

Constructing Change: Accelerating Energy Efficiency in India's Buildings Market

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Methodology

The report methodology included extensive discussions and information-sharing during meetings, phone calls, and written communication with key building efficiency stakeholders in India to better understand efficiency initiatives, stakeholder perspectives, and barriers to implementing efficiency measures. ASCI and NRDC conducted discussions in workshops and stakeholder meetings to identify the successes of, barriers, and opportunities for energy efficiency, with a focus on state and local governments, real estate developers, and financial institutions. Primary and secondary research was involved in analyzing national and international best practices.

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Credit: Bhaskar Deol.

(Top right) LEED Platinum-certified ITC Grand Central Hotel in Mumbai, Maharashtra, India.
Credit: Meredith Connolly & David Goldstein.

(Bottom right) India's first commercial radiant cooled building, Infosys Software Development Building, Hyderabad, Andhra Pradesh, India. Credit: Bhaskar Deol.

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LIST OF ABBREVIATIONS

ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers	GHMC	Greater Hyderabad Municipal Corporation	NCR	National Capital Region
BEE	Bureau of Energy Efficiency	GRIHA	Green Rating for Integrated Habitat Assessment	NREDCAP	New & Renewable Energy Development Corporation of Andhra Pradesh
BOMA	Building Owners and Managers Association	GUDC	Gujarat Urban Development Company	NHB	National Housing Bank
BRANZ	Building Research Association of New Zealand	HDFC	Housing Development Finance Corporation Limited	PACE	Property Assessed Clean Energy
CFL	Compact Fluorescent Lamp	HFC	Housing Finance Company	PPP	Public Private Partnership
CIBSE	Chartered Institution of Building Services Engineers	HMDA	Hyderabad Metropolitan Development Authority	PRGF	Partial Risk Guarantee Fund
CII	Confederation of Indian Industries	HVAC	Heating Ventilation and Air Conditioning	QIP	Qualified Institutional Placement
CREDAI	Confederation of Real Estate Developers' Associations of India	ICSC	International Council of Shopping Centers	RBI	Reserve Bank of India
CSE	Centre for Science and Environment	IDBI	Industrial Development Bank of India	REF	Real Estate Funds
CSEE	Centre for Sustainable Environment and Energy	IFC	International Finance Corporation	REIT	Real Estate Investment Trusts
ECB	External Commercial Borrowing	IGBC	Indian Green Building Council	RENECP	Real Estate Network for Energy and Climate Policy
ECBC	Energy Conservation Building Code	IGEA	Investment Grade Energy Audit	RER	Real Estate Roundtable
ECO-III	Energy Conservation and Commercialization-III	IIIT	International Institute of Information Technology	RLF	Revolving Loan Fund
EEFP	Energy Efficiency Financing Platform	IL&FS	Infrastructure Leasing and Financial Services Limited	SBI	State Bank of India
EESL	Energy Efficiency Services Limited	IPO	Initial Public Offering	SDA	State Designated Agency
EIA	Environmental Impact Assessment	IREDA	Indian Renewable Energy Development Agency	SEBI	Securities and Exchange Board of India
EPC	Energy Performance Contract	ITES	Information Technology Enabled Services	SEZ	Special Economic Zone
EPI	Energy Performance Index	LED	Light Emitting Diode	SIDBI	Small Industries Development Bank of India
ESA	Energy Service Agreement	LEED	Leadership in Energy and Environmental Design	SNA	State Nodal Agency
ESCO	Energy Service Company	MD	Managing Director	TABC	Taiwan Architecture & Building Center
ESPC	Energy Savings Performance Contract	MNIT	Malaviya National Institute of Technology	TEDA	Tamil Nadu Energy Development Agency
FDI	Foreign Direct Investment	MNRE	Ministry of New and Renewable Energy	TERI	The Energy and Resources Institute
FHFA	Federal Housing Finance Agency	MoUD	Ministry of Urban Development	TNEI	Tamil Nadu Electrical Inspectorate
FSI	Floor Space Index	NAR	National Association of Realtors	TOBY	The Outstanding Building of the Year
FVCI	Foreign Venture Capital Investors	NBC	National Building Code	ULI	Urban Land Institute
GDP	Gross Domestic Product	NBFC	Non-Bank Financial Companies	UNDP	United Nations Development Program
GEDA	Gujarat Energy Development Agency			UNEP	United Nations Environment Program
				USAID	United States Agency for International Development
				VCFEE	Venture Capital Fund for Energy Efficiency

FOREWORD

Energy is both at the heart of development and a major barrier to development. As the expected growth in India's commercial buildings sector is tremendous, unprecedented demand has been placed on the country's energy resources. Cutting demand through energy efficiency is the cheapest, fastest, and most effective way to close the gap between energy demand and supply, and sets India on the track to a sustainable energy future.

Meeting India's staggering energy demand is no easy task and will require a multi-pronged approach, bringing together concerned stakeholders in the public and private sector to work in tandem. While India has made remarkable strides to enhance energy efficiency over the past decade through efforts by the Bureau of Energy Efficiency and Ministry of Power, along with state leaders like Andhra Pradesh, daunting challenges remain. Market transformation can only occur if industry players are encouraged to lead through market signals, rating systems, and other incentives at the same time that efficiency codes and regulations ensure minimum standards are met.

As this aptly-named report, *Constructing Change*, sets forth, the key stakeholders within the building construction market must all be engaged to unleash the enormous potential for energy savings across India's growing buildings market. By examining the barriers and identifying action steps for three leading groups in the energy efficiency market—state and local governments, real estate developers, and financial institutes—this report sets the stage for widespread adoption of efficiency measures.

We congratulate the Administrative Staff College of India and Natural Resources Defense Council for providing this critical analysis of India's building efficiency market, and we look forward to working together to build momentum for energy efficiency across India. The findings and recommendations in this report will be extremely useful for the national, state, and local government agencies, real estate developers, financial institutions, research institutions, and others keen on meeting India's energy needs through viable energy-efficient solutions. The actions we take to accelerate the decline of the country's energy intensity today will drive innovation and ensure India's sustainable development in the future.

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EXECUTIVE SUMMARY

Blackouts across India in July 2012 revealed the severity of India's energy crisis. Looking ahead to 2017, India must increase its energy production by 6.5 percent annually from 2011 levels to maintain a 9 percent growth rate.¹ This growth rate will result in rapid urbanization—India's building-occupied area is projected to skyrocket from 8 billion square meters in 2005 to 41 billion in 2030.² Incorporating energy efficiency measures in these new buildings will help India meet its energy needs and increase its energy security.

Energy efficiency is the fastest, cleanest, and cheapest way to meet energy needs. India could save \$42 billion each year by improving energy efficiency in buildings.³ If developers across India implemented standard energy efficiency measures in new construction and major retrofits, the country could avoid the need for 2,988 megawatts (MW) of generation capacity.⁴ State and local governments, real estate developers, and financial institutions are particularly critical to the successful development and implementation of energy-efficient buildings.⁵

State and Local Governments are vital for setting standards for the building market and supporting market leaders to accelerate energy efficiency. City and state leaders can create building codes and provide technical support for implementation and compliance. States across India are already taking significant steps to accelerate energy efficiency. For instance, by announcing plans to make the Energy Conservation Building Code (ECBC) operational by 2012 for new commercial construction, many states have set an important precedent to promote energy efficiency leadership in the country.

In *Andhra Pradesh*, some progressive developers are constructing and retrofitting energy-efficient buildings to gain a market edge with leadership from the Confederation of Real Estate Developers' Association of India (CREDAI) and the Indian Green Building Council.⁶ State and local officials have coordinated with stakeholders, including the Administrative Staff College of India (ASCI) and Natural Resources Defense Council (NRDC), to create a Steering Committee on Energy Efficiency to support code adoption and implementation.⁷ Leading software companies have built state-of-the-art energy-efficient buildings. For example, Infosys' new Software Development Building 1 (SDB-1) is the first commercial radiant cooled building in India and boasts 50 percent more efficiency than any other Infosys building.⁸

Though *Gujarat* enjoys a power surplus, energy efficiency adoption is gaining momentum.⁹ The Gujarat Energy Development Agency (GEDA) is driving renewable energy

and energy conservation policy and implementation.¹⁰ The Centre for Sustainable Environment and Energy at CEPT University is raising awareness among building designers, academia, government authorities and the construction industry about energy efficiency and the ECBC.

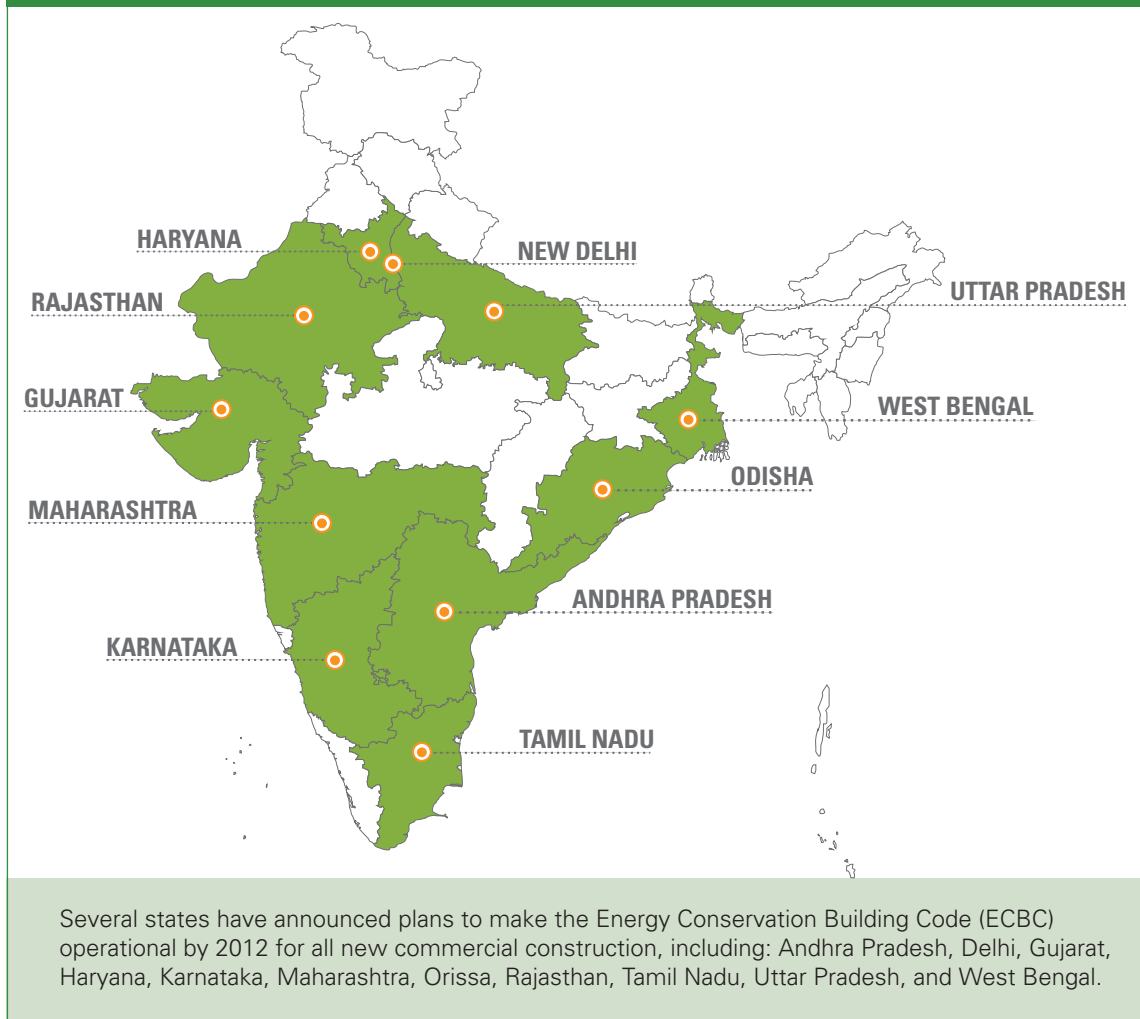
In *Rajasthan*, the Rajasthan Renewable Energy Corporation, the designated state agency for enforcement of the Energy Act of 2001, has established state-level initiatives to increase code compliance.¹¹ These initiatives include preparing Energy Conservation Building Directives (ECBDs) through a collaborative process, notifying municipal bodies of the ECBDs, and raising awareness about ECBDs through workshops and training programs for building professionals. The state has also created a Rajasthan Energy Conservation Award to recognize leadership in adopting ECBDs in commercial buildings.

In *Karnataka*, the Karnataka Electricity Regulatory Commission plans to implement the ECBC in all public buildings in 2012.¹² Similar initiatives have been undertaken by the government of Karnataka to implement Green Rating for Integrated Habitat Assessment (GRIHA) and Leadership in Energy and Environmental Design (LEED) standards.¹³ Global software leaders are constructing state-of-the-art buildings in Bangalore, such as Cisco's new Globalization Center East Campus with sustainability features such as rainwater harvesting, day-lighting, waste recycling, and integrated building management systems.¹⁴

In *Tamil Nadu*, the Tamil Nadu Electrical Inspectorate (TNEI), Chennai Municipal Development Authority, the pollution control board and other stakeholders are discussing how the ECBC can be adopted to improve energy efficiency in buildings. Furthermore, the Tamil Nadu Energy Development Agency is working to integrate new and renewable energy sources into construction projects.¹⁵

Real Estate Developers drive demand for building development. Their investment significantly influences whether new buildings in India's booming cities will be

Figure 1. States Leading on Advancing Energy Efficiency Measures in Buildings



energy-efficient. Some leading developers are building more efficiently. Yet, the developer community needs to become more aware of the reduced costs and energy savings from energy-efficient buildings. Many developers perceive a “higher upfront cost of efficiency measures” as an obstacle, even though such measures pay for themselves. The upfront cost barrier is more pronounced in tenant-occupied buildings since the building owner is responsible for the upfront capital costs, while tenants enjoy the resulting energy savings. Local standards, such as energy efficiency building codes, can level the playing field among developers and accelerate the construction of energy-efficient buildings.

Financial Institutions are critical to reducing potentially high upfront costs for efficiency measures through low-interest loans and innovative financial products. Currently, the financial industry is concerned about the lack of demand for these products from building owners and developers, and also the lack of standards for such energy-efficient equipment, technology, and applications. At the same time, building owners point to the lack of financial products that can help overcome the upfront cost of efficiency technologies. Increasing the dialogue between the real estate developers and financial institutions to share best practices and develop solutions can overcome this gridlock between supply and demand.

ACTION STEPS FOR GOVERNMENTS, DEVELOPERS, AND BANKS

Looking ahead, leadership by state and local governments, real estate developers, and financial institutions is crucial to shift India's buildings market toward cost-saving, energy-efficient and state-of-the-art buildings. Based on ASCI and NRDC's extensive research and stakeholder discussions, highlighted below are the key action steps for state and local government, real estate developers, and financial institutions.

State and local governments should:

- *Create local steering committees* composed of specialists from state, policy, technical, and real estate stakeholder groups, to adopt the ECBC into local building bylaws for new buildings and major retrofits; develop a framework for third-party verification and software tools to check ECBC compliance; build capacity for urban local bodies, architects, engineers, and third-party verifiers; and work with municipal governments to ensure that local environments are well-incorporated into the building efficiency roll-out roadmap.
- *Provide training programs* on building efficiency and implementation. Currently, local governments perceive the code as too technical. Government agencies can also award "best building efficiency developers" to drive market competition.
- *Enact benchmarking practices for public disclosure of annual building energy use* (through a building's utility bills) to buyers, lenders, and tenants. Benchmarking by collecting annual energy data creates a much-needed baseline that can be used to compare energy use and drive competition among owners for efficiency leadership.
- *Adopt commercial and residential building ratings and labels* to create a market brand for energy-efficient buildings. Building labels are also essential for prospective owners to understand building energy use and garner premiums for developer sales and rentals.
- *Consider providing policy incentives to both developers and consumers* for energy efficiency initiatives in new construction and retrofits in existing buildings. The incentives could be in terms of lower taxes or lower fees to encourage developers to offer initiatives and consumers to adopt them.

Real estate developers should:

- *Create a real estate developer network* that initiates peer-to-peer education; collaborates with state and local governments to develop code adoption; engages with financial institutions to design products for energy-efficient building construction; and works with civil society groups and academic institutions to build awareness within the developer community to simplify ECBC compliance and rating systems.
- *Produce case studies* to promote the benefits of energy efficiency for businesses. By understanding the business case and best practices, real estate networks can identify and then publicize through their member base the top five cost-effective efficiency measures that are both simple and workable for building owners.
- *Promote energy efficiency leases* that divide the costs and benefits of building improvements between landlords and tenants to overcome the perceived upfront cost obstacle.
- *Create regulatory incentives* to promote efficiency measures adoption by developers. Developers can work with the government to introduce such beneficial incentives as expedited and transparent clearance of energy-efficient projects, a credible agency dedicated to ECBC certification, and amendments to building bylaws to incorporate efficiency measures.
- *Work with efficiency equipment vendors and manufacturer associations* to increase access and awareness of efficiency products as part of the energy efficiency supply chain. Increased vendor activity can further incentivize real estate investment in green buildings.

Financial institutions should:

- *Work with energy service companies (ESCOs) and create financial products for new buildings and existing building upgrades* to finance efficiency measures and address the hurdle of upfront construction costs.
- *Consult with the Reserve Bank of India (RBI) and National Housing Bank (NHB)* to issue RBI and NHB guidelines on energy efficiency investment. Annual portfolio-based efficiency targets for financial institutions followed by regular audits can significantly channel project finance toward building efficiency. RBI can make energy efficiency



The Park Hotel, Hyderabad, Andhra Pradesh, India.

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investment a priority lending sector that will promote economic development through the benefits of energy efficiency.¹⁶

- *Develop a well-defined, standardized, transparent energy performance contract (EPC) to boost ESCO operations and aggregate projects to ensure project mix and stable cash flows. They should also create case studies of owner-occupied bank buildings to have a data source of energy efficiency implementation and savings to provide metrics for developing related financial products.*
- *Work with real estate developers and promote peer-to-peer learning among financial institutions to understand and strengthen the link between customers and financial institutions, assess risks in the efficiency market, learn from international best practices, and level the playing field from the current varying degrees of knowledge held by different players.*

- *Work with the Bureau of Energy Efficiency (BEE) and the National Productivity Council's certified energy auditors to provide access to market funds to promote entrepreneurship among this skilled workforce and scale the ESCO industry. BEE's landmark Partial Risk Guarantee Fund should be used as an opportunity to provide guarantees to new ESCOs.*

Existing government policies, building-rating systems, and active stakeholders provide a foundation for accelerating progress in energy efficiency. Yet, as India's real estate market continues to grow, the current policy framework needs to be further developed and implemented by coordinated stakeholder action. It is critical for these three leading stakeholder groups—state and local governments, real estate developers, and financial institutions—to drive development and adoption of energy efficiency measures in the buildings market for new construction and major retrofits.

INTRODUCTION

India is at a crossroads in its development path. To keep pace with a projected 9 percent growth rate, India's energy production must grow 6.5 percent per year from 2011 to 2017.¹⁷ India's growth rate means rapid urbanization with more infrastructure and buildings. Buildings already account for more than 30 percent of its electricity consumption.¹⁸ Nearly 70 percent of the buildings in India that will exist by 2030 have yet to be built.¹⁹ However, as the July 2012 record-breaking blackouts highlighted, the country already experiences severe energy shortages. India's current power production cannot meet the expected energy demand to sustain future growth.

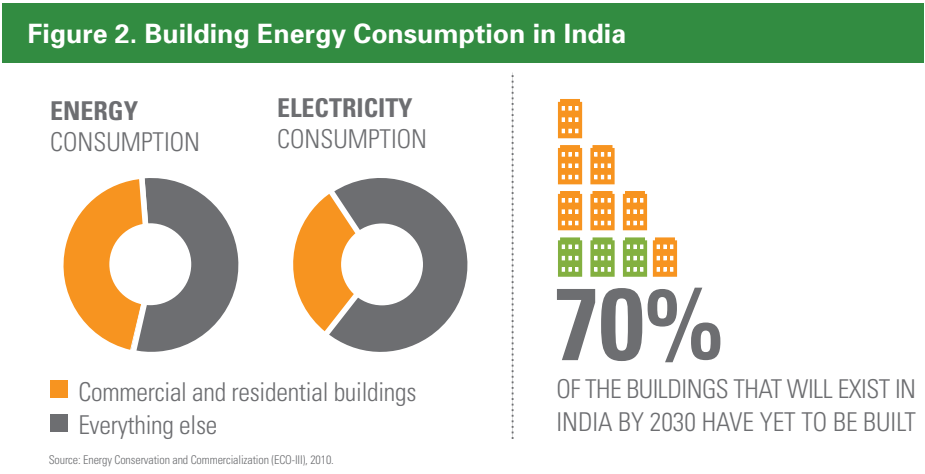
Energy efficiency—an invisible resource—is the cheapest, fastest way to close the energy demand and supply gap.²⁰ Incorporating energy-efficient windows, lighting, and air-conditioning systems at the design stage for new construction is more economical than costly retrofits that developed countries now must perform to save energy. Given the unprecedented growth of new buildings, India has a singular opportunity to lock in lower costs and energy savings through energy-efficient design and thus generate more resources for development for decades to come.

ENERGY CONSUMPTION IN INDIA'S BUILDINGS

Buildings account for more than one-third of the electricity consumption in India.²¹ The overall share of the commercial sector in India's electricity consumption is 6.5 percent, growing at a rate of 11 percent to 12 percent over the last few years.²² Commercial buildings—new office spaces,

information technology (IT)-based offices and data centers, multispecialty hospitals, luxury hotels, and retail malls—are becoming more energy-intensive. The rate of increase in commercial electricity consumption is much more rapid than the annual 9 percent rate of increase in the floor area of commercial buildings.²³

Modern office buildings cater to high-quality standards. However, India's modern offices can use more than twice the amount of energy of their international counterparts. The Energy Performance Index (EPI) of Indian buildings ranges from 200 to 400 kilowatt hour per square meter per year (kWh/sq m/year), compared to similar buildings in developed nations with an EPI of less than 150 kWh/sq m/year.²⁴ The EPI fluctuates depending on the use of central heating or cooling and hours of operation. For typical Indian buildings that do not use central heating or cooling, the EPI is towards the lower end of the spectrum, closer to 200 kWh/sq m/year. For new high-end commercial buildings with 24-hour daily use patterns the EPI can be as high as 400 kWh/sq m/year.



Under a business-as-usual scenario, India's current power production is and will be unable to meet the expected demand. As much of this increased demand will be generated by new building construction, accelerating building efficiency can quickly reduce increases in associated load and consumption. Enforcing building codes can cut energy use in new construction and major retrofits in existing buildings by 50 percent, allowing India to halve the growth rate of building-sector electricity use.²⁵

INDIA'S REAL ESTATE SECTOR

In India, construction is the second largest economic activity after agriculture. India's real estate sector is a key growth driver of the country's economy. It is valued at INR \$2,000 to \$2,250 billion (\$40 to \$45 billion), representing 5 to 6 percent of gross domestic product (GDP).²⁶ The Indian real estate industry (residential, commercial, retail, and hospitality) is projected to reach INR 8,640 billion (\$180 billion) by 2020. It is one of the highest attractors of foreign direct investment (FDI) for the country, with FDI inflow of more than INR 403 billion (\$8.9 billion) between April 2000 and September 2010.²⁷

Within India's real estate sector, key trends include:

- *Increasing Special Economic Zone (SEZ) development:* State governments are incentivizing SEZ development for large infrastructural projects, currently without additional incentives for energy and water efficiency.
- *Demand for luxury projects:* Developers are launching luxury commercial spaces and high-rise residential projects, especially in urban areas.
- *Geographic concentration of real estate activity beyond large metros:* In the past few years, tier-II and tier-III cities and rural areas have witnessed rapid development. This is expected to increase the demand for retail outlets in these areas.²⁸
- *Green buildings gaining popularity:* Real estate projects are increasingly acquiring LEED and Green Rating for Integrated Habitat Assessment (GRIHA) certification to gain a competitive market edge.
- *Demand for affordable housing:* Developers are launching low-cost housing projects in city suburbs to overcome India's significant shortage of such housing.
- *Integrated townships gaining popularity:* Developers diversify risks and achieve high margins by offering planned communities with high-rise residential areas close to offices and shopping complexes.

- *Growing interest of foreign players:* Over the last decade international developers (e.g., Emaar, Ascendas, Keppel Land, Tishman Speyer) and investors (e.g., Morgan Stanley, Goldman Sachs, JP Morgan, Deutsche Bank) have entered the Indian real estate market.
- *New construction technologies:* Developers are moving away from traditional construction styles and adopting such technologies as My-One for, more efficient, faster to build, and standardized dwelling units.

The growth trajectory of the real estate sector is rapid, driven by large-scale urbanization, a young population, increasing household income and a burgeoning services sector, including IT, telecom and financial services. More than 50 percent of the demand for office space in India is driven by over 7,000 Indian IT and information technology enabled services (ITES) firms and 15 percent by financial service providers and the pharmaceutical sector.²⁹ More than 64 percent of the country's IT SEZs are in the southern states.³⁰ The sector holds immense potential to integrate energy efficiency into the country's changing landscape.

CONSTRUCTION AND REAL ESTATE FINANCING IN INDIA

Investment in construction accounts for nearly 65 percent of the total investment in infrastructure.³¹ Several commercial banks offer loans for purchasing commercial property. ICICI, Housing Development Finance Corporation Limited (HDFC), and Industrial Development Bank of India (IDBI) are the largest players.³² Foreign direct investment (FDI) is limited in small and medium businesses, mainly because only a few of their projects are investment-grade. On the other hand, larger projects are mostly self-financed.³³ In most cases, sustainability and green design are not typically addressed in the appraisal process for commercial buildings.³⁴

The major sources of real estate financing are private funding,³⁵ which is still the most common mechanism, followed by bank lending, non-bank financial companies (NBFC),³⁶ external commercial borrowing (ECB).³⁷ In recent years, real estate companies have turned to private equity and investors, through instruments such as private equity funds, initial public offering (IPO), offshore listing, qualified institutional placement (QIP), and real estate investment trusts (REIT).³⁸



India's first commercial radiant cooled building, Infosys Software Development Building, Hyderabad, Andhra Pradesh, India.

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MAJOR ORGANIZATIONS INVOLVED WITH REAL ESTATE FINANCING IN INDIA

Real Estate Funds

As per the Securities and Exchange Board of India (SEBI), foreign venture capital investors (FVCIs) may invest in real estate, within the framework of SEBI. A deviation from the India real estate mutual fund is the India REIT. Unlike the mutual funds that are invested in company stocks, real estate investment trusts are traded in real estate stocks. Major financial institutions such as ICICI, HDFC, IL&FS, and Kotak Mahindra have all launched real estate funds, either as joint ventures or sole investors. Most institutional funds operate on a pan-Indian basis, and are increasingly looking at opportunities in tier III cities, in order to gain “first mover advantage.”⁴⁰ Active property market funds in India include HDFC Property Fund,⁴¹ DHFL Venture Capital Fund,⁴² Kshitij Venture Capital Fund,⁴³ and India Advantage Fund (ICICI).⁴⁴

Real Estate Consultants

These consultants offer services to developers, investors, advisors, and lenders seeking assistance with existing assets, potential acquisitions, new development projects, and properties slated for disposition. Their services include feasibility studies, concept testing, business planning exercises, investment advice, market research and analysis, demand forecasting, financial modeling and project structuring exercises, portfolio optimization and re-engineering strategies, brokerage services, legal documentation review, and valuations.⁴⁵ Major real estate consultants in the Indian market are Jones Lang Lasalle, Colliers, CBRichard Ellis, Frank Knight, and Trammell Crow Meghraj.

Developers and Construction Companies

Historically, Indian companies preferred to own real estate as a means of collateral value, tax benefits from depreciated assets, and unrealized gains to absorb business risk. The recent trends show a shift from ownership to leasing by liquidating their real estate assets and leasing corporate spaces.

Real Estate Investment Banks

The banking focus in real estate investment banking is on structured financing products and structuring of entire portfolios. Other services include structuring of real estate projects, legal advice, operative management of real estate projects, and support in marketing properties.⁴⁶

Foreign Direct Investment in India's Real Estate Industry

Different forms of FDI in the real estate industry include Private Equity/Real Estate Funds (REF) (a preferred entry

RISKS INVOLVED IN THE REAL ESTATE INVESTMENT MARKET

Several risk factors are present in Indian real estate market, including:³⁹

- **Liquidity risk:** The time required for liquidity of real estate property depends on the quality and location of the property.
- **Regulatory risks:** For capital repatriation, foreign investor needs to acquire permission from the Reserve Bank of India. Also, foreign investment is limited to a number of opportunities (e.g. townships). Absence of a single regulator to monitor business practices prevailing in Indian real estate market adds to this uncertainty.
- **Property market transparency risk:** The Indian property market lacks transparency and needs more professional due diligence and valuation institutions.
- **Macroeconomic risks:** Macroeconomic factors such as interest rates, inflation, and exchange rates still have considerable uncertainty, although their volatility has decreased.

route for overseas investors), joint venture, wholly-owned subsidiary, and public-private partnerships (PPP). Major foreign real estate investors in India include: Siachen Capital, Tishman Speyer Properties, Dawnay Day, Ascendas Fund, Warburg Pincus, Blackstone Group - Broadstreet, Morgan Stanley Real Estate Fund, Columbia Endowment Fund, Hines, and Sam Zell's Equity International.^{47, 48}

BUILDING ENERGY EFFICIENCY POLICIES AND PROGRAMS

Several government and private programs exist to advance building efficiency in India. Yet, as India's real estate market continues to grow, the current policy needs to be further developed and implemented by all efficiency stakeholders. The key programs highlighted below are described in more detail in the ASCI-NRDC 2011 report, *Taking Energy to New Heights*.⁴⁹

Energy Conservation Building Code

The Energy Conservation Building Code (ECBC), developed by the Bureau of Energy Efficiency (BEE), prescribes a minimum standard for energy use in new buildings and major retrofits.⁵⁰ The load requirement for buildings to comply is 100 kW or 120 kilovolt-amps (kVA), which enables commercial and high-rise residential buildings (approximately five stories or higher)⁵¹ to come under the code's purview. The ECBC establishes minimum requirements for energy-efficient building design and construction.⁵² The code is voluntary at the national level, and the Ministry of Urban Development and state governments are responsible for its implementation and enforcement. Several states have announced plans to make the ECBC operational for new construction and major retrofits, including: Andhra Pradesh, Delhi, Gujarat, Haryana, Karnataka, Maharashtra, Odisha, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal. These leading states are setting an important precedent to promote energy efficiency leadership in India.⁵³

Environmental Impact Assessment for Buildings

Developers are required to obtain an Environmental Impact Assessment (EIA) clearance from the Ministry of Environment and Forests before constructing projects greater than 20,000 square meters. The EIA is a comprehensive assessment of resource use, including energy, water, air, land, and ecological impacts. Currently, environmental clearances are not designed to effectively assess energy savings. Integrating energy use guidelines with EIA can have a significant impact on reducing the energy footprint of buildings. Governments can integrate ECBC compliance

with EIA clearance by establishing minimum energy benchmarks for environmental clearance and leveraging local enforcement mechanisms.⁵⁴

National Building Code

The National Building Code (NBC) of India is a comprehensive building code which provides guidelines for regulating construction activities. It serves as a model code for adoption by all agencies involved in building construction. The NBC contains administrative regulations and general building requirements, as well as stipulations regarding materials, structural design and construction, and building and plumbing services. The Bureau of Indian Standards is in the advanced stage of revising the code to incorporate sustainability and ECBC references.

National Mission for Sustainable Habitat

The National Mission for Sustainable Habitat is one of the eight missions under the National Action Plan on Climate Change. The mission promotes sustainable cities, including energy-efficient buildings and local government adoption of ECBC, and other efficiency measures. The program aims to transform the design of new construction and major retrofits of commercial and high-rise residential buildings to optimize their energy efficiency.

BUILDING RATING PROGRAMS

Leadership in Energy and Environmental Design (LEED)

LEED is an internationally recognized green building rating system.⁵⁵ LEED verifies that a building was designed and built using improved performance strategies, including energy savings, water efficiency, and carbon dioxide emissions reduction. LEED India is the localized version of the international rating system and is administered by the Indian Green Building Council (IGBC). Currently, there are 1,482 LEED India registered buildings and 214 LEED certified buildings, representing 1,012.92 million square feet of registered green building footprint. According to IGBC, projects that comply with the ECBC also qualify for LEED India ratings, provided they are equivalent to specific standards, such as ASHRAE 90.1-2007.⁵⁶ LEED should strengthen its standards to encourage compliance beyond the ECBC.

Green Rating for Integrated Habitat Assessment (GRIHA)

GRIHA is the national rating system for green building design, developed and implemented by The Energy and

Resources Institute (TERI) and the Ministry of New and Renewable Energy (MNRE).⁵⁷ If buildings contain fully air-conditioned interiors, ECBC compliance is mandatory for GRIHA ratings. If buildings are naturally ventilated, only partial ECBC adoption is required. All new central government and public sector buildings are to comply with the requirements of at least three-star GRIHA ratings.⁵⁸

BEE Buildings Star Rating System

BEE has a star rating program based on the actual performance of a building in terms of its specific energy usage in kWh/sq m/year.⁵⁹ The program rates buildings (office buildings, shopping malls, hotels, hospitals, and IT parks) on a one- to five-star scale, with five stars being the most efficient. The rating considers operational characteristics that define building use, hours of operation, climatic zone, and conditioned space. It allows comparison to a peer group representing buildings with similar primary function and operating characteristics.

BUILDING ENERGY EFFICIENCY STAKEHOLDERS

Everyone benefits from energy efficiency in buildings, from workers and landlords to tenants and society as a whole. Identifying the groups responsible for the successes of, and obstacles to, energy efficiency is critical to building a roadmap with targeted actions for each stakeholder to capitalize on the opportunity to save energy.⁶⁰ To be effective, all of the following stakeholders must work collaboratively to generate greater awareness, provide accurate information and, effectively enforce and comply with government policies:

- Real estate developers
- Financial institutions
- State and central governments
- Skilled workforce
- Media and civil society groups
- Corporate entities
- Utilities
- Tenants
- Energy efficiency service companies
- Manufactures, suppliers, and vendors

Three groups—state and local governments, real estate developers, and financial institutions—are particularly critical to creating a framework to move the buildings market toward energy efficiency.

State and local government policies are vital for setting standards for the bottom of the buildings market and supporting the top of the market to accelerate efficient construction. City and state leaders, and urban local bodies, can enforce building codes and provide technical and capacity-building support for implementation and compliance. Progressive states can become efficiency leaders, creating sustainable cities of the future.

Real estate developers drive demand for building development and have significant influence over the adoption of efficiency practices. Currently, India's developer community is largely fragmented. A few of the developers that cater to high-paying luxury clients and IT companies are champions of building efficiency and set international best practice. However, a majority of developers are unfamiliar with the benefits of building efficiency. To galvanize the market, leading developers can create a network for promoting energy efficiency. The network can provide a forum for peer-to-peer education and engagement with industry and the government to increase awareness and adoption of efficiency practices.

Financial institutions are critical to reducing the upfront costs for efficiency measures through effective low-interest loans and innovative financial products. Developing financial products for building efficiency represents a tremendous untapped opportunity in India. Currently, the financial industry is concerned about the lack of demand for these products from building owners and developers. At the same time, building owners point to the lack of financial products that can help overcome the higher upfront cost of efficiency technologies. Opening up a dialogue between the real estate developers and financial institutions to share international best practice and develop solutions can overcome the gridlock between the demand and supply for efficiency measures.

STATE EFFICIENCY INITIATIVES: SPOTLIGHT ON LEADING STATES

Andhra Pradesh, Gujarat, Haryana, Karnataka, Maharashtra, New Delhi, Odisha, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal are working with stakeholders toward code implementation and scaling building efficiency for new construction and major retrofits. Based on ASCI and NRDC's research and stakeholder discussions, this section highlights trends in the real estate market and building efficiency incentives in Andhra Pradesh, Gujarat, Tamil Nadu, Rajasthan, and Karnataka.

ANDHRA PRADESH

Andhra Pradesh has India's third highest GDP and generates much of its revenues from the services sector.⁶¹ Real estate development in Andhra Pradesh has grown dramatically in the past decade; Hyderabad's property development has increased by five-fold. Much of the development boom is tied to the expanding services sector, including IT parks and ITES, pharmaceuticals, biotechnology and telecommunications that were created via government-established SEZs. As a result of the IT boom, major national and international developers have entered Hyderabad's real estate market to build premium commercial complexes and luxury high-rise housing. Recognizing the significant profit that energy efficiency yields, some progressive developers are constructing energy-efficient buildings to gain a market edge.

Building Efficiency Initiatives in Andhra Pradesh

Awareness of building efficiency best practices is rising in Andhra Pradesh through progressive builders and in large part because of the IGBC in Hyderabad.⁶² State and local officials have coordinated with stakeholders, including ASCI and NRDC, to create a Steering Committee on Energy Efficiency to support code adoption and implementation.⁶³

Steering committee members boast governmental expertise (Commissioner, Hyderabad Metropolitan Development Authority (HMDA) and the Greater Hyderabad Municipal Corporation (GHMC)); private sector expertise (Confederation of Real Estate Developers' Associations of India (CREDAI) and Andhra Pradesh Real Estate Developers Association); technical expertise (building science and software experts); policy expertise (IGBC, ASCI, NRDC); and real-world construction expertise. The committee is working in tandem with the municipal government to implement the ECBC by 2013.

While developing strategies for efficiency implementation, the steering committee is engaging with local municipalities, the central power distribution authority, the New & NREDCAP, financial institutions and private citizens.⁶⁴ The committee focuses on developing, and with other agencies, implementing, a roadmap for three main activities: revising the current building bylaws to incorporate a locally adapted ECBC tailored to local climate conditions; developing a framework for third-party verification and software tools to check ECBC compliance and enforcement; and capacity building of municipal bodies, architects, engineers and third party verifiers. The committee will also work on increasing awareness of compliance software, including developing pilot projects to test software tools and third-party verification frameworks.

In addition to the state's ECBC-focused activities, the HMDA developed voluntary Environmental Building Regulations & Guidelines in 2009.⁶⁵ These guidelines establish parameters to reduce the environmental impact of new buildings. Despite readily available information, the guidelines have not been implemented broadly. The GHMC created a Green Channel to incentivize the construction of buildings that are designed according to the established National Building Code and the Hyderabad Master Plan. The Green Channel provides ease, transparency and accountability to fast-track building permits and certifications and encourages compliance with regulations.⁶⁶ This Green Channel does not yet include measures for building efficiency and should be modified in the immediate future to encourage such construction.

It also promotes energy efficiency through broad sustainability practices, which include offering incentives to affordable-housing developers.⁶⁷ The state utilities also have energy conservation awareness-building programs for consumers.

Figure 3. Examples of State-Level Efficiency Efforts across India

Haryana: The state received the first national award for its energy conservation program from the Government of India in 2010.^a Haryana Renewable Energy Development Agency (HAREDA) awards monetary prizes to industrial, commercial, and educational buildings with energy conservation achievements.^b

New Delhi: The Municipal Corporation of New Delhi (MCD) is to replace all existing light bulbs in municipal buildings with energy-efficient lamps.^k In 2012, Bayer's new 10,000-square-foot office building outside New Delhi has achieved LEED Platinum and is the highest-rated LEED building in the world.^l

Uttar Pradesh: A project to install different energy-efficient technologies was undertaken by TERI in selected villages of district Sultanpur (block Jagdishpur) in the state of Uttar Pradesh.

Rajasthan: Rajasthan Renewable Energy Corporation (RREC) prepared Energy Conservation Building Directives to help code adoption. RREC acknowledges high-performance buildings with Rajasthan Energy Conservation Award.^d

West Bengal: Department of Power and the Government of West Bengal are establishing a regional energy efficiency center in Kolkata.^j Energy efficiency is addressed in West Bengal's action plan for climate change.^j

Gujarat: Gujarat Energy Development Agency (GEDA) provided funds to the Centre for Sustainable Environment and Energy (CSEE) at CEPT University to construct a pilot Net Zero Energy Building.^e CSEE develops building simulation and characterization facilities, supports ECBC implementation, and facilitates capacity building.^f

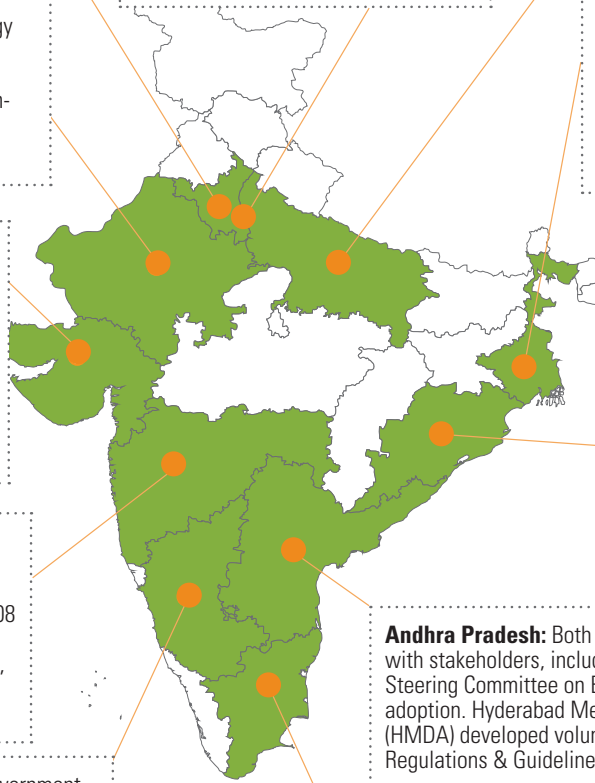
Odisha: The first state to amend the ECBC to match local requirements. Orissa State Energy Conservation Fund (OSECF) has been established to promote code compliance. The State Action Plan for Climate Change for energy conservation and efficiency and an Energy Conservation Policy for the state have been finalized.^g

Maharashtra: The Energy Conservation Committee prepared a strategic plan of 1,000 MW power saving, which helped save 743 million watts in its first year (2008 to 2009).^m The committee has also set up state awards, public awareness programs, energy audit programs, mandatory use of CFLs, and promotes ESCOs.

Andhra Pradesh: Both state and local officials are working with stakeholders, including ASCI and NRDC, to create a Steering Committee on Energy Efficiency to support code adoption. Hyderabad Metropolitan Development Authority (HMDA) developed voluntary Environmental Building Regulations & Guidelines in 2009.^h

Karnataka: Plans to make government buildings ECBC-compliant. Karnataka Energy Development Corporation collaborates with BEE to hold training programs and collects data to identify inefficient buildings.ⁿ The final version of the ECBC for Karnataka was finished in August 2012 and is to be placed before the State Cabinet for clearance.^o

Tamil Nadu: Tamil Nadu Electrical Inspectorate (TNEI), Chennai Municipal Development Authority, Public Works Department and other stakeholders are working to adopt the ECBC into municipal bylaws. The Tamil Nadu Legislative Assembly Complex is the largest green certified government building and first parliamentary building in India to be awarded LEED Gold certification.^g



a EAI, "Energy Conservation in Haryana, India," December 15, 2010, <http://www.eai.in/club/users/harita/blogs/673>.

b "Haryana announces energy conservation award scheme," Times of India, September 12, 2011, http://articles.timesofindia.indiatimes.com/2011-09-12/gurgaon/30144856_1_energy-conservation-solar-energy-green-energy.

c Orissa Policy Initiative Homepage: http://as1.ori.nic.in/demosdaorissa/cons_Activities.aspx.

d NRDC, ASCI, Interim Issue Paper: Constructing Change: Accelerating Energy Efficiency in India's Buildings Market, March 2012, <http://www.nrdc.org/international/files/india-constructingchange.pdf>.

e USAID ECO-III Project, International Resources Group, "Net Zero Energy Buildings Program," <http://eco3.org/NZEBs>.

f Regional Energy Efficiency Center for Buildings, Ahmedabad, <http://eco3.org/reec-buildings/>.

g NBM Media, "Tamil Nadu's New Legislative Assembly Building – World's First Green Assembly Building," October 2010, <http://www.nbmcw.com/articles/architects-a-project-watch/18657-tamil-nadus-new-legislative-assembly-building-worlds-first-green-assembly-building.html>.

h HMDA, "Environmental Building Guidelines for Hyderabad," <http://www.hmda.gov.in/EBGH/home/hmdasinitiative.html>.

i West Bengal Renewable Energy Development Agency, "Regional Energy Efficiency Center for Home Appliances," 2010: <http://eco3.org/wp-content/plugins/downloads-manager/upload/Regional%20Energy-Efficiency%20Center%20for%20Home%20Appliances.pdf>.

j GOI Ministry of Environment and Forests and Government of West Bengal, "West Bengal State Action Plan on Climate Change," March 2012, <http://moef.nic.in/downloads/public-information/West-Bengal-SAPCC.pdf>.

k Surinder Saini, "Energy-efficient Lights in MCD Buildings, New Delhi, India," March 11, 2010, <http://ec2-50-17-84-249.compute-1.amazonaws.com/community/blogs/all/5376-Energy-efficient-lights-in-MCD-buildings-New-Delhi-India>.

l EAI, "Bayer's new office building, Greater Noida, highest LEED rated in India," September 18, 2012, <http://www.eai.in/club/users/Nitin/blogs/1555>.

m Maharashtra Energy Development Agency, "Energy Efficiency Activities in Buildings in Maharashtra," <http://www.emt-india.net/Presentations2010/11-Building-11May2010/MEDA.pdf>.

n DNA, "Energy-efficient buildings needed" – Bangalore," April 10, 2012, http://www.dnaindia.com/bangalore/report_energy-efficient-buildings-needed_1673914.

o EAI, "New buildings in Karnataka may become more energy-efficient," August 18, 2012, <http://www.eai.in/360/news/pages/6299>.

Examples of Efficient Buildings and Developers in Andhra Pradesh

*Aliens Group:*⁶⁸ Promotes IGBC LEED ratings for projects (e.g., Aliens Space Station pre-certified and on track to be registered as LEED Platinum). Address: Plot no # 57, sVittal Rao Nagar, Madhapur, Hyderabad - 500 081; <http://www.aliensgroup.in/>.

*DuPont Knowledge Center:*⁶⁹ CFL and LED lighting systems with sensors; building model simulations indicate 16.39 percent energy savings compared to ASHRAE 90.1-2004. Address: Genome Valley, Survey No. 542/2, DS-9, ICICI Knowledge Park, Turkapally Village, Shameerpet Mandal, Ranga Reddy District - 500 078; http://www2.dupont.com/Tyvek_Weatherization/en_US/products/building_knowledge/building_knowledge_center.html.

*HMDA Annexe II Building:*⁷⁰ Reflective roof with a minimum solar reflective index of 78; 50 mm Styrofoam insulation sheets; optimized natural light and ventilation; no mechanical systems as naturally ventilated building. Address: Block 'A', District Commercial Complex, Tarnaka, Secunderabad - 500 017; Tel: +91-04-2700-3313; <http://hmda.gov.in/>.

*Manjeera Group:*⁷¹ Employs green technological solutions (e.g., Manjeera Majestic Commercial project); LEED certified construction (e.g., LEED Gold certification for Platina project). Address: #304 Aditya Trade Centre, Aditya Enclave Road Ameerpet, Hyderabad – 500 038; Tel: +91-40-6617-6617; www.manjeera.com.

*S and S Constructions and Elite Properties:*⁷² Certifies projects with IGBC Green Homes (e.g., Green Grace, Green Meadows pre-certified LEED Platinum). Address: Plot No.1299/D, T1, Green View Plaza, Road No.1, Jubilee Hills, Hyderabad - 500 033; Tel: +91-40-2355-5112; <http://greengrace.in/>.

Infosys Pocharam Campus: Infosys' new 447-acre complex at Pocharam in Hyderabad is the first office building to use radiant cooling technology in India (radiant cooling optimizes the cooling processes used for air conditioning in the buildings) and has shown impressive energy savings. Address: Special Economic Zone - Developer, Survey No. 50 (Part), Pocharam Village, Singapore Township Post Office, Ghatkesar Mandal, Ranga Reddy District, Hyderabad - 500 088. <http://www.infosys.com>.

Rajiv Gandhi International Airport, Hyderabad: The passenger terminal of the new RGIA, developed by the GMR group, is the only Asian airport to get LEED Gold rating. Address: GMR Hyderabad International Airport Ltd., Shamshabad – Hyderabad 500 409, A.P., India. Tel: +91-40-6676 4000. <http://www.hyderabad.aero/traveller>.

GUJARAT

Gujarat is one of India's most industrialized states, with a per capita GDP higher than the national average.⁷³ It has the country's fastest growing economy, as well as a power surplus.⁷⁴ Many Gujarati developers are eager to learn more about energy efficiency measures, benefits, and implementation. The entrepreneurial mindset of stakeholders makes the higher upfront financial cost of efficiency investments less of a barrier in Gujarat, as the state has a large business community that is accustomed to self-financing and taking risks with new and innovative commercial projects.

Energy Efficiency Initiatives in Gujarat

Energy efficiency adoption is gaining momentum in Gujarat. The Confederation of Real Estate Developers' Associations of India (CREDAI) and Indian Green Building Council (IGBC) are promoting green buildings along with other initiatives. The Gujarat Energy Development Agency (GEDA) works on renewable energy and energy conservation policy and implementation.⁷⁵ GEDA is the State Nodal Agency (SNA) for the Ministry of New and Renewable Energy (MNRE) and the State Designated Agency (SDA) for BEE. GEDA provided funds to the Centre for Sustainable Environment and Energy (CSEE) at CEPT University to construct a pilot Net Zero Energy Building. CSEE is recognized by USAID and MNRE as a research center for energy efficiency in buildings.⁷⁶

CSEE and CEPT support BEE's initiatives on energy efficiency in buildings.⁷⁷ CSEE develops building simulation and characterization facilities, and supports ECBC implementation and capacity building.⁷⁸

The Gujarat Forest and Environment Department is working on green building guidelines to incorporate water harvesting methods or fly-ash bricks in all state government building construction projects. Gujarat Urban Development Company's (GUDC) statewide Municipal Energy Efficiency Program implements energy performance contracts for municipal street lighting and water pumping systems for more than 160 municipalities.⁷⁹ Surat Municipal Corporation established an Energy Efficiency Cell in 2001 focused on reducing energy bills.⁸⁰ The cell monitors the corporation's energy use, and identifies and evaluates energy conservation projects. GEDA performs an Investment Grade Energy Audit on government buildings, including offices, educational institutions and municipal buildings, to track savings for efficiency measures implemented.⁸¹

Gujarat also has state-level energy conservation funding based on recommendations from the Energy Conservation Action Plan prepared by USAID's ECO-III program.

Examples of Efficient Buildings and Developers in Gujarat

*Environmental Sanitation Institute:*⁸² Constructed eco-friendly building, designed by Yatin Pandya, utilizing passive and active technologies for energy efficiency, although not certified or rated. Address: Near Narmada Main Canal, Ahmedabad – Sabarmati – Gandhinagar Highway, Sughad, Ta./Dist. Gandhinagar – 382 424; www.esi.org.in/.

*Royal Bank of Scotland N.V.:*⁸³ In Ahmedabad in 2007, built LEED Platinum Viva Complex, 8,000 square feet of space incorporating efficient lighting and HVAC design, Energy Star rated equipment, and water efficient fixtures. Address: Viva Complex, Opp. Parimal Garden, Ellisbridge, Ahmedabad - 380 006; www.rbs.in/.

*Sabarmati Gas Limited:*⁸⁴ Built LEED Gold certified 15,000-square-foot office in Gandhinagar in 2009, integrating efficient thermal performance to reduce heat gain, natural light, recycled and local materials, and efficient lighting systems. Address: Plot No. 277, 1st Floor, Opp. Khand Bhavan, Sector-16, Gandhinagar - 382 016; www.gspcgroup.com/.

*Savvy Infrastructures Pvt. Ltd.:*⁸⁵ Constructed LEED Gold certified Shapath V commercial 20,000-square-foot building with terraced garden to block direct heat and reduce cooling costs, efficient window glass. Address: B-900, Shapath IV, Opp. Karnavati Club, S.G. Highway, Ahmedabad – 380 051; www.savvygroup.in/.

*Torrent Pharmaceuticals Ltd.:*⁸⁶ Constructed research laboratories for 600 scientists integrating passive downdraft evaporative cooling without mechanical air conditioning units, and using locally available materials and natural light. Address: Ashram Road, Ahmedabad - 380 009; <http://www.torrentpharma.com/randd%20centre.php/>.

Burt Hill India Office Interiors, Ahmedabad: The 10,500-square-foot building is certified as LEED Platinum for Commercial Interiors. Address: 71/72, Titanium Nr, Prahladnagar Auda Garden, Corporate Road, Satellite Ahmedabad 380015 http://www.burthill.com/projects/pages/bh_ahmedabad.

TAMIL NADU

Tamil Nadu is the fourth largest contributor to India's GDP and one of the country's most urbanized states.⁸⁷ Chennai, Tamil Nadu's capital, is India's fifth most populous city and second largest exporter of software, IT, and ITES, after Bangalore.⁸⁸

The Chennai office market has experienced remarkable growth, expanding from nearly 10 million square feet in the

fourth quarter of 2005 to 45 million square feet in the second quarter of 2011.⁸⁹ Offices built for the IT industry (e.g., IT parks or IT SEZs) constitute 86 percent of the operational office stock in Chennai.⁹⁰ Chennai is one of India's leading energy-efficient cities, with more certified green buildings than any city in the country.⁹¹

Energy Efficiency Initiatives in Tamil Nadu

The Tamil Nadu Electrical Inspectorate (TNEI) is the SDA for the BEE.⁹² TNEI, with implementation support from local and non-governmental partners, is planning to make energy efficiency mandatory in all new commercial buildings and building retrofits by adopting the ECBC measures on a modular basis. The TNEI, Chennai Municipal Development Authority, Public Works Department, and other stakeholders are working to adopt the ECBC into municipal bylaws.

The Tamil Nadu Energy Development Agency, established in 1985, works to integrate new and renewable sources of energy and implements energy efficiency-related projects, including mandatory rain water harvesting and solar water heating systems in large buildings.⁹³ Bharat Sanchar Nigam Ltd. promotes energy efficiency in energy intensive telecom buildings, which require round-the-clock reliable lighting and air-conditioning systems for optimal equipment performance.⁹⁴ The Tamil Nadu Legislative Assembly Complex is the largest green certified government building and first parliamentary building in India to be awarded LEED Gold certification.⁹⁵ The complex has emerged as a leader in sustainable urban development and sets the tone for future developments.

Examples of Efficient Buildings and Developers in Tamil Nadu

*Ascendas IT Park Pvt. Ltd.:*⁹⁶ The Pinnacle building is LEED Silver certified from the U.S. Green Building Council, first multi-tenanted building in India to be certified under the LEED Existing Buildings Operations and Management (version 2009) standard, uses highly reflective roofing and Energy Star-rated appliances. Address: Periyar Street, Tharamani, Chennai 600113; <http://www.tidco.com/ascendas.html>.

*C. N. Raghavendran:*⁹⁷ Architectural firm reputed for innovative eco-sensitive projects, received Padma Shri award in 2011 for innovative building technology and climate responsive designs. Address: #10, Karpagambal Nagar, Mylapore, Chennai 600 004; www.crn.co.in.

*Great Lakes Institute of Management, Manamai Village:*⁹⁸ First educational institute (200,000 square feet) in India to achieve LEED Platinum certification in 2010, integrating insulated and highly reflective roofs, efficient lighting design, ample

naturally lit spaces, and covered walkways to reduce heat island effects. Address: East Coast Road, Manamai Village - 603 102; <http://greatlakes.edu.in/>.

Grundfos Pumps Pvt. Ltd.:⁹⁹ Built LEED Gold certified 35,000 square foot office for pump manufacturing unit in 2005. Address: Grundfos Pumps India Private Ltd., 118 Old Mahabalipuram Road, Thoraiakkam, Chennai - 600 097; www.grundfos.in/.

RMZ Corporation:¹⁰⁰ RMZ's Millennia Business Park is India's largest LEED Gold certified core and shell green building, spanning more than 22 acres, with 2.2 million square feet of buildings, and consuming 10 percent less energy and 30 percent less water compared to similar buildings. Address: RMZ Millenia, #143, Old Mahabalipuram Road, Kandanchavadi, Perungudi, Chennai - 600 096; www.rmzcorp.com/chennai_millenia.htm.

Shell Business Service Center, Chennai: Building is certified as LEED Platinum by the USGBC. Address: Campus 4A, RMZ Millennia Business Park, No.143, Dr. M.G.R Road, Kandanchavady, Perungudi, Chennai - 600 096; <http://www.shell.com/home/content/ind/>.

Turbo Energy Limited, Chennai: Owned by the TVS group, the TEL building has been awarded LEED Platinum for new construction. First time a centralized solar air conditioning system of 90TR has been installed in India; double wall with stabilized soil-cement foundry sand bricks for insulation; task lighting and occupancy sensors reduce lighting load. Energy simulation projects an energy savings of 65 percent. Address: Turbo Energy Limited 67, Chamiers Road, Chennai - 600028; <http://www.turboenergy.co.in/>.

RAJASTHAN

Rajasthan is the largest state of India by area. Its capital, Jaipur, is a popular tourist destination, but the state's primary economic activity is agriculture. Two-thirds of the population is actively involved in agriculture, and it contributes 30 percent to the NSDP of Rajasthan.¹⁰¹

Energy Efficiency Initiatives in Rajasthan

Rajasthan Renewable Energy Corporation, the designated agency for enforcement and provisions of Energy Act of 2001, has initiated state-level initiatives to increase code compliance.¹⁰² They include preparing energy conservation building directives (ECBDs) through a collaborative process, notifying ULBs of the contents of ECBDs, and raising awareness about ECBDs by holding workshops and training programs for building professionals. The government has also created the Rajasthan Energy Conservation Award to

recognize leadership in ECBD adoption.¹⁰³

In 2010, the Government of Rajasthan published a directive mandating the use of certain energy efficiency measures including efficient lights, solar heated water, computer-simulated energy-efficient design, and energy-efficient appliances in governmental and commercial buildings.¹⁰⁴

Examples of Efficient Buildings and Projects in Rajasthan

High-end residential developers in Rajasthan have started incorporating green features in their developments. Some modern residential projects include:

Ivy Homes: A residential estate by the New York-based Vatika Infotech City group in Jaipur. Modern homes, flats, and villas, totalling 10,800 units, are spread over 808 acres.¹⁰⁵

Harbinger Heights: Affordable modern homes within the Jaipur City limits. The complex includes open spaces, garden balconies, and rooftop and lawn gardens.¹⁰⁶

Ajmer Greens: Built by YDPL Group along the Jaipur-Ajmer Highway in a pollution-free environment employing green measures.¹⁰⁷

Several commercial projects with sustainable, energy-efficient design have been constructed as well, including:

CEG Tower: An eight-story building constructed on a 1,416-square-meter plot, CEG Tower received attention at the Rajasthan Energy Conservation Awards 2011 for adoption of measures that included insulated external walls, blocks to reduce heat transmission, recycled waste water flushing, cement incorporating fly ash, mosaic tile roof, and optimal compact fluorescent lamp lighting.¹⁰⁸

Other buildings that have achieved star rating in Rajasthan include Vidhyut Bhawan, Reserve Bank of India, and Rajasthan State Road Development Corporation.

KARNATAKA

Karnataka is the eighth largest state by area in India. It is best known for its software and biotechnology industries. Bangalore, its capital and largest city, is the hub of the IT industry in India. With the growing investment in IT and biotechnology in India by Western-based companies, the construction of industrial and commercial buildings has been on the rise.¹⁰⁹

Energy Efficiency Initiatives in Karnataka

The Karnataka Electricity Regulatory Commission plans to implement the ECBC in all public buildings in 2012.¹¹⁰ Karnataka is also implementing GRIHA and LEED through

MOUs with local public agencies.¹¹¹ Global corporations are constructing state-of-the-art buildings in Bangalore, such as Cisco's new Globalization Center East Campus. Cisco's campus incorporates sustainability features such as rainwater harvesting, day-lighting, waste recycling, transportation programs, and integrated building management systems.¹¹²

Karnataka is also developing such renewable energy infrastructure as wind and solar farms.¹¹³

Examples of Efficient Buildings and Projects in Karnataka

Like Rajasthan, high-end developers in Karnataka are constructing new residential projects with green features in mind. Two examples of these projects:

Net City: A housing project from the Green Homes builder located near Koramangala and Electronic Park I & II. The project plans to use green features such as waste management and roof-top gardens.¹¹⁴

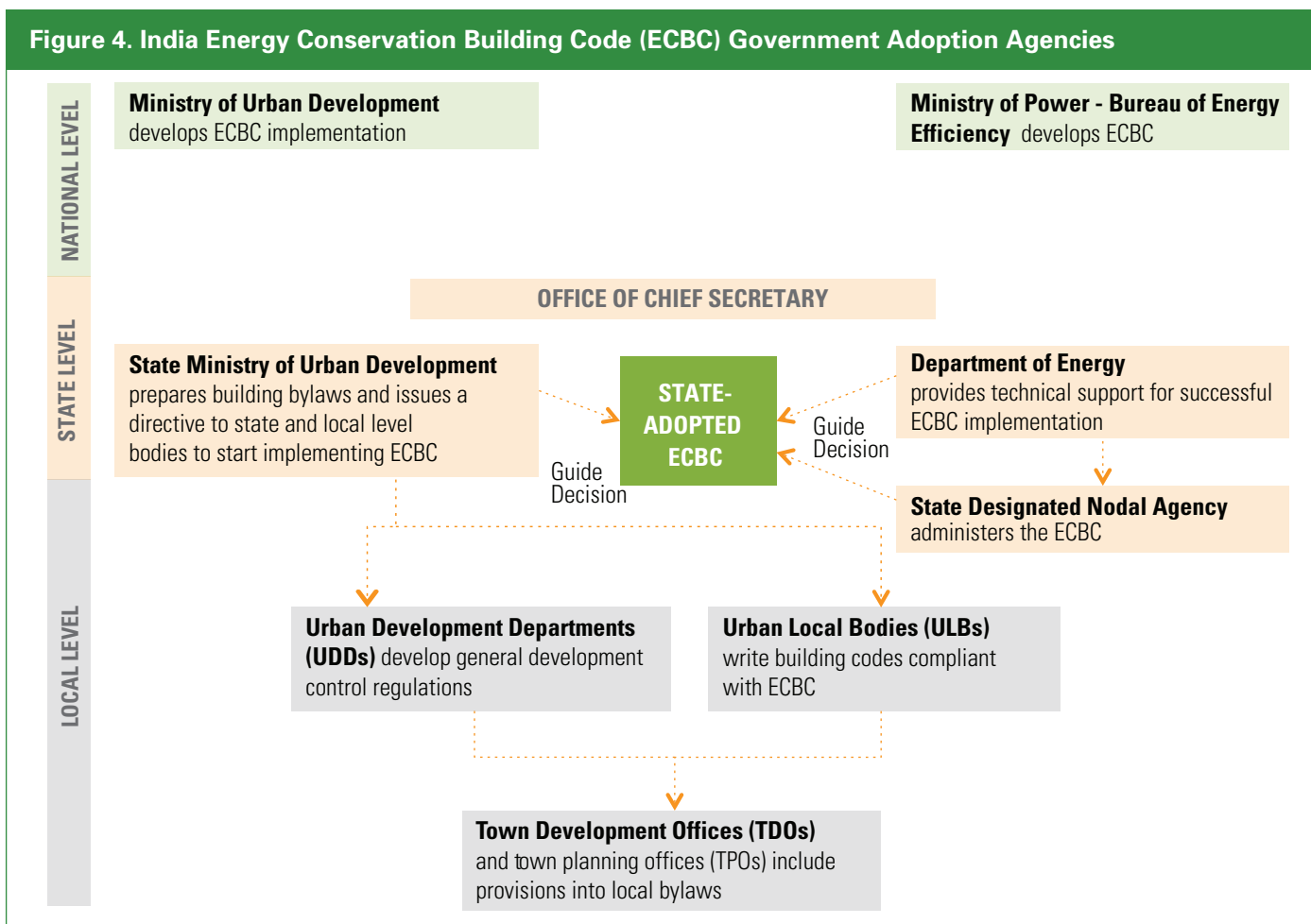
Samskruti Maurya Eco Village: Built by the Samskruti builders

on a sprawling 100 acres. The property features parks, pools, playgrounds, and community clubs in natural settings. Organic farming has started on land connected to the plot.¹¹⁵

ACTION STEPS FOR STATE AND LOCAL GOVERNMENTS TO SCALE EFFICIENCY ADOPTION

Leading state and local governments are working to develop policies and structures to promote efficient buildings. A critical step in supporting local action is the adoption of the ECBC. The actions outlined below can accelerate movement toward this goal:

Create local state-level steering committees composed of specialists from the state, policy, technical, financial and real estate stakeholder groups. The committee will work in tandem with the municipal government on effective adoption of the ECBC into local building bylaws, including ensuring that local environments and cultures are incorporated into



the state's efficiency rollout roadmap. The committee will also develop a framework for third-party verification and tools to facilitate ECBC compliance and enforcement. It will also build capacity for urban local bodies, architects, engineers and third party verifiers. On determining the most effective compliance tools, state governments, through the steering committee, should require its use as part of building permits.

Provide awareness and training programs within local governments on building efficiency and implementation. Currently, local governments perceive the code as too technical. Training programs are needed for all state and municipal officials who issue building certificates and permits. Municipalities should also provide workshops focused on awareness building and region-specific concerns, both internally and within their constituencies. Different government agencies can also compete for awards for efficiency.

Enact benchmarking practices for public disclosure of annual building energy use (through a building's utility bills) to buyers, lenders, and tenants. Collecting data on annual energy use—benchmarking—creates a baseline that can be used to compare the energy use of “similar” buildings. Releasing benchmarking results to prospective buyers, lenders, and tenants will drive competition among owners to achieve leadership in efficiency. Local governments can introduce pilot programs to make benchmarking mandatory and conduct energy audits for their own buildings.

Encourage commercial and residential building ratings, as they are essential for prospective owners to understand a building's energy use. State and local governments can adopt BEE's five-star rating system, or encourage LEED/GRIHA implementation for efficiency in buildings to create a market brand for efficient buildings.¹¹⁶ Creating rating labels as



Spectral Services' LEED Platinum-certified office building is positioned to let the most winter sun in (reducing the need for indoor heating) and the least summer sun in (reducing the need for indoor cooling), located in Greater Noida, Uttar Pradesh, India.

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brands rewards the leaders and incentivizes others toward efficient construction. Ratings can be extended to companies that provide efficient technologies required for building construction. By branding efficient buildings, governments can create jobs and new vendors in the market.

Provide incentives to energy efficiency initiatives. Policy incentives should be provided to projects that adopt energy efficiency measures. For instance, lower registration charges, reduced property taxes or longer period of repayments, and permitting higher FSI (floor space index) may be provided to such projects, to compensate for the upfront costs for both developers and consumers.

Activism at the state and local governmental levels is essential if India is to generate a nationwide movement toward incorporating energy efficiency in new and existing buildings. Perhaps equally important, however, is creating and nurturing a new mindset in the real estate and construction sectors—one that embraces the advantages of energy-efficient buildings for developers, owners and tenants as well as for society at large.

REAL ESTATE DEVELOPERS AND OWNERS: DRIVING DEMAND FOR ENERGY EFFICIENCY

Real estate developers drive demand for building development. As coordinators of property development—from purchasing land, financing deals and contracting with builders—developers have significant influence over the market’s adoption of efficiency practices. While architects and engineers have the technical know-how of the range of energy efficiency options available, real estate developers and building owners make the ultimate decision about the financial investment in energy-efficient construction.

Currently, some leading developers are building more efficiently. Yet, the developer community needs to increase awareness of the opportunity and benefits of lower costs and energy savings that energy-efficient buildings deliver. Many developers view the perceived “higher upfront cost of efficiency measures” as a significant obstacle, even though

the measures pay for themselves. As developers make investment and financial decisions for construction projects, they heavily influence whether new buildings across India’s booming cities will be energy-efficient, locking in cost and energy savings for the coming decades.

Table 1: Major Real Estate Developers’ Energy Efficiency Activities

Developer	Building Type	Location	Efficiency Actions
Ansal Properties & Infrastructure Limited	Residential, IT parks, commercial, SEZs Developing integrated townships with malls and hotels	Pan-India, North India focus	Ansal Esencia Township, Gurgaon registered as a pilot project for GRIHA rating ¹¹⁷
DLF Limited	Residential, commercial (offices, retail property) Hotels, infrastructure, SEZs	India’s largest real estate developer (29 cities, across 16 states) Majority of projects in Gurgaon, Haryana; DLF City, more than 3,000 acres, is Asia’s largest private township Active in Kolkata, Hyderabad, and Chandigarh	Provided partial funding and expertise to UNDP and BEE on ECBC implementation ¹¹⁸ Set up DLF utilities for captive power Installed natural gas-based Combined Cooling Heating and Power systems for commercial buildings ¹¹⁹
Hiranandani Group	Commercial (hotels, retail, IT offices), SEZ, and residential	Major presence in Mumbai, with increasing presence in other metro cities	Designed BG House, a Platinum LEED building
K Raheja Corp	Commercial (hotels, retail, IT offices), SEZ, and residential Developing 15 townships and 10 hotels	Mumbai focus Developments in Bangalore, Ahmedabad, Goa, Pune, and Hyderabad	MoU with CII-IGBC to facilitate LEED certification for 10 large-scale projects, in Mumbai, Pune, Ahmedabad, Hyderabad and Chennai ¹²⁰
Omaxe Ltd.	Residential, commercial (malls, office spaces, IT parks)	North India focus, active in 40 cities, 12 states	Constructed the energy-efficient Trade Tower in Chandigarh ¹²¹
Parsvnath Developers	Residential, IT park, commercial and SEZ	Pan-India, National Capital Region (NCR) focus Active in more than 46 cities, 15 states	Part of study on energy efficiency in India ¹²²
Sobha Developers	Residential, commercial (hotels, offices)	Bangalore focused along with Coimbatore, Mysore, NCR and Pune	Develop Infosys energy-efficient buildings Develop IGBC accredited buildings ¹²³
Unitech Group	Residential, commercial and SEZ Retail, hotels, and integrated townships	Pan-India footprint (NCR, Kolkata, Chennai and Hyderabad)	Indian Green Building Council member NCR developments registered as LEED Core or Shell rating ¹²⁴

BARRIERS TO ENERGY EFFICIENCY FOR REAL ESTATE DEVELOPERS AND OWNERS

Real estate developers and owners face the following barriers to adopting building efficiency measures:

- **Lack of Awareness of the Business Case of Energy Efficiency:** Energy efficiency measures pay for themselves over the lifecycle of the building. Measures such as efficient lighting can pay for themselves in less than three years, and significant measures such as building central systems have a slightly longer payback period.¹²⁵ A severe lack of peer-to-peer information sharing on cost and energy savings creates skepticism about the benefits and payback of financing efficiency investments.
- **Perceived High Initial Investment Costs:** Efficiency measures have a higher upfront cost compared with standard technologies. Often, developers pay the initial upfront costs, which sometimes conflicts with a desire for a quick return on investment. As building efficiency measures often have longer time horizons for recovering monetary benefits by saved energy costs during the life of the building, the higher costs at the time of construction make adoption of efficiency measures a lower priority for real estate developers.
- **Split-Incentives:** In owner-occupied buildings, energy savings and other benefits from efficiency measures are available to repay the building owner's investment. In contrast, upgrading the performance of tenant-occupied buildings is more challenging since the building owner is responsible for the upfront efficiency capital costs, but tenants enjoy the resulting energy savings. This "split" of responsibility for capital versus operating expenses leaves building owners and developers with little incentive to invest in energy-efficient construction.
- **Insufficient Financial and Regulatory Incentives:** Banks and financial institutions currently offer limited programs and products for energy-efficient construction. Low-interest loans can reduce the burden of the higher upfront cost of energy efficiency measures. Financial products can help the middle and bottom of the real estate market increase adoption of efficiency measures during construction providing faster returns on investment. Presently, lack of effective governance mechanisms and regulatory incentives do not reduce the administrative steps involved in permitting and certification of energy-efficient construction. Also, financial products for promoting energy efficiency in existing buildings are lacking.
- **Limited Technical Expertise and Standardized Products:** The lack of skilled expertise (architects, engineers,

third-party performance verifiers) and vendors of standardized energy-efficient products reduces the real estate community's ability to adopt energy-efficient construction even if developers and banks are motivated to make energy-saving investments.

BENEFITS OF ENERGY EFFICIENCY TO REAL ESTATE DEVELOPERS AND OWNERS

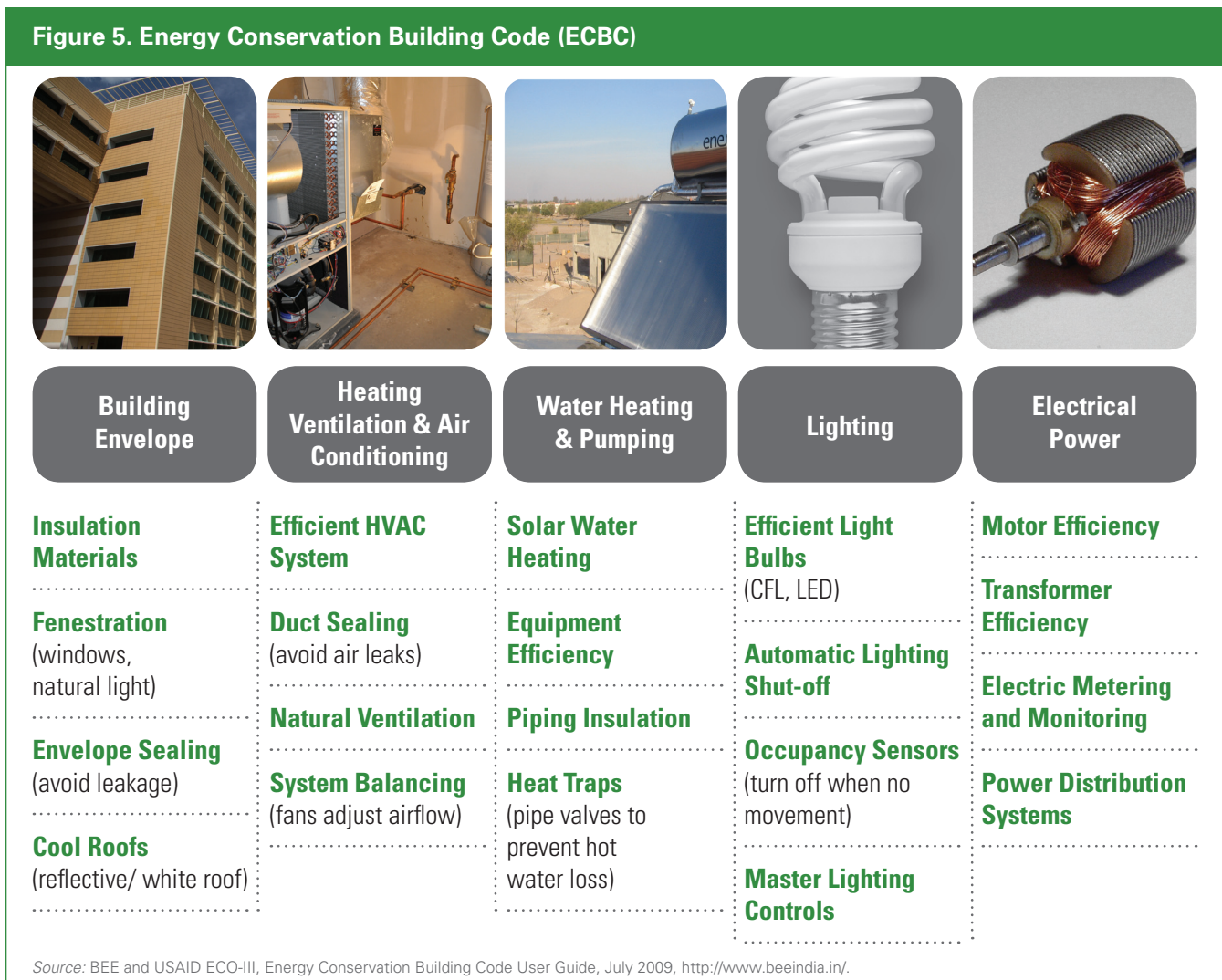
Despite the barriers, many benefits of energy efficiency adoption exist for real estate developers:

- **Cost and Energy Savings:** Implementing building efficiency measures leads to significant cost savings from reduced energy and utility bills. For large projects, real estate developers often install diesel-powered generators sets to provide back-up power to their buildings. Developers can save costs and energy by adopting energy efficiency measures to reduce additional investments in back-up diesel generation, and overall HVAC and electrical infrastructure costs.
- **Increased Tenant Demand:** High-end tenants, driven by multinational and Indian companies, recognize the cost savings, energy reduction, and higher employee productivity opportunities enabled by energy-efficient buildings. Developers with energy efficiency practices have a competitive edge and maximize profits by attracting high-end customers, who are often willing to pay higher rents for energy-efficient buildings.
- **Profits from Health Benefits:** Well-designed efficient buildings produce better indoor air quality and an overall healthier environment for tenants, resulting in higher employee productivity and retention. These health benefits translate into monetary savings for employers and ultimately allow developers to charge higher premiums and rents.
- **Market Leadership:** Local efficiency codes, based on the ECBC, are expected to become mandatory in the next two years. Building owners who invest in efficiency now will have a market advantage with timely compliance and pave the way for the rest of the market to follow.

INTERNATIONAL REAL ESTATE DEVELOPER NETWORK BEST PRACTICES

Developers' networks that focus on accelerating building-efficiency adoption are central to mobilizing energy-efficient construction. In other countries, real estate developers have formed networks to support energy-efficient buildings:

Figure 5. Energy Conservation Building Code (ECBC)



*The Real Estate Network for Energy and Climate Policy (RENECP), U.S.*¹²⁶

RENECP is a voluntary network of real estate professionals that supports comprehensive clean energy and climate policies that advance building efficiency. RENECP is facilitated by the U.S. Green Building Council and NRDC. RENECP's activities include communicating with policymakers, engaging with builders and other businesses on scaling efficiency, and working with network participants to develop effective strategies for increasing investments in building efficiency.¹²⁷

*Building Owners and Managers Association (BOMA)*¹²⁸

BOMA is an international federation of more than 16,500 members who own or manage more than 9 billion square feet of commercial properties. BOMA's activities include an energy efficiency program for commercial real estate

professionals on energy consumption reduction with no- and low-cost strategies for optimizing equipment, people and practices; a "Green Lease Guide" to help building owners, tenants and managers write efficiency operations and management practices into lease agreements; and The Outstanding Building of the Year (TOBY) Awards for energy management systems and community impact buildings.

*Urban Land Institute (ULI)*¹²⁹

ULI is a nonprofit research and education organization, with 30,000 members worldwide, representing property owners, investors, developers, architects, lawyers, lenders, planners, regulators, contractors, engineers, and academics. ULI partnered with Johnson Controls to conduct a Global Energy Efficiency Survey of 4,000 executives and building owners responsible for energy management and investment decisions in commercial and public sector buildings.¹³⁰

*Real Estate Roundtable (RER), U.S.*¹³¹

RER is a network of the leading U.S. public and private real estate owners, developers, lenders and management firms. RER, Johnson Controls and NRDC published a study on energy efficiency in commercial buildings that highlights the top efficiency priorities for the U.S. government using existing authorities and no new legislation.¹³²

*National Association of Realtors (NAR), U.S.*¹³³

NAR is a facility for professional development, research and information exchange for property owners, government officials and the public aiming to maintain the right to own, use, and transfer property. NAR has a Green Resource Council that provides training on green real estate practices to real estate agents and property managers.¹³⁴

*International Council of Shopping Centers (ICSC)*¹³⁵

ICSC is the shopping center industry's global trade association, whose 50,000 members are shopping center owners, developers, managers, marketing specialists, investors, lenders, retailers, and other professionals. ICSC's goal is to enable members to develop business through networking, but also to share ideas on energy efficiency, energy performance of buildings, construction products regulation, and an E.U. low-carbon roadmap for 2050.

*Chartered Institution of Building Services Engineers (CIBSE), U.K.*¹³⁶

CIBSE is a network of the United Kingdom's leading experts on reducing energy use in buildings. CIBSE's energy center provides energy certificates, information on carbon reduction and independent certification for the approval of low carbon consultants and energy assessors. It also provides Energy Performance Certificates to accredited Low Carbon Energy Assessors to label the energy efficiency grade of a commercial building.

*Taiwan Architecture & Building Center (TABC), Asia-Pacific*¹³⁷

TABC is a building inspection, testing, evaluation, and certification organization developed by Taiwan's Ministry of Interior, along with leaders from government, industry, academic, and research institutes, to enhance building construction quality and provide a better living environment. TABC analyzes the energy consumption of office buildings, department stores, hotels, hospitals, and residential buildings and recommends energy saving measures and energy management policies.

*Building Research Association of New Zealand (BRANZ) Group, New Zealand*¹³⁸

BRANZ Group, an independent research, testing, and consulting company owned by New Zealand's building and construction industry, conducted a long-term study on energy use in New Zealand's households.¹³⁹

ACTION STEPS FOR REAL ESTATE DEVELOPERS TO SCALE EFFICIENCY ADOPTION

Based on research and discussions with more than 50 developers, ASCI and NRDC found that some real estate developers already support energy-efficient construction and recognize the significant potential to scale efficiency adoption. A much larger number of developers can take the following actions to maximize profits, save energy and build sustainable cities across India:

- *Create a real estate network to drive efficiency* by initiating activities in four principal areas: peer-to-peer education; collaboration with local and state governments; engagement with financial institutions; and communication with citizen groups and academic and professional institutions. Increasing peer-to-peer learning that shares best practices for efficiency is critical to overcoming awareness and business-case barriers. The network can convene conferences that share state-of-the-art efficiency techniques, lessons and experiences among the real estate community and a wider network of architects and engineers to overcome barriers involving access to skilled expertise and products. This collaborative network can work with government on developing policy and code adoption. Engaging with financial institutions to effectively design loans and products for energy-efficient building construction is another critical area of focus for the network. Developers can work with citizen groups and academic and professional institutions to build awareness within the real estate community to simplify the technical details of the ECBC and the different rating systems (e.g., LEED India and GRIHA).
- *Produce case studies* to promote and demonstrate the advantages of building efficiency for businesses. The business case studies can cover key building types: commercial, high-rise residential, retail and IT buildings. Progressive builders that have in-house sustainability teams (e.g., K Raheja Developers) can showcase their experiences with energy-efficient construction. Real life experiences and data from within the developer community are vital to raising awareness on the benefits of efficiency.
- *Identify cost-effective efficiency measures for building owners* to allow real estate networks to promote integrated packages of the most cost-effective efficiency measures that are simple, workable and cost-effective for building owners to implement. The real estate network can publicize these measures throughout their member base.



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- *Promote energy efficiency or “energy aligned” leases* that divide the costs and benefits of building improvements between landlords and tenants to overcome the split-incentive. International environmental groups can share expertise with developers on drafting and implementing innovative leasing structures.
- *Create regulatory incentives* to promote adoption of efficiency measures by real estate developers. Developers can work with the government to introduce such incentives as simplified, transparent and faster clearance of energy-efficient projects; establishing a credible dedicated agency for ECBC certification; and amending building bylaws to incorporate efficiency measures suitable for local conditions.
- *Drive financial incentives*, such as reduced interest rate loans for energy-efficient construction through financial institutions or municipal authorities, particularly for small- and medium-sized builders. Developers can work collaboratively with financial institutions to develop financial products that will enable the bulk of the real estate community to invest in efficiency, simultaneously opening up a new line of revenue for banks.
- *Work with energy-efficient equipment vendor and manufacturers’ associations* to increase access and awareness of efficiency products and technical expertise in the efficiency supply chain (e.g., energy auditors and certifiers who can conduct monitoring and verification of savings). This work will further incentivize real estate investment in building efficiency.

A commitment to energy efficiency by real estate developers, fostered by state and local government action, cannot shape India’s energy future without the demonstrated support of the financial sector. Banks and other lenders must assume an activist role in building an energy-efficient nation.

FINANCIAL INSTITUTIONS: CREATING BUSINESS OPPORTUNITIES FOR ENERGY EFFICIENCY

Banks and financial groups are crucial to energy-efficient building construction in India. While energy efficiency is the most cost-effective way to achieve significant energy savings, such measures are often rejected because of high upfront costs, especially for the bottom and middle of the market. India's finance sector has yet to realize its potential. Brazil, with 60 percent less total energy consumption but 2.4 times consumption per capita compared to India, has an energy services company (ESCO) market 16 times larger than India's.¹⁴⁰ Leadership by financial institutions to innovate and create effective products with leading developers is vital for a large-scale movement toward energy-efficient construction.

India's trends in energy efficiency finance include:

- Commercial, industrial, and institutional sectors pay high prices for electricity.
 - Executives are increasingly interested in energy efficiency investments yet the market provides limited products and options.
 - Existing bank programs fail to provide attractive loans for real estate developers.
 - Although BEE with its State Designated Agencies are creating a State Energy Conservation Fund, Energy Efficiency Finance Platform, and Partial Risk Guarantee Fund, these programs have yet to reach significant scale, though government and utility efficiency incentives have increased.
 - Commercial banking and financing efforts have not yet translated into a significant level of activity by private banking institutions.
 - For existing building retrofits, ESCOs have had limited success in engaging with financial institutions and real estate developers, especially when compared to India's building growth.
- *Limited Market Experience:* Financial institutions lack technical knowledge to evaluate energy efficiency projects based on their energy- and cost-saving potential compared with traditional assets- and collateral-based financing decisions. Commercial banks have limited experience in efficiency financing. Consumers lack information about existing loan products and gains from improved building efficiency, which results in insufficient and unpredictable demand.¹⁴³
 - *Lack of Energy Efficiency Focused Guidelines:* The Reserve Bank of India (RBI) has no guidelines on bank loans for energy efficiency, and thus does not conduct audits to assess financial institutions' lending for such financing.¹⁴⁴
 - *Small ESCO Market:* More than 100 ESCOs are registered with BEE, but few are active. BEE has an ESCO rating process but few ESCOs make it to an investment grade, compared to large ESCO markets in China and Brazil.¹⁴⁵
 - *Risk Perception and Insufficient Collateral:* Since India's building efficiency market is still maturing, banks perceive risks to increased investments for efficiency. There is insufficient data on verified savings. Since efficiency measures, like lighting systems and windows, are part of the buildings, banks cannot repossess these products.
 - *Regulatory Barriers on Loan-to-Value (LTV) Ratio:* To control excessive speculative investments, regulators have capped lending to 80 percent of the value of property. Any incremental energy efficiency upfront costs are not encouraged by developers because borrowers will not get additional loans for these initiatives compared to standard projects.

BARRIERS TO ENERGY EFFICIENCY FINANCING AND OTHER STAKEHOLDERS

Despite the tremendous investment potential,¹⁴¹ barriers to financing efficiency are:

- *Single Project Financing:* Financing small-scale efficiency projects can have high transaction costs.¹⁴² Further, single projects may not qualify for financing because commercial banks have minimum levels of returns. Banks and developers also overlook opportunities to aggregate efficiency projects into "deal size" projects.

BENEFITS OF ENERGY EFFICIENCY FOR FINANCIAL INSTITUTIONS AND OTHER STAKEHOLDERS

Breaking the gridlock in access to energy efficiency financing has benefits for all stakeholders:

- **Significant Business Potential:** The Indian energy management services market (ESCOs, consultants, energy saving product manufacturers, energy management companies) is estimated to grow at 18.8 percent annually from 2009 to 2014, with 2014 revenues of INR 2,700 crores (\$540 million).¹⁴⁶ Increasing policy support and demand for efficiency will spur market growth.
- **Increased Profits:** Building efficiency results in reliable payment streams and lower default risks for banks that invest in efficiency and with ESCOs.¹⁴⁷
- **Reduced Capital, Lower Performance Risk, and Increased Savings:** Financial institutions that invest in energy efficiency improve the overall buildings market with reduced upfront capital, lower performance risks, and increased savings, especially when working with ESCOs.¹⁴⁸
- **Better Economic Outcomes:** Banks will have increased profit margins as projects receiving efficiency financing can take an integrated, whole-building approach rather than piecemeal energy-saving installations, to blend paybacks from low capital costs and major improvements.¹⁴⁹
- **Stable Savings and Investments:** Financial institutions help stabilize the buildings market by hedging against future energy costs increases.¹⁵⁰
- **Increased Market and Sales:** Financial institutions can work with developers to overcome upfront costs for energy-efficient buildings and thus attract higher premiums and increased sales from buyers and tenants.
- **Improved Service and Customer Satisfaction:** By partnering with utilities in energy efficiency finance schemes, financial institutions can help reduce power outages in India.

The Role of ESCOs in the Existing Buildings Market

An ESCO, or energy service company, develops, installs, and arranges financing for projects designed to improve energy efficiency for facilities over an extended time period.¹⁵¹

An ESCO can be involved in one or several activities associated with the lifecycle of an energy efficiency project: perform an audit to quantify potential savings; develop recommendations on systems and equipment to upgrade; design, implement, and commission energy-efficient equipment; install and maintain equipment to ensure savings are delivered; and measure, monitor, and report energy savings.

A client and an ESCO enter into an energy performance contract (EPC) that allows the client to transfer the financial and performance risk associated with the efficiency project to the ESCO. The EPC typically guarantees that the energy and cost savings produced by the energy conservation measures will equal or exceed all costs associated with project implementation over the contract's term. The project capital investment is either self-funded by the client or paid for through a variety of leases from a financial institution.¹⁵²

Limited success of ESCOs in India

The ESCO market in India has significant growth potential, with a projected annual growth rate of 19 percent and revenues of \$600 million by 2014.¹⁵³ So far, in comparison to peer economies of China and Brazil, ESCO growth in India has been relatively slow.¹⁵⁴ Though more than 100 ESCOs are registered with BEE, few have experienced growth in the past five years. Competition is low, leading to little differentiation between services and poor choices for customers. The lack of technical expertise to evaluate opportunities is also a significant barrier for decision-makers.¹⁵⁵ Furthermore, most ESCOs are "equipment vendors," specializing in one technology rather than a suite of comprehensive energy conservation measures.¹⁵⁶ Other disincentives include: the multi-tenanted leasing structures of the commercial buildings that prevent the uptake of comprehensive ESCO services because of the split incentive; inexperienced market players, with small balance sheets, who are not creditworthy to lenders; and the lack of large assets for ESCOs, which do not convince developers and banks about the certainty of energy savings.

BEE is promoting ESCOs as a primary vehicle to deliver energy efficiency and has instituted ESCO ratings and a venture capital fund to facilitate entrepreneurship and commercial bank efficiency financing.

Table 2: Key Groups Supporting Energy Efficiency in the Financial Sector

Key players	Finance Mechanism	Products	Key Features	Launch year
Bank of Baroda	Project Finance	Small and Medium Enterprises loans	Loans of up to INR 1 crore (\$0.2 million) for efficiency audits, retrofits and upgrades. ¹⁵⁷	2010
Bureau of Energy Efficiency (Ministry of Power)	Loan Loss Reserve	Partial Risk Guarantee Fund (PRGF)	Partial risk coverage to commercial lenders by covering up to 50 percent of loan loss amount.	Expected 2012
	Risk Mitigation	Energy Efficiency Financing Platform (EEFP)	Bankable detailed project reports to enhance comfort for lenders for aggregated energy efficiency projects. Tata Capital joined EEFP in 2012 with INR 5000 crore (\$1 billion) to fund energy efficiency projects. ¹⁶⁰	2009
	Venture Capital Finance	Venture Capital Fund for Energy Efficiency (VCFEE) ¹⁶¹	Leverages private venture investments in energy efficiency by identifying co-investment opportunities with other venture capitalists.	Expected 2012
ICICI Bank	Commercial Bank Lending	Mortgage finance	Reduced processing fees for LEED-rated buildings. ¹⁶²	2009
	Energy Performance Contracting	ESCO financing	Funded ESCO project with Nasik Municipal Corporation that demonstrated 40 percent savings in energy bills with a 1.5 year payback.	2005
	Seed-Funding		Funded inception of the IGBC (through USAID). ¹⁶³	2009
	Project Finance		Signed a \$300 million loan agreement with Japan Bank for International Cooperation for funding energy efficiency and renewable energy projects. ¹⁶⁴	2012
IDBI Bank	Capacity Building	Training	Implementing Agency for USAID-funded Energy Management Consultation and Training Project for conservation in energy-intensive industrial sectors and demand-side management. ¹⁶⁵	2000
IL&FS	Energy Performance Contracting	ESCO financing	Provided financing to ESCOs for shared energy savings from the operation and maintenance of Urban Local Bodies in Gujarat. ¹⁶⁶	2007
Indian Renewable Energy Development Authority (IREDA)	Capital Subsidy	Equipment subsidy for solar hot water installation	Work with ESCOs for solar hot water system installations. ¹⁶⁷ ESCOs act as aggregators of demand and IREDA provides capital subsidy.	2010
State Bank of India	Commercial Bank Lending	Mortgage finance	Lower margins, lower interest rate and zero processing fee for green home loans. ¹⁶⁸	2009
Yes Bank	Energy Performance Contracting	ESCO financing	Facility for energy efficiency lending for off-balance sheet energy efficiency activities. ¹⁶⁹	2008
State Governments	Project Finance	State Energy Conservation Fund (SECF)	India's national Energy Conservation Act of 2001 requires states to establish energy conservation funds to facilitate implementation of energy efficiency projects. In 2010, states pledged an initial contribution of INR 2 crore (more than \$440,000) to the fund.	2001
Asian Development Bank (ADB)	Project Finance	The Energy Efficiency Initiative (EEI)	In 2007, ADB earmarked INR 5,000 crore (\$1 billion) to spend on energy efficiency and renewable energy projects. From 2013, ADB has pledged to double its target to INR 10,000 crore (\$2 billion) a year.	2005

(Continued) Table 2: Key Groups Supporting Energy Efficiency in the Financial Sector

Key players	Finance Mechanism	Products	Key Features	Launch year
International Finance Corporation (IFC) India	Project Finance	Local Banks financing and ESCO financing	IFC works with local banks to provide them equity, and then local banks can give debt to energy efficiency projects.	2012
Infrastructure Development Finance Company Limited (IDFC)	Project Finance		IDFC has loaned more than INR 1,625 crore (\$325 million) for energy efficiency program of utilities. ¹⁷⁰	2010
	Project Finance		INR 375 crore (\$75 million) loan from IFC for funding energy efficiency and renewable energy projects. ¹⁷²	2010
Small Industries Development Board of India (SIDBI)	Project Finance		IDFC has loaned more than INR 1,625 crore (\$325 million) for energy efficiency program of utilities. ¹⁷²	2010
Canara bank	Project Finance	Small and Medium Enterprises loans	Interest rate concession for energy efficiency upgrades and retrofits up to a maximum of INR 1 crore (\$0.2 million). ¹⁷³	2004
Axis Bank	Energy Performance Contracting	ESCO financing	Joint initiative with New Ventures to pilot ESCO financing for small and growing business customers. ¹⁷⁴	2009
	Project Finance		Long term loan of \$35 million from IFC and \$65 million from parallel investors to provide funding for energy efficiency and renewable energy projects. ¹⁷⁵	2011

INTERNATIONAL BEST PRACTICE ON ENERGY EFFICIENCY FINANCING

The United States and other countries use innovative financing options to scale adoption of energy efficiency by end users (e.g., residential; small, medium and large commercial and industrial customers, including multi-tenant buildings):

Energy Savings Performance Contracting

ESCOs manage entire building upgrades and take on the performance risk of the project by entering into an energy savings performance contract (ESPC). For instance, the U.S. Federal Energy Management Program uses ESCOs to develop, install and fund projects designed to improve building efficiency and reduce operation and maintenance costs for federal agency buildings.¹⁷⁶

Energy Service Agreements (ESAs)

In an ESA model, an investment fund serves as an intermediary between the building owner and the energy efficiency service provider who installs efficiency measures. For example, Transcend Equity, through its Managed Energy

Service Agreement, pays the upfront costs for efficiency measures and installation.¹⁷⁷ Transcend also pays the property owner's utility bills while the owner pays Transcend an amount that is equal to the historical cost of energy services that are replaced by the efficiency measures during the term of the agreement.

Property Assessed Clean Energy (PACE)

PACE is a finance program enabling residential and commercial building owners to afford energy efficiency and renewable energy improvements. Under a typical PACE model, a municipality issues special revenue bonds, the proceeds of which are used by owners to pay for their efficiency improvements. Property owners who receive PACE financing agree to repay the costs of the improvement through an assessment on their property taxes for up to 20 years. The City of Berkeley, Sonoma County, and City of Palm Desert pioneered PACE financing in California.¹⁷⁸

Utility-Based Finance Programs

The "decoupling" of utility profits from electricity sales provides the basis of many successful utility-based finance programs. The utility no longer benefits from how much

electricity it sells after decoupling, as profits are no longer directly “coupled” to customer usage. Energy efficiency and distributed generation thus become more valued by utilities. Utilities provide loan capital, usually from ratepayer funds collected to promote energy efficiency or in partnership with a commercial financial institution. The split-incentive problem is addressed because the tenant both benefits from the upgrade and pays for the cost through utility bills. For example, in China, Xinao Gas (a utility) markets energy efficiency to customers and the Bank of Beijing provides financing for the efficiency measures through loans. Customers make payments for the loan as part of their utility bill (a loan default results in suspension of gas service).¹⁷⁹

Mortgage Products

Mortgage lending is a typical means of financing commercial and multi-family properties. For financing energy efficiency measures, a supplemental loan is extended to eligible borrowers. Various modifications of the typical mortgage loan product exist in the market, and the additional leverage associated with underwriting the energy savings is approved by the bank. For example, U.S. Bank Green Home Equity Loan finances retrofits through the first mortgage.¹⁸⁰

Vendor Finance Programs

A vendor finance program is designed for companies selling energy efficiency equipment. Financial institutions provide loans to the vendor’s customers, or the vendor can borrow from financial institutions and provide financing to their customers. In the latter, the vendor borrows from financial institutions against the payment stream that arises from the efficiency cost savings. In the Czech Republic, Cseka Sporitelna Bank and Siemens Building technologies have a vendor finance program.¹⁸¹

Loan Loss Reserve Funds from Commercial Banks

This is a public fund that provides partial risk coverage to motivate lenders to pioneer new efficiency products, broaden access to finance, modify underwriting criteria, increase the size of unsecured energy efficiency loans, extend loan tenors, and lower interest rates. In Pennsylvania, the Keystone Home Energy Loan Program is supported by a loan-loss reserve fund with a loss rate of 1 percent to 2 percent per annum over three years.¹⁸²

State-based Revolving Loan Funds (RLF)

In a state-sponsored RLF, the state either acts as a lender or delegates the lending functions (e.g., loan origination, underwriting, servicing, and collection) to a financial institution. An RLF targets loans to specific markets—residential, commercial, industrial or institutional—and as loans are repaid, the RLF re-lends the funds. For example, the Nebraska Energy Office uses a revolving loan fund in collaboration with Nebraska-based lenders to operate the

longstanding Dollar and Energy Savings Loan Program, which delivers affordable commercial loans for building retrofits.¹⁸³

State Treasurer Linked-Deposit Programs

Linked-deposit programs distribute a portion of state treasurer funds to financial institutions that lend to priority sectors at below-market rates. The state treasurer does not share any of the risk, leaving the financial institution responsible for credit underwriting, collections and losses. Pennsylvania, Illinois, and Colorado have linked-deposit programs for efficiency projects.

Pooled Bond Financing

Pooled bond financing aggregates small public building projects to gain more favorable financing terms. Investors create pools by first issuing bonds and then identifying borrowers, or by first identifying projects and borrowers prior to bond issue. For example, Iowa State School Facilities Corporation’s lease-purchase financing program is available for energy efficiency retrofits.¹⁸⁴

Credit Enhancement

Credit enhancement is a technique by which the lender is provided with a reassurance that the borrower will honor the obligation of loan repayment. The assessment or senior lien serves as a security, ensuring that the lender will be repaid, even in the event of default. In order to further reduce risk to lenders and improve the interest rates offered to consumers, many governments have used public funds as a financing “credit enhancement.” The most common options include Debt Service Reserve Fund.¹⁸⁵

Partial Risk Guarantee Fund (PRGF)

A PRGF lowers the risk to the lender by ensuring repayment of part of the loan upon a default event. The PRGF guarantees a maximum 50 percent of the loan provided by the Participating Financial Institution (PFI).

Venture Capital Funds for Energy Efficiency

This method identifies possible co-investment opportunities (not in competition with other private funds), allowing venture capitalists to engage in energy efficiency projects and companies.

Energy Efficiency Insurance

This program offers Energy Savings Warranty insurance to high quality ESCOs that provide energy improving upgrades and guarantee the amount of savings to be achieved. For an example of implementation of energy efficiency insurance, see Energi’s program: <http://www.energi.com/esw.php>.

Escrow Repayment

In this innovative repayment option, an escrow account (tri-partite agreement) is created to enable implementation of energy efficiency projects. The escrow account enables the

investors to get the first charge on monitored energy savings. In the municipality sector, SNAs are creating escrow accounts and ensuring payments to ESCOs by routing electricity bills through them.

Re-negotiating Rental Agreement

In this model, an owner re-negotiates a rental contract by incorporating the expected savings from planned energy-saving retrofits. In New York, the Empire State Building's retrofit is an example.

Role of the Reserve Bank of India (RBI) and the National Housing Bank (NHB)

RBI, as India's central banking institution, determines the monetary policy of the Indian rupee. NHB is a state owned bank and regulation authority that was created by the Reserve Bank of India in 1988 to promote private real estate acquisition. Both these agencies can play important role in enhancing finance to promote energy efficiency in buildings. Some of the steps that they could take are:

- Consider providing finance lines to HFCs and banks for onward lending to builders for energy efficiency measures
- Offer credit lines to mortgage loan customers to incentivize investments in energy efficiency
- Include energy efficiency equipment costs, such as lighting and HVAC, in the loan amount for consumers
- Consider subsidizing registration charges and property tax for projects that meet energy efficiency standards
- Facilitate the creation of an entity to standardize the measurement of energy savings in existing and new projects
- Consider inclusion of low cost housing with energy efficiency for priority sector lending by banks and HFCs

ACTION STEPS FOR FINANCIAL INSTITUTIONS TO SCALE EFFICIENCY ADOPTION

BEE estimates that savings from energy efficiency in India are INR 74,000 crore (\$14.8 billion), indicating only 5 percent of the market potential has been realized.¹⁸⁶ Financial institutions can take the following actions to overcome the lack-of-capital barrier and unleash the significant potential of energy efficiency financing in India:

Liaison with ESCOs to finance energy efficiency measures and develop innovative off-balance-sheet solutions for clients to address the hurdle of non-viability of balance-sheet debt.



LEED Platinum-certified ITC Grand Central Hotel in Mumbai, Maharashtra, India.

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Establish a list of eligible technologies and equipment to reduce the perceived high risk of efficiency installations that financial intuitions and customers can access when making energy efficiency decisions. Banks can set a target for debt financing and lending to ESCOs.

Consult with the RBI to issue guidelines on energy efficiency investment for banks. Annual portfolio-based energy efficiency targets for financial institutions followed by regular audits of their lending can significantly encourage energy efficiency financing. RBI can make energy efficiency investment a priority lending sector that will promote economic development.¹⁸⁷

Develop a well-defined, standardized, transparent EPC contract format to boost ESCO operations and promote full-service financing models that include lenders, equipment manufacturing and installation, and energy saving monitoring and verification.

Aggregate projects to ensure project mix and stable cash flows. Currently, the maximum costs for building energy efficiency projects for ESCOs range from INR 3 to 4 crores (\$0.6 to 0.8 million), which is meager compared with average bank projects of INR 300 to 400 crores (\$60 to 80 million).¹⁸⁸ Banks should bundle projects and determine the cost point at which undertaking smaller projects is feasible.

Create case studies of owner-occupied bank buildings to have a data source of energy-efficient projects and savings. For example, all new campuses for ICICI have a directive to be LEED Gold rated. Documenting efficiency costs and savings from these sites can provide the bank with a unique, easy and accessible source of metrics to inform the development of related financial products for energy efficiency.

Consult with real estate developers and associations to understand and strengthen the link between customers and providers of efficiency financing. Financial products can be structured based on the requirements of the clients to ensure successful uptake. Banks need confidence in the volume of uptake to launch a new product and can work with real estate developer organizations to size the potential market.

Design customized approaches to analyze risk in energy efficiency investment. Banks can transition from simple concessions on mortgage loans to innovative lending

products that offer a substantial value to borrowers engaging in energy efficiency projects. Banks could consider collateral-free lending backed by the savings from energy efficiency.

Promote peer-to-peer learning among financial institutions on international best practice and the risks in the efficiency market. Banks such as Axis Bank, Canara Bank, HSBC, ICICI, IDBI, Infrastructure Development Finance Company Limited (IDFC), IL&FS, SBI, Small Industries Development Bank of India (SIDBI), and Yes Bank can have focused discussions to arrive at a level playing field from the current varying degrees of knowledge held by different players.

Work with the BEE to improve financial underwriting by providing reliable and accessible information on potential savings associated with energy efficiency. BEE's Energy Efficiency Financing Platform can attract big commercial lenders and be a rich resource base to enhance underwriting standards for the development and evaluation of efficiency investment.

Work with BEE and the National Productivity Council's Certified Energy Auditors to provide access to market funds to promote entrepreneurship among this skilled workforce and scale the ESCO industry. BEE's landmark PRGF should be used to support new ESCOs.

CONCLUSION

The barriers to energy efficiency construction can lead to a vicious cycle in which building owners cannot benefit from improved cash flow from improvements and are therefore resistant to making them. This lack of demand leads to a lack of supply of products and services to make buildings greener. It also leads to higher prices when products are unavailable in local markets. Lack of supply deters designers from using energy-efficient products or services. Information and market facilitation programs like labels are not demanded because there are no real differences in energy efficiency to measure. Financial institutions likewise ignore differences in energy costs because they are perceived to be small and uncommon.



Construction underway in Greater Noida, Uttar Pradesh, India.

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However, you can start to break this cycle on a modest scale through a combination of standards, incentives, labeling, information, financing, metering, leasing reform, and direct intervention with equipment suppliers and designers. The purpose of energy efficiency policy should be to establish the *virtuous cycle* by tracking which elements are evolving positively and working synergistically and which others require intervention.

State and local government, developers, and financial institutions can break the gridlock to create change towards energy-efficient buildings. Accelerating energy efficiency while India experiences an unprecedented growth in its buildings market provides a singular opportunity to generate tremendous financial benefits, while improving public health, combating climate change, and closing the widening gap between India's energy production and demand.

STAKEHOLDER DISCUSSIONS AND CONSULTATIONS

From September 2011 to September 2012, we held discussions and roundtables with many stakeholders, including the following organizations, to develop this report:

ABPS Infrastructure Advisory
ACC Ltd
ACCE(J) Dharmataru Consultants
Administrative Staff College of India (ASCI)
AECOM
Ahmedabad Municipal Corporation
Akshaya Homes
Alliance for Energy-efficient Economy
Alliance to Save Energy
Amarnath Projects
Amaya Properties LLP
Ambuja Cements Limited
American Chamber of Commerce (AMCHAM)
Ankur Constructions Inc.
Apurva Amin Architect
Arihant Foundations and Housing
ARK Builders
ASA Consultants
Ashoka Infra Projects Pvt. Ltd.
B. Safal Constructions Pvt. Ltd.
Bakeri Engineering and Infrastructure Pvt. Ltd.
British High Commission
Bureau of Energy Efficiency (BEE)
Burt Hill
Carbon Minus India
Ceebros Property Dev. Pvt. Ltd.
Center for Environment Planning & Technology University (CEPT)
Central Power Research Institute
Centre for Science and Environment (CSE)
Chaitanya Builders & Leasing Pvt. Ltd.
Chennai Petroleum Corporation Ltd.
Christian Medical Association of India
Climate Change Dept., Government of Gujarat
Climate Connect
Confederation of Indian University
Confederation of Real Estate Developers' Associations of India (CREDAI)
Deep Builders Pvt. Ltd.
Delegation of the E.U. to India
Desi Energy Solutions India (P) Ltd.
Design Consortium
Devansh Constructions
Development Alternatives
Devinarayan Housing
DSL Infrastructure & Space Developers Pvt. Ltd.
Embassy of the United States
Emergent Ventures
Emergent Ventures
En3 Sustainability Solutions
Energy and Fuel Users' Association of India
Faridabad Municipal Corporation
First Green Pvt. Ltd.
Foot Prints
Foot Prints Earth
G K Developers
GIZ
Green Planet Waste Management (P) Ltd.
Green Rating for Integrated Habitat Assessment (GRIHA)
GreenTree Building Energy Ltd.
Gujarat Cleaner Production Centre (GCPC)
Gujarat Energy Development Agency (GEDA)
Gujarat Energy Research & Management Institute (GERMI)
Gujarat Urban Development Company Ltd.
Hindustan University
Hiren Patel Architects
Honeywell
HSBC Holdings
ICICI Bank
Indian Institute of Management Ahmedabad
Indian Institute of Science
Indian Institute of Technology Gandhinagar

Indian School of Business (ISB)
 Indus Cityscapes Construction Pvt. Ltd.
 Ingersoll Rand
 Integrated Research and Action for Development (IRADe)
 International Finance Corporation, World Bank
 International Resources Group (IRG)
 Isofoam
 Isolux Corsan
 ITC Welcomgroup, ITC Hotels
 Johnson Controls
 Kalpakrit
 Keerthi Estates Pvt. Ltd.
 KfW Development Bank
 Kyocera
 Lloyd Insulations (India) Ltd.
 Malaviya National Institute of Technology (MNIT)
 Mantri Developers Pvt. Ltd.
 McKinsey and Company
 Mega Electro Trade Inc.
 Mercados Energy Markets India Pvt. Ltd.
 Narendra Properties Ltd.
 National Power Training Institute (NPTI)
 Navi Mumbai Municipal Corporation
 New Ventures India, WRI
 Nexant Inc.
 NSL Infratech (Nuziveedu Seeds Ltd Group)
 PADGRO Consultants Pvt. Ltd.
 Pandit Deendayal Petroleum University
 Parshwanath Corp. Ltd.
 PBEL Property Development (India) Pvt. Ltd.
 Planner & Analyst
 Prestige Group
 PricewaterhouseCoopers (PWC)
 Prozeal Consulting
 PS Engineering Consultants
 Public Health Foundation of India
 Quick Logic Controls
 Rajasthan Renewable Energy Corporation
 Reliance Innovative Building Solutions Pvt. Ltd.
 Saint Gobain Glass India
 Satyavani Projects and Consultants Pvt. Ltd.
 Savvy Infrastructures Pvt. Ltd.
 SCDC Associates Pvt. Ltd.
 Schneider Electric
 School of Planning & Architecture
 Shanta Sriram Constructions (P) Ltd.
 Shri Balaji Developers
 Six Elements Environment Consulting
 Society of Energy Engineers and Managers (SEEM)
 Sri Vasavi Builders & Developers
 Stanford University
 State Street Global Advisors
 Sugal & Damani
 Swiss Agency for Development & Cooperation
 Synergy Group Holdings Pvt. Ltd.
 Synergy Infra Consultants Pvt. Ltd.
 Synergy Property Development Services Pvt. Ltd.
 Tameer Consulting Associates
 TATA Group
 TEKNOV Consultants & Engineers Pvt. Ltd.
 The Energy and Resources Institute (TERI)
 Tirtha Projects Pvt. Ltd.
 TRA International Ltd.
 Treawise consultants Pvt. Ltd.
 UCLG Sub Regional Office India
 Unitech Ltd.
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 Vijaya Polymers
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