customer

<sup>23</sup> Significance of PUE category: By measuring PUE in category 1 & 2, accuracy of the measured data is compromised. PUE = Total power / IT power. In category 1 & 2, the IT power measured will be higher thus resulting in lower PUE. While in category 3, the IT power will be actual power used by the IT load and thus giving the accurate value.

### Power issues

Out of all the issues that a data center operator faces, availability of power is the major issue. Power issues results in cascade effect ultimately reducing the overall operating efficiency of the data center.

Due to unreliable power, data center operators are forced to install more equipments for reliability. Extra sets of UPS and DG sets are normally installed in order to maintain availability of the data center. These equipments operate at low efficiency due to lower loading thus decreasing the overall operating PUE of the data center.

### Inability to reduce air conditioning set point

One another side effect of power issues is the inability to reduce air conditioning set point. It is a well known fact that air conditioning is one of the major energy consumers in a data center. Any small improvement in the efficiency of the air conditioning system results in considerable energy savings thus reducing the overall cost of operation<sup>24</sup>.

During the survey it was observed that data center operators are well aware of the energy savings opportunities that an air conditioning system offers. All data center operators wish to operate at highest possible temperature. However, due to power outages they are unable to increase the temperature.

If the data center operates at low temperature, a five minute stoppage of chiller system will not drastically affect the temperature profile of the conditioned space. That is, the temperature rise will not be high. On the other hand, in a data center operating at higher temperature, chiller stoppage would immediately lead to temperature rise thereby putting the overall operation at risk.

### Overdesign

Over design of data centre is a common problem faced by many data centers. During the survey, it was observed that overdesign can be of two types:

- ❖ Overdesign by consultants and operators
- ❖ Overdesigned due to unpredictable IT load

#### a. Overdesign by consultants and operators

Design and selection of data centre equipment plays a very vital role in the energy efficient operation of data center. If equipment is over designed, i.e., not designed for its actual capacity, the equipment would never be loaded to its capacity. Equipment would operate at its maximum efficiency when it is fully loaded. Therefore, overdesigned equipment would never operate at its maximum efficiency.

The reason for overdesign varies from an error in judgment in the part of the consultant to the intentional overdesign by the operators to accommodate future expansions.

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<sup>24</sup> Chiller efficiency improves by 1% for every 1°F raise in the temperature of water leaving the evaporator with all other factors held constant. Therefore when the conditioned space temperature is to be increased, the temperature of the chilled water leaving the chiller ought to be raised. This reduces the power consumption of the chiller thereby decreasing the operating PUE.

*b. Overdesigned due to unpredictable IT load*

Data center designers are unable to calculate as to how the IT load would be in the future. Data centers are designed for a forecasted load at which the data center seldom operates.

In certain observed cases, the growth in IT load increased to such an extent that the data center ran out of space very soon. In order to avoid this condition, data centers are always overdesigned.

Equipments are always designed for the peak load. Due to this when the loading is less, the equipment operates in low efficiency zone<sup>25</sup>.

*Technical knowledge of the supplier*

Data center is a hi-tech facility which requires high end solutions. Unlike other facilities, a data center requires high levels of understanding of surroundings from the suppliers. A minor design error will result in energy loss throughout the life cycle of the data center.

During the survey, several operators opined that the knowledge levels of the personnel, that equipment suppliers appoint to install the equipment, were low regarding the energy efficient aspects of the design. Wide spread opinion is that the criticality of the equipment is not properly understood and it leads to mistakes in installation. This is a common phenomena in air conditioning system duct installation and layout of cable.

One of the operators revealed that a small defect in plenum's design for conditioned air had resulted in leakage of cold air and thus resulting in energy loss. Another operator shared that the passage of conditioned air in the plenum was blocked due to improper cable management in the plenum.

*Technical knowledge of the customer*

Data centers face a peculiar situation where the knowledge of the customers also affects the efficiency levels. Several customers who are availing the services of data centers have a preconceived notion that data centers can operate only at lower temperature.

Data center operators and customers enter into agreement that any modification in the data center space has to be in consultation with the customer. Thus when an operator wishes to increase the operating temperature of the conditioned space, the operator faces resistance from the customer because of the ill conceived notion leading to non implementation of idea. Educating customers on the aspects of energy efficiency is an important activity.

***Heat, Ventilation and Air Conditioning (HVAC)***

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Air conditioning consumes 35-40% of the energy consumed by the data center. Higher power consumption translates to higher criticality of the system. Heat generated by IT equipment has to be taken out from the data center for smooth functioning of the facility.

Though high in criticality, air conditioning system offers good opportunities for energy savings. Air conditioning system is usually the first area that a data center operator concentrates on. Simple

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<sup>25</sup> Higher the loading of equipments like UPS, transformer, PDU, higher will be the efficiency. If the loading is less, the equipments operate in low efficiency zone.

activities like increasing the operating temperature of the conditioned space would yield considerable energy savings without any investment.

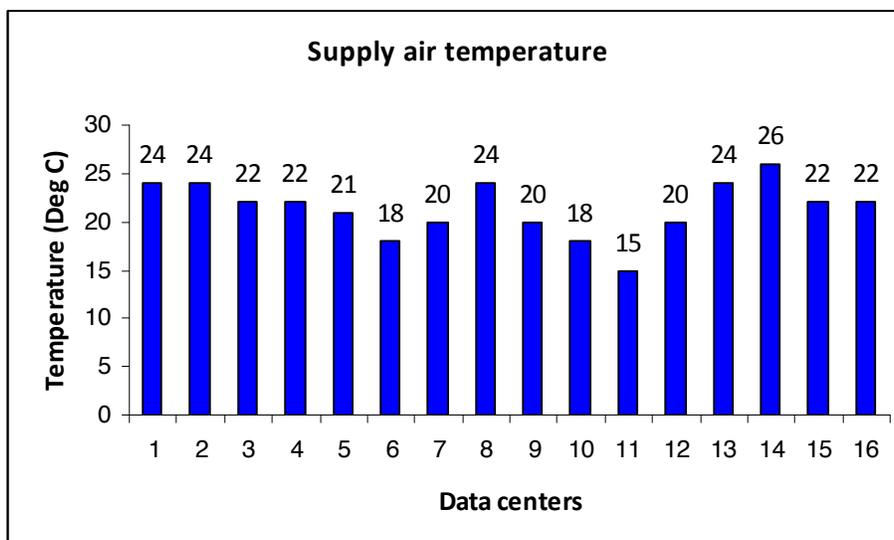


Figure 11: Supply air temperature on surveyed data centers

The awareness level of data center operators regarding the energy saving opportunities in air conditioning system is high. Several operators have explored the possibilities and have implemented energy saving projects in their data centers.

## 2.2 Common energy saving projects / measures implemented

Energy saving measures taken by data centers was given special importance during the survey. The readiness and open mindedness of operators to accept and to implement energy saving measures was studied in the survey. The following are the most common energy saving measures implemented in Indian data centers:

- ❖ Increasing the operating temperature of the conditioned space
- ❖ Hot aisle / cold aisle containment
- ❖ Segregating medium and high density racks thereby optimizing the air conditioning system
- ❖ Utilization of blanking panels
- ❖ Variable frequency drive for chillers, PACs, chilled water pumps
- ❖ Lighting transformer for optimizing lighting voltage
- ❖ Software to monitor power consumption patterns of the data centers
- ❖ Power management for servers

### **3.0 Mapping Stakeholder Initiatives**

#### **3.1 Data Center Operators**

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Data center operators are typically classified into two categories.

1. Hosted data centers
2. Captive data centers

##### ***Hosted data centers***

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Hosted data centers are third party service providers to any business where the infrastructure and the maintenance are provided to the clients by the data centers.

There are many major hosted data centers operating in India. Few are listed below.

##### ***a. Netmagic Solutions***

Netmagic Solutions is one of India's leading managed IT hosting services provider, specializing in internet datacenter & managed hosting, infrastructure management, managed security, cloud computing, application hosting, messaging & collaboration and disaster recovery & availability.

Netmagic Solutions provide high Service Level Agreement (SLA), highly scalable infrastructure, and availability. Netmagic Solutions work with market leaders from diverse industry verticals which include banking and financial services, insurance, e-commerce, healthcare, manufacturing, media & entertainment, IT & ITes, logistics, hospitality, and education to reduce their IT operating costs and focus on their core competencies.

##### ***b. Tulip Data Center***

Tulip Data Center is India's largest data centre player offering more than 1 million sq ft<sup>26</sup> of space spanning over 4 cities. Tulip also has Asia's largest and world's third largest data centre in Bangalore.

##### ***c. CtrlS Data Center***

CtrlS is India's first Tier IV certified data center providing a penalty backed SLA of 99.995% uptime. The facilities of CtrlS are ISO – 20000-1, ISO – 27001 and BS 25999 certified. CtrlS owns data centers in Delhi<sup>27</sup>, Mumbai and Hyderabad offering scalable IT infrastructure solutions to suit the needs of every business.

##### ***d. Spectranet Solutions***

Spectranet solutions are one of the major internet service providers in the country. Spectranet solutions provide data center solutions as well as cloud computing services and also security solutions. Spectranet has data centers in Delhi, Mumbai, Chennai, Hyderabad, Bangalore and Chandigarh.

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<sup>26</sup> Source: [http://www.tulip.net/data\\_centre](http://www.tulip.net/data_centre)

<sup>27</sup> CtrlS Delhi Data Center is under construction

e. National Informatics Center (NIC)

NIC, under the Department of Information Technology of the Government of India, is a premier Science and Technology organization, at the forefront of the active promotion and implementation of Information and Communication Technology (ICT) solutions in the government. NIC has spearheaded the e-Governance drive in the country for the last three decades building a strong foundation for better and more transparent governance and assisting the governments endeavor to reach to the next level. NIC hosts data centers in New Delhi, Pune & Hyderabad for shared hosting & collocation facilities for Government departments, disaster recovery and storage.

f. Sify Hosting

Sify Hosting has the country's first<sup>28</sup> Level 3 Internet Data Center (IDC) at the Vashi Infotech Park, Navi Mumbai as well as numerous other IDCs across the country.

Few other hosted data centers are listed below:

**Table 4: Hosted data centers**

<i>S. No</i>	<i>Name of the Data Center</i>	<i>Location</i>	<i>Website</i>
1	Netmagic Solutions	Mumbai Chennai Pune Bangalore Delhi	<a href="http://www.netmagicsolutions.com/">http://www.netmagicsolutions.com/</a>
2	Tulip Data Center	Bangalore Delhi Mumbai Kolkata	<a href="http://www.tulip.net/data_centre">http://www.tulip.net/data_centre</a>
3	CtrlS	Hyderabad Mumbai Delhi	<a href="http://www.ctrls.in/">http://www.ctrls.in/</a>

<sup>28</sup> Source: <http://sifyhosting.com/scripts/sifyhosting.asp>

4	Spectra Solutions	Delhi	<a href="http://www.spectranet.in/">http://www.spectranet.in/</a>
		Chennai	
		Hyderabad	
		Bangalore	
5	Net4 Data Center	Bangalore	<a href="http://www.net4.in/">http://www.net4.in/</a>
		Delhi	
		Hyderabad	
		Mumbai	
		Pune	
		Chennai	
6	Server Colocation	Delhi	<a href="http://servercolocation.in/datacenters-india">http://servercolocation.in/datacenters-india</a>
		Mumbai	
		Hyderabad	
		Bangalore	
		Chennai	
7	Netcon Technologies India Pvt Ltd.	Coimbatore	<a href="http://netcon.in/">http://netcon.in/</a>
		Chennai	
		Bangalore	
8	Cyber Futuristics	Jaipur	<a href="http://www.cyfuture.com/">http://www.cyfuture.com/</a>
		Noida	
9	Sify Hosting	Mumbai	<a href="http://sifyhosting.com/">http://sifyhosting.com/</a>
10	Data Galaxy	Pune	<a href="http://www.datagalaxy.in/">http://www.datagalaxy.in/</a>
11	Aride Ocean	Cochin	<a href="http://arideocean.com/">http://arideocean.com/</a>
12	ESDS Data Center	Nashik	<a href="http://www.esds.co.in/">http://www.esds.co.in/</a>
13	Data First	Ahmedabad	<a href="http://www.datafirst.co.in/">http://www.datafirst.co.in/</a>

14	Trimax Data Centre	Mumbai	<a href="http://www.trimax.in/data-centre.aspx">http://www.trimax.in/data-centre.aspx</a>
		Bangalore	
15	Cyquator	Mumbai	<a href="http://www.cyquator.com/Html/home.html">http://www.cyquator.com/Html/home.html</a>
16	Kedia Data Centre	Hyderabad	<a href="http://www.kediainfo.com/DataCenter%20Information.aspx">http://www.kediainfo.com/DataCenter%20Information.aspx</a>
17	Data Zone IDC	Ernakulam, Kerala	<a href="http://www.datazoneidc.com/">http://www.datazoneidc.com/</a>
18	ABT info.net	Coimbatore	<a href="http://www.abtinfo.net/">http://www.abtinfo.net/</a>
19	Jaipur Data Centre	Jaipur	<a href="http://www.jaipurdatacenter.com/">http://www.jaipurdatacenter.com/</a>
20	Microhosting	Noida	<a href="http://www.microhosting.in/">http://www.microhosting.in/</a>
21	QuantM Net Technologies	Gurgaon	<a href="http://www.quantm.com/green-data-centers.html">http://www.quantm.com/green-data-centers.html</a>

### ***Captive Data Centers***

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The second classification on the type of data centers are the captive data centers. The majority of the data centers in India are mainly captive data centers. Few captive data centers also provide third party services for hosting in their captive data centers, thereby improving the loading/occupancy of their data center space. Major players in captive data center space are the private telecom and banking giants like tata communications, reliance communications, bharati airtel, ICICI, Bank of America etc.

There are many major Captive data centers operating in India. Few are listed below

#### ***a. Bharti Airtel***

Airtel provides state of the art Tier 3 Data Centers to host business critical IT & telecom equipments and applications. Airtel data center services include entire suite of managed hosting, storage, business continuity, data protection and security services. Airtel's Data Centers are located in major Indian cities – Bangalore, Chennai, Delhi & NCR, Mumbai and Pune.

The majority of the data center space is used by Airtel itself. However, certain portion of the data center space is provided for third party hosting services.

#### ***b. Reliance Communications***

Reliance data center is a leading provider of outsourced data center infrastructure for organizations with mission-critical IT operations. It currently has nine data centers across India. These data are located at Mumbai, Bangalore, Chennai and Hyderabad. Reliance provides various kinds of service which include co-location, managed hosting, storage & backup, network connectivity, application hosting and managed services.

Similar to Bharati Airtel, Reliance communications too utilize majority of the data center space for their operations and some portion of the remaining space is made available for third party hosting services.

c. Tata Communications

The Tata communications manages nearly 1 million square feet of data center and collocation space worldwide. Tata communications operate data centers in Mumbai, Chennai, Delhi, Bangalore, Hyderabad and Pune. Tata communications offer collocation, managed hosting & storage services, managed security services, content delivery network services, application optimization, and network services.

Few other major captive data centers are listed below:

**Table 5: Captive data centers**

<i>S. No</i>	<i>Name of the Data Center</i>
1	Infosys
2	Accenture
3	ITC
4	Wipro
5	Tata Consultancy Services
6	Convergys
7	Cognizant
8	ICICI bank
9	BSNL
10	Bank of America

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### 3.2 Data Center Consultants

Data center consultants are the third party consultants who provide exclusive services on data center design, construction of the data center, building security systems and also disaster recovery systems. The data center consultants are generally responsible for the construction and relocation of a data center whereas the maintenance of the data center is taken care of by the datacenter service providers.

During the data center survey conducted, the details of the data center consultants were also gathered. Few of the major data center consultants noted during the survey are listed below.

**Table 6: Data Centre Consultants**

<i>S. No</i>	<i>Name of the Consultant</i>	<i>Website</i>
1	Schnabel DC Consultants India Private Ltd	<a href="http://www.schnabelag.in/site.php?site=leist">http://www.schnabelag.in/site.php?site=leist</a>
2	Progressive Consulting Technologies Inc.	<a href="http://www.progressive.in/consulting.html">http://www.progressive.in/consulting.html</a>
3	<i>Wipro</i>	<a href="http://www.wipro.com/products/infrastructure-technology-solutions/">http://www.wipro.com/products/infrastructure-technology-solutions/</a>
4	<i>PTS Data Center Solutions</i>	<a href="http://www.ptsdcs.com/">http://www.ptsdcs.com/</a>
5	<i>Helwett Packard (HP)</i>	<a href="http://www8.hp.com/us/en/software-solutions/software.html?compURI=1079554#.ULxCAOS-oeM">http://www8.hp.com/us/en/software-solutions/software.html?compURI=1079554#.ULxCAOS-oeM</a>
6	<i>Tulip Telecom Limited</i>	<a href="http://www.tulip.net/data_centre_consulting_and_built">http://www.tulip.net/data_centre_consulting_and_built</a>
7	<i>3i Infotech</i>	<a href="http://www.3i-infotech.com/content/about/profile.aspx">http://www.3i-infotech.com/content/about/profile.aspx</a>

### ***3.3 International agencies participating in data center activities***

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#### ***a. Gartner Inc***

Gartner Inc. is one of world's leading information technology research and advisory company. Gartner was founded in 1979 and is headquartered in Stamford, Connecticut, U.S.A.

Gartner events and conferences on data centers mainly focus on making optimum use of initiatives like consolidation, virtualization, mobility, big data, disaster recovery, storage, infrastructure convergence, facilities, cost optimization and cloud computing.

Website: <http://www.gartner.com/technology/home.jsp>

*Few Gartner events exclusively on data centers in this year are mentioned below*

1. Gartner Data Center Conference, December 2012 in Las Vegas
2. Gartner IT Infrastructure Operations & Data Center Summit, March 2013 in Sydney
3. Gartner Data Center Summit, November 2012 in London
4. Gartner IT Infrastructure Operations & Data Center Summit, May 2012 in Mumbai
5. Conferência de Data Center, April 2012 in Sao Paulo

#### ***b. Green Grid Association***

The Green Grid Association is a non-profit, open industry consortium of end users, policy makers, technology providers, facility architects, and utility companies that works to improve the resource efficiency of information technology and data centers throughout the world. Green Grid has more than 175 member companies around the world.

Green Grid hosts events and forums to further the dialog on data center resource efficiency, and actively participates in key industry events.

Website: <http://www.thegreengrid.org/>

*Few events organized by Green Grid exclusively on data centers in this year are mentioned below*

1. Data center dynamics held in London in Nov 2012
2. Data Center Dynamics: Data Center Leaders Award in Tokyo in Oct 2012
3. The Green Grid forum in Japan in July 2012
4. Data Center Pulse Summit in California in March 2012
5. Green Data Center Conference in California in Jan 2012

c. Uptime Institute

The Uptime Institute is a third-party data center research, education, and consulting organization focused on improving data center performance and efficiency through collaboration and innovation. The Uptime Institute serves all shareholders of the data center industry, including enterprise and third-party operation, manufacturers, providers and engineers

*Few events organized by uptime institute exclusively on data centers in this year are mentioned below*

1. The annual **Uptime Institute Symposium** brings together the wide range of perspectives in the global data center industry to work to address common challenges of improving the efficiency of IT and facilities, while maintaining the most demanding levels of uptime.
2. In 2011, the Institute announced its first **Uptime Institute Server Roundup**, encouraging organizations to remove duplicate, unused, out-of-date, or obsolete servers wherein the winners are rewarded with a free registration and a dedicated presentation slot at Uptime Institute Symposium.
3. Uptime Institute grants **Green Enterprise IT (GEIT) Awards** to projects, ideas, and products that significantly improve energy productivity and resource use in IT. A principal objective of the GEIT Awards is to share effective ways to reduce energy and resource consumption by highlighting innovation and best practices.

d. DatacenterDynamics

DatacenterDynamics conduct a unique series of events tailored specifically to deliver knowledge and networking opportunities to professionals that design, build and operate data centers.

*DatacenterDynamics mainly conduct events which mainly focus on three major aspects of data centers which are*

1. *Design, Construction and Operation*

Design, Build, Operate is one of longest running conference theme which focuses on every part of the mission-critical facility lifecycle. From site selection and engineering design through to power availability and full data center automation; this event is mainly targeted for organizations embarking on a new data center project or operating existing facilities.

2. *Outsourcing Decisions*

This conference theme explores an enterprise's strategic options for data center outsourcing, weighing up the economic benefits, the risks and the performance characteristics against those of doing it individually.

3. *IT Optimization*

The ITO conference stream provides insight on how IT needs drive data centre strategy and how that impacts infrastructure requirements. It focuses on optimizing the systems that run within the data center right from processing to storage, to network and to application.

*Some of the major events organized by DatacenterDynamics are mentioned below.*

1. DatacenterDynamics Converged in Toronto in Nov 2012
2. 7<sup>th</sup> annual DatacenterDynamics Converged Dubai conference in Nov 2012
3. Converged DatacenterDynamics in Mexico City in Oct 2012
4. DatacenterDynamics Converged in Rome in Nov 2012
5. DatacenterDynamics Converged in Beijing in Dec 2012

e. Lawrence Berkeley National Laboratory (LBNL)

Berkeley Lab is a member of the national laboratory system supported by the U.S. Department of Energy through its office of Science. Berkeley Lab is managed by the University of California (UC) conducts unclassified research across a wide range of scientific disciplines.

As part of its research, LBNL also works on improving the energy efficiency of data centers, thereby making the business more competitive and the operations more reliable.

LBNL website also offers tools and information to capture cost-effective savings opportunities during the design of new data centers or the retrofit of existing ones.

*Some of the key areas of research in the data centers sector are*

1. Characterizing of baseline energy use and savings potential
2. Benchmarking data centers and documentation of best practices
3. Technology development and assessment
4. Demonstration projects, assessment tools development, conduction of training programs
5. Showcasing of best practices at LBNL's own facilities

### ***3.4 National agencies participating in data center activities***

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a. National Association of Software and Services Companies (NASSCOM)

The National Association of Software and Services Companies (NASSCOM) is a trade association of Indian Information Technology (IT) and Business Process Outsourcing (BPO) industry. NASSCOM is a non-profit organization and was established in 1988. NASSCOM was set up to facilitate business and trade in software and services and to encourage advancement of research in software technology.

“The India Data Center Technology Conference” organized by NASSCOM in 2012 in Mumbai aimed at bringing together major players in the industry to discuss critical topics including power availability, cooling solutions, green IT, and operation maintenance that confronts the day to day actions of the data center operators

b. CII Sohrabji Godrej Green Business Centre (CII Godrej GBC)

CII-Sohrabji Godrej Green Business Centre offers advisory services to the industry in the areas of Green buildings, energy efficiency, water management, environmental management, renewable energy, Green business incubation and climate change activities.

CII Godrej GBC also conducts specialized events and workshops exclusively data center sector. CII Godrej GBC also conducts studies on market trends, feasibility studies, energy efficiency guidelines and best practices specifically in data centers.

CII Godrej GBC in collaboration with Bureau of Energy Efficiency (BEE) under Ministry of Power has come up with a manual termed "Energy Efficiency Guidelines & Best Practices in Indian Datacenters" which was made publicly available for the benefit of all the stakeholders.

*Few events organized by CII exclusively for the data centers are*

1. Workshop on Energy Efficiency in Indian Datacenters in 2012
2. Conference on Green Datacenters in 2011
3. Conference on Green Data Centers held in 2010

c. *Federation of Indian Chambers of Commerce and Industry (FICCI)*

The Federation of Indian Chambers of Commerce and Industry (FICCI) is a non-government, not for profit organization. FICCI in association with International Copper Promotion Council (India) under the aegis of the Asia Power Quality Initiative (APQI) organized a seminar on 'Power Quality Management for IT/ Data Centers' in 2011.

The focus of the seminar was on power quality issues & its impact in mission critical process, current status of power quality management in IT/data centers, technologies & solutions for power quality issues and few case studies.

*Other major events conducted on Data Centers in India*

1. DatacenterDynamics Conference & Expo organized by DatacenterDynamics in 2012
2. India Data Center Infratech Conference organized by Noppen in 2012
3. Data Centre India 2012 - 2nd International Conference organized by Bharat Exhibitions
4. Green Datacenters organized by MP TFCI Events in 2011
5. The NextGen Data Center Forum hosted by Express Computer in 2011
6. Data Center Dynamics organized by Delta India Electronics in 2008

#### **4.0 Setting up a new Data Centre in India**

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As mentioned earlier, the growth of data center industry in India is inevitable. There are many factors which favor the growth of the industry and also a few factors which might affect the growth.

##### Factors favoring a new entrant (both suppliers & operators) in data center industry

- ❖ Major users of data center services like BFSI, telecom, IT & social media are showing remarkable growth and is forecasted to grow at the same pace in the future
- ❖ Government schemes to digitalize information
- ❖ Availability of technical man power
- ❖ Lower labor cost
- ❖ Reduction in bandwidth cost

##### Factors that might affect a new entrant

- ❖ Availability of power
- ❖ High cost of real estate in Tier 1 cities
- ❖ Bandwidth availability in Tier 2 cities
- ❖ High initial investment

## **5.0 Conclusion**

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Indian data center industry growth story will continue in the years to come, thanks to the strong demand from the domestic and international market. India in its present developing phase offers all opportunities for data centers to grow.

With majority of the third party data centers in the expansion mode, it is a clear indication that data center market is in the ascent. Abundant opportunities are present for both equipment suppliers and data center operators to grow. Growing market means more business for equipment suppliers and chance for new player to enter into the market.

On the flip side, the growth would place a huge burden on the already stressed energy market. If the power issues are sorted out, there is no doubt that the growth of data centers in India will be sky rocketing.

Abbreviations

BEE- Bureau of Energy Efficiency

BFSI- Banking, Financial Services & Insurance

BPO- Business Process Outsourcing

CAGR- Compounded Annual Growth Rate

CII- Confederation of Indian Industry

CII Godrej GBC- CII Sohrabji Godrej Green Business Centre

DCIM- Data center infrastructure management

DG- Diesel Generator

FICCI- Federation of Indian Chambers of Commerce and Industry

GDP- Gross Domestic Product

GEIT- Green Enterprise IT

HVAC- Heat, Ventilation & Air Conditioning

ICT- Information and Communication Technology

IDC- International Data Corporation

IP- Internet Protocol

ISO- International Organization for Standardization

IT- Information & Technology

ITes- Information Technology Enabled Services

ITO- Information Technology Optimization

KVA- kilo Volt Ampere

LBNL- Lawrence Berkeley National Laboratory

LED- Light Emitting Diode

MVA- Mega Volt Ampere

NASSCOM- National Association of Software and Services Companies

NCR- National Capital Region

NIC- National Informatics Centre

O&M- Operation & Maintenance

PAC- Precision Air Conditioner

PDU- Power Distribution Unit

PUE- Power Usage Effectiveness

RBI- Reserve Bank of India

SaaS- Software as a Service

SDC- State Data Centre

SLA- Service Level Agreement

SWAN- State Wide Area Network

UPS- Uninterrupted Power Supply

US- United States

USD- US Dollars

Y2k- Year 2000