India's State-Level ENERGY EFFICIENCY IMPLEMENTATION READINESS

Prepared for the World Bank Energy and Extractives Global Practice, South Asia Region

Prepared by :
Ashok Sarkar and Neha Mukhi of the World Bank, Padu S. Padmanaban, Senior Advisor and team from PwC comprising of Amit Kumar, Kulbhushan Kumar, Manoj Bansal, Shyamasis Das, Shuboday Gantaand Anurag Verma

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Acronyms and Abbreviations

AC	Air conditioner
AFEX	Arab Future Energy Index
AgDSM	Agricultural DSM Program
ARR	Annual revenue requirement
BEE	Bureau of Energy Efficiency
DC	Designated consumer
DELP	Domestic Efficient Lighting Program
DISCOM	Distribution company
DPR	Detailed Project Report
DSM	Demand-side management
EA	Electricity Act
EC Act	Energy Conservation Act
ECBC	Energy Conservation Building Code
EE	Energy efficiency
EEFP	Energy Efficiency Financing Platform
EESL	Energy Efficiency Services Limited
ESCO	Energy service company
FAR	Floor area ratio
GRIHA	Green Rating for Integrated Habitat Assessment
GSDP	Gross state domestic product
HP	Horsepower
IEA	International Energy Agency
IGBC	Indian Green Building Council
IMF	International Monetary Fund
INR	Indian rupee
IRP	Integrated energy resource planning
JICA	Japan International Cooperation Agency
KPI	Key performance indicator
kVA	Kilovolt-ampere
kW	Kilowatt
LED	Light-emitting diode
LEED	Leadership in Energy and Environmental Design
M&V	Measurement and verification
MoUD	Ministry of Urban Development
MSME	Micro, small, and medium enterprise
MTEE	Market Transformation for Energy Efficiency
Mtoe	Million tons of oil equivalent
MW	Megawatt
NABARD	National Bank for Agricultural and Rural Development
NMEEE	National Mission for Enhanced Energy Efficiency
PAT	Perform, Achieve, and Trade
PSU	Public sector undertaking
PwC	PricewaterhouseCoopers Private Limited, a limited liability company in India, which is a member firm of PricewaterhouseCoopers International Limited, each member firm of

	which is a separate legal entity
RE	Renewable energy
RISE	Readiness for Investment in Sustainable Energy
ROI	Return on investment
SAD	Special additional duty
SAPCC	State's Action Plan on Climate Change
SDA	State-designated agency
SE4ALL	Sustainable Energy for All
SEC	Specific energy consumption
SECF	State Energy Conservation Fund
SECM	State Energy Conservation Mission
SEEP	Super Efficient Equipment Program
SERC	State Electricity Regulatory Commission
SFC	State finance corporation
SHR	Station heat rate
SSEE	Supply-side energy efficiency
T&D	Transmission and distribution
ToD	Time of day
toe	Tons of oil equivalent
TPA	Third-party accessor
UDD	Urban development department
ULB	Urban local body
UT	Union territory

Executive Summary

India is currently one of the fastest growing major economies in the world. Sustaining a high growth rate is believed to be critical for India to alleviate poverty in the country, since it feeds more than a billion people. Energy, being a key enabler of a country's economic growth and development, has witnessed a significant rise in its consumption in India. In 2013 about 528.34 million tons of oil equivalent (Mtoe) were consumed, making India the third largest consumer of energy in the world—more than 70% of which is supplied by fossil sources.

Increasing energy demand naturally strains the country's resources and impacts the environment. This warrants decoupling the country's economic growth and energy demand. This is also echoed through India's Intended Nationally Determined Contribution submitted in the run-up to the Paris Climate Conference, where the government has highlighted energy conservation as a key mitigation strategy. It seeks to achieve total avoided capacity addition of 19,598 MW and fuel savings of around 23 million tons per year through the National Mission for Enhanced Energy Efficiency (NMEEE). However, this requires concerted effort at the central and state levels, especially considering the existing federal governance architecture where many subjects, including electricity, fall under the jurisdictions of both the center and the state.

Rationale and Objectives

In the current structure of India's energy efficiency and electricity governance framework, states have an important role to play to achieve the desired developmental goals. This is clearly spelled in the Energy Conservation Act (EC) 2001, where the states are required to develop and enforce critical energy efficiency standards and regulations, build institutional capacity, formulate policies, plan and implement projects, extend financial support, and create self-sustaining markets for energy efficiency. The distribution vertical of the electricity value chain, where the majority of energy efficiency potential (both supply and demand side) exists, lies entirely with the states according to the Electricity Act (EA) 2003. Moreover, since the business of electricity generation, transmission, and distribution is regulated, the state electricity regulatory commissions are poised to play a crucial role in guiding and regulating the electrical energy efficiency activities in the states.

With the energy efficiency agenda gaining traction and momentum in India, there is a need to continuously evaluate institutional capacity, policies, programs, and markets at the state level to identify best practices and promote cross learning. Comparative benchmarking is a proven methodology to evaluate states and give recommendations for improving their governance performance. This study aims to develop a framework and methodology for the evaluation of state's readiness for energy efficiency implementation. The study adopts an index-based evaluation of individual states to benchmark their readiness. The benchmarking across the states will serve as a comparative reference point for the states to measure, monitor, and evaluate the chosen indicators that best depict the energy efficiency implementation readiness.

To benchmark Indian states, this study has considered 28 states (excluding the newly formed state of Telangana) and the National Capital Territory: Delhi.

Methodology

The framework for establishing the "energy efficiency implementation readiness index" consists of 11 readiness factors under three broad categories: (a) policy and incentives (b) market maturity, and (c) institutional capacity. These 11 factors are further evaluated by a suite of evidence indicators that are both qualitative and quantitative. The qualitative evidence indicators capture whether a specific policy, mandate, incentive, institution, financing mechanism, and other characteristics exist under each of the readiness factors. The quantitative evidence indicators aim to assess the energy efficiency potential already unlocked and also reflect the current progress towards implementing important energy efficiency measures or programs. Recognizing states' performance in project implementation has significance since the states having prior implementation experience are expected to be better prepared to scale up intervention in the future.

The 11 readiness factors chosen for evaluation, as presented in Table 1, reflect the various aspects of the state's readiness for scaling up energy efficiency implementation. The evidence indicators are chosen primarily on the basis of data availability in the public domain.

Table 1: Readiness Factors Chosen for Establishing the "Energy Efficiency Implementation Readiness Index"

Policy and incentives	Market maturity	Institutional capacity
• Sector-specific action plan for scaling up energy efficiency efforts • Mandates for utilities to invest in energy efficiency • Mandates for public institutions to invest in energy efficiency • Incentives for MSMEs to invest in energy efficiency • Incentives for large-scale users (industry or commercial) to invest in energy efficiency • Implementation of energy conservation building codes	• Information or tools available to consumers on electricity usage • Energy efficiency potential and implementation experience • Financing mechanisms available for energy efficiency investments	• Institutional framework and capacity • Monitoring and evaluation systems

Table 2 provides the comprehensive list of evidence indicators chosen under each of the 11 readiness factors.

Table 2: List of Evidence Indicators Evaluated for Establishing the Energy Efficiency Implementation Readiness Index

Sector specific action plan for scaling up energy efficiency efforts	**Mandates for utilities to invest in energy efficiency**	**Mandates for public institutions to invest in energy efficiency**
Adoption of legislation, policy or sector-specific action plan	Mandates for compliance with energy efficiency Penalties for noncompliance	Obligations for procurement of energy efficiency end use applications
Quantified energy efficiency goals or targets	Notification of DSM regulations	Adoption of energy conservation awards
	Notification of guidelines on cost effectiveness and M&V	
	Mandate for establishment of DSM cells within Distribution Utilities	
	Incentives for demand response (e.g., peak-time rebates)	
	Mandate for integrated resource planning	
Incentives for MSMEs to invest in energy efficiency	**Incentives for large scale users (industry/commercial) to invest in energy efficiency**	**Implementation of energy conservation building codes**
Incentives to invest in energy efficiency	Incentives to invest in energy efficiency	Status of adoption of ECBC
Programmatic assistance to identify energy savings investment opportunities	Programmatic assistance to identify energy savings investment opportunities	Type of buildings and building renovation covered for ECBC compliance
		Availability of standardized rating system (certification) for qualifying the energy performance of buildings
		Incentives for individual buildings to meet high quality energy efficiency certifications
		Mandates to disclose property energy

		usage
Information or tools available to consumers on electricity usage	**Energy efficiency potential and implementation experience**	**Financing mechanisms available for energy efficiency investments**
Bills with energy usage information Customised bills comparing previous energy consumption Customised bills comparing with other users in the same region and/or usage class	Distribution of LED lamps among households	State Energy Conservation Fund (SECF)
Customer access to real-time energy usage data	Upgrading of agriculture pumpset efficiency	Capital subsidy for energy efficiency programs
Customer ability/control to manage energy usage remotely	Adoption of LED technology for street lighting applications	On-bill financing/prepayment
	Distribution of BEE star rated household fans	Credit lines with banks for energy efficiency activities
	Implementation of solar irrigation pump program	Energy services agreements (pay-for-performance contracts)
	Transmission & Distribution losses (%)	Partial risk guarantees
	Peak power deficit (%)	Cost recovery through ARR/tariffs
	Electrical energy deficit (%)	DSM funds created by levy/cess
		Others
Institutional framework and capacity	**Monitoring and evaluation systems**	
Dedicated entity for formulating energy efficiency strategy/policy	Monitoring / tracking system for energy efficiency targets / performance indicators for Utilities	
Dedicated entity for regulating energy efficiency activities of energy suppliers	Independent validation of energy efficiency targets / performance indicators by third parties	
Dedicated entity for regulating energy efficiency activities of energy consumers	Tracking utilities' compliance with for providing energy usage information to customers by regulator	
Dedicated entity for regulating equipment energy efficiency standards	Load research studies conducted by the utilities to plan for DSM programs	
Dedicated entity for enforcing / certifying compliances with building energy efficiency standards	Empanelment mechanism for energy consultants and auditors	
	Compliance monitoring system for ECBC	
	Independent verification of ECBC compliance by third parties	

Like any index-based benchmarking exercise, this evaluation also depends heavily on data or information. Most of the information or data used for the assessment of states against evidence indicators has been sourced from publicly available sources. None of the information collected or compiled for the purposes of this report has been vetted by state government officials. For maintaining consistency while assessing the states' readiness, the exercise has considered states' actions recorded until December 2015, unless otherwise mentioned in the report.

Readiness Assessment

The following sections present the benchmark of the performance of the states under each of the three readiness categories: policy and incentives, market maturity, and institutional capacity. Here, the readiness of individual states is expressed in percentage of the total index-based score in each category.

Policy and Incentives

This readiness category comprising of six readiness factors broadly captures the state of play in the states concerning the existence of specific policies, mandates or incentive mechanisms.

Key Findings

This section highlights the main outcomes of the state level energy efficiency readiness assessment under each of the six readiness factors of the category "policy and incentives."

State Plan for Energy Efficiency

About 14 states have officially adopted a sector-specific energy efficiency action plan. Most of these states have included the energy efficiency action plan as part of the State's Action Plan on Climate Change (SAPCC). Andhra Pradesh has developed an energy efficiency action plan as part of the Power for All program recently launched by the Government of India. None of the states have enacted legislation backing the energy efficiency action plan. Kerala and Karnataka are the only states that have identified energy savings targets. However, these targets are yet to be officially adopted. Some other states have mentioned energy-saving potential without setting any target to achieve them.

Mandates for Utilities

Regarding energy efficiency intervention in power transmission and distribution (T&D), SERCs in all states have given targets or issued directives to utilities to reduce T&D losses in power distribution. The regulators have also extended incentives for utilities to achieve the targets.

Demand-side management (DSM), a promising frontier to improve energy efficiency in the power sector, has attracted certain initiatives at the state level. As of April 2016, 19 states have issued DSM regulations, which provide a framework for undertaking DSM measures. Andhra Pradesh deserves special mention in this regard. In spite of the absence of any announced DSM regulation, the state has witnessed several utility-driven DSM measures thanks to the initiatives taken by the state regulator and DISCOMs (distribution companies). Up to now, none of the state DSM regulations specifies any energy saving targets through utility-driven DSM or offers any incentive to DISCOMs to take DSM measures. The regulations only allow provisions DISCOMs to recover the DSM-related costs by accounting them in the annual revenue requirement (ARR) estimates.

As far as introducing guidelines on evaluation of the cost-effectiveness and M&V of utility-driven DSM measures is concerned, Maharashtra and Punjab are the only states in the country that have acted upon it.

International experience suggests that mandating utilities to adopt integrated energy resource planning (IRP) is one of the important enabling factors for promoting utility-driven DSM programs in a country. However, none of the existing national policies, acts, or regulations in India (read EC Act 2001; EA 2003; National Electricity Policy 2005) has promoted mandating utilities to adopt IRP in their investment plans.

Mandates for Public Institutions

As far as public procurement of energy efficient end-use applications are concerned, the index-based evaluation finds that in 15 states, the governments have issued circulars on the procurement of star-rated appliances: split ACs, frost-free refrigerators, ceiling fans, and water heaters for use in public buildings. States where such circulars have not been traced have failed to score under the relevant sub-indicator. Few states have made it mandatory for municipalities to incorporate energy efficiency measures in their services. For instance, the government of Himachal Pradesh has directed all urban local bodies (ULBs) in the state to install energy-efficient streetlighting. The study also found that none of the states has made it mandatory for state road transport corporations to improve fuel economy in public vehicles.

Incentives to MSMEs

The assessment reveals that initiatives to encourage energy efficiency among MSMEs are limited. These initiatives may include giving fiscal incentives for investing in energy efficiency, recognizing selected MSMEs for their energy-saving efforts, and offering assistance to identify energy efficiency opportunities.

The state of Andhra Pradesh, Gujarat, Karnataka, Kerala, Maharashtra, Punjab, and Tamil Nadu reportedly have energy efficiency investment promotion schemes for MSMEs. One of the initiatives is conducting walkthrough energy audits and preparing feasibility studies for certain MSME clusters to identify energy efficiency opportunities. Some states also provide monetary assistance (such as a subsidy for energy audits) to MSMEs to undertake energy audit exercises and/or prepare Detailed Project Reports (DPRs).

Incentives for Large-Scale Energy Users

In India, one can see center-driven energy efficiency initiatives targeted at large-scale energy users, namely, the Perform, Achieve and Trade (PAT) scheme. However, although section 18 of the EC Act includes provisions allowing states to devise any energy efficiency regulation for large-scale energy consumers, hardly any state government has utilized them. Only Kerala and Maharashtra have offered some kind of financial incentives to these consumers for taking up energy efficiency activities.

Implementation of Energy Conservation Building Codes

The readiness index result gives a fair impression of state-wise status of energy conservation policy thrust in the buildings sector. While the EC Act directs the states to amend the Energy Conservation Building Codes (ECBCs) and issue notification for enforcement, only six states—Andhra Pradesh, Karnataka, Odisha, Punjab, Rajasthan, and Uttarakhand—have notified the ECBC, whereas 13 states have amended it, but are yet to notify it.[1] In some cases, the ECBC directives include disclosure of building energy usage annually. However, currently no ECBC-compliant building is reported in any of these states, and it is difficult to confirm the actual procedure followed to enforce the building code. Moreover, none of the states has made it mandatory to submit a disclosure of the property's energy usage at the time of sale or leasing of building.

Some states (Andhra Pradesh, Karnataka, Odisha, Punjab, Rajasthan, and Sikkim) have adopted an energy labeling or rating system (GRIHA or BEE star labeling) for building certification.[2] Some of these states reportedly offer incentives in the form of tax concessions or additional free-of-cost floor area ratio (FAR) to GRIHA-compliant buildings[3]. Few cities or ULBs (such as Hyderabad in Andhra Pradesh; Pune, Pimpri, and Mumbai in Maharashtra; Jaipur in Rajasthan; Noida in Uttar Pradesh; and Kolkata in West Bengal) also give incentives to GRIHA-compliant buildings.

It is found that in states where SERCs give energy efficiency targets to utilities with respect to power generation and T&D, those targets are usually associated with some kind of penalty mechanism in the case of noncompliance. For instance, SERC considers the target level of T&D loss in estimating ARR for the DISCOM, even though the latter could not achieve the target. This implies that a part of the power purchase cost for the volume of electricity lost in T&D is not accounted for in the ARR, which is therefore a loss of revenue to the DISCOM. Similar penalization mechanism is followed if the utility is given a target at the generation side. However, such penalty mechanism is not universally applicable across all states.

As far as introducing guidelines on evaluation of cost-effectiveness and measurement and verification (M&V) of utility-driven DSM measures is concerned, Maharashtra and Punjab are the only states in the country that have acted upon it.

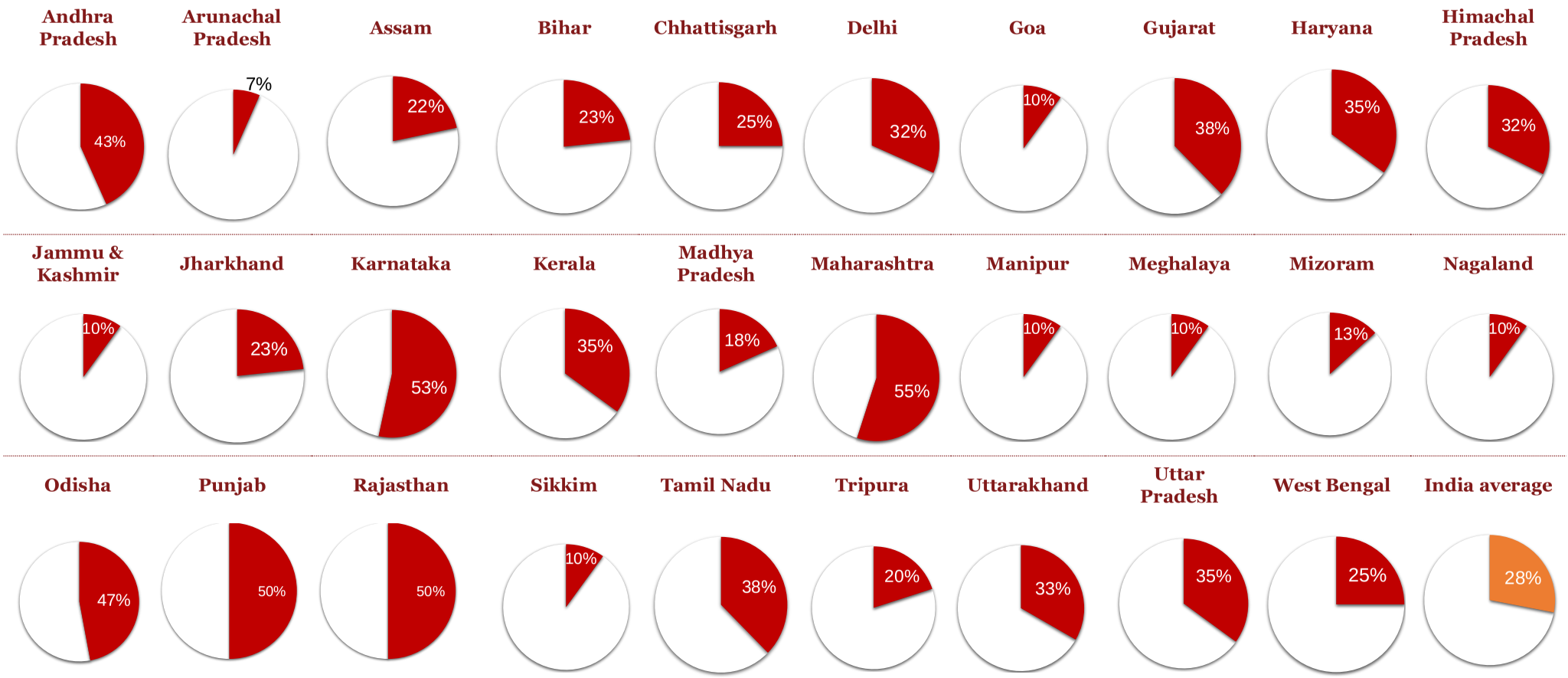
A review of the retail tariff orders indicates that in almost all states, the tariff structures include an off-peak time rebate or time of day (ToD) tariff as an instrument to reduce peak load. However, currently, such a tariff rebate is applicable only for industrial consumers.

International experience suggests that mandating utilities to adopt IRP is one of the key enabling factors for driving utility-driven DSM programs in a country. However, none of the existing national policies, acts, or regulations in India (that is, EC Act 2001; EA 2003; or National Electricity Policy 2005) has promoted mandating utilities to adopt IRP in their investment plans.

Figure 1 showcases the benchmark of the performance of the states in percentage scores, under the readiness category "policy and incentives."

[1] Union Territory of Puducherry has also notified ECBC.
[2] GRIHA.
[3] In addition, multi-story residential buildings having GRIHA or IGBC certification are entitled to get fast-track environmental clearance.

Figure 1: Percentage Scores of the States for Their Performance in "Policy and Incentives"



Market Maturity

This readiness category comprising three readiness factors reflects the status of enabling factors, such as financing mechanisms or consumer tools available in the states, and the energy efficiency potential currently harnessed, which can be scaled up in the near future.

Key Findings

This section highlights the key takeaways of the state-level energy efficiency readiness assessment under each of the three readiness factors of the category "market maturity."

Information or Tools Available to Consumers

All the states are typically guided by the electricity supply codes that specify the standards and norms for providing electricity usage information to consumers. Currently, none of the states inform the consumers about the electricity usage levels of peer groups or make any such comparison to benchmark usage levels. Also, there is no regulation that requires utilities to furnish such information by defining what constitutes peer groups and what indicators are to be adopted.

With regard to empowering consumers through smart features in power distribution, other than in Delhi, the facility for real-time feedback to customers about their energy usage or managing consumption remotely is yet to be implemented beyond pilot project scale in the country.[4,5]

Energy Efficiency Potential and Implementation Experience

India has made significant headway in implementing DSM programs, largely driven by Energy Efficiency Services Limited (EESL), a Government of India undertaking. The most significant initiative is EESL's DSM-based DELP (UJALA Distribution scheme), which involves large-scale replacement of incandescent bulbs with self-ballasted LED lamps in the residential sector. As of May 6, 2016, 16 states have undertaken the DELP with varying degree of LED lamp penetration among consumers. The Agricultural DSM Program (AgDSM) and Energy Efficient Street Lighting Program are two other major DSM programs currently pursued throughout India. While performing the evaluation of the states, this study has taken into consideration those initiatives that have been undertaken since 2010 through utility-driven DSM programs whereby old inefficient agricultural pumpsets are replaced by BEE star-rated pumps. As of February 2016, these states include Andhra Pradesh, Karnataka, Maharashtra, and Rajasthan. With respect to energy-efficient streetlighting programs, states that have started implementing them include Andhra Pradesh, Chhattisgarh, Delhi, Gujarat, Jharkhand, Kerala, Maharashtra, Odisha, Rajasthan, Tripura, and Uttar Pradesh.

Recently EESL has launched the energy-efficient domestic fan program, which, until May 6, 2016, was limited to two states: Andhra Pradesh and Uttar Pradesh.

The state nodal agencies in nine states, with support from the Government of India, have started implementing the solar irrigation pump program. They are Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Karnataka, Madhya Pradesh, Rajasthan, Tamil Nadu, and Uttar Pradesh.

Financing Mechanisms for Energy Efficiency Activities

The evaluation outcome reflects that many states are yet to adequately consider energy efficiency in making fiscal policies. One can see limited number of financial instruments applied in implementing energy efficiency measures. Financing energy efficiency measures through energy service contracts (ESCO model) is one of them, which has been getting traction in recent years. Cost recovery through tariffs on utilities is also one of the preferred financing options. Here, expenditures incurred for adopting energy efficiency measures by the utilities are accounted for in the latter's ARR as stated in their retail tariff orders.

The states of Delhi, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, and Punjab have capital subsidy schemes for energy efficiency projects. On-bill financing, a new breed of financing model for energy efficiency projects, has been tried in such states as Delhi, Gujarat, Himachal Pradesh, Karnataka, Maharashtra, and Punjab for funding DSM-based DELP among households. Here, the costs of the LED lamps distributed to households are included in the monthly electricity bills of the consumers.

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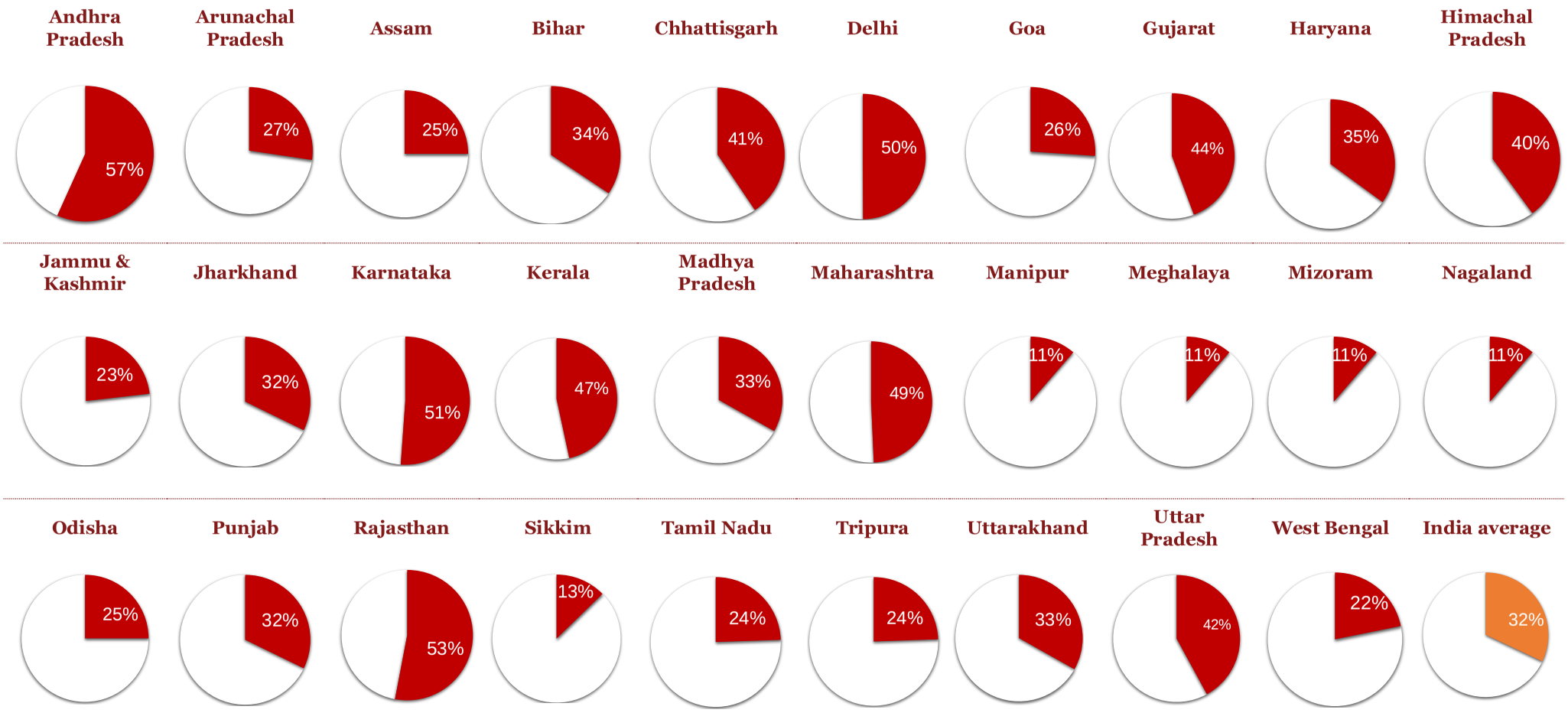
[4] L. Philip (May 10, 2015). "Honeywell, Tata Power implement first ever automated demand response project," *The Economic Times*. Retrieved from http://articles.economictimes.indiatimes.com/2015-05-20/news/62413011_1_tata-power-delhi-distribution-tpddl-honeywell).

[5] Pilot-scale projects have not been considered in the evaluation.

Figure 2 presents the benchmark of the performance of the states in percentage scores, under the readiness category "market maturity."

Figure 2: Percentage Scores of the States for Their Performance in "Market Maturity"



Institutional Capacity

This readiness category, comprising two readiness factors, intends to capture the existing institutional framework and oversight systems in the states.

Key Findings

This section highlights the key findings of the state-level energy efficiency readiness assessment under each of the two readiness factors of the category "institutional capacity."

Institutional Framework and Capacity

In the current framework of energy efficiency governance, SDAs have been vested with the responsibility of formulating energy efficiency strategies or policies at the state level, according to the provisions of the EC Act (2001). It is interesting to note that the profiles of the SDAs vary greatly among the states. Out of the 34 SDAs, 14 are renewable energy development agencies, 9 are power departments of state governments, 6 are electrical inspectorate offices, 3 are electricity DISCOMs, and 2 are societies registered under the Societies Registration Act, 1860. Clearly, most SDAs have been given the mandate of energy efficiency governance as an additional mission or portfolio. This creates a sense of competition between the energy efficiency and other mainstream functions of the SDAs for internal resources.

Only the SDA of Andhra Pradesh's (State Energy Conservation Mission (SECM)) has been constituted with the sole mandate of promoting energy efficiency in the state.[6] The Energy Management Centre (EMC), Kerala's SDA, is also unique in this regard. Constituted in 1996 as an autonomous body under the Department of Power, Government of Kerala, its primary mandate includes promotion of energy conservation in the state.[7]

It is interesting to note, however, that Section 18 of the EC Act empowers a state to direct the *regulation of the energy consumption standards for equipment and appliances*. However, Kerala is the only state that has exercised this power; it has issued the *Energy Conservation (Energy Consumption Standards for Equipment and Appliances) Directions, 2015*. Otherwise, currently this function is carried out by the BEE at the central level.

Alternatively, while the EC Act (2001) directs the states to amend the ECBC and issue notification for enforcement, only six states (Andhra Pradesh, Karnataka, Odisha, Punjab, Rajasthan, and Uttarakhand) have notified the ECBC.

Monitoring and Evaluation System

In case SERC sets energy efficiency targets to utilities in power generation and T&D, the energy savings or related indicators, such as SHR and T&D losses, are measured and reported to SERC at the time of annual performance reviews.

Load research studies holds strategic importance as they help characterize the end-use electricity consumption, identify strategic demand side measures, and develop action plans to formulate and design possible DSM interventions. Load research studies were reportedly being carried out by one or more utilities in 23 states as of April 2016.

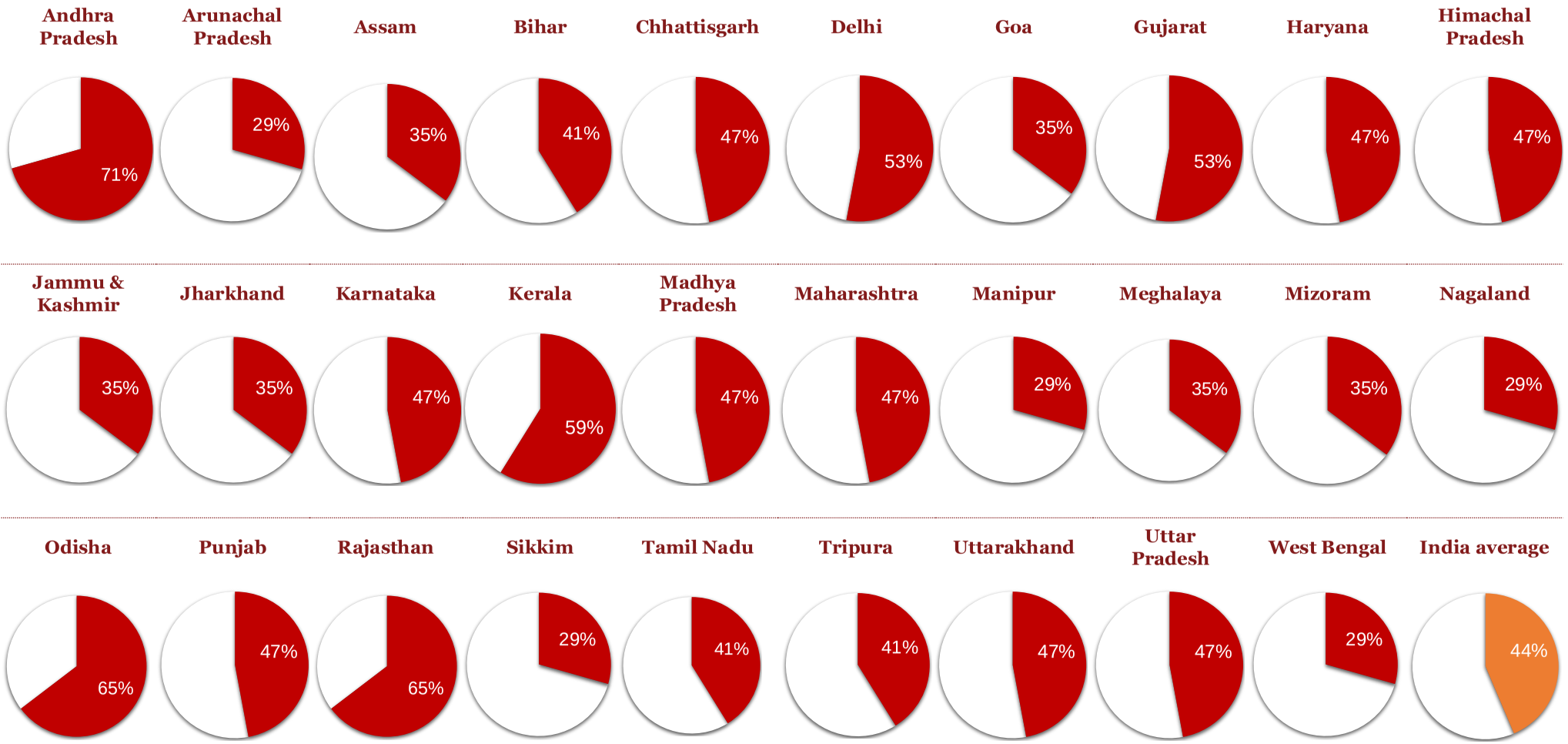
Empanelling energy consultants or auditors is one of the important steps SDAs should take to create an ecosystem for scaling up energy conservation efforts in a state. This state-wise assessment on energy efficiency implementation readiness has identified 12 states that have adopted mechanisms for the empanelment of energy auditors. Other states do not have a publicized system for empanelling these players.

The ECBCs notified by the states should clearly state the compliance or M&V protocol for proper enforcement. However, there are cases where ECBC directives lack clear-cut guidelines on compliance–roles and responsibilities of the authorities involved are not clearly mentioned, leaving enough ambiguity. Moreover, compliance requirement involving verification by independent third parties is not included in the ECBC directives in all the six states where ECBC is notified.

Figure 3 showcases the benchmark of the performance of the states in percentage scores, under the readiness category "institutional capacity."

[6] Society registered under the AP Societies Registration Act, 2001.
[7] Registered under the Travancore-Cochin Literary, Scientific and Charitable Societies Act of 1955.

Figure 3: Percentage Scores of the States for Their Performance in "Institutional Capacity"



Recommended Action Points

From the assessment, one could identify key intervention areas where most states are found lagging and that warrant further action. Based on this, the study has put forward a set of key recommendations or action points (refer to Table 3) for the states to improve their readiness for scaling up energy efficiency activities. Because of the varied energy efficiency scenarios and economic profiles among the states, proposing a separate set of recommendations for each state is beyond the scope of this exercise. It is also to be underlined that prioritizing these actions depends on the states' development objectives and need. In the cases where interventions at national level are deemed important, the following recommendations also highlight those action-points.

Table 3: Key Action Points for the States to Improve Their Readiness for Scaling Up Energy Efficiency Activities

Issue	Recommended actions
The state energy efficiency action plans lack specific energy savings targets.	Undertake a detailed study to identify plausible energy efficiency interventions across energy-consuming sectors, and estimate their energy-saving potential and corresponding investment requirements.
	Adopt achievable energy savings targets against the identified energy efficiency interventions and set a time frame to pursue these targets.
Absence of an energy efficiency policy or legislation at the state level.	The states should endeavor to bring sector-specific energy efficiency policies with definite goals and time-bound action plans. This can be reinforced by introducing necessary legislation.
Although states have designated agencies (SDAs) for pursuing energy efficiency, most of these organizations are vested with other missions (ranging from RE to power distribution) even though they are not fully equipped to drive all these missions.	It is necessary for each state to have a dedicated agency with adequate resources (including budgetary) and expertise for steering energy efficiency action plans.
Enforcing energy efficiency compliance requirements, such as star labeling of appliances and ECBC, has been a challenge. Currently, these are mostly centrally driven.	States should exercise their power conferred by section 18 of the EC Act to enforce such compliance requirements.
Empaneling energy consultants or auditors can catalyze energy efficiency investments across sectors, and are essential in enforcing energy efficiency compliance requirements, such as ECBC.	Direct all states to set mechanisms to empanel certified energy consultants or auditors.
	They should be properly mobilized to pursue the states' energy efficiency goals.
There is enormous potential to scale up utility-driven DSM in India. So far India's utility DSM progress and achievements have been primarily driven by national institutions, policies, and programs in the broader context of energy efficiency and conservation.	Policy-level actions should consider providing a clear, unambiguous, and explicit clarification that demand-side resources can be an alternative resource option for utilities.
	Regulatory actions may involve: - Stipulating and enforcing DSM targets in the form of resource purchase obligations. - Institutionalizing load research functions within the utility with dedicated resources and authority.
	These should be followed by: - Issuing regulations and guidelines on examining cost effectiveness of DSM programs. - Issuing guidelines on M&V of DSM measures to evaluate the resulting energy savings.

	In order to facilitate these changes, the center should bring necessary provisions in the legal and regulatory framework to promote demand-side resources with supply-side options.
Are regulations evolving in tandem with new financing mechanisms in DSM? Adoption of new financing models: The On-bill Financing and Standard Offer program have raised serious questions about adequacy of current DSM regulations to accommodate the evolving dynamics of DSM.	An adaptive regulatory regime is paramount to support new DSM financing models. Recognizing the potential risks and liabilities of stakeholders and their legal implications, SERCs should initiate consultation with all partners and reassess key provisions of current DSM regulations from the point of view of suitability to support the On-bill Financing and Standard Offer program.
	SERCs should bring necessary regulatory provisions to support effective application of new financing mechanisms: On-bill Financing and Standard Offer.
Information or tools provided to consumers goes a long way towards improving end-use efficiency by way of operational and behavioral changes of consumers. Certain critical information can help consumers make informed decisions to respond to price signals or utility incentives, thereby increasing the overall capacity for DSM.	Provide consumers with the right kind of information, such as comparisons of their electricity consumptions with average usage levels in same category of consumers. The supply codes issued by the SERCs should include the necessary provisions to mandate utilities to provide this information.
	The utilities should explore implementing automated metering infrastructure to enable real-time feedback to consumers on their electricity consumptions. This will allow consumers to manage their electricity usage.
Off-peak time rebate is still applicable for industrial consumers only.	SERCs should also extend off-peak time rebate or ToD tariff to domestic and commercial consumers also.
Currently, none of the national policies, acts or regulations, which usually give direction to state-level actions, have given thrust on mandating utilities to adopt IRP in their investment plans. Recently, the draft National Renewable Energy Act, 2015, has put emphasis on the need to move towards IRP. However, there is no clear mandate for the utilities or SERCs to undertake or enforce IRP by considering demand-side resources.	To strengthen the draft Renewable Energy (RE) Act to promote demand-side resources, a simple yet effective amendment can be implemented to include demand-side resource as a qualifying resource under the definition of RE sources, along with separate definitions that clarify what constitutes the demand-side resource and meaning of DSM.
	Moreover, suitable amendments in the Electricity (Amendment) Bill, 2014, and/or in the Electricity Act, 2003, can be made to provide an explicit impetus for DSM as a resource option for the utilities and empower state commissions to stipulate DSM resource purchase obligations.
Notification of state ECBC is limited to six states only. It is facing a myriad of challenges, such as the absence of policy guidelines for building bylaws, ineffective institutional structure for ECBC administration, a limited number of building planners who have a proper understanding of ECBC, and lack of awareness.	Each state should develop a group of experts on ECBC, consisting of BEE ECBC experts, architects, engineers, town planners, and representatives of the state urban development department (UDD). The group of experts will be responsible to address the technical challenges related to ECBC implementation and for amending the code.
	To overcome the hurdles in notifying ECBC, a steering committee comprising representatives from a group of experts, ULBs, SDAs, and state officials from the Ministry of Urban Development (MoUD) is proposed, which should initiate a consultative process with other stakeholders, such as DISCOMs, building planners, and schools of architecture.
	Taking inputs from stakeholders, the steering committee should develop a model general development control regulation (GDCR); this will outline the framework for land use and building bylaws.

	Following this, the UDD can amend the existing building bylaws and building approval process. These key measures can pave the way for notification of ECBC in a state.
Enforcement of ECBC is facing hurdles ranging from lack of proper framework and planning to inadequate capacity of the implementing agencies.	ULBs should have the central role in enforcing ECBC. However, considering their limited capacity and preoccupation, a TPA system should be developed for ECBC implementation. TPAs should be ECBC-accredited professionals certified by the BEE.
	BEE should lay out separate guidelines that TPAs should follow in their assessment and reporting, and on appointment of TPAs by the compliant party.
The lack of incentives is discouraging builders from applying for certification under a labeling scheme, such as GRIHA or BEE star labeling.	A greater number of urban local bodies should offer incentives to builders to apply for energy labeling.
Though the states have constituted SECFs, they are yet to realize the full potential of the financial support line.	Mobilize the fund for identifying potential new financing mechanisms required to overcome the barriers in investing in energy efficiency.
	Being a revolving fund, SECFs can be utilized to provide support to targeted financial instruments, such as energy audit subsidies, interest buy-down schemes, and partial risk guarantees.
Until now, only a few states have taken initiatives to realize the energy-saving potential in the MSME sector.	Provide financial assistance to MSMEs to conduct investment-grade energy audits and to prepare feasibility studies for implementing cost-effective energy efficiency measures.
	Design schemes for demonstration projects on energy efficiency in selected MSME clusters, followed by scaling up through an energy service contract (ESCO) based model.

1. Economic and Energy Use Paradigms of Indian States: Need for Local Approach towards Energy Efficiency

India is currently one of the fastest-growing major economies in the world. Sustaining a high growth rate is believed to be critical for India to alleviate poverty in the country, since it feeds more than a billion people. Energy, being a key enabler of a country's economic growth and development, has witnessed a significant rise in its consumption in India. In 2013 about 528.34 million tons of oil equivalent (Mtoe) were consumed, making India the third largest consumer of energy in the world—more than 70% of which is supplied by fossil sources.[8]

Increasing energy demand naturally strains the country's resources and impacts the environment. This warrants decoupling the country's economic growth and energy demand. This is also echoed through India's Intended Nationally Determined Contribution, which was submitted in the run-up to the Paris Climate Conference, where the government highlighted energy conservation as an important mitigation strategy. It seeks to achieve a total avoided capacity addition of 19,598 MW and fuel savings of around 23 million tons per year through the National Mission for Enhanced Energy Efficiency (NMEEE). However, this requires concerted effort at the central and state levels, especially considering the existing federal governance architecture where many subjects, such as electricity, economic and social planning, and industrial development, fall under the jurisdictions of both the center and the state.

India consists of 29 states, including the recently formed Telangana, the National Capital Territory of Delhi and six union territories (UTs). It exemplifies a myriad of variations in demography, geographic and climatic patterns, and economic profiles across the length and breadth of the country. It is therefore impractical to take a "one-size-fits-all" approach in solving the problems of the country. It is imperative to consider policies, programs, or activities tailor-made for local situations. Otherwise, the possibility of failure in achieving the targeted objectives will be high. To gain a necessary understanding of India's energy efficiency scenario, it is therefore not sufficient to limit the understanding to the central level; one has to endeavor to have knowledge of the situation at the state level.

This chapter intends to give a snapshot of the state-level variations in economic and energy use profiles by highlighting some important parameters: highest sectoral shares in electricity use and gross state domestic product (GSDP), per capita electricity consumption, and energy intensity related to electricity consumption or GSDP (refer to Figures 4–7).

[8] Based on IEA's data on India's energy balance for 2013.
https://www.iea.org/statistics/statisticssearch/report/?country=India&product=balances

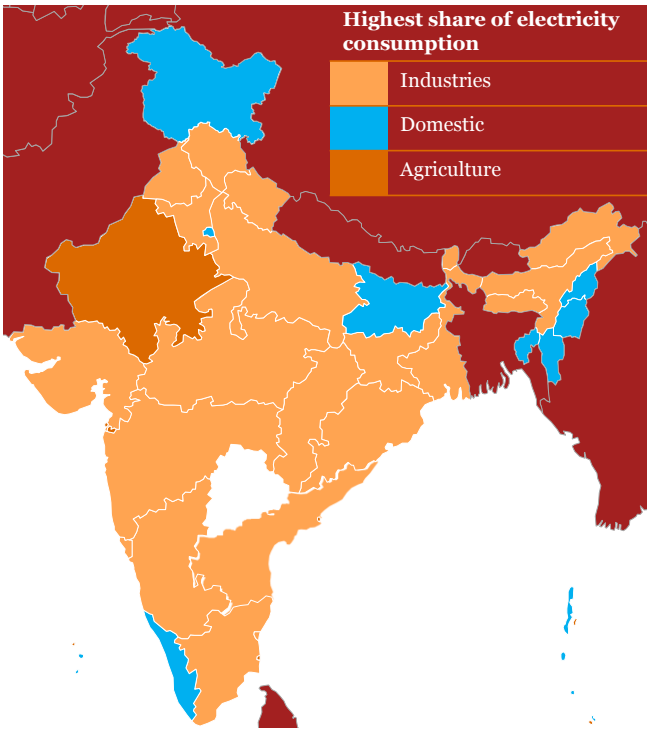


Figure 4: Highest Sectoral Share in Electricity Consumption, 2013–14

Source: CEA General Review 2014; Energy Statistics 2015.

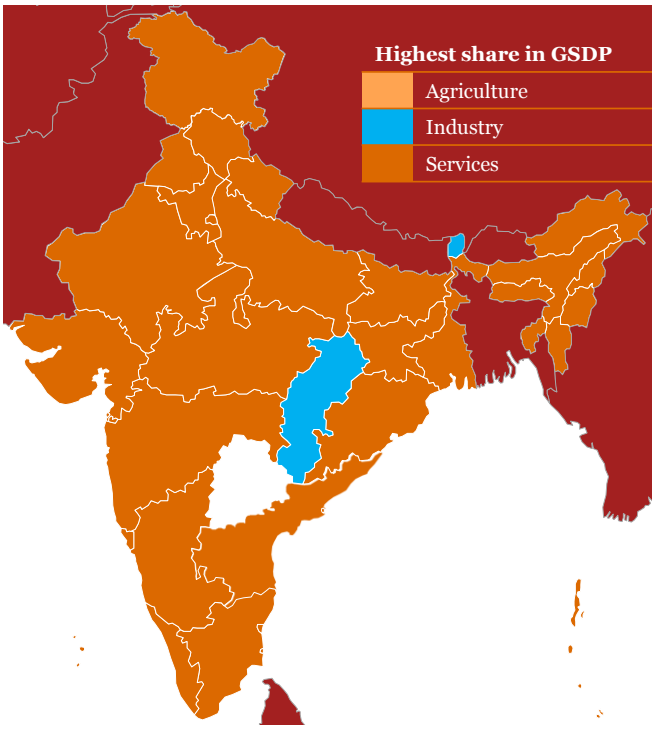


Figure 5: Highest Sectoral Share in GSDP, 2013–14

Source: Ministry of Statistics and Programme Implementation.

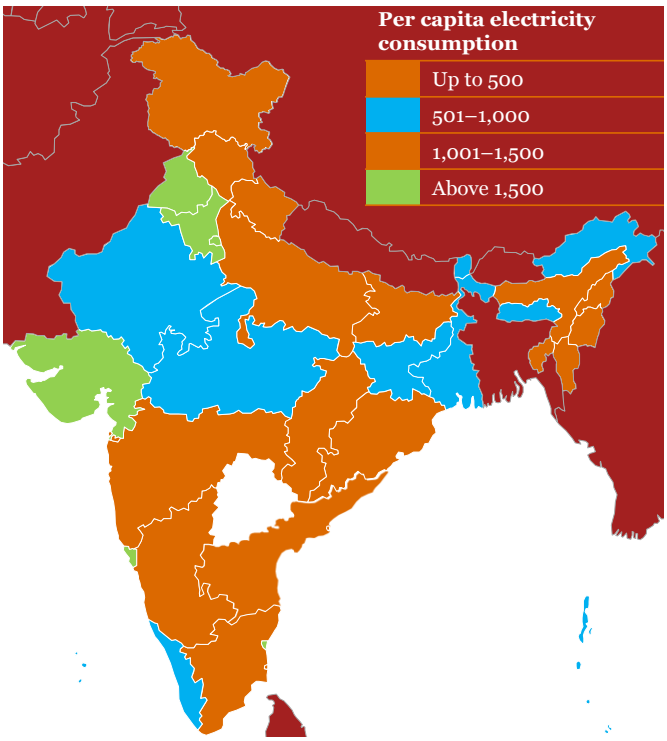


Figure 6: State-Wise per Capita Electricity Consumption

Source: CEA General Review 2014; Census 2011.

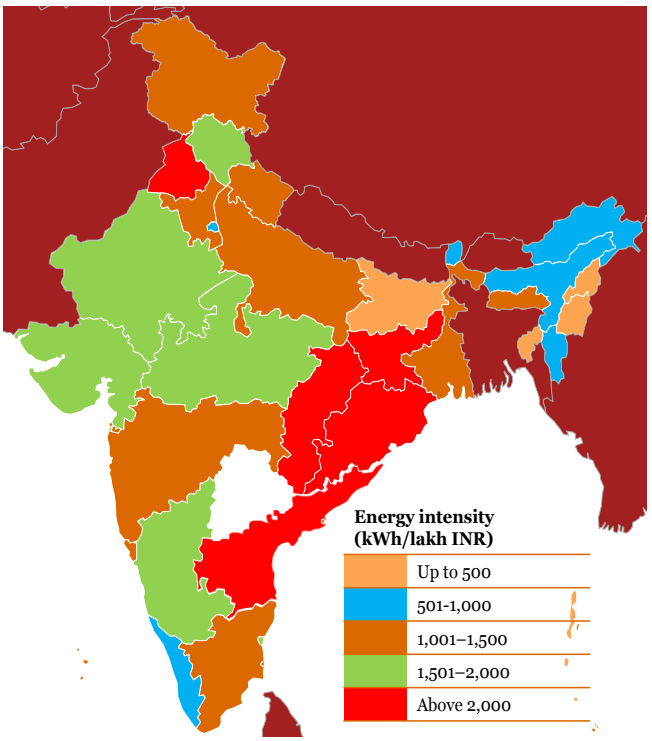


Figure 7: State-Wise Energy Intensity for Electricity

Note: A *lakh* is a unit in the Indian numbering system equal to 100,000.
Source: CEA General Review 2014; Ministry of Statistics and Programme Implementation.

2. India's Energy Efficiency Governance Framework and the States' Roles

In India, both supply and demand sides are important to ensure the energy efficiency is advanced in a comprehensive manner. Supply-side energy efficiency (SSEE) ensures that the extraction, mining, production, and transmission and distribution (T&D) of energy commodities are conducted efficiently. Demand-side energy efficiency ensures that the end-use of energy (for example, energy consumption by appliances, buildings, industries, and vehicles) is efficient as a result of technological performance and effective energy management through operational or behavioral changes.

The supply side of energy is governed by both central and state agencies,[9] whereas the demand side is predominantly governed by the states.

Energy Conservation Act, 2001

Without discriminating between any form or source of energy, the Energy Conservation (EC) Act, 2001, defines the governing framework for efficient use of energy and its conservation in India. Under the EC Act, the central and state governments are provided with multiple functions and statutory powers to facilitate, coordinate, regulate, and enforce efficient use of energy and its conservation. The EC Act provides a statutory basis for regulating energy consumption and enforcing energy efficiency standards among any energy users notified as designated consumers (DCs), buildings or building complexes, and energy-consuming equipment or appliances.

The Bureau of Energy Efficiency (BEE) has been set up under the EC Act as a central nodal agency with specific powers and functions to implement provisions at the national level. The EC Act also required the state governments to designate an agency for the implementation of the functions assigned to the states. In this regard, the state designated agencies (SDAs) for energy efficiency have been notified in the 28 states and 6 union territories. The box highlights the key roles of the state governments as delineated by the EC Act (2001).

Box: Role of the State Governments under the EC Act, 2001

- *Coordinate, regulate, and enforce provisions of the EC Act, 2001, within the state.*
- *Regulate norms for process and energy consumption standards in any industry or building or building complex.*
- *Regulate energy consumption standards for equipment and appliances.*
- *Take all measures necessary to create awareness and disseminate information for efficient use of energy and its conservation.*
- *Arrange and organize training of personnel and specialists in the techniques for efficient use of energy and its conservation.*
- *Take steps to encourage preferential treatment for the use of energy efficient equipment or appliances.*
- *Constitute a fund to be called the State Energy Conservation Fund (SECF) to promote efficient use of energy and its conservation within the state.*
- *Enforcement of Perform, Achieve, and Trade (PAT) scheme compliance within the state.*

[9] Coal, oil, and other petroleum products, as well as gas and nuclear energy sources, are predominantly governed by national agencies. Electricity and renewable energy sources of energy are governed by both central and state agencies, but with the state playing a major role.

The Electricity Act, 2003

The Electricity Act (EA), 2003, was enacted to restructure and reform the ailing power sector. The EA has created a consolidated governance framework for generation, transmission, distribution, trading, and consumption of electricity adhering to market-based mechanisms. The EA aims to promote efficient and environmentally benign policies across the value chain of electricity.

The EA has empowered the State Electricity Regulatory Commissions (SERCs), under section 61 (c) and (e), to regulate tariffs by considering the factors that will encourage competition, efficiency, economical use of resources, good performance, optimal investments, and principles rewarding efficiency in performance. Section 42 (1) of the EA stipulates that developing and maintaining an efficient, coordinated, and economical distribution system is one of the principal duties of the distribution licensees in the country. This signifies the important role played by the states in advancing energy efficiency across the value chain of electricity in India.

National Action Plan on Climate Change

Recognizing the need to maintain a high economic growth rate for realizing developmental objectives while also reducing vulnerability to the impacts of climate change, the Prime Minister's Council on Climate Change (PMCCC) initiated the National Action Plan on Climate Change in 2008. The plan outlined eight national missions running through 2017.

- National Solar Mission.
- **National Mission for Enhanced Energy Efficiency (NMEEE).**
- National Mission on Sustainable Habitat.
- National Water Mission.
- National Mission for Sustaining the Himalayan Ecosystem.
- National Mission for a Green India.
- National Mission for Sustainable Agriculture (NMSA).
- National Mission on Strategic Knowledge for Climate Change (NMSKCC).

With the ultimate goal of advancing market-based approaches to unlock energy efficiency opportunities in India, the NMEEE was administered under four major initiatives:

Perform, Achieve, and Trade (PAT): PAT is a market-based mechanism to enhance the cost-effectiveness of improvements in energy efficiency in large energy-intensive industries and facilities, through certification of energy savings that can be traded. The EC Act (2001) provides the legal framework to establish and prescribe energy consumption norms for any energy user notified as a DC. Under the PAT scheme, introduced in 2010, the Government of India notified energy efficiency improvement targets in 2012 for 478 individual obligated entities in eight energy-intensive sectors, namely, thermal power plants, aluminum, cement, chlor-alkali, fertilizer, iron and steel, pulp and paper, and textiles. These sectors represent 65% of India's total industrial energy consumption. The targets were stipulated in the form of specific energy consumption (SEC) improvement over a three-year cycle (2012–15).

To drive compliance under the PAT scheme, DCs achieving SEC levels that are lower than their targets can receive energy savings certificates for their excess savings. These certificates can be traded on the power exchanges and bought by other DCs, notified under the PAT scheme, to meet their compliance requirements. DCs that are unable to meet the targets, either through their own actions or through purchase of certificates, are liable for financial penalty under the EC Act.

The SDAs are entrusted with a crucial role of enforcement of compliance under the PAT scheme.

Market Transformation for Energy Efficiency (MTEE): The objective of this initiative is to accelerate the shift to energy-efficient appliances in designated sectors through innovative measures to make the products more affordable. Under the MTEE, the BEE has launched the Super Efficient Equipment Program (SEEP). This aims to enhance the penetration of the best available energy efficient technology in the market. SEEP is structured to offer upstream incentives to the manufacturers that meet the technical specifications set out by

the BEE that are beyond the current product specifications prevalent in India. The BEE has also developed a robust M&V framework involving quantity and quality checks of samples at the manufacturer and retailer premises to verify compliance with technical standards, production, and sales data. A third-party measurement and verification (M&V) agency will be appointed by the BEE for validation of sales and quality standards. In times to come, the SDAs may play a crucial coordination role in monitoring and evaluating the effectiveness of this scheme within the states.

Energy Efficiency Financing Platform (EEFP): This initiative aims to create mechanisms that will help finance energy efficiency investments in all sectors by capturing future energy savings. Partial Risk Guarantee Fund and Venture Capital Fund are conceptualized to be administered at the national level to support energy efficiency investments. Another key objective of this platform is to stimulate financing from energy service companies (ESCOs) by adopting energy performance contracting models. Some of the potential markets for scaling up ESCO financing are municipal lighting, commercial buildings, industry (including micro, small, and medium enterprises (MSMEs)), and utility demand-side management (DSM) (including residential appliances and agriculture pumping). **The states have a major role to play in demonstrating the benefits of innovative financing mechanisms through pilot-scale energy efficiency projects and also facilitating a conducive policy environment to replicate successful models.**

Framework for Energy-Efficient Economic Development (FEEED): This component intends to provide appropriate fiscal instruments that may supplement the efforts of the government for the creation of an energy efficiency market. The central government (income tax department) has allowed accelerated depreciation of 80%[10] (percentage of written-down value) for 43 energy-saving devices. The Government of India has exempted special additional duty (SAD) on all imported components for their use in the manufacture of light-emitting diode (LED) drivers and metal-clad printed circuit board for LED lights and fixtures and LED lamps. In addition, the basic customs duty is being exempted on lithium-ion automotive batteries for manufacture of lithium ion battery packs for supply to the manufacturers of hybrid and electric vehicles. The Government of India has also launched the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles scheme, known as FAME India, offering demand incentives to buyers of hybrid and electric vehicles at the point of purchase.

In times to come, the states will have a crucial role to further drive the uptake of energy-efficient technologies and services through state-administered fiscal instruments.

Other National Energy Efficiency Programs

Apart from NMEEE initiatives, BEE has been administering several other programs, which include the following:

Standards and Labeling (S&L): S&L is one of the flagship initiatives of BEE that aims to enable consumers make informed decisions regarding the purchase of energy-consuming equipment or appliances based on the latter's energy consumption labels. The EC Act, 2001, has provided the necessary legal framework to specify energy performance standards and direct display of labels for appliances and equipment consuming energy. Currently, 14 categories of appliances and equipment have been covered under the program with four categories (frost-free refrigerator, tubular fluorescent lamp, room AC, and distribution transformer) in the mandatory comparative labeling regime and 10 others in the voluntary comparative labeling regime. During 2007–11, BEE's S&L program delivered about 11.6 billion units of energy savings and 5,100 MW of avoided generation capacity. Six more categories of appliances and equipment are expected to be covered in the near future. As per the EC Act, SDAs have a crucial role in appointing inspecting officers for ensuring compliance of S&L within the state.

Energy Conservation Building Code (ECBC): The BEE developed and issued the ECBC in 2007, which applies to commercial buildings with a connected load of 100 kW or 120 kVA. However, currently only seven states have notified it. Another nine states have amended the ECBC to suit their local and regional climatic

[10] Retrieved from www.incometaxindia.gov.in/Pages/charts-and-tables.aspx.

condition. Another seven states are in the process of making such amendments.[11] The National Building Code, 2005, formulated by the Bureau of Indian Standards, is the comprehensive building code providing guidelines for regulating all types of building construction activities across the country. It serves as a model code for adoption by all states and agencies in all jurisdictions. Apart from this, there are other systems, such as the Leadership in Energy and Environmental Design (LEED) and Green Rating for Integrated Habitat Assessment (GRIHA) that consider environmental norms for rating of buildings and labeling them as green buildings.

The state governments have an important role to play by incorporating the ECBC into the building bylaws and enforced by municipalities. The BEE has developed ECBC compliance check tools to build the capacity of local municipalities for the enforcement of ECBC.

Capacity building of electricity distribution utilities: The BEE, in partnership with the Energy Efficiency Services Limited (EESL), has recently initiated a nationwide capacity building program to mainstream DSM into utility operations. As part of the capacity building initiatives, The EESL is currently supporting 33 selected utilities across the country in doing the following:

- Conducting load research study to characterize end-use electricity consumption and identify strategic demand-side measures.
- Developing concrete action plans to formulate and design programmatic DSM interventions.
- Strengthening the capacity of DSM cells with technical and financial advisory support for DSM program implementation and coordination.
- The states have an important role to effectively coordinate with central agencies, plan, and realize demand-side resources in a cost-effective manner within the purview of relevant regulations.

Table 4 lists the different stakeholders whose participation is necessary in implementing the BEE-promoted national schemes.

Table 4: Required Involvement of Key Stakeholders in Implementing the BEE Programs in the States

National scheme/program	SDA	SERC	Distribution companies (discoms)	Generation companies	Urban local bodies (ULBs)
PAT	X			X	
MTEE	X		X		
EEFP			X		X
S&L	X				
ECBC	X				X
Capacity building of electricity distribution utilities	X	X	X		

Note: The Framework for Energy-Efficient Economic Development involves fiscal policies, such as tax instruments, which are currently governed by central departments or agencies.

[11] Retrieved from http://www.beeindia.in/.

3. Assessment: Objectives and Methodology

Rationale

Given that the energy sector, specifically the power sector, is in the concurrent list of the Indian constitution and that economic and industrial development is also a state subject, the promotion and implementation of energy efficiency policies and programs are a shared responsibility of the center and states. It is, therefore, important that national institutions like the BEE, responsible for the formulation of energy conservation programs, engage with the states to pursue energy efficiency goals in the country. In other words, the effectiveness of central policies towards a resource efficient economy lies in pursuing a state focused agenda.

On the other hand, the concerned state agencies must complement the central efforts, guided by the states' priorities and local conditions, to facilitate market-driven approaches and create self-sustaining energy efficiency markets.

With the energy efficiency agenda gaining traction and momentum in India, there is a need to continuously evaluate the policies and programs at the state level. Comparative benchmarking is a proven methodology to evaluate states on their policy and program efforts, identify best practices, and give recommendations for improving their governance performance.

Objectives

One of the key objectives of this study is to develop a framework and methodology for the evaluation of a state's strategic energy efficiency policies, market maturity for its energy efficiency services, and institutional strength to plan, implement, and deliver energy efficiency programs, projects, or activities. This report presents an index-based evaluation of individual states to benchmark their readiness for energy efficiency implementation. The benchmarking across the states will serve as a comparative reference point for the states to measure, monitor, and evaluate the chosen indicators that best depict the energy efficiency implementation readiness.

This report is expected to raise the profile of energy efficiency in the state government's decision-making process, strengthen ongoing activities, and enable state-level institutions to perform and target better results. Moreover, the indexing of the states will act as a benchmarking tool, which in turn will create a sense of competitiveness, leading the states to push for more aggressive reforms and programs towards energy efficiency. The report will also highlight unique and successful best practices adopted across the states, which have the potential to be scaled up or replicated throughout the country.

To benchmark Indian states, this study has considered 28 states (excluding the newly formed state of Telangana) and the National Capital Territory of Delhi.

Literature Review

The idea of comparative benchmarking of territorial energy efficiency performance has been in existence for more than a decade now. Earlier research has scored and ranked states and countries in a particular region on a number of energy efficiency policies. Recent efforts have considered a wider range of indicators going beyond policies. Some of the world-recognized efforts in this regard are described below.

- The American Council for an Energy-Efficient Economy (ACEEE) has published nine editions of the ***State Energy Efficiency Scorecard*** and two editions each of the ***city and international energy efficiency scorecards***. These scorecards have measured the progress of policies and programs that save energy while also benefiting the environment and promoting economic growth. The state scorecard ranks U.S. states on six broad categories of indicators—utility programs, transportation, building energy codes, combined heat and power, state initiatives, and appliance standards. The city scorecard ranked 51 large U.S. cities for their energy efficiency efforts across five policy areas: local government operations, community-wide initiatives, buildings, energy and water utilities, and transportation. The international

scorecard ranked the world's 16 largest economies by looking at policies and quantifiable performance indicators to evaluate how efficiently these economies use energy.

- ***Readiness for Investment in Sustainable Energy (RISE)*** involves a suite of indicators that assesses the legal and regulatory environment for investment in sustainable energy. It establishes a framework for depicting the national enabling environment better to attract investments into three pillars of sustainable energy—energy access, RE, and energy efficiency. With more than 25 specially designed indicators and detailed country-specific data from across the globe, RISE intends to provide a global reference point that will support decision making for governments and inform country-level interventions under SE4ALL (Sustainable Energy for All). The data collected through RISE will help countries evaluate their enabling environment in each of the three SE4ALL pillars and identify policies and other instruments they may need to move towards their sustainable energy vision. RISE ultimately will help stimulate policy dialogue, identify priority areas for change, and point to good practices across nations that can foster an enabling environment for sustainable energy. The RISE pilot report covered 17 developed and developing countries and was launched in November 2014.

- ***The Arab Future Energy Index (AFEX)*** is the first native Arab index dedicated to monitoring and analyzing sustainable energy competitiveness in the Arab region. AFEX offers both quantitative and qualitative analysis for key RE and energy efficiency market dimensions. Countries are ranked under 30 indicators that illustrate key energy market aspects, including policies, institutional and technical capacities, strategies, socioeconomic data, and investments. AFEX is published annually and consists of two components: AFEX RE and AFEX Energy Efficiency. The latest edition (2013) of AFEX Energy Efficiency index ranked 17 Arab nations and provided tailored recommendations for countries to help improve their transition towards sustainable energy pathways.

In India's context, a study carried out by Prayas Energy Group had performed assessment of state-level initiatives on DSM front. The study reviewed utility-driven DSM activities, DSM regulations or directives by state commissions, and DSM-related planning in eight States: Andhra Pradesh, Delhi, Gujarat, Haryana, Karnataka, Maharashtra, Tamil Nadu, and West Bengal. Maharashtra, Gujarat, Andhra Pradesh, Karnataka, Tamil Nadu, Delhi, Haryana, and West Bengal.

Methodology

Aligning with the objective of the study, which is to evaluate state-level energy efficiency implementation readiness under three broad areas or categories—(a) policies and incentives, (b) market maturity, and (c) institutional strength—this study adopts a set of 11 readiness factors that are assessed by applying a suite of evidence indicators that are both qualitative and quantitative. The qualitative evidence indicators capture whether a specific policy, mandate, incentive, institution, financing mechanism, or other characteristic exists under each of the readiness factors. The quantitative evidence indicators aim to assess the energy efficiency potential already unlocked and also reflect the current progress towards implementing key energy efficiency measures or programs recognizing that the states having prior implementation experience would be better prepared to scale the intervention. Appendix A provides an overview of the selection approach for the different evidence indicators.

These 11 factors and corresponding evidence indicators are chosen so that the assessment becomes comprehensive yet simple and analytical, and that it appropriately reflects the states' readiness performances in the context of their role in the existing energy efficiency governance framework, growing market-based opportunities, and overall national policy environment. This approach will allow meaningful comparative analysis and benchmarking among the states. The 11 factors considered for the evaluation are presented in Table 5. These are further broken down into 77 evidence indicators for appropriate depiction of energy efficiency implementation readiness at the state level (refer to Table 6).

Table 5: Readiness Factors Chosen for Establishing the "Energy Efficiency Implementation Readiness Index"

Policy and incentives	Market maturity	Institutional capacity
• Sector-specific action plan for scaling up energy efficiency efforts • Mandates for utilities to invest in energy efficiency • Mandates for public institutions to invest in energy efficiency • Incentives for MSMEs to invest in energy efficiency • Incentives for large-scale users (industry or commercial) to invest in energy efficiency • Implementation of energy conservation building codes	• Information or tools available to consumers on electricity usage • Energy efficiency potential and implementation experience • Financing mechanisms available for energy efficiency investments	• Institutional framework and capacity • Monitoring and evaluation systems

Table 6: Evidence Indicators Applied under the Three Broad Categories and Eleven Factors

I. Policies and incentives

(i) Sector-specific action plan for scaling up energy efficiency efforts

Is there legislation, policy, or sector-specific action plan that aims to improve energy efficiency?

Is there a quantified energy efficiency goal or target (such as kWh/toe saving)?

(ii) Mandates for utilities to invest in energy efficiency

Are state utilities required to carry out energy efficiency activities in the following areas?

- Generation
- T&D
- Demand side

Are there penalties for noncompliance with energy efficiency requirements?
- Generation
- T&D
- Demand side

Are DSM regulations notified for state utilities?

Are there guidelines on evaluation of cost-effectiveness and measurement and verification (M&V) of utility-driven DSM measures?

Are the utilities required to establish in-house DSM cells?

Does the selected utility provide customers incentives for demand response, such as peak-time rebates?

Are utilities required to submit an IRP to the regulators?

(iii) Mandates for public institutions to invest in energy efficiency

Are there obligations for procurement of energy efficiency end-use applications for the following?

- Public buildings
- Municipalities (includes water supply, waste water services, and streetlighting)
- State road transport corporation

Is the Energy Conservation Award given at the state level?

(iv) Incentives for MSMEs to invest in energy efficiency

Are there energy efficiency incentives for MSMEs?

Is there a program offering assistance to MSMEs to identify energy savings investment opportunities?

(v) Incentives for large-scale users (industry/commercial) to invest in energy efficiency

Are there energy efficiency incentives for large-scale energy consumers?

Is there a program offering assistance to large-scale energy consumers to identify energy savings investment opportunities?

(vi) Implementation of ECBCs

Status of adoption of ECBC

- Notification issued
- Amended

Are there energy efficiency codes for the following building types?

- New residential buildings
- New commercial buildings

Are building renovations required to meet a building energy efficiency code?

- Residential
- Commercial

Is there a standardized labeling scheme or rating system (certification) for qualifying the energy performance of buildings (such as LEED/GRIHA/BEE star labeling)?

Are owners of commercial and residential buildings required to disclose property energy usage at the point of sale or when leased?

Are commercial and residential buildings required to disclose annual property energy usage?

Are there incentives for individual buildings to meet high-quality energy efficiency certifications?

II. Market maturity

(vii) Information or tools available to consumers on electricity usage

Do customers receive a bill or report that shows their energy usage compared to previous bills or reports over time?

- Domestic
- Commercial
- Industrial

Do customers receive a bill or report which compares them with other users in the same region and/or usage class?

- Domestic
- Commercial
- Industrial

Does the utility offer customers access to the following:

- Real-time feedback on energy usage (for either prepaid or post-paid systems)
- Ability to manage energy usage levels remotely (through apps or other technology mediums that can track real-time energy usage)

(viii) Energy efficiency potential and implementation experience

Has the state implemented utility driven domestic LED program?

Has the state implemented utility driven DSM program to replace old agricultural pumps with BEE star-rated pumpsets?

Have the state municipalities adopted a program of installing LED lighting technology for streetlighting applications?

Has the state implemented a domestic energy-efficient fan program?

Has the state nodal agency implemented a solar irrigation pump program?

To what extent have the state utilities been successful in driving the adoption of LED self-ballasted lamps among households?

To what extent have old agricultural pumps been replaced with BEE star-rated pumpsets through a utility-driven DSM program?

To what extent have the state municipalities been successful in driving the adoption of LED lighting technology for streetlighting applications?

To what extent have the state utilities been successful in driving the adoption of BEE 5-star–rated fans among households?

To what extent has the state nodal agency been successful in installing solar irrigation pumps?

Level of T&D loss (%)

Level of peak power deficit (%)

Level of power deficit (%)

(ix) Financing mechanisms available for energy efficiency investments

Are the following financial mechanisms available for energy efficiency activities?
- State Energy Conservation Fund (SECF)

- Capital subsidy for energy efficiency programs

- On-bill financing/prepayment

- Credit lines with banks for energy efficiency activities

- Energy services agreements (pay-for-performance contracts)

- Partial risk guarantees

- Cost recovery through annual revenue requirement (ARR) or tariffs

- DSM funds created by levy or cess or any notification in this regard

- Others

III. Institutional capacity

(x) Institutional framework and capacity

Are entities set up to do the following?
- Setting up a state energy efficiency strategy or policy. Do they have the sole mandate of promoting energy efficiency?
- Regulating energy efficiency activities of energy suppliers
- Regulating energy efficiency activities of energy consumers
- Regulating equipment energy efficiency standards
- Enforcing and certifying compliance with building energy efficiency standards

(xi) Monitoring and evaluation systems

Are energy savings or other target indicators measured to track performance in meeting energy efficiency requirements?

- Generation
- T&D
- Demand side

Are the requirements measured or validated by independent third parties?

- Generation
- T&D
- Demand side

Does the regulator track utilities' compliance with directives for providing energy usage information to customers?

Are load research studies conducted by the utilities to plan DSM programs?

Has the SDA developed an empanelment mechanism for energy consultants and auditors?

Does the notified ECBC directive specify a system for compliance with the building energy efficiency codes?

Is the ECBC compliance verified by independent third parties?

As discussed earlier, both qualitative and quantitative evidence indicators are adopted to capture and evaluate the current status and progress of the readiness factors. All the evidence indicators considered under "Energy efficiency potential and implementation experience" are quantitative. All other remaining evidence indicators across the 10 different readiness factors are qualitative. For the sake of maintaining simplicity and objectivity in the evaluation, most of the evidence indicators are structured as questions with simple "Yes/No" alternatives.

Index-based assessment against each evidence indicator is done on a scale of 0 to 1. A state is awarded a score of 1 against an evidence indicator when a qualifying activity is recorded in the state on that front, or else it gets a 0. In some cases, for example, when an energy efficiency regulation, policy, or action plan is found to be in the process of development, in the draft stage or yet to be notified, the state is awarded a score of 0.5.

Evidence indicators that represent quantitative performance (such as the extent of distribution of LED lamps among households) are normalized to compare states on a level playing field irrespective of their size, and scaled between 0 and 1. The distance to frontier approach is adopted, where the frontier represents the best performance by any state observed against that evidence indicator.

All evidence indicators are scored between 0 and 1 and aggregated with equal weights. While each factor can have a different number of evidence indicators, the latter holds equal weight and the indicators are aggregated to form the factor score. One may construe that the number of evidence indicators in each of the readiness factor becomes an inherent weight for that factor in estimating the overall index for the state. In this regard, the states with higher index values are deemed to be able to fare better than other states.

In addition, this exercise expresses factor-wise or category-wise scores of individual states in percentages, which will reflect the progress of the states in specific areas as well as overall.

As with any index-based benchmarking exercise, this evaluation also heavily depends on data or information. Most of the information or data used for the assessment of states against evidence indicators has been sourced from publicly available sources. None of the information collected or compiled for the purpose of this report is vetted by state government officials. Information related to state legislation, policies, regulations, directives or schemes and programs has been checked on the websites of competent authorities, which include state-designated agencies (nodal agency for energy efficiency in a state) and state electricity regulatory commissions. Relevant data related to given energy efficiency programs are collected from reliable databases in public domain. Data on sector parameters are sourced from flagship reports or central information repositories of the Government of India. All these sources are so chosen that the furnished information or data are authentic.

For maintaining consistency while assessing the states' readiness, the exercise has considered states' actions recorded until December 2015 unless otherwise mentioned in the report.

Caveats

Domestically, this is a significant and first-of-its-kind effort that aims to benchmark the readiness of all the Indian states for advancing energy efficiency implementation. With no precedence of such evaluation, the study has its own share of challenges and imperfections.

The readiness factors and corresponding evidence indicators chosen for benchmarking under this study may not be comprehensive in all aspects to reflect the readiness of states for advancing energy efficiency implementation. Moreover, the current structure of readiness index builds on the hypothesis that it is important to accelerate energy efficiency implementation by way of enforcing regulatory compliance, building institutional capacity, creating self-sustaining policy driven markets and attracting investments. While this may be true, there are several other factors that may drive the implementation of energy efficiency measures and actions within states and therefore that may be relevant for consideration in building a more comprehensive readiness index. It is envisaged that this benchmarking exercise will be updated at least once every two years to sustain the objectives and outcomes. The future editions of this report can gradually build the readiness index into a more comprehensive one, considering all facets of energy efficiency implementation drivers within the control of states.

Some of the readiness factors and indicators that can be considered for future index building are listed below:

1. The political environment.
2. Coordination and cooperation with national and federal policies and institutions.
3. Access to energy efficient technologies.
4. Energy efficiency services market.
5. Cross-cutting factors relevant for attracting energy efficiency investments (such as energy price or tariff and level of subsidies).
6. The budget allocated for energy efficiency promotion (as % of total State budget).
7. The budget allocated for energy efficiency awareness and training programs (as a percentage of the total energy efficiency budget).
8. The energy-saving potential unlocked through successful pilots by utilities and other state authorities (such as state road transport corporations and municipalities).
9. The energy-saving potential unlocked from energy audits.
10. The human resource capacity available with the state authorities for energy efficiency governance and implementation.

Furthermore, 90% of the readiness factors and the corresponding evidence indicators considered for comparative benchmarking of states are qualitative in nature and reflect the current status of policy, institutions, and market maturity. Only 10% of the readiness factors are quantitative in nature. They reflect the potential for energy efficiency and also the performance towards implementation of energy efficiency actions in the states. At this early and nascent stage of energy efficiency evolution among most of the Indian states, the current mix of readiness, potential, and results-oriented indicators may be acceptable; this mix best reflects the

state's energy efficiency readiness. However, as the scenario evolves, it is important that the future iterations of this benchmarking exercise increases the share of performance-driven factors in order to reflect the readiness of Indian states in the best way possible.

It is also important to note that the states with higher readiness index than others may not always achieve greater progress towards implementation. This is simply because there are multiple factors that affect private and public investment decisions, many of them outside the immediate control of authorities, private sector, and other stakeholders.

Another key challenge is the availability of updated and latest information to periodically update the readiness index and make it more comprehensive. Most of the information used for the assessment of evidence indicators in this report has been sourced from publicly accessible sources, including laws, regulations, public documents, and existing databases. None of the information collected and compiled for the purpose of this report has been vetted by state government officials.

4. Readiness Assessment of States

This chapter examines the state-level energy efficiency readiness under 11 readiness factors with the help of index-based evaluation framework. The index-based scores of the states against each evidence indicator and their resulting factor scores are presented in Appendix B.

Sector-Specific Action Plan for Scaling Up Energy Efficiency Efforts

The following subsections provide details of the assessment and its outcome under this readiness factor.

Significance of the Readiness Factor

Planning represents the visions of governments translated into time-bound targets, actions, and milestones. Clearly articulated sector-specific actions and targets are important ingredients of an enabling ecosystem for energy efficiency implementation. Planning helps in setting a direction for all stakeholders to align their decision making. Action plans backed by legislation show the commitment of the government towards achieving energy efficiency goals.

Targets help in motivating implementing agencies to be more proactive and to measure the progress of the energy efficiency initiatives. Targets also provide a basis for long-term energy efficiency programs and provide justification for obtaining funding. For targets to be useful in measuring progress, they should be supported by a strong analytical base, high-quality data, and a transparent measurement procedure. Targets can be expressed in different ways while keeping in mind the SMART principles: specific, measurable, ambitious, realistic, and time-bound. Sector and subsector level targets are the most effective, since they are more focused. Targets must be quantified, and they should reflect the intended change from the baseline situation. In this regard, a core task of indicative target-setting for energy efficiency is a precise calculation of the baseline consumption.

Following are the key elements of a successful energy efficiency action plan:

- Baseline assessment: Energy consumption disaggregated among various economic sectors and energy sources and fuels.
- Assessment of energy efficiency and conservation potential: Disaggregated among sectors and energy sources and fuels.
- Assessment of short- and long-term targets, goals, and performance indicators: Disaggregated among sectors.
- Sector-specific action plan to achieve desired goals.
- Resource (human and financial) assessment to meet desired goals.
- Monitoring and evaluation framework.

Indian states pursuing energy efficiency on a mission mode are expected to progress faster and more effectively. This is also advocated in the national legislative framework for energy efficiency (EC Act 2001).

A state that has formulated sector-specific policy or an action plan, along with quantified energy savings targets, is expected to score full marks. States that have not taken any of the measures will obviously score nil.

Answers to the following questions yield the evidence indicators evaluated under this factor:

- Is there legislation, policy, or a sector-specific action plan that aims to improve energy efficiency?
- Is there a quantified energy efficiency goal or target (such as kWh/toe saving)?

Outcome of Index-Based Evaluation

About 14 states have officially adopted sector-specific energy efficiency action plans. Most of these states have included the energy efficiency action plan as part of the State's Action Plan on Climate Change (SAPCC). Andhra Pradesh has developed an energy efficiency action plan as part of the Power for All program recently launched by the Government of India. None of the states have enacted legislation backing the energy efficiency action plan.

Karnataka and Kerala are the only states that have identified energy savings targets. However, these targets are yet to be officially adopted. Some other states have mentioned energy-saving potential without setting any target to achieve it.

Mandates for Utilities to Invest in Energy Efficiency

The following subsections provide details of the assessment and its outcome under this readiness factor.

Significance of the Readiness Factor

Electricity utilities are at the center of energy efficiency delivery systems in India. The collective potential of utilities to improve energy efficiency both at supply and demand sides is enormous. The quintessential approach to capture this potential is by regulating the energy efficiency activities of utilities with clear and unambiguous mandates.

Worldwide experience shows that several countries (for example, Australia: New South Wales; Canada: Ontario; China; Italy; Poland; the United Kingdom; and the United States: California) have mandated some form of quantified energy efficiency improvement targets for energy utilities, enforced by laws and regulations with the threat of financial penalties. In the United States, compliance with such mandates is poised to be the primary driver for the increase in utility spending for energy efficiency programs through 2025.[12]

Similarly for Indian states, utility mandates for energy efficiency will significantly enhance the readiness for large-scale implementation.

Evidence indicators considered for evaluation of the readiness index in the above context are mentioned in Table 7.

Table 7: Evidence Indicators for Evaluating the Readiness Index Factor, "Mandates for Utilities to Invest in Energy Efficiency"

Are state utilities required to carry out energy efficiency activities in the following areas? - Generation - T&D - Demand side
Are there penalties for noncompliance with energy efficiency requirements? - Generation - T&D - Demand side
Are DSM regulations notified for state utilities?
Are there guidelines on evaluation of cost effectiveness, measurement & verification (M&V) of utility-driven DSM measures?
Are the utilities required to establish in-house DSM cells?

[12] The future of utility customer–funded energy efficiency programs in the United States: Projected spending and savings to 2025; Ernest Orlando Lawrence Berkeley National Laboratory, 2013.

Does the selected utility provide customers incentives for demand response, such as off-peak time rebates?

Are utilities required to submit an IRP to the regulators?

Outcome of Index-Based Evaluation

The findings of the assessment have been presented under each evidence indicator applied.

Stipulating State Utilities to Carry Out Energy Efficiency Activities in Generation, T&D, or Demand Side

The EA, 2003, allows SERCs to bring necessary regulations in power generation, transmission, distribution, and trading. The EA also empowers SERCs to advise the state governments on matters related to *promotion of efficiency in activities of the electricity industry*. This index-based assessment intends to find out whether state utilities are carrying out energy efficiency activities in their operations. As far as energy efficiency in power generation is concerned, in few states, SERCs are found to direct thermal power generators to improve efficiency in the form of reducing station heat rates (SHRs). The electricity regulatory commissions in Delhi, Gujarat, Karnataka, Rajasthan, and Tamil Nadu are the notable ones that have set targets through generation tariff orders to the state utilities to achieve certain SHRs.

Regarding energy efficiency intervention in power T&D, SERCs in all states have given targets or issued directives to utilities to reduce T&D losses in power distribution. The regulators have also extended incentives for utilities to achieve the targets. For example, Delhi Electricity Regulatory Commission (DERC) has included incentives in the form of additional return on investment (ROI) in the retail tariff orders if the distribution companies (DISCOMs) surpass the T&D loss targets.

DSM, a promising frontier to improve energy efficiency in the power sector, has attracted certain initiatives at the state level. As of April 2016, 19 states have notified DSM regulations, which establish a framework for undertaking DSM measures. However, this does not necessarily imply that the DISCOMs in these states are obligated to implement DSM measures. There should be directives from SERCs to the DISCOMs to implement DSM measures. Alternatively, in the absence of a DSM regulation, SERCs can require a DISCOM to take necessary action against the DSM, which may include ToD tariff as a demand-side response. Andhra Pradesh deserves special mention in this regard. In spite of the absence of any notified DSM regulation, the state has witnessed several utility-driven DSM measures, thanks to the initiatives taken by the state regulator and DISCOMs. Up to now, none of the state DSM regulations specify any energy savings targets through utility-driven DSMs or offer any incentive to DISCOMs to take DSM measures. The regulations only allow provisions for DISCOMs to recover the DSM-related costs in their accounting by including them in the ARR estimates.

In this scoring exercise, states that have directives to implement DSM measures, including ToD, are considered for scoring.

Awarding Penalties for Noncompliance with Energy Efficiency Requirements

It is found that in states where SERCs give energy efficiency targets to utilities with respect to power generation and T&D, those targets are usually associated with some kind of penalty mechanism in the case of noncompliance. For instance, SERC considers the target level of T&D loss in estimating the ARR for the DISCOM, even though the latter could not achieve the target. This implies that a part of the power purchase cost for the volume of electricity lost in T&D is not accounted for in the ARR, which is therefore a loss of revenue to the DISCOM. A similar penalization mechanism is followed if the utility is given a target at the generation side. However, such a penalty mechanism is not universally applicable across all states.

Alternatively, since DISCOMs do not have a DSM-based energy savings target, the question of penalty for noncompliance does not arise.

Notification of DSM Regulations in States

DSM initiatives have gained traction in the states in recent years. As of April 2016, 19 states have announced DSM regulations that establish a framework for undertaking DSM measures. Few other states have published draft regulations. Figure 8 depicts the states where the DSM regulations have become effective.

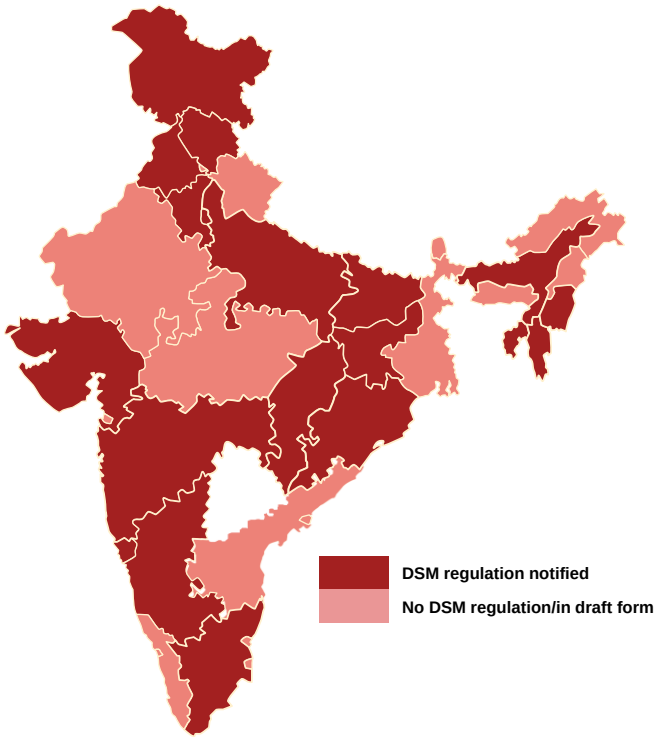


Figure 8: Status of DSM Regulations in the States, as of April 2016

Guidelines on the Evaluation of Cost-Effectiveness and M&V of Utility-Driven DSM Measures

DSM is at a nascent stage of development in the country. Currently, Maharashtra and Punjab are the only states in the country that have guidelines on the evaluation of cost-effectiveness or the M&V of DSM measures. Maharashtra is the first state to so implement them.

Directive to Establish In-House DSM Cells

The Government of India launched a scheme for capacity building of distribution licensees in an effort to mainstream DSM activities in their operation. In this regard, 30 DISCOMs across 21 states were selected under this program. Under this program, the DISCOMs were required to establish in-house DSM cells. The current assessment has awarded score against this evidence indicator to those states. Moreover, DSM regulations in certain states have also stipulated that DISCOMs to set up DSM cells.

Providing Customer Incentives for Demand Responses

A review of the retail tariff orders indicates that in almost all states, the tariff structures include off-peak time rebates or ToD tariffs as an instrument to reduce peak load. However, currently, such a tariff rebate is applicable only for industrial consumers.

Some special-category states, namely, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, and Sikkim, do not have such provisions in their retail tariffs.

Directive to Submit an IRP to the Regulators

IRP is a long-term utility plan for meeting forecast annual and peak energy demand, plus some established reserve margin, through a combination of supply-side and demand-side resources over a specified future

period. International experience suggests that mandating utilities to adopt IRP is one of the important enabling factors for driving utility-driven DSM programs in a country. IRP has been practiced in the United States for more than 25 years through state legislation and regulatory oversight.

However, none of the existing national policies, acts, or regulations in India (read EC Act 2001; EA 2003; or National Electricity Policy 2005) has given thrust on mandating utilities to adopt IRP in their investment plans. Recently, the National Renewable Energy Act (2015), which is currently in draft form, has put emphasis on the need to move towards IRP. It also provides the following definition for the same.

Section 3 of the draft RE Act—Definitions: IRP is a strategic plan for securing reliable and cost-effective energy resources. The plan is an exhaustive, research-based examination of potential risks and opportunities in procuring future energy supplies. Such a planning exercise does the following:

- Examines all available energy resource options, including supply-side, as well as demand-side, options.
- Makes a thorough, objective assessment of the benefits, co-benefits, direct and indirect costs, cost of externalities, and risks associated with each energy option.
- Evaluates all resources to maximize energy, as well as environmental and economic security.

Section 14 of the draft RE Act proposes the development of long-term vision for IRP as one of the functions of the National Renewable Energy Advisory Group, proposed to be established to advise the central government on the effective implementation of this act. However, there is no explicit consideration of demand-side resources in the main body of the proposed act. In the absence of a policy, legislative or regulatory push, or adoption of IRP by utilities in India is yet to be formalized. State-level initiatives in the form of directives to utilities to submit IRP is not seen either.

Mandates for Public Institutions to Invest in Energy Efficiency

The following subsections provide details of the assessment and its outcome under this readiness factor.

Significance of the Readiness Factor

Adoption of new alternatives with high upfront costs by the public, although far better in performance, is a challenge. However, when a government takes a stake in the use of these options, it often sends a positive signal to the public for adopting them. In the case of promoting energy efficiency, the government at the center has adopted a similar approach. To set a precedence, the Ministry of Finance, Government of India, has issued a notification directing all central government departments, ministries, and attached and subordinate offices to ensure that all the procurement of the specified product categories (shown in Table 8) must carry the threshold BEE star rating indicated against them, or higher.[13] However, such mandates should not be limited to central public institutions only. The state governments should follow suit by notifying the public institutions under their jurisdiction to procure energy-efficient appliances or equipment for their use (such as efficient lights and star-rated appliances).

Table 8: Specified Threshold Star Ratings for Select Appliances for Public Procurement

Appliance	Threshold star rating
Split ACs	Five star (under normal conditions where annual usages are expected to be more than 1,000 hours) Three star (where the usage of air conditioning is limited, such as in conference rooms)
Frost-free refrigerators	Four star
Ceiling fans	Five star
Water heaters	Five star

Apart from this, plenty of other opportunities exist for the state governments to promote energy efficiency, such as advocating fuel economy in public vehicles and instituting energy conservation awards. This scorecard matrix evaluates the states against these metrics as well. Table 9 highlights the evidence indicators employed here.

Table 9: Evidence Indicators for Evaluating the Readiness Factor, "Mandates for Public Institutions to Invest in Energy Efficiency"

Are there binding obligations for procurement of energy efficiency applications for the following?

- Public buildings
- Municipalities (includes water supply, waste water services, and streetlighting)
- State road transport corporation

Is the Energy Conservation Award given at the state level?

Outcome of Index-Based Evaluation

The findings of the assessment have been presented under each evidence indicator applied.

[13] Office memorandum no. 26/6/12-PPD dated January 21, 2013, issued by the Ministry of Finance.

Obligations for Procurement of Energy-Efficient Applications for Public Buildings and Municipality and State Road Transport Corporation Services

The index-based evaluation finds that in 15 states, the governments have issued circulars regarding the procurement of star-rated appliances—split ACs, frost-free refrigerators, ceiling fans, and water heaters—for use in public buildings. States where such circulars have not been traced have failed to score under relevant sub-indicator. Few states have made it mandatory for municipalities to take energy efficiency measures in their services. For instance, the Government of Himachal Pradesh has directed all ULBs in the state to install energy-efficient streetlighting. The study also found that none of the states have made it mandatory for state road transport corporations to improve fuel economy in public vehicles.

Instituting the Energy Conservation Award

Instituting an award for energy conservation efforts is an effective way to promote energy efficiency. Although the annual National Energy Conservation Awards instituted by the BEE have been presented since 1999, similar initiatives are found only in eight states, which include Chhattisgarh, Haryana, Jharkhand, Kerala, Maharashtra, Punjab, Rajasthan, and Uttarakhand. They have constituted the state energy conservation awards.

Incentives for MSMEs to Invest in Energy Efficiency

The following subsections provide details of the assessment and its outcome under this readiness factor.

Significance of the Readiness Factor

MSMEs play a pivotal role in the economic and social development of the country, often acting as a nursery of entrepreneurship. The MSME sector contributes significantly to the country's manufacturing output, employment, and exports. At present, MSMEs account for about 45% of India's manufacturing output and 40% of India's total exports, and MSMEs have the highest employment growth rate. Despite this, MSMEs lack modernization, which is reflected in the efficiency of energy use. Considering the potential of the sector, the Government of India has set its focus on the upgrading technology in this sector. BEE has taken certain initiatives in this regard, which include conducting situation analysis of 35 pre-selected MSME clusters, energy audit, and technology gap assessment in 25 clusters, and preparation of Detailed Project Reports (DPRs) on adoption of energy-efficient technologies.[14] These apart, the Small Industries Development Bank of India (SIDBI) has obtained a line of credit from the Japan International Cooperation Agency (JICA) for financing energy efficiency projects in MSMEs. The financial assistance is channelled through SIDBI, as well as through refinance to banks or state finance corporations (SFCs) and nonbanking financial institutions. However, to expand the reach of such initiatives, support at the state level is necessary.

Recognizing this fact, the evaluation framework employs the following evidence indicators to assess the states' readiness for scaling up energy efficiency drives in the MSME sector:

- Are there energy efficiency incentives for MSMEs?
- Is there a program offering assistance to MSMEs to identify energy savings investment opportunities?

Outcome of Index-Based Evaluation

The assessment reveals that initiatives to encourage energy efficiency among MSMEs are very limited. These initiatives may include giving fiscal incentives for investing in energy efficiency, recognizing selected MSMEs for their energy-saving efforts, and offering assistance to identify energy efficiency opportunities. For instance, Kerala has launched the Kerala State Energy Conservation Fund Credit Guarantee Scheme for energy efficiency projects under which MSMEs can make use of collateral security-free loans for investing in energy efficiency. However, it could not be ascertained whether the scheme is still in effect. Another key promotional initiative taken by these states is to publicly recognize MSMEs for their energy savings through the state energy conservation awards. They also publicize the energy savings realized by the awardees. However, this initiative

[14] Retrieved from http://sameeeksha.org/pdf/bee_sme.pdf.

has not been considered in the scoring framework to avoid duplicity, since there is already an evidence indicator to account the states' action on energy conservation award.

Few states, such as Andhra Pradesh, Gujarat, Karnataka, Kerala, Maharashtra, Punjab, and Tamil Nadu, reportedly have energy efficiency investment promotion schemes for MSMEs. One of the initiatives is conducting walkthrough energy audits and preparing feasibility studies for certain MSME clusters for identifying energy efficiency opportunities. Few states also provide monetary assistance (subsidy for energy audit) to MSMEs to undertake energy audit exercises and/or prepare DPRs.

Incentives for Large-Scale Users to Invest in Energy Efficiency

The following subsections provide details of the assessment and its outcome under this readiness factor.

Significance of the Readiness Factor

Industries represent about 38% of India's final energy use,[15] and they consume around 45% of electricity generated in the country. It is quite evident that this sector offers significant opportunity to reduce energy consumption through energy efficiency interventions. Although the Government of India has introduced the PAT mechanism where large industrial and commercial energy consumers (DCs) are given energy intensity targets (toe/ton of production), quite a few industries or commercial entities are not included in the current PAT scheme (only 478 DCs have been considered). Empowered by the EC Act (section 18), the states are free to bring regulations on energy consumption standards in industries or the commercial sector. This can also act as a precursor for any future mandatory targets to these consumers under a national scheme.

Taking due consideration of the states' possible role to encourage energy conservation investments among large energy consumers, this index-based framework applies certain evidence indicators for the assessment as mentioned below.

- Are there energy efficiency incentives for large-scale energy consumers?
- Is there a program offering assistance to large-scale energy consumers to identify energy savings investment opportunities?

Outcome of Index-Based Evaluation

In India, one can see center-driven energy efficiency initiatives targeted at large-scale energy users, namely the PAT scheme. However, although section 18 of the EC Act includes provisions allowing states to devise any energy efficiency regulation for large-scale energy consumers, hardly any state governments have utilized them. Only Kerala and Maharashtra have offered some kind of financial incentives to these consumers for taking up energy efficiency activities. For instance, Kerala has launched an interest buy-down scheme for industrial and commercial entities, wherein the latter can avail loans for investing in energy efficiency projects at lower than standard commercial lending rates from financial institutions, with whom the state government has entered into an agreement to implement this scheme. However, it could not be ascertained whether the scheme is still being continued.

As far as recognizing energy conservation efforts of large energy consumers is concerned, the states that have instituted the state energy conservation awards have used the platform to publicly recognize the energy-saving efforts of these consumers. However, this initiative has not been considered in the scoring framework to avoid duplicity, since there is already an evidence indicator to account for the states' action on energy conservation award.

[15] Based on IEA's data on India's energy balance for 2013.
https://www.iea.org/statistics/statisticssearch/report/?country=India&product=balances.

Implementation of ECBCs

The following subsections provide details of the assessment and its outcome under this readiness factor.

Significance of the Readiness Factor

Residential and commercial buildings sectors, which together contribute 29% of India's total electricity consumption,[16] have witnessed a considerable rise in electricity consumption in recent years. The load from these sectors is expected to increase further, considering the Government of India's policy announcements, for example, "Housing for All" by 2022. Recognizing the need to improve energy efficiency in the buildings sector, following the provisions of the EC Act, the Government of India announced in 2007 the ECBCs for new commercial buildings[17] with a connected load of 100 kW or 120 kVA. However, this must be complemented by the individual states through amendment and notification of ECBC at the state level to suit local or regional conditions and needs.

Moreover, the state-notified ECBC should make it mandatory for the buildings to achieve a minimum energy performance standard under a rating and labeling program, such as BEE star labeling. This apart, energy efficiency certification systems, such as LEED and GRIHA, consider environmental norms, including energy performance, for rating and labeling of buildings. Since these labeling programs are currently voluntary, the states should incentivize builders to apply for energy labeling.

Considering the energy efficiency potential in the buildings sector, this index-based evaluation considers a set of evidence indicators for assessing the states' energy efficiency implementation readiness, as presented in Table 10.

Table 10: Evidence Indicators for Assessing the Readiness Factor, "Implementation of ECBCs"

Status of adoption of ECBC - Notification issued - Amended
Are there energy efficiency codes for the following building types? - New residential buildings - New commercial buildings
Are building renovations required to meet a building energy efficiency code? - Residential - Commercial
Is there a standardized labeling scheme or rating system for qualifying the energy performance of buildings (such as LEED/GRIHA/BEE star labeling)?
Are commercial and residential buildings required to disclose property energy usage at the point of sale or when leased?
Are commercial and residential buildings required to disclose annual property energy usage?
Are there incentives for individual buildings to meet high-quality energy efficiency certifications?

[16] *Source:* India Energy Security Scenarios 2047 – version 2.0, NITI Aayog. http://www.indiaenergy.gov.in/docs/demand.pdf

[17] Definition of commercial building according to the ECBC guideline of BEE: All buildings, except for multifamily buildings of three stories or fewer above grade and single-family buildings.

Outcome of Index-Based Evaluation

The readiness index result gives a fair impression of state-wise status of energy conservation policy thrust in the buildings sector. While the EC Act directs the states to amend the ECBCs and issue notification for enforcement, only six states[18]—Andhra Pradesh, Karnataka, Odisha, Punjab, Rajasthan, and Uttarakhand—have notified the ECBC, whereas 13 states have amended it, but are yet to announce it. In some cases, the ECBC directives include disclosure of building energy usage annually. However, currently no ECBC compliant building is reported in any of these states, and it is difficult to confirm the actual procedure followed to enforce the building code.

Moreover, none of the states have made it mandatory to submit a disclosure of the property's energy usage at the time of sale or leasing of building.

Some states (such as Andhra Pradesh, Karnataka, Odisha, Punjab, Rajasthan, and Sikkim)[19] have adopted an energy labeling or rating system (GRIHA or BEE star labeling) for building certification. Some states reportedly offer incentives in the form of tax concessions or additional free-of-cost floor area ratio (FAR) to GRIHA compliant buildings.[20] Few cities or ULBs (for example, Hyderabad in Andhra Pradesh; Pune, Pimpri, and Mumbai in Maharashtra; Jaipur in Rajasthan; Noida in Uttar Pradesh; and Kolkata in West Bengal) also give incentives to GRIHA-compliant buildings.

Information or Tools Available to Consumers on Electricity Usage

The following subsections provide details of the assessment and its outcome under this readiness factor.

Significance of the Readiness Factor

Insights into electricity usage go a long way in delivering end-use efficiency by way of operational and behavioral changes of consumers. Information depicting how much, when, and at what cost energy is consumed can help consumers make informed decisions to respond to price signals or other utility incentives, thereby increasing the overall capacity for DSM. Information pertaining to past and peer usage enables utilities and consumers to monitor, measure, and evaluate energy efficiency impacts in a transparent and reliable manner. It is not just the knowledge of electricity usage; control is also an important function to leverage vital information for acting timely upon demand-side measures.

This index-based evaluation exercise recognizes the usefulness of such practices and hence captures certain key industry best practices that can strengthen the readiness of states for scaling up energy efficiency measures.

Table 11 presents the evidence indicators used in evaluating this readiness factor.

Table 11: Evidence Indicators for Evaluating the Readiness Factor, "Information or Tools Available to Consumers on Electricity Usage"

Do customers receive a bill or report that shows their energy usage compared to previous bills or reports over time? - Domestic - Commercial - Industrial
Do customers receive a bill or report which compares them with other users in the same region and usage class?

[18] Union Territory of Puducherry has also notified ECBC.
[19] GRIHA: http://www.grihaindia.org/index.php?option=com_content&view=article&id=109
[20] In addition, multistory residential buildings having GRIHA or Indian Green Building Council (IGBC) certification are entitled to get fast-track environmental clearance.

- Domestic
- Commercial
- Industrial

Does the utility offer customers access to the following:

- Real-time feedback on energy usage (for either prepaid or post-paid systems)
- Ability to manage energy usage levels remotely (through apps or other technology mediums that can track real-time energy usage)

Outcome of Index-Based Evaluation

After reviewing the supply codes of the respective SERCs, 21 states are currently found to furnish electricity consumption details of previous months to the select consumer classes (domestic, commercial, and industrial). Such information is typically provided in the electricity bills or, in some states, this facility is made available online with restricted access to customers who can view past consumption in their accounts.

However, currently, none of the states inform the consumers about the electricity usage levels of peer groups or make any such comparison to benchmark usage levels. Also, there is no regulation that stipulates that utilities furnish such information by defining what constitutes peer groups and what indicators are to be adopted.

All the states are typically guided by the electricity supply codes that specify the standards and norms for providing electricity usage information to consumers. Only in few states do utilities provide additional information over what is stipulated in the supply codes to follow industry best practices and gain competitive advantages. However, in a majority of cases, the largest utilities in individual states have been considered for the assessment.

With regard to empowering consumers through smart features in power distribution, other than in Delhi,[21] the facility for real-time feedback to customers about their energy usage or managing consumption remotely is yet to be implemented beyond pilot project scale in the country.[22] Tata Power Delhi Distribution Ltd. has implemented automated demand response, which allows the DISCOM and the consumers to manage demand or consumption based on real-time feedback.

Energy Efficiency Potential and Implementation Experience

The following subsections provide details of the assessment and its outcome under this readiness factor.

Significance of the Readiness Factor

DSM is a promising frontier to improve energy efficiency in the power sector, especially in India's current scenario where imbalances in the power supply and demand have been a plaguing issue and traditionally been dealt with ad hoc measures like involuntary load-shedding. The resulting depleted grid voltage or frequency also puts at risk the stability of the grid system. This causes enormous problems and costs for both supply and the demand-side players, while also creating social unrest. This state of play of the Indian power sector makes the challenge of managing shortfalls in electricity supply indispensable for Indian utilities.

Demand-side measures effectively complement supply-side measures to mitigate such electricity crises by focusing on measures that deliver end-use energy savings. International experience suggests that utility-driven

[21] L. Philip (May 10, 2015). "Honeywell, Tata Power implement first ever automated demand response project," *The Economic Times*. Retrieved from http://articles.economictimes.indiatimes.com/2015-05-20/news/62413011_1_tata-power-delhi-distribution-tpddl-honeywell).
[22] Pilot-scale projects have not been considered in the evaluation.

DSM can be delivered within short gestation periods unlike the conventional sources (coal, gas, and hydro-based electricity generation systems). Also, the DISCOMs, serving end users, are uniquely positioned to deliver demand-side measures by virtue of their relationship with the end consumers. Because of these advantages, DISCOMs in India should adopt DSM measures to reduce load.

The current level of T&D loss (%), peak power deficit (%), and energy deficit (%) are the KPIs for tracking the operational performance of DISCOMs in power supply and distribution. In India, since power is a concurrent subject and most power DISCOMs are state-owned, the state governments play a major role in the decision-making of these DISCOMs. Hence, the aforesaid KPIs can be effectively employed as evidence indicators to evaluate the states on this front. While assessing the states, "distance to frontier" approach has been applied in such a manner that the states having high T&D losses or power deficits will score less than the states who have achieved lower losses or deficits.

One of the key institutions set up to tap the DSM potential across the country is EESL. Established in December 2009 under the aegis of the Ministry of Power, as a joint venture of four central public sector undertakings (PSUs)—that is, the National Thermal Power Corporation Ltd (NTPC), Power Grid Corporation of India Ltd (PGCIL), Power Finance Corporation Ltd (PFC), and Rural Electrification Corporation Ltd (RECL)—EESL aims at unlocking energy efficiency and the DSM market, and implementing large-scale demand-side energy efficiency projects, particularly in the public sphere, such as in municipalities, buildings, and agriculture. In most cases, EESL has entered into agreements with state DISCOMs or municipalities to implement large-scale DSM programs that include the Domestic Efficient Lighting Program (DELP)[23], Energy-Efficient Street Lighting Program, and Agricultural DSM Program (AgDSM). Recently, EESL launched the energy-efficient domestic fan program wherein BEE 5 star–rated fans are provided to households to replace old inefficient fans.

Implementation of solar-powered irrigation pumps is one of the key thrust areas of the Government of India to reduce agricultural load and improve network efficiency of DISCOMs. The Government of India has targeted the installation of 1 million of solar pumps primarily for irrigation[24] through state nodal agencies and the National Bank for Agricultural and Rural Development (NABARD). The central government provides a 30% capital subsidy to farmers for the installation of solar pumps through state nodal agencies, and state governments may also provide additional subsidy from their own funds.

Across all these initiatives, the active participation of the state governments is essential. Considering this fact, the scorecard intends to capture the progress of the states by employing evidence indicators related to the above-mentioned DSM programs. Table 12 showcases the evidence indicators applied in the present evaluation.

Table 12: Evidence Indicators for Assessing the Readiness Factor, "Energy Efficiency Potential and Implementation Experience"

Has the State Implemented Utility-Driven Domestic LED Program?
Has the state implemented utility-driven DSM program to replace old agricultural pumps with BEE star-rated pumpsets?
Have the state municipalities adopted a program of installing LED lighting technology for streetlighting applications?
Has the state implemented domestic energy-efficient fan program?
Has the state nodal agency implemented solar irrigation pump program?
To what extent have the state utilities been successful in driving the adoption of LED self-ballasted lamps among households?
To what extent have old agricultural pumps been replaced with BEE star-rated pumpsets through utility driven DSM program?
To what extent have the state municipalities been successful in driving the adoption of LED lighting technology for streetlighting applications?

[23] Now, it is renamed the UJALA Distribution scheme.
[24] The government has also included pumps for drinking water under the scheme.

To what extent have the state utilities been successful in driving adoption of BEE 5-star–rated fans among households?
To what extent has the state nodal agency been successful in installing solar irrigation pumps?
Level of T&D loss (%)
Level of peak power deficit (%)
Level of power deficit (%)

Outcome of Index-Based Evaluation

The findings of the assessment have been presented under each evidence indicator applied.

Distribution of LED Lamps among Households

The most significant achievement in scaling up demand-side energy efficiency through DSM is EESL's DSM-based DELP (UJALA Distribution scheme) that involves large-scale replacement of incandescent bulbs with self-ballasted LED lamps in the residential sector. As of May 6, 2016, 16 states have undertaken the DELP with varying degree of LED lamp penetration among consumers (refer to Figure 9). For instance, Andhra Pradesh has recorded distribution of nearly 19 million LED lamps which, when normalized with the state's population, will have achieved a penetration level estimated to be 0.22 LEDs per person, whereas Himachal Pradesh has witnessed distribution of about 6 million LEDs with a penetration extent of 0.87. All 16 of these states have been evaluated based on the distribution of LED lamps until May 6, 2016. It is worthwhile to mention that some states have carried out LED lamp distribution program with support from EESL under a separate scheme known as Institutional Distribution scheme, whereby institution-run public spaces (such as railway stations and colonies) have largely benefited. In this scorecard-based evaluation, these states have not been considered.

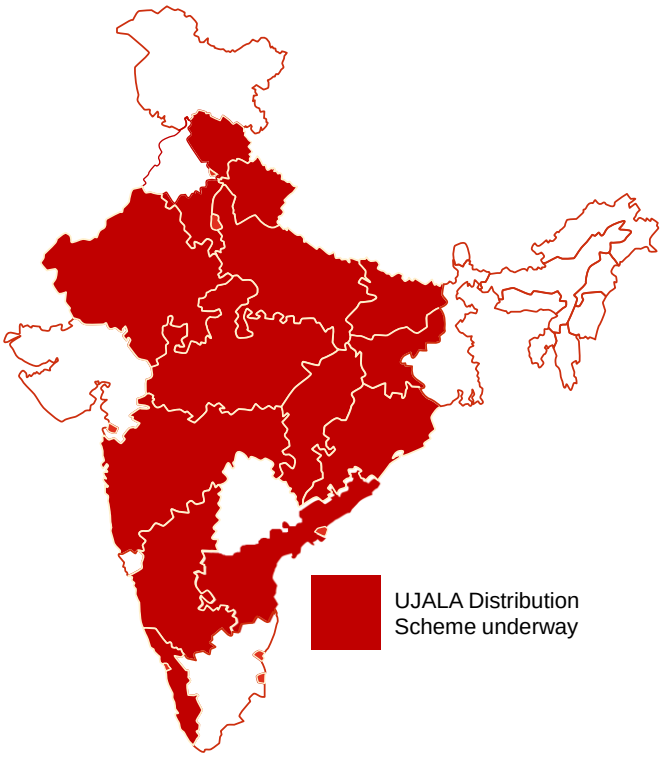


Figure 9: Status of UJALA Distribution Scheme in the States, as of May 6, 2016

Replacement of Agricultural Pumpsets with BEE Star–Rated Pumps through Utility-Driven DSM Programs

While performing the evaluation of the states against this evidence indicator, this study has taken into consideration those initiatives that have been undertaken post 2010 through utility-driven DSM programs whereby old inefficient agricultural pumpsets are replaced by BEE star-rated pumps. These states include Andhra Pradesh, Karnataka, Maharashtra, and Rajasthan. Andhra Pradesh has recorded replacement of 2,496 pumps as compared to 1,927 pumps in Karnataka, 3,530 pumps in Maharashtra and 1,966 in Rajasthan (as of February 2016). Gujarat has launched a subsidy scheme to encourage farmers to replace existing inefficient pumpsets with BEE star labeled ones.

Adoption of LED Streetlighting

Installation of LED streetlights is one of the prominent DSM measures for reducing the load from municipalities or public services. States that have undertaken this program include Andhra Pradesh, Chhattisgarh, Delhi, Gujarat, Jharkhand, Kerala, Maharashtra, Odisha, Rajasthan, Tripura, and Uttar Pradesh. Some of these projects are undertaken with assistance from EESL. Table 13 gives a snapshot of the projects conceived under EESL's Energy-Efficient Street Lighting Program.

Table 13: State-Wise Progress of EESL's LED Street Lighting Program, as of May 6, 2016

States	LED streetlights installed
Andhra Pradesh	337199
Delhi	183106
Kerala	4528
Maharashtra	659
Rajasthan	185208
Tripura	34200
Uttar Pradesh	17290

Other than the EESL-driven program, some states have also taken their own initiatives, including Kerala, Chhattisgarh, Gujarat, Jharkhand, and Odisha. Apart from these, certain cities are at different stages of implementing energy-efficient streetlighting programs, but are mostly limited to pilot scale, which are not considered for scoring purpose. Few other states have also in principle given approval of such energy-efficient streetlighting projects, such as in Karnataka.

Distribution of 5-Star–Rated Domestic Fans among Households

Recently EESL launched the energy-efficient domestic fan program, currently limited to two states: Andhra Pradesh and Uttar Pradesh. Until May 6, 2016, the program could realize distribution of more than 5,000 fans (BEE 5 star–rated) in Andhra Pradesh and about 1,000 fans in Uttar Pradesh.

Implementation of Solar Irrigation Pump Program by the State Nodal Agency

The state nodal agencies in nine states, with support from the Government of India, have started implementing the program. They are Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Karnataka, Madhya Pradesh, Rajasthan, Tamil Nadu, and Uttar Pradesh. Rajasthan has installed the maximum number of solar pumps, to the tune of 3,400 until January 31, 2016, out of 9,902 pumps sanctioned.

Status of T&D Losses and Power Deficits

Demand-side measures are one of the effective ways to improve operational performance of DISCOMs in power supply and distribution. T&D loss, peak deficit and energy deficit are the KPIs for tracking the performance. India's T&D loss is one of the highest in the world, estimated to be around 20%, with a wide variation between the states. Arunachal Pradesh, Bihar, Jharkhand, Nagaland, and Odisha reportedly have the highest T&D losses, more than 30%. On the other hand, Himachal Pradesh and Andhra Pradesh have achieved significantly low T&D losses.

Apart from T&D loss, peak power deficit and energy deficit are the two other major concerns in India's power distribution. Nation-wide average peak power deficit is to the tune of 3.2%. Only 10 states have recorded peak power deficits of zero in the last financial year.

It is worthwhile to mention that the Government of India and state governments have made progress in reducing the energy deficit, which is reportedly about 2.1% (in 2015-16). Goa, Gujarat, Madhya Pradesh, Punjab, and Sikkim have realized a zero energy deficit in the last financial year.

To revive the power DISCOMs and improve their operational efficiencies, the Government of India has launched the Ujwal DISCOM Assurance Yojana (UDAY) scheme. UDAY is expected to utilize the best principles of cooperative and competitive federalism in achieving its goals. UDAY is operationalized through a tri-partite agreement among the Ministry of Power, Government of India, State Government, and the DISCOM. Adopting UDAY is optional for states. Table 14 highlights the key features of the UDAY scheme.

Table 14: Salient Features of UDAY Scheme

Activity	Targeted Benefit
Compulsory feeder and distribution transformer metering by states	Ability to track losses at the feeder and distribution transformer level for corrective action
Consumer indexing and GIS mapping of losses	Identification of loss making areas for corrective action
Upgrade or change transformers and meters.	Reduced technical losses and minimized outages
Smart metering of all consumers consuming above 200 units per month	Reduced commercial losses; enable effective implementation and evaluation of DSM measures
DSM (LED bulbs, agriculture pumpsets, fans, ACs, and industrial equipment through PAT)	Reduced peak load and energy consumption
Quarterly tariff revision, particularly to offset fuel price increase, to be permitted	Reduced burden of rising power costs on DISCOMs
Assure increased power supply in areas of reduced Aggregate Technical & Commercial losses	Improved collection efficiency

It is yet to be seen how the states have fared in reducing the distribution losses and peak and energy deficits.

Scoring against the applied evidence indicators, the progress in implementation of energy efficiency projects has been evaluated based on normalization to compare the states on a level playing field irrespective of their size, and scaled between 0 and 1. The "distance to frontier" approach is adopted, where the frontier represents the best performance by any state observed against that indicator.

Financing Mechanisms Available for Energy Efficiency Investments

The following subsections provide details of the assessment and its outcome under this readiness factor.

Significance of the Readiness Factor

Investment potential in India's energy efficiency market is pegged at about 150,525 crore.[25][26] However, in current scenario, the market is largely starving of sufficient investments. High upfront costs and not-so-attractive financial returns (for example, longer pay-back periods) are considered to be the major barriers for investing in energy efficiency projects. In view of this challenge, the EC Act directs the states to constitute a fund for the purpose of promoting energy conservation in the states.

In recent times, several energy efficiency financing options or models are taking shape and have been tried worldwide. These include energy service performance contracting, on-bill financing, and partial risk guarantees. Recognizing the critical role of these evolving financing options for scaling up energy conservation efforts, this index-based readiness assessment includes a suite of evidence indicators to examine existing financial support frameworks for energy efficiency in the states (refer to Table 15).

Table 15: Evidence Indicators for Examining the Readiness Factor, "Financing Mechanisms Available for Energy Efficiency Investments"

Are the following financial mechanisms available for energy efficiency activities?
State Energy Conservation Fund (SECF)
Capital subsidy for energy efficiency programs
On-bill financing or prepayment
Credit lines with banks for energy efficiency activities
Energy services agreements (pay-for-performance contracts)
Partial risk guarantees
Cost recovery through ARR or tariffs
DSM funds created by levy or cess or any notification in this regard
Others

Outcome of Index-Based Evaluation

The evaluation outcome reflects that many states are yet to adequately consider energy efficiency in making fiscal policies. One can see a limited number of financial instruments applied in implementing energy efficiency measures. Financing energy efficiency measures through energy service contracts (ESCO model) is one of them, which is getting traction in recent years. Cost recovery through tariffs of utilities is also one of the preferred financing options. Here, expenditures incurred for adopting energy efficiency measures by the utilities are accounted in latter's ARR, as stated in their retail tariff orders.

According to the EC Act, 2001 the states are required to constitute the SECF for the purpose of overcoming the major financial barriers in implementing energy efficiency projects in the states. The SECF of each state must be formed from equal contributions of INR 4 crore from the state government and the BEE (with the exception of the north-east states). Most states have developed this fund for financing energy efficiency activities.

[25] PwC and Government of India estimates.
[26] A *crore* is a unit in the Indian numbering system equal to 10 million.

Few states (for example, Delhi, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, and Punjab) have capital subsidy schemes for energy efficiency projects. On-bill financing, a new breed of financing model for energy efficiency projects, has been tried in states like Delhi, Gujarat, Himachal Pradesh, Karnataka, Maharashtra, and Punjab for funding DSM-based DELP among households. Here, the costs of the LED lamps distributed to households are included in the monthly electricity bills of the consumers.

It is worthwhile to mention that Kerala reportedly launched an interest buy-down scheme and a credit guarantee program for energy efficiency project financing. Under the interest buy-down scheme, commercial entities interested to invest in energy efficiency can take advantage of credit at lower rates from selected banks. The credit guarantee program allows MSMEs to put to use collateral security free loans for investing in improving energy efficiency. However, it could not be ascertained whether these schemes are being continued.

Institutional Framework and Capacity

The following subsections provide details of the assessment and its outcome under this readiness factor.

Significance of the Readiness Factor

This study identifies five primary functional areas where institutional support is required at the state level for enhancing energy efficiency implementation readiness, in line with the provisions of EC Act, 2001. They include setting energy efficiency strategy and policy, regulating energy efficiency at the supply side (including distribution), as well as demand sides, setting equipment energy efficiency standards, and enforcing or certifying compliance with building energy codes.

The SDA constitutes the heart of energy efficiency governance system within a state in India. The structure and design of such an institution must be carefully considered and adapted to fit local needs. The choice of the SDA should reflect a state's priorities, and should align with energy efficiency objectives, policy implementation requirements, and many other factors. Strong leadership, dedicated and sufficient resources, financial independence, good external cooperation, and private sector involvement are the critical factors and core competences that contribute to successful functioning of an energy efficiency nodal agency.

Based on this understanding of required institutional framework in the Indian states, the following evidence indicators have been considered for evaluation under this factor (refer to Table 16).

Table 16: Evidence Indicators for Evaluating the Readiness Factor, "Institutional Framework and Capacity"

Are there entities for the following:
Setting up a state energy efficiency strategy or policy. Do they have the sole mandate of promoting energy efficiency?
Regulating energy efficiency activities of energy suppliers
Regulating energy efficiency activities of energy consumers
Regulating equipment energy efficiency standards
Enforcing or certifying compliances with building energy efficiency standards

States that have dedicated institutions for energy efficiency policy formulation and regulation can be regarded as frontrunners under this readiness factor.

Outcome of Index-Based Evaluation

The findings of the assessment have been presented under each evidence indicator applied.

Dedicated Entities for Setting State Energy Efficiency Strategy or Policy.

This evidence indicator captures whether the states have assigned entities for setting their strategies or policies on energy efficiency and, if at all, whether they have the sole mandate of promoting energy efficiency. In the current framework of energy efficiency governance, SDAs have been vested with the responsibility of formulating energy efficiency strategies or policies at the state level, as per the provisions of EC Act, 2001. It is interesting to note that the profiles of the SDAs vary greatly among the states. Out of the 34 SDAs, 14 are renewable energy development agencies, 9 are power departments of state governments, 6 are electrical inspectorate offices, 3 are electricity DISCOMs, and 2 are societies registered under the Societies Registration Act, 1860. Clearly, most SDAs have been given the mandate of energy efficiency governance as an additional mission/portfolio. This creates a sense of competition between the energy efficiency and other mainstream functions of the SDAs for internal resources.

Only the SDA of Andhra Pradesh's (State Energy Conservation Mission (SECM)) has been constituted[27] with the sole mandate of promoting energy efficiency in the state. The Energy Management Centre, Kerala's SDA, is also unique in this regard. Constituted[28] in 1996 as an autonomous body under the department of Power, Government of Kerala, its primary mandate includes promotion of energy conservation in the state. Nevertheless, the Kerala SDA does not qualify as an SDA with the sole mandate of promoting energy efficiency, considering its other activities like developing small hydropower. The sole mandate with the Andhra Pradesh SDA is expected to garner adequate resources without any competition for internal funds for advancing energy efficiency implementation in times to come.

Dedicated Entities for Regulating Energy Efficiency Activities of Power Suppliers

In the current framework of electricity governance (EA 2003), SERCs are vested with the authority to regulate power suppliers in the states. SERCs usually promote energy efficiency activities of DISCOMs through setting T&D loss reduction targets to or bringing DSM regulations for the DISCOMs.

Dedicated Entities for Regulating Energy Efficiency Activities of Energy Consumers

Having a broad mandate of promoting energy conservation in the states, SDAs are responsible for regulating energy consumption in the states. Apart from SDAs, SERCs serve a major role to regulate energy consumption by introducing DSM regulations or tariff-based incentives (ToD tariffs).

Dedicated Entities for Regulating Equipment Energy Efficiency Standards

As per section 18 of the EC Act, a state can exercise its power to direct the *regulation of the energy consumption standards for equipment and appliances*. However, Kerala is the only state that has exercised this power. It has issued the *Energy Conservation (Energy Consumption Standards for Equipment and Appliances) Directions, 2015*. Otherwise, this function is currently carried out by the BEE at the central level. For necessary country-wide regulation of the equipment energy efficiency standards, the active involvement of the states in this regard is vital.

Dedicated Entities for Enforcing and Certifying Compliance with Building Energy Efficiency Standards

While the EC Act, 2001, directs the states to amend the ECBC and issue notification for enforcement, only six states (Andhra Pradesh, Odisha, Punjab, Rajasthan, and Uttarakhand) have notified the ECBC. Although a system for enforcement should be an integral part of the notified ECBC, ECBC notification in Karnataka does not clearly designate any specific party for enforcement of the building energy codes. On the other hand, owing to unavailability of a gazette copy of the ECBC notification of Uttarakhand, it would not be possible to give them a score against this metric. In other states, in the absence of an ECBC notification, enforcing building energy efficiency standards does not arise. However, Kerala is the only state that has introduced energy efficiency standards for buildings (residential, commercial, and public) in spite of a pending ECBC notification. The announced *Energy Conservation (Energy Consumption Standards for Equipment and Appliances) Directions, 2015,* also spells out the compliance framework, including directing DISCOMs to act in the case of noncompliance.

[27] Society registered under the AP Societies Registration Act, 2001.
[28] Registered under the Travancore-Cochin Literary, Scientific and Charitable Societies Act of 1955.

Monitoring and Evaluation Systems

The following subsections provide details of the assessment and its outcome under this readiness factor.

Significance of the Readiness Factor

For successful enforcement of regulations, institutional framework alone may not be enough for ensuring compliance. It should be backed by appropriate compliance or enforcement mechanisms. Loopholes in the mechanisms often defeat the very objective of such regulations. For example, in spite of the stipulating energy efficiency targets to utilities in their generation, T&D or other business activities, real energy savings may not be achieved until and unless relevant indicators are measured and tracked. Similarly, enforcement of ECBCs warrants instituting an unambiguous and robust system for compliance. In both the aforesaid cases, lack of propriety and transparency in the functioning of the enforcing agencies can be damaging and can lead to mistrust among the stakeholders. This calls for engaging independent third parties for ensuring compliance.

Similar to enforcement, realizing the full energy-saving potential from energy efficiency solutions and programs warrants a holistic approach. The latter may entail a range of steps, from undertaking comprehensive studies to creating a self-sustaining system for stimulating energy efficiency efforts.

Taking into account the importance of readiness for enforcement or implementation of energy efficiency efforts, this evaluation study examines the states based on the following set of evidence indicators (refer to Table 17), which are chosen maintaining relevance with preceding factors.

Table 17: Evidence Indicators for Assessing the Readiness Factor, "Monitoring and Evaluation Systems"

Are energy savings or other target indicators measured to track performance in meeting energy efficiency requirements? - Generation - T&D - Demand side
Are the requirements measured or validated by independent third parties? - Generation - T&D - Demand side
Does the regulator track utilities' compliance with directives for providing energy usage information to customers?
Are load research studies conducted by the utilities to plan DSM programs?
Has the SDA developed an empanelment mechanism for energy consultants and auditors?
Does the notified ECBC directive specify a system for compliance with the building energy efficiency codes?
Is the ECBC compliance verified by independent third parties?

Outcome of the Index-Based Evaluation

The findings of the assessment have been presented under each evidence indicator applied.

Measuring Energy Savings or Related Indicators to Track Energy Efficiency Compliance of Utilities

In case SERC sets energy efficiency targets to utilities in power generation and T&D, the energy savings or related indicators, such as SHR and T&D losses, are measured and reported to SERC at the time of annual performance reviews.

With regard to energy savings from utility-driven DSM measures, the DISCOMs usually report deemed or expected energy savings from the implemented DSM measures based on certain M&V protocol. This study considers such reporting as evidence of energy savings measurement to track the usefulness of DSM measures. States that have implemented DSM-based DELP, LED streetlighting projects, or agriculture-DSM are considered for scoring against this metric.

Validation of Energy Efficiency Measurement by an Independent Third Party

Upon examining the tariff orders, it is found that an independent third party is not involved in validation of the energy efficiency measurement in any of the states. Regarding energy efficiency in power generation and supply by improving station heat rate and through the reduction of T&D losses respectively, DISCOMs are required to report necessary audited data to the SERCs for computing the losses. In case of energy savings through DSM, DISCOMs only inform the SERCs about the expected energy savings from implementation of a DSM measure. However, in some cases, validation of energy savings through DSM is conducted through surveys without any direct monitoring using energy meters.

Regulator Tracking Utility's Compliance with Directives for Providing Energy Usage Information to Customers

All the state utilities are typically guided by the electricity supply codes that specify the standards and norms for providing electricity usage information to consumers. Regulators track utilities' compliance according to the supply codes.

Load Research Studies by Utilities to Plan DSM Programs

Load research studies holds strategic importance as they help characterize the end-use electricity consumption, identify strategic demand side measures, and develop action plans to formulate and design possible DSM interventions. Load research studies are reportedly being carried out by one or more utilities in 23 states as of April 2016 (see Figure 10).

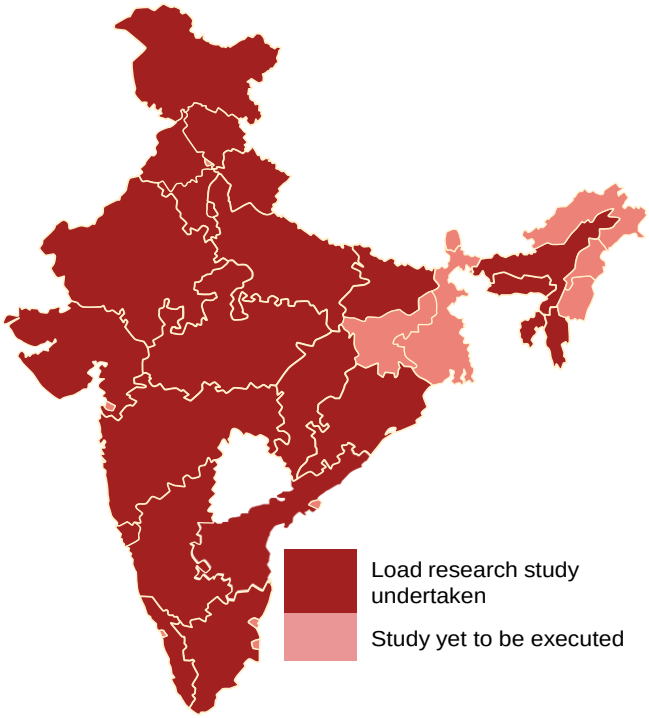


Figure 10: Status of Load Research Study across the States, as of April 2016

Empanelment of Energy Consultants or Auditors

Empanelling energy consultants or auditors is one of the important steps SDAs should take to create an ecosystem for scaling up energy conservation efforts in a state. This state-level assessment on energy efficiency implementation readiness has identified 12 states (Andhra Pradesh, Chhattisgarh, Delhi, Gujarat, Haryana, Himachal Pradesh, Kerala, Madhya Pradesh, Maharashtra, Odisha, Uttarakhand and Uttar Pradesh) that have adopted mechanisms for the empanelment of energy auditors. Other states do not have a publicized system for empanelling these players.

ECBC Directive Specifying a System for Compliance with Building Energy Efficiency Codes

The ECBCs notified by the states should clearly state the compliance or M&V protocol for proper enforcement. However, there are cases where ECBC directives lack clear-cut guidelines on compliance—the roles and responsibilities of the authorities involved are not clearly mentioned, which leaves plenty of ambiguity. Moreover, the compliance requirement that involves verification by independent third parties is not included in the ECBC directives in all the six states where ECBC has been notified.

Overall Outcome of Index-Based Evaluation

This evaluation study examines the energy efficiency implementation readiness of 28 states and the National Capital Territory of Delhi against a suite of evidence indicators under 11 different energy efficiency readiness factors. The latter is grouped under three broad categories: (a) policy and incentives (bi) market maturity, and (c) institutional capacity. This stratified approach leads to index-based scoring of individual states under 11 factors (taking into consideration how they fare against the evidence indicators), based on which the states are assessed under the three broad categories.

Tables 18–20 present the factor-wise index-based scores of the states, followed by their status in each of the three readiness categories.

Table 18: Index-Based Scorecard of the States for Policy and Incentives

States	Factors						Category
	State plan for energy efficiency (out of 2)	Mandates for utilities (out of 11)	Mandates for public institutions (out of 4)	Incentives to MSMEs (out of 2)	Incentives to large scale energy users (out of 2)	Implementation of ECBCs (out of 9)	Policy and incentives (out of 30)
Andhra Pradesh	1.0	4.0	1.0	1.0	0.0	6.0	13.0
Arunachal Pradesh	0.0	1.0	1.0	0.0	0.0	0.0	2.0
Assam	0.0	5.0	1.0	0.0	0.0	0.5	6.5
Bihar	0.5	6.0	0.0	0.0	0.0	0.5	7.0
Chhattisgarh	0.0	6.0	1.0	0.0	0.0	0.5	7.5
Delhi	0.0	8.0	1.0	0.0	0.0	0.5	9.5
Goa	0.0	3.0	0.0	0.0	0.0	0.0	3.0
Gujarat	1.0	8.0	1.0	1.0	0.0	0.5	11.5
Haryana	1.0	6.0	2.0	1.0	0.0	0.5	10.5
Himachal Pradesh	1.0	6.0	2.0	0.0	0.0	0.5	9.5
Jammu &	0.0	2.0	1.0	0.0	0.0	0.0	3.0

Kashmir							
Jharkhand	1.0	5.0	1.0	0.0	0.0	0.0	7.0
Karnataka	1.0	7.0	1.0	1.0	0.0	6.0	16.0
Kerala	1.0	4.0	2.0	2.0	1.0	0.5	10.5
Madhya Pradesh	0.0	5.0	0.0	0.0	0.0	0.5	5.5
Maharashtra	1.0	7.0	2.0	2.0	2.0	2.5	16.5
Manipur	1.0	2.0	0.0	0.0	0.0	0.0	3.0
Meghalaya	0.0	3.0	0.0	0.0	0.0	0.0	3.0
Mizoram	1.0	3.0	0.0	0.0	0.0	0.0	4.0
Nagaland	1.0	2.0	0.0	0.0	0.0	0.0	3.0
Odisha	1.0	6.0	2.0	0.0	0.0	5.0	14.0
Punjab	1.0	7.0	1.0	1.0	0.0	5.0	15.0
Rajasthan	0.0	7.0	3.0	0.0	0.0	5.0	15.0
Sikkim	0.0	2.0	0.0	0.0	0.0	1.0	3.0
Tamil Nadu	1.0	8.0	1.0	1.0	0.0	0.5	11.5
Tripura	0.0	6.0	0.0	0.0	0.0	0.0	6.0
Uttarakhand	1.0	5.0	1.0	0.0	0.0	3.0	10.0
Uttar Pradesh	0.0	6.0	1.0	1.0	0.0	2.5	10.5
West Bengal	1.0	4.0	0.0	0.0	0.0	2.5	7.5

Table 19: Index-Based Scorecard of the States for Market Maturity

States	**Factors**			**Category**
	Information or tools available to consumers (out of 8)	**Energy efficiency potential and implementation experience (out of 13)**	**Financing mechanisms for energy efficiency activities (out of 9)**	**Market maturity (out of 30)**
Andhra Pradesh	3.0	11.01	3.0	17.01
Arunachal Pradesh	3.0	2.20	3.0	8.20
Assam	3.0	2.38	2.0	7.38
Bihar	3.0	4.30	3.0	10.30
Chhattisgarh	3.0	6.31	3.0	12.31
Delhi	4.0	6.06	5.0	15.06
Goa	3.0	2.68	2.0	7.68
Gujarat	3.0	5.29	5.0	13.29

Haryana	3.0	3.62	4.0	10.62
Himachal Pradesh	3.0	4.99	4.0	11.99
Jammu & Kashmir	3.0	1.96	2.0	6.96
Jharkhand	3.0	4.67	2.0	9.67
Karnataka	3.0	7.34	5.0	15.34
Kerala	3.0	4.98	6.0	13.98
Madhya Pradesh	3.0	4.96	2.0	9.96
Maharashtra	3.0	6.79	5.0	14.79
Manipur	0.0	2.39	1.0	3.39
Meghalaya	0.0	2.39	1.0	3.39
Mizoram	0.0	2.37	1.0	3.37
Nagaland	0.0	2.29	1.0	3.29
Odisha	0.0	4.40	3.0	7.40
Punjab	3.0	2.74	4.0	9.74
Rajasthan	3.0	8.89	4.0	15.89
Sikkim	0.0	2.81	1.0	3.81
Tamil Nadu	0.0	4.34	3.0	7.34
Tripura	0.0	4.26	3.0	7.26
Uttarakhand	3.0	3.98	3.0	9.98
Uttar Pradesh	3.0	6.62	3.0	12.62
West Bengal	3.0	2.54	1.0	6.54

Table 20: Index-Based Scorecard of the States for Institutional Capacity

States	**Factors**		**Category**
	Institutional framework and capacity (out of 6)	**Monitoring and evaluation systems (out of 11)**	**Institutional capacity (out of 17)**
Andhra Pradesh	5.0	7.0	12.0
Arunachal Pradesh	3.0	2.0	5.0
Assam	3.0	3.0	6.0
Bihar	3.0	4.0	7.0
Chhattisgarh	3.0	5.0	8.0
Delhi	3.0	6.0	9.0
Goa	3.0	3.0	6.0
Gujarat	3.0	6.0	9.0

Haryana	3.0	5.0	8.0
Himachal Pradesh	3.0	5.0	8.0
Jammu & Kashmir	3.0	3.0	6.0
Jharkhand	3.0	3.0	6.0
Karnataka	3.0	5.0	8.0
Kerala	5.0	5.0	10.0
Madhya Pradesh	3.0	5.0	8.0
Maharashtra	3.0	5.0	8.0
Manipur	3.0	2.0	5.0
Meghalaya	3.0	3.0	6.0
Mizoram	3.0	3.0	6.0
Nagaland	3.0	2.0	5.0
Odisha	4.0	7.0	11.0
Punjab	4.0	4.0	8.0
Rajasthan	4.0	7.0	11.0
Sikkim	3.0	2.0	5.0
Tamil Nadu	3.0	4.0	7.0
Tripura	3.0	4.0	7.0
Uttarakhand	3.0	5.0	8.0
Uttar Pradesh	3.0	5.0	8.0
West Bengal	3.0	2.0	5.0

Table 21 gives an overview of the index-based scores of the states under each of the three readiness categories, as well as for their overall energy efficiency implementation readiness.

Table 21: Index-Based Scorecard of the States for Overall Energy Efficiency Implementation Readiness

States	**Categories**			**Energy efficiency implementation readiness (out of 77)**
	Policy and incentives (out of 30)	**Market maturity (out of 30)**	**Institutional capacity (out of 17)**	
Andhra Pradesh	13.0	17.01	12.0	42.01
Arunachal Pradesh	2.0	8.20	5.0	15.20
Assam	6.5	7.38	6.0	19.88
Bihar	7.0	10.30	7.0	24.30
Chhattisgarh	7.5	12.31	8.0	27.81
Delhi	9.5	15.06	9.0	33.56
Goa	3.0	7.68	6.0	16.68

Gujarat	11.5	13.29	9.0	33.79
Haryana	10.5	10.62	8.0	29.12
Himachal Pradesh	9.5	11.99	8.0	29.49
Jammu & Kashmir	3.0	6.96	6.0	15.96
Jharkhand	7.0	9.67	6.0	22.67
Karnataka	16.0	15.34	8.0	39.34
Kerala	10.5	13.98	10.0	34.48
Madhya Pradesh	5.5	9.96	8.0	23.46
Maharashtra	16.5	14.79	8.0	39.29
Manipur	3.0	3.39	5.0	11.39
Meghalaya	3.0	3.39	6.0	12.39
Mizoram	4.0	3.37	6.0	13.37
Nagaland	3.0	3.29	5.0	11.29
Odisha	14.0	7.40	11.0	32.40
Punjab	15.0	9.74	8.0	32.74
Rajasthan	15.0	15.89	11.0	41.89
Sikkim	3.0	3.81	5.0	11.81
Tamil Nadu	11.5	7.34	7.0	25.84
Tripura	6.0	7.26	7.0	20.26
Uttarakhand	10.0	9.98	8.0	27.98
Uttar Pradesh	10.5	12.62	8.0	31.12
West Bengal	7.5	6.54	5.0	19.04

The outcome of the index-based evaluation reflects the significant gap between the states' current level of readiness in energy efficiency implementation and best practices for the sector, thus pointing out that most states in India have a lot to act on to improve their capacity to pursue energy efficiency objectives. It is paramount that state actors seriously consider the agenda of energy conservation an essential part of delivering governance. Moreover, the concerned authorities, both at central and state levels, should recognize the significance of creating a self-sustaining ecosystem at regional or local levels for driving energy efficiency initiatives across the country.

5. Snapshot and Insights

The following sections give a snapshot of the current status of energy efficiency implementation readiness of 28 states and the National Capital Territory of Delhi under 11 readiness factors based on the index-based evaluation detailed above. Here, the readiness of the states under each factor has been expressed in a percentage of their index-based scores, and is presented in pie charts (refer to Figures 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, and 31). A similar approach is followed to present the outcome of the evaluation for each readiness category (see Figures 33–35) and the overall energy efficiency implementation readiness (refer to Figure 36). This helps draw a quick comparative assessment of progress among the states at factor and category levels. The assessment is also reflected with the pan India average score to give a sense of where individual states stand with respect to the countrywide level.

In addition, progress against major energy efficiency readiness indicators (represented in this study as evidence indicators) has been tracked by accounting the number of states registering qualifying action against each indicator. This is presented in the ensuing bar diagrams (refer to Figures 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, and 32), which suitably highlight specific areas where most states are lagging, and therefore warrant further action.

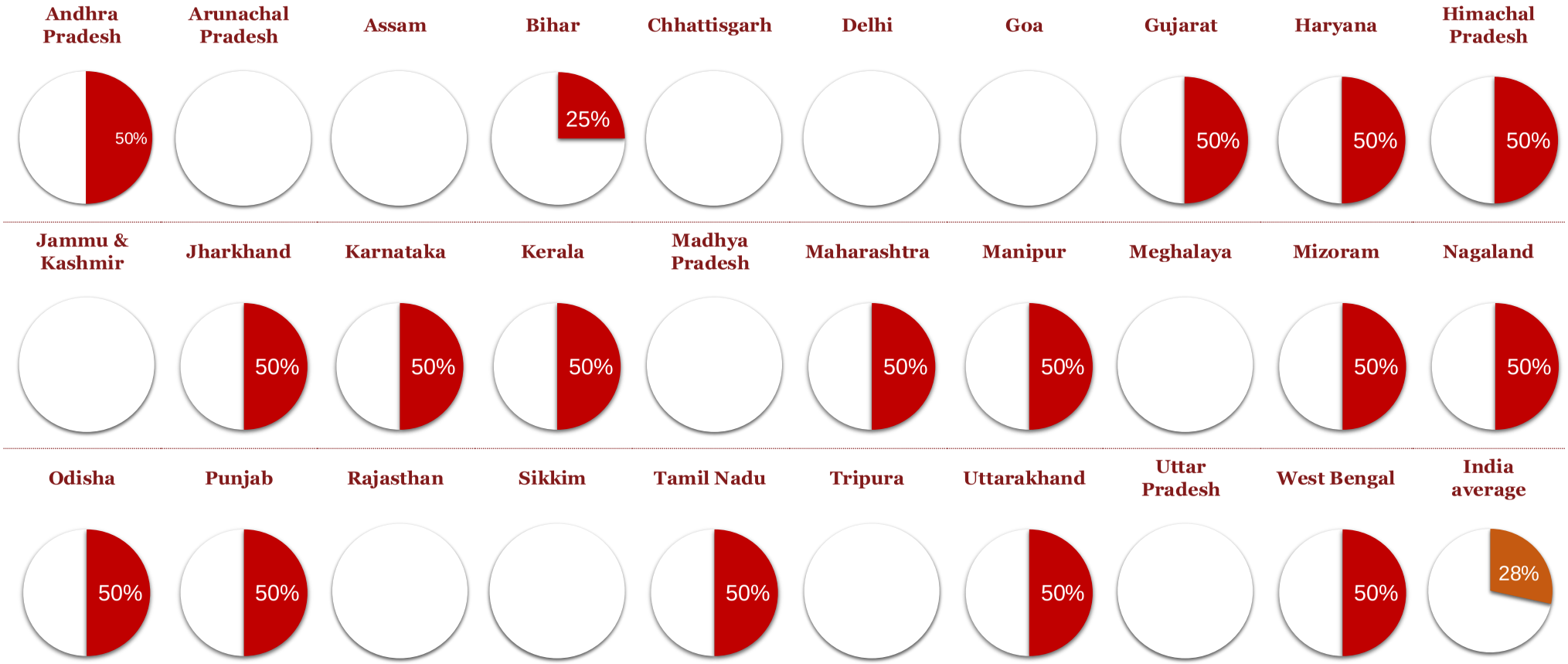
The causal impact of existing state policies, regulations or institutional capacity on current scale of project implementation is considered to be an interesting piece of information. This study, therefore, endeavors to examine possible correlation between states' performance in implementing energy efficiency projects (as captured under the implementation experience readiness factor) and their preparedness for pursuing energy efficiency. To this end, regression analyses have been carried out where implementation activities (accounted by quantitative evidence indicators) are considered dependent variables, and qualitative readiness evidence indicators relevant to those implementation activities are treated as independent variables. The causal effect of individual energy efficiency readiness evidence indicators on project implementation can be evaluated from the regression analysis-derived coefficient values. Whether the dependent variables (endogenous) are sensitive to the independent variables (exogenous) can be determined from the statistically derived R-square value. Closer the value to 1, more sensitive the endogenous variables are on the independent variables. It is also to be seen whether the result is statistically significant as reflected from the F-value.

While the pace of energy efficiency project implementation activities in the states is gradually picking up, the full impact of the state policies, regulations, or institutional capacity could not be ascertained assertively from the regression analysis. There could be several reasons. The outcome of this analysis indicates that apart from the defined exogenous factors—that is, states' policies, regulations, or institutional strength—there can be other ingredients to this energy efficiency ecosystem, such as political environment, coordination, and cooperation with national and federal policies and institutions, access to energy-efficient technologies, and cross-cutting issues like energy price and tariff, and level of subsidies. These factors might mask the effect of the states' initiatives. There is scope to improve this regression analysis once sufficient time-series data are available.

Sector-Specific Action Plan for Scaling Up Energy Efficiency Efforts

Figure 11 showcases the benchmark of the performance of the states in percentage scores, under the readiness factor "*Sector-Specific Action Plan for Scaling Up Energy Efficiency Efforts.*"

Figure 11: Percentage Scores of the States for Their Performance in "Sector-Specific Action Plan for Scaling Up Energy Efficiency Efforts"



Clearly articulated sector-specific actions and targets are key ingredients of an enabling ecosystem for energy efficiency implementation. Hence, to start with the states should ascertain the energy efficiency potential across different sectors in the state, formulate their own energy efficiency action plans and adopt sector-wise and time-bound targets to achieve. However, only 14 states have developed action plans or policies towards energy efficiency, and only two states have identified energy savings targets, but are yet to be formally adopted (refer to Figure 12).

None of the states have enacted legislation backing the energy efficiency action plan (refer to Figure 12).

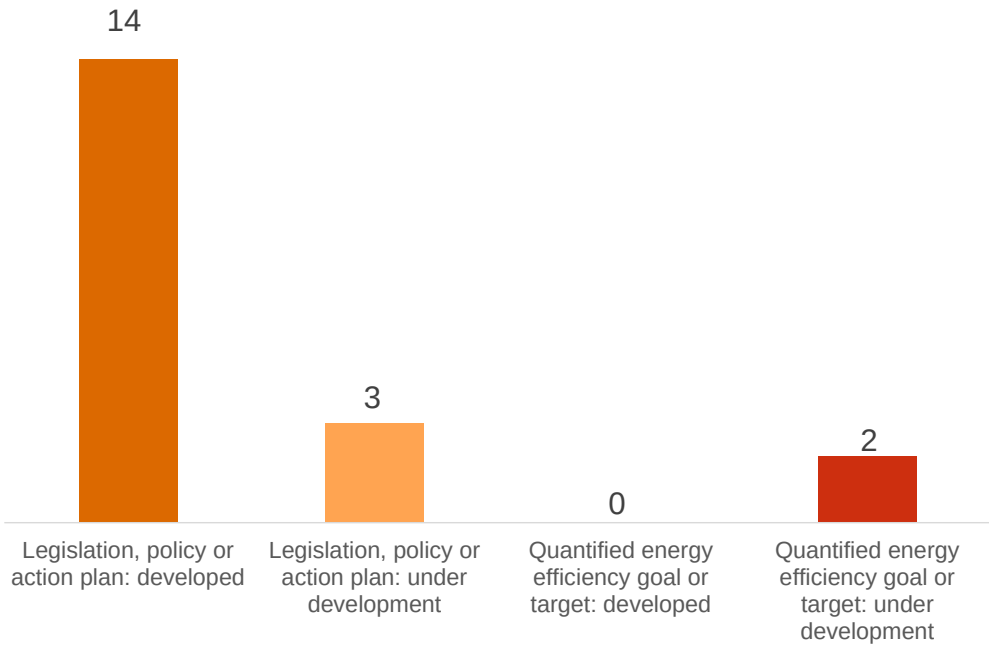
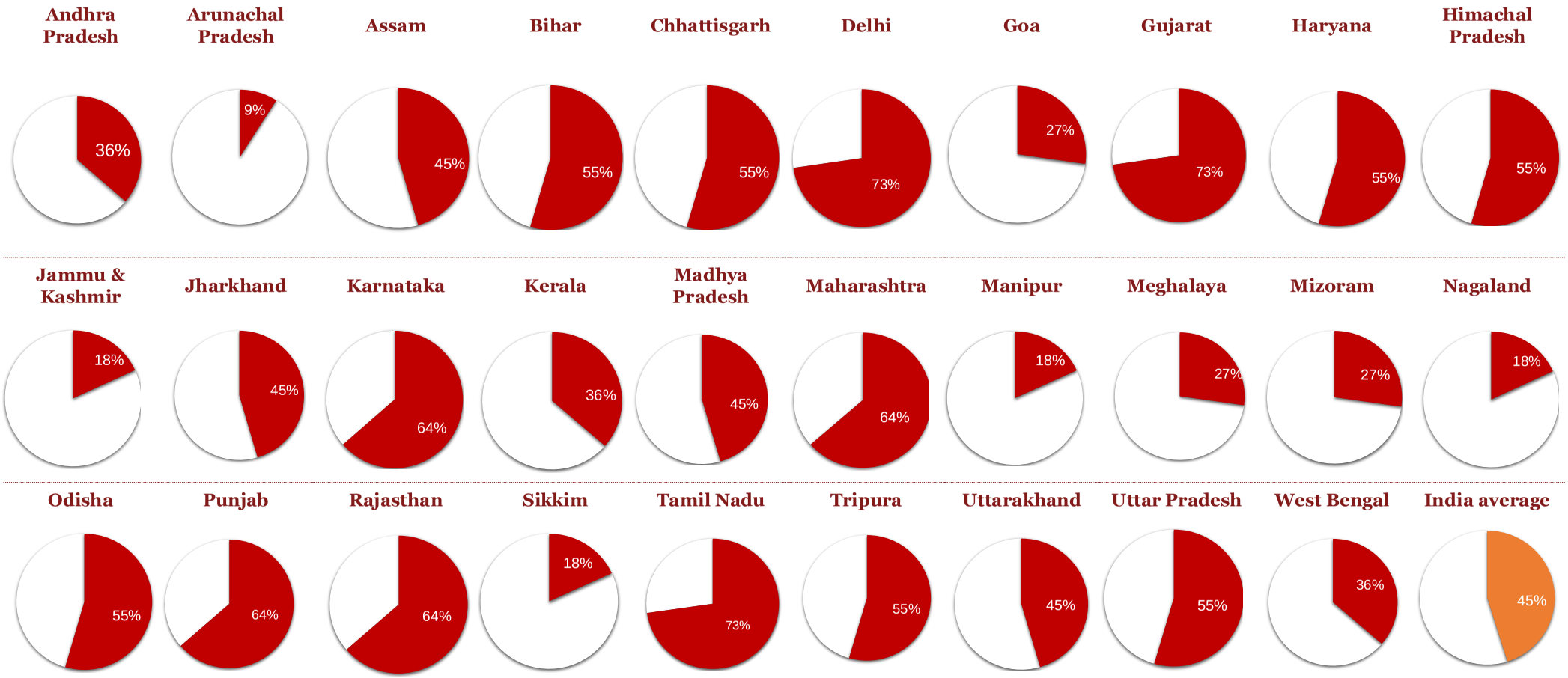


Figure 12: Number of States Having a Sector-Specific Action Plan

Mandates for Utilities to Invest in Energy Efficiency

Figure 13 showcases the benchmark of the performance of the states in percentage scores, under the readiness factor "*Mandates for Utilities to Invest in Energy Efficiency.*"

Figure 13: Percentage Scores of the States for Their Performance in "Mandates for Utilities to Invest in Energy Efficiency"



Power utilities are the most critical agents for achieving energy efficiency in a country. The collective potential of utilities to improve energy efficiency both at supply and demand sides is enormous. The quintessential approach to capture this potential is by regulating the energy efficiency activities of utilities with clear and unambiguous mandates.

The assessment shows that state electricity regulatory commissions across all 28 states and the National Capital Territory of Delhi have issued some kind of directives to the DISCOMs to reduce T&D losses in their networks (refer to Figure 14). Another intervention area that has gained traction is DSM. Nineteen states up to now have notified DSM regulations. However, up to now, none of the state DSM regulations specify any energy savings targets to the utilities. Moreover, detailed guidelines on cost-effectiveness and M&V of DSM measures, a key component to scale up a DSM initiative, are missing in most states. With regard to demand response, most of the state regulatory commissions have approved a ToD-based tariff; however, it is limited to industrial consumers. It is worthwhile to mention that integrated resource planning (IRP), considered one of the key factors for sustaining utility-driven DSM initiatives, is yet to be part of India's energy efficiency ecosystem.

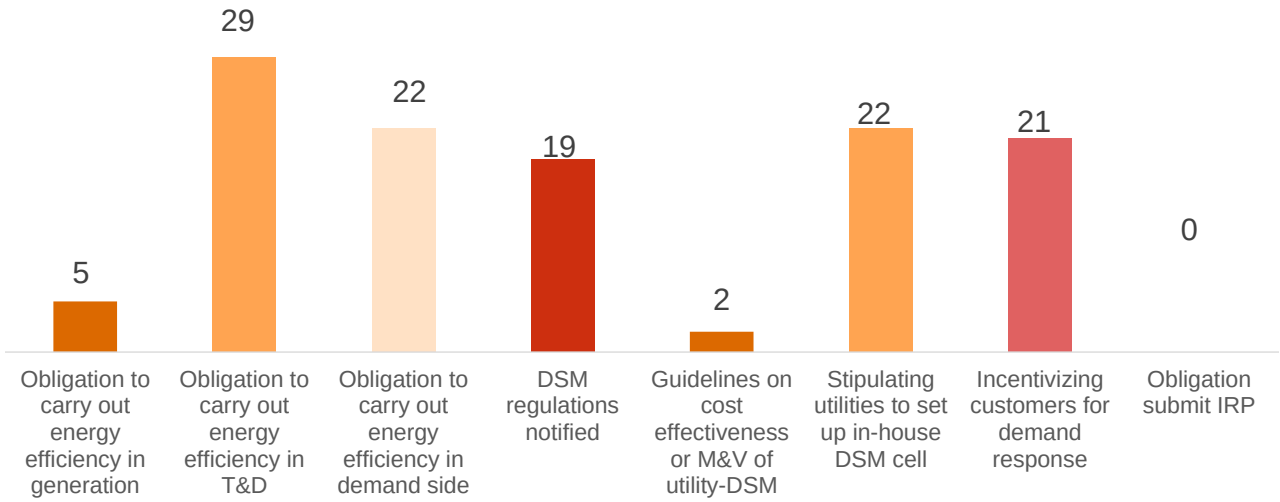
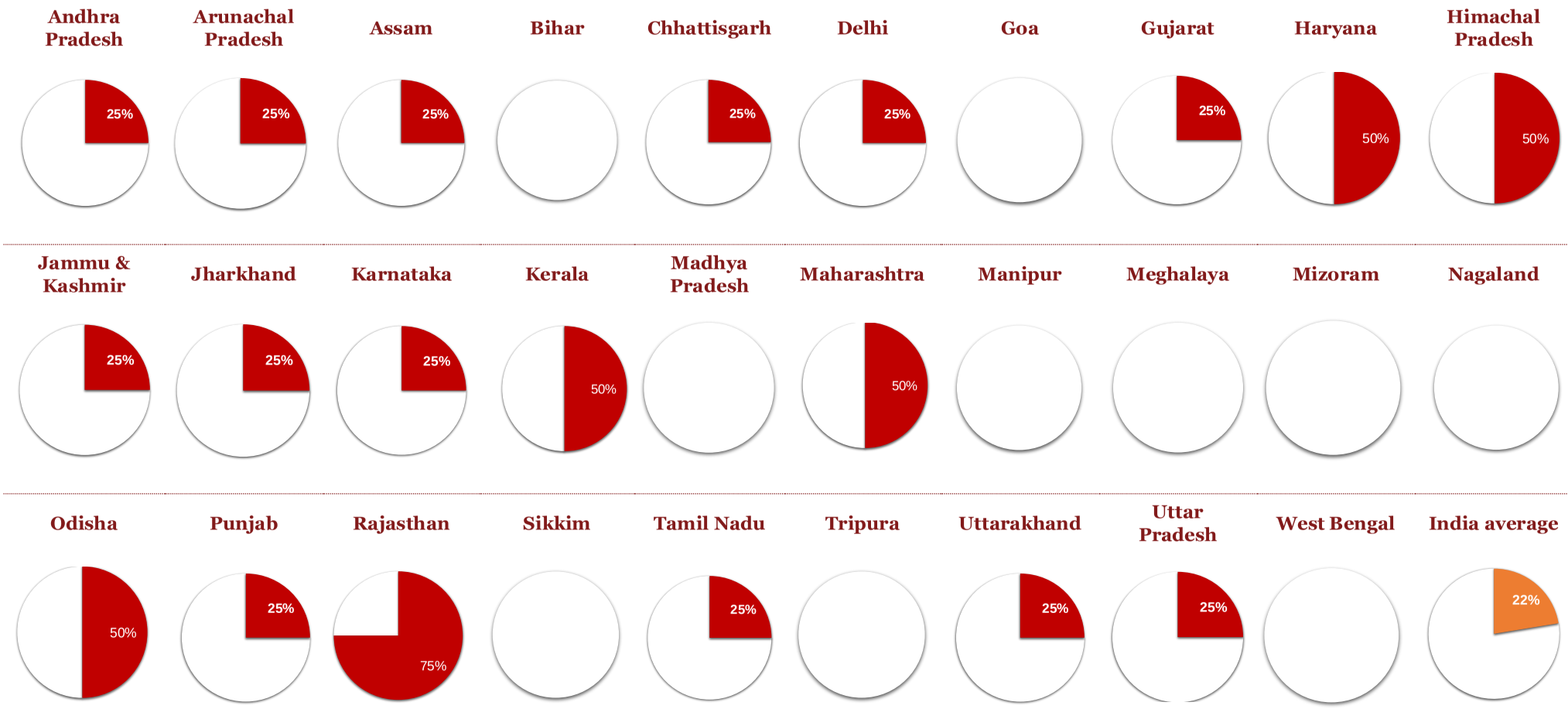


Figure 14: Number of States Where Utilities Have Specific Energy Efficiency Obligation

Mandates for Public Institutions to Invest in Energy Efficiency

Figure 15 showcases the benchmark of the performance of the states in percentage scores for "*Mandates for Public Institutions to Invest in Energy Efficiency*."

Figure 15: Percentage Scores of the States for Their Performance in "Mandates for Public Institutions to Invest in Energy Efficiency"



On the issue of public procurement of energy efficient appliances, the central government has issued a notification directing all central government departments, ministries, and attached and subordinate offices to ensure that the procurement of the specified product categories—that is, split ACs, frost-free refrigerators, ceiling fans, and water heaters—must carry the threshold BEE star rating indicated against them, or higher. The state governments should follow suit by notifying the public institutions under their jurisdiction to procure energy-efficient appliances and equipment for their uses (such as efficient lights and star-rated appliances). However, only 15 states are found to act on this (refer to Figure 16). Alternatively, there is hardly any directive to municipalities or state road transport corporations to undertake necessary measures to improve energy efficiency. To promote energy efficiency, some states have instituted the State Energy Conservation Award.

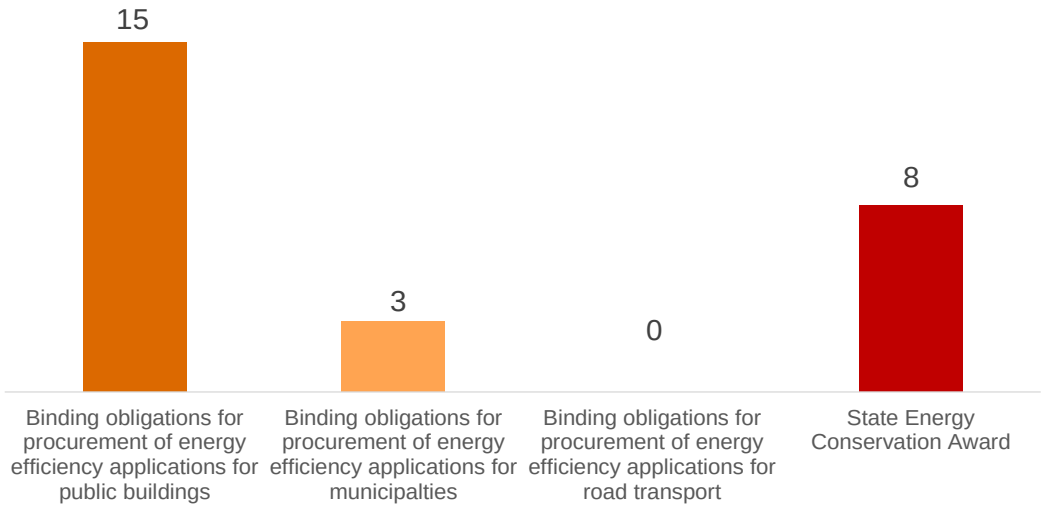
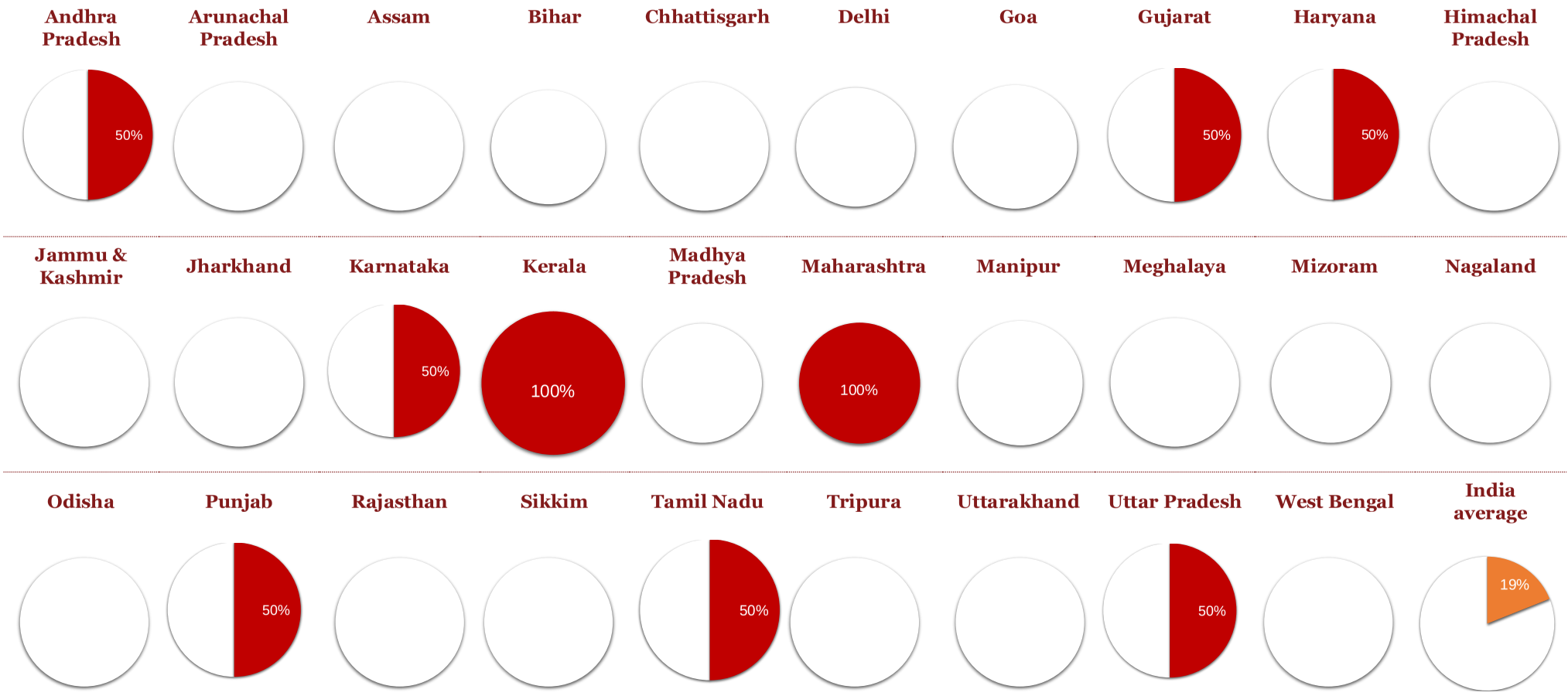


Figure 16: Number of States Where Public Institutions Have Specific Energy Efficiency Mandate

Incentives for MSMEs to Invest in Energy Efficiency

Figure 17 showcases the benchmark of the performance of the states under the readiness factor "*Incentives for MSMEs to Invest in Energy Efficiency*."

Figure 17: Percentage Scores of the States for Their Performance in "Incentives for MSMEs to Invest in Energy Efficiency"



Despite MSMEs accounting for about 45% of India's manufacturing output and 40% of India's total exports, they lack modernization, which is reflected in the efficiency of energy use. Considering the potential of the sector, the Government of India has emphasized upgrading technology in this sector and launched several schemes. However, to expand the reach of such initiatives, support at the state level is necessary, which is found to be lacking. Only six states have given some kind of financial incentives to MSMEs for adopting energy efficiency measures (refer to Figure 18). Fewer states have provided them assistance to explore energy efficiency opportunities.

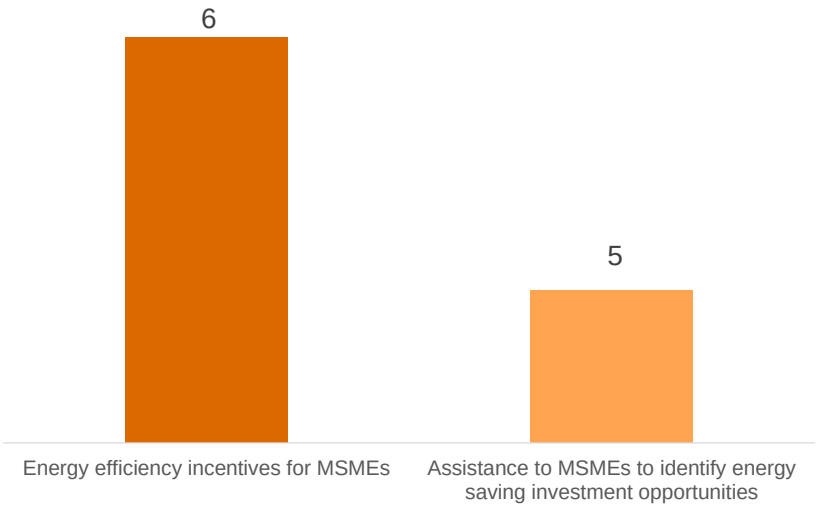
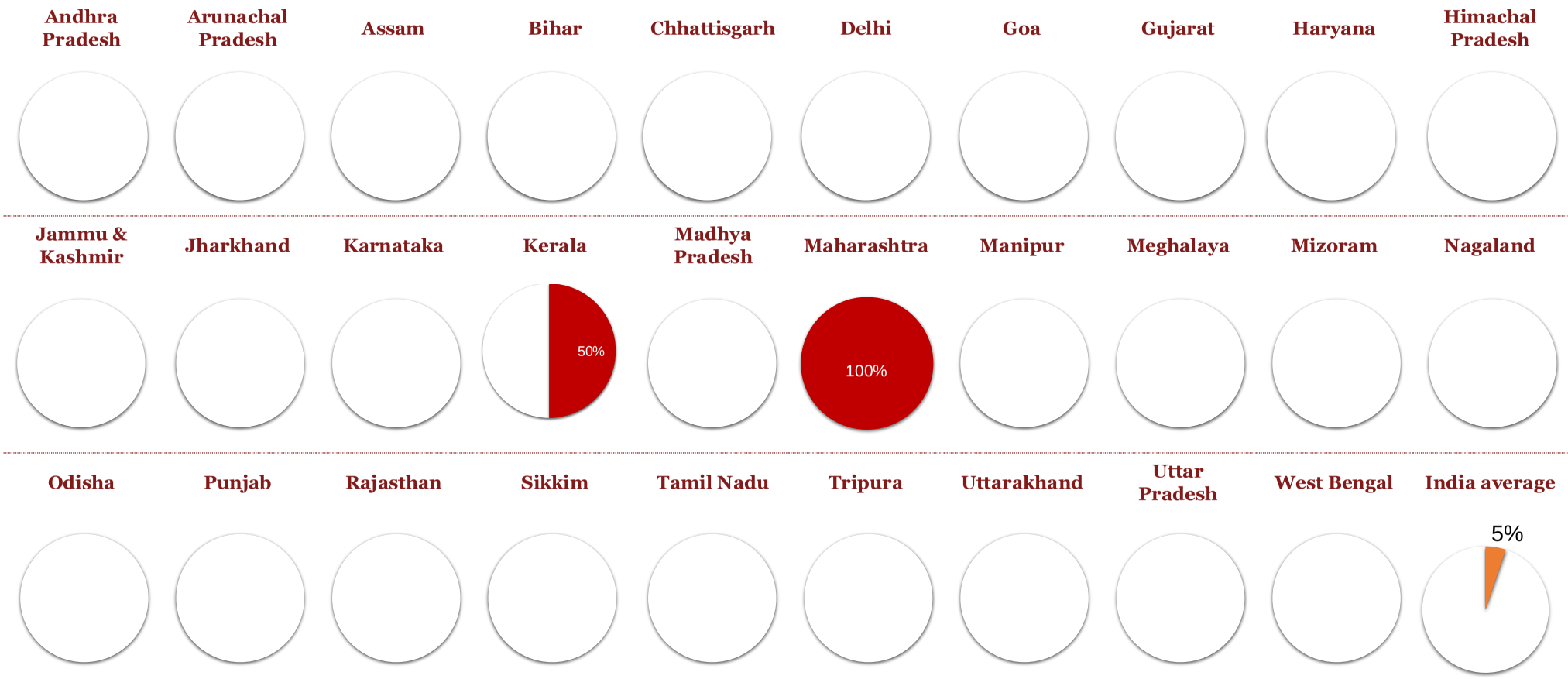


Figure 18: Number of States Providing Incentives to MSMEs

Incentives for Large-Scale Users to Invest in Energy Efficiency

Figure 19 showcases the benchmark of the performance of the states in percentage scores, under the readiness factor "*Incentives for Large-Scale Users to Invest in Energy Efficiency*."

Figure 19: Percentage Scores of the States for Their Performance in "Incentives for Large-Scale Users to Invest in Energy Efficiency"



The energy efficiency readiness assessment of the states also reveals the lack of initiative of the states in promoting energy efficiency among large energy users: industrial and commercial consumers (refer to Figure 20).

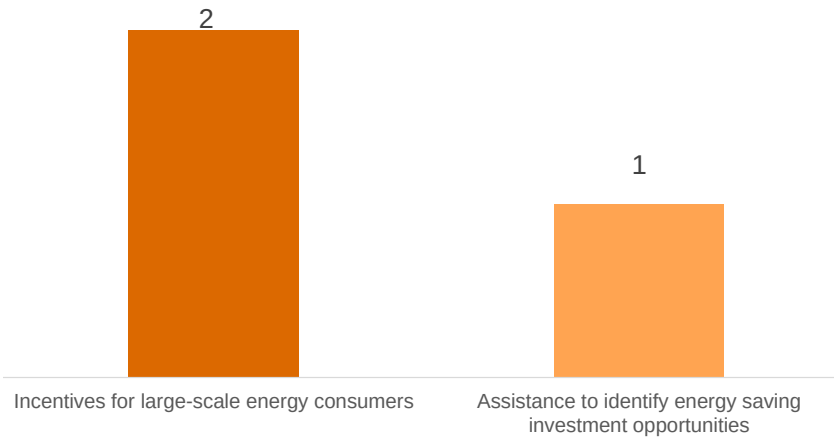
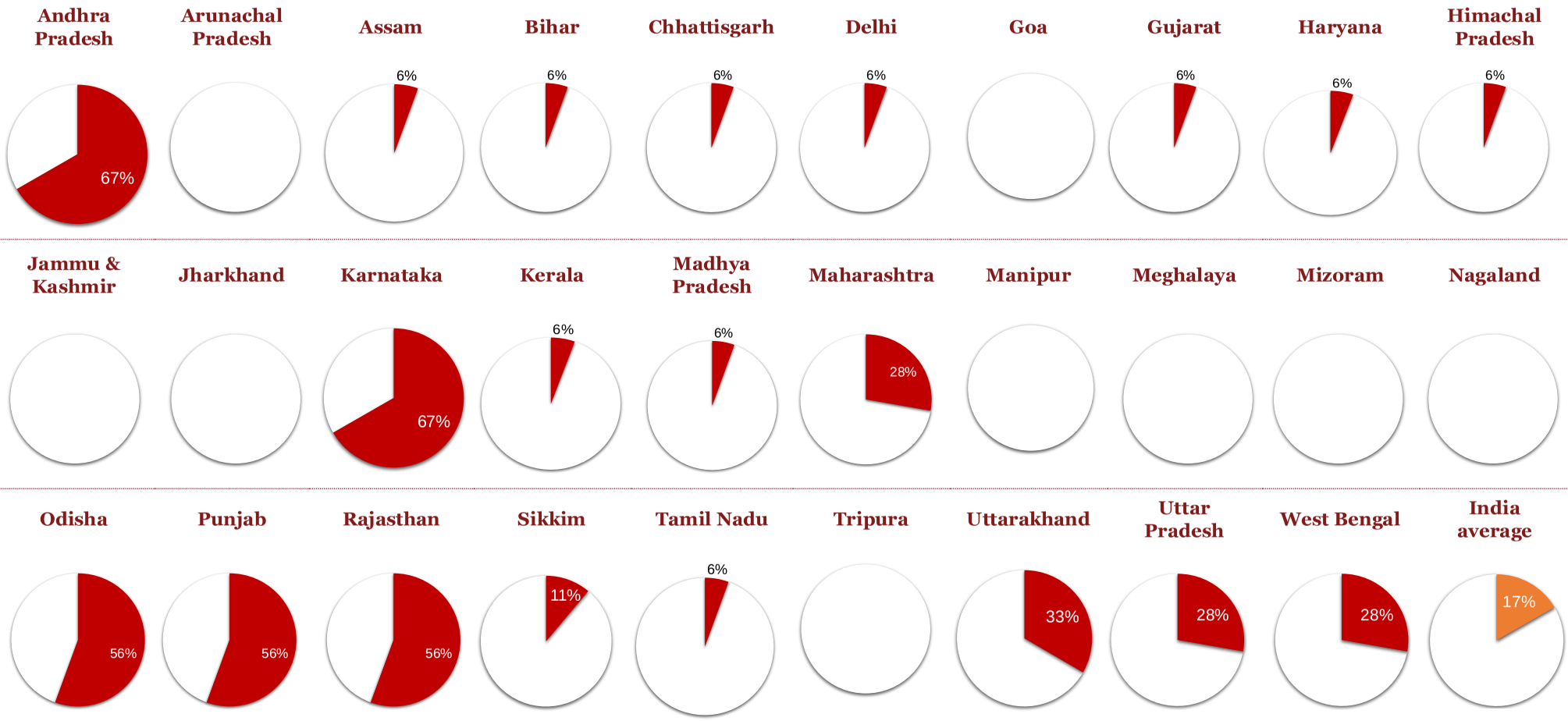


Figure 20: Number of States Giving Incentives to Large-Scale Energy Users

Implementation of ECBCs

Figure 21 showcases the benchmark of the performance of the states in percentage scores, under the readiness factor "*Implementation of ECBCs.*"

Figure 21: Percentage Scores of the States for Their Performance in "Implementation of ECBCs"



The EC Act 2001 allows the states to amend the ECBCs to suit the regional and local climatic conditions and subsequently notify the codes. However, only six states have issued notification of ECBC, and 13 more states have amended ECBC, but have yet to notify (refer to Figure 22). With respect to building energy labeling or rating, municipalities or ULBs in only nine states have adopted GRIHA or BEE star labeling, whereas seven of these states have offered incentives to builders in the form of tax concessions or additional free-of-cost FAR for obtaining the labeling or rating certification. Interestingly, some of these states have yet to notify ECBC.

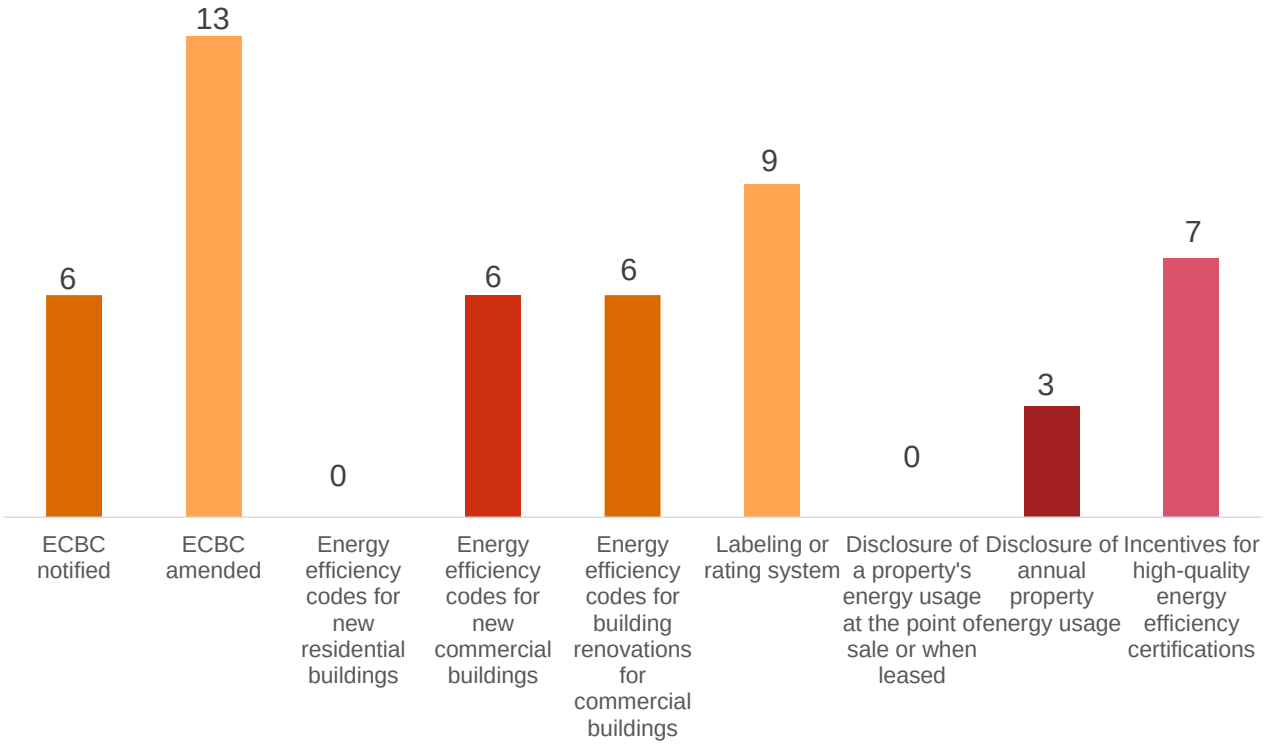
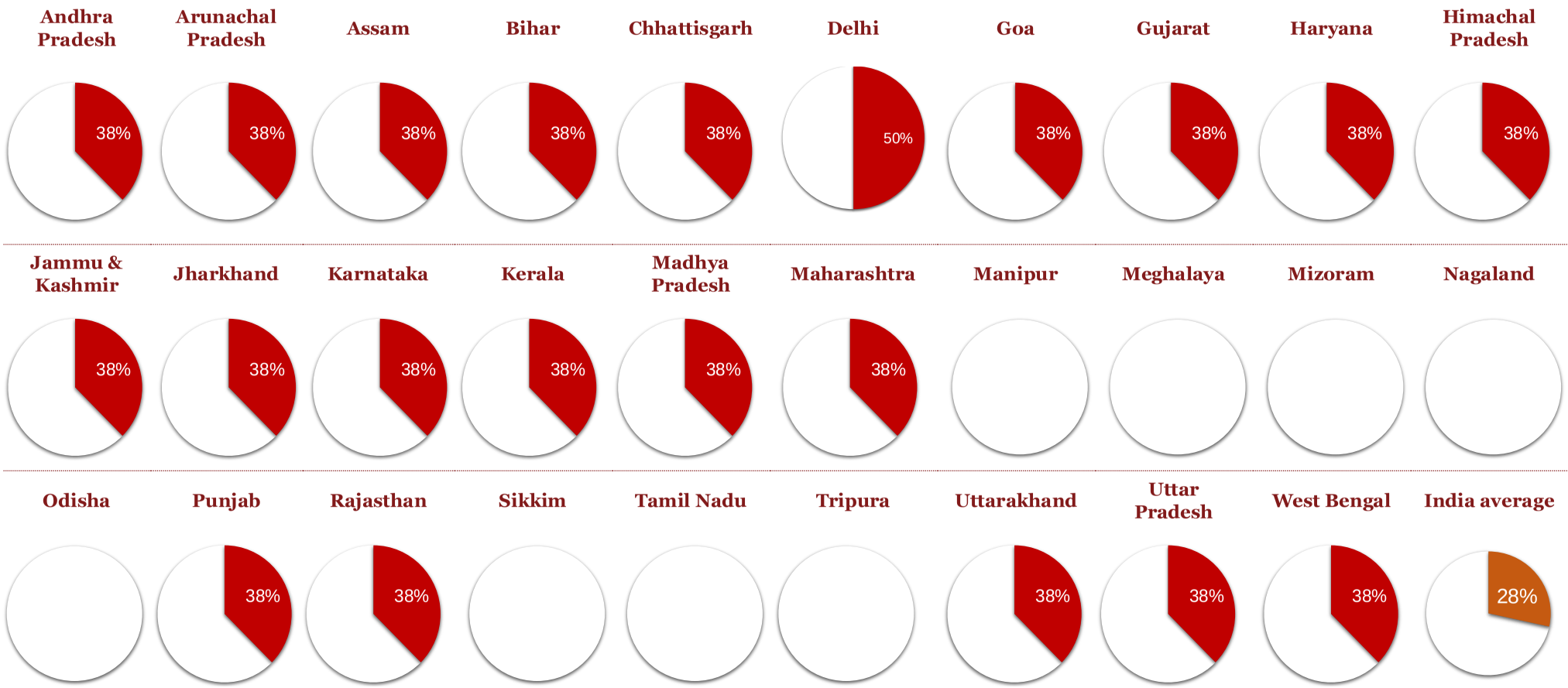


Figure 22: Number of States Implementing Building Energy Codes

Information or Tools Available to Consumers on Electricity Usage

Figure 23 showcases the benchmark of the performance of the states in percentage scores, under the readiness factor "*Information or Tools Available to Consumers on Electricity Usage.*"

Figure 23: Percentage Scores of the States for Their Performance in "Information or Tools Available to Consumers on Electricity Usage"



Information pertaining to past and peer usage enables utilities and consumers to monitor, measure, and evaluate energy efficiency impacts in a transparent and reliable manner. It is not just the knowledge of electricity usage; control is also an important function to leverage vital information for acting in a timely manner on demand-side measures. Although providing past electricity usage data through customers' electricity bills is a common practice in most parts of the country, currently utilities in none of the states inform the consumers about the electricity usage levels of peer groups or make any such comparison to benchmark usage levels (refer to Figure 24). Introduction of smart features is also at its infancy.

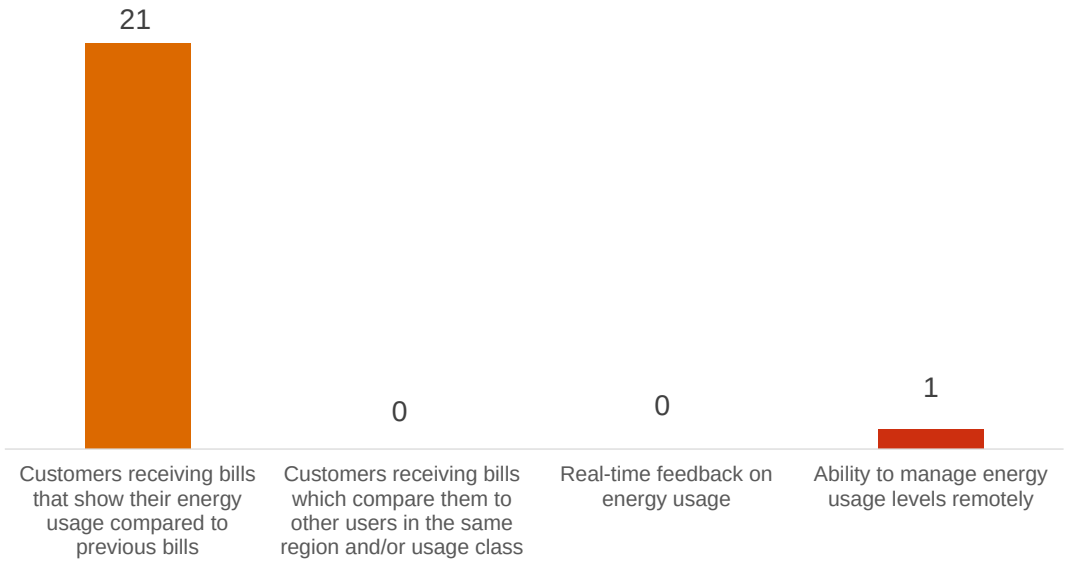
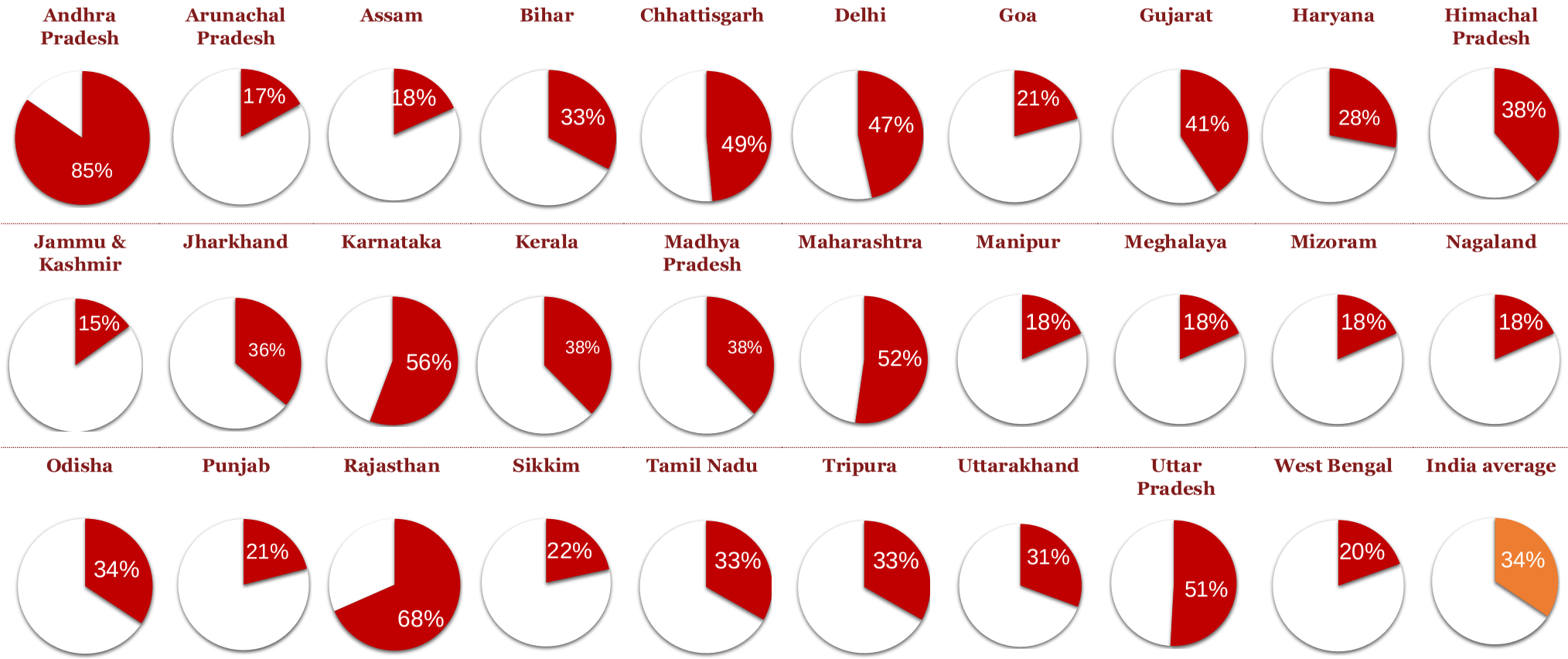


Figure 24: Number of States Providing Quality Information or Tools to Consumers

Energy Efficiency Potential and Implementation Experience

Figure 25 showcases the benchmark of the performance of the states in percentage scores, under the readiness factor "*Energy Efficiency Potential and Implementation Experience.*"

Figure 25: Percentage Scores of the States for Their Performance in "Energy Efficiency Potential and Implementation Experience"



The most significant progress in energy efficiency project implementation in the country came on the heels of establishment of "Energy Efficiency Services Limited" (EESL), a public sector ESCO to lead the investment related actions and create self-sustaining energy efficiency and DSM markets in the country. In most cases, EESL has entered into agreements with state DISCOMs or municipalities to implement large-scale DSM programs that include the DELP[29], Energy-Efficient Street Lighting Program, and AgDSM. Fifteen states have taken part in household LED program, whereas LED streetlighting initiatives are running in 11 states (refer to Figure 26). AgDSM, however, has immense potential, but could make less progress. Recently, EESL has launched the energy-efficient domestic fan program wherein BEE 5 star–rated fans are provided to households to replace old inefficient fans.

With regard to the Government of India's program targeting the installation of 1 million solar pumps primarily for irrigation through state nodal agencies and NABARD, nine states have been found to make progress.

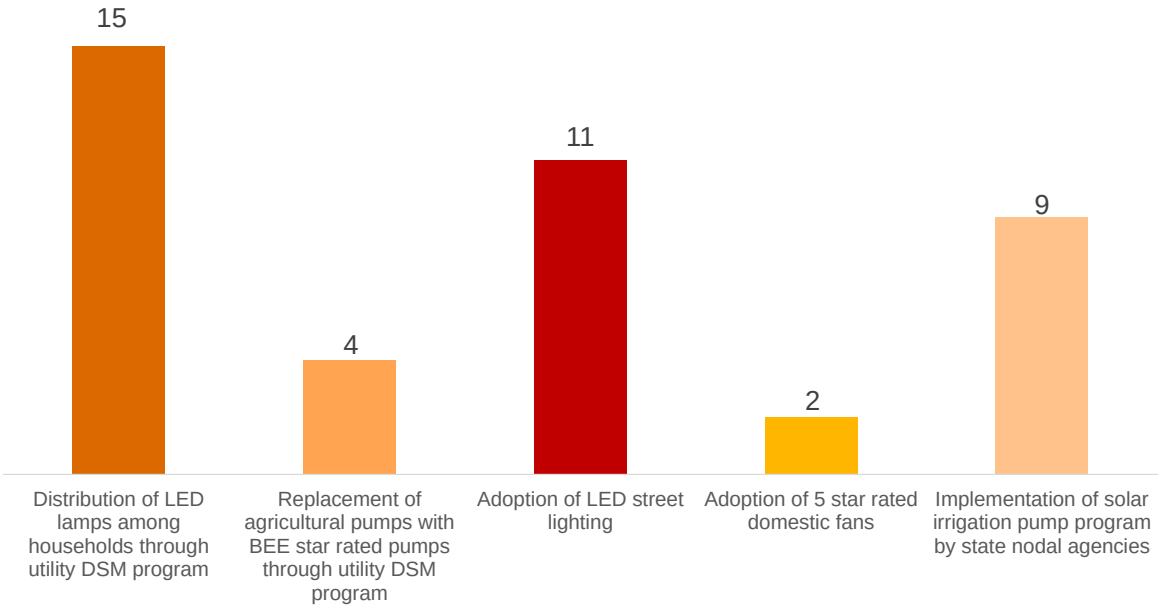


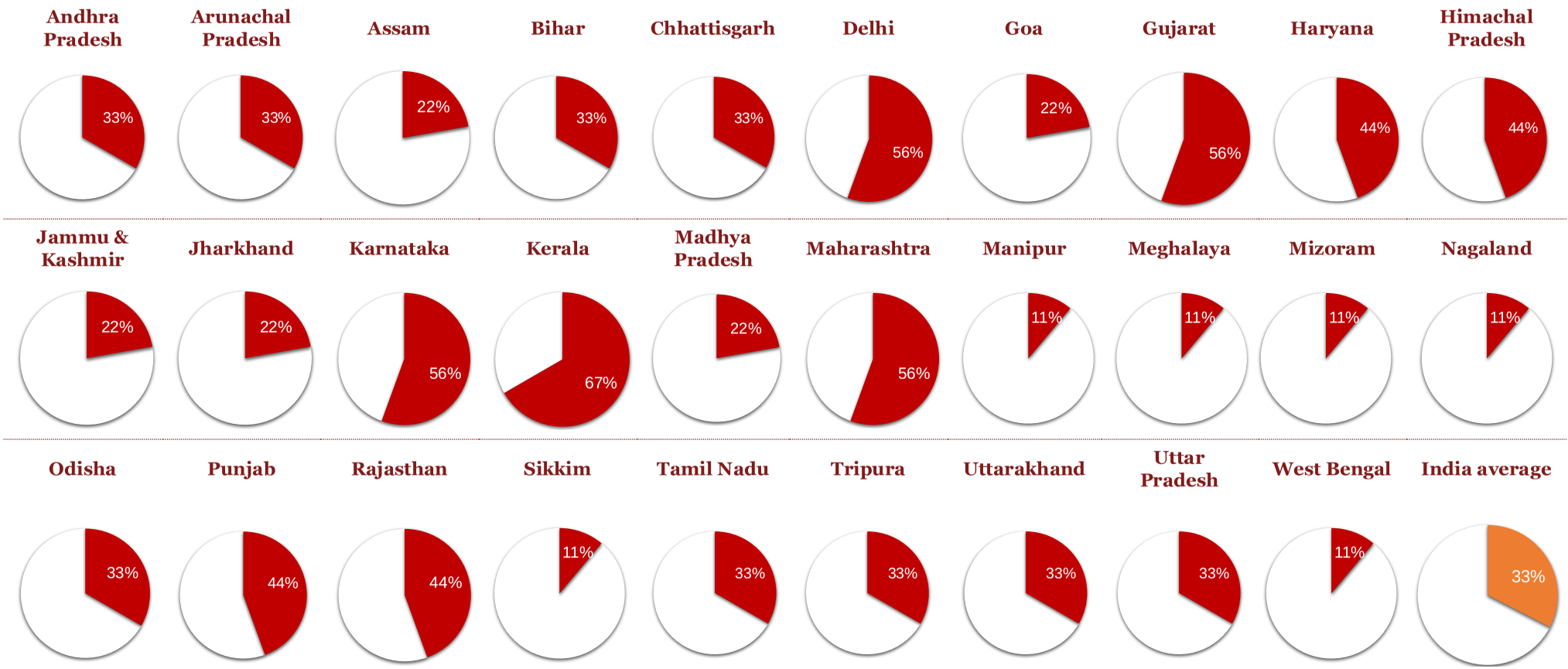
Figure 26: Number of States Implementing Energy Efficiency Programs

[29] Now, it is renamed the UJALA Distribution scheme.

Financing Mechanisms Available for Energy Efficiency Activities

Figure 27 showcases the benchmark of the performance of the states in percentage scores, under the readiness factor "*Financing Mechanisms Available for Energy Efficiency Activities*."

Figure 27: Percentage Scores of the States for Their Performance in "Financing Mechanisms Available for Energy Efficiency Activities"



The index-based energy efficiency readiness evaluation outcome reflects that many states are yet to adequately consider energy efficiency in making fiscal policies. Three classical financial mechanisms are found to be the mainstay to fund energy efficiency projects in the states: the state energy conservation fund, energy service agreements, and cost recovery through electricity tariffs. Other more intricate mechanisms have hardly at all been tried (refer to Figure 28).

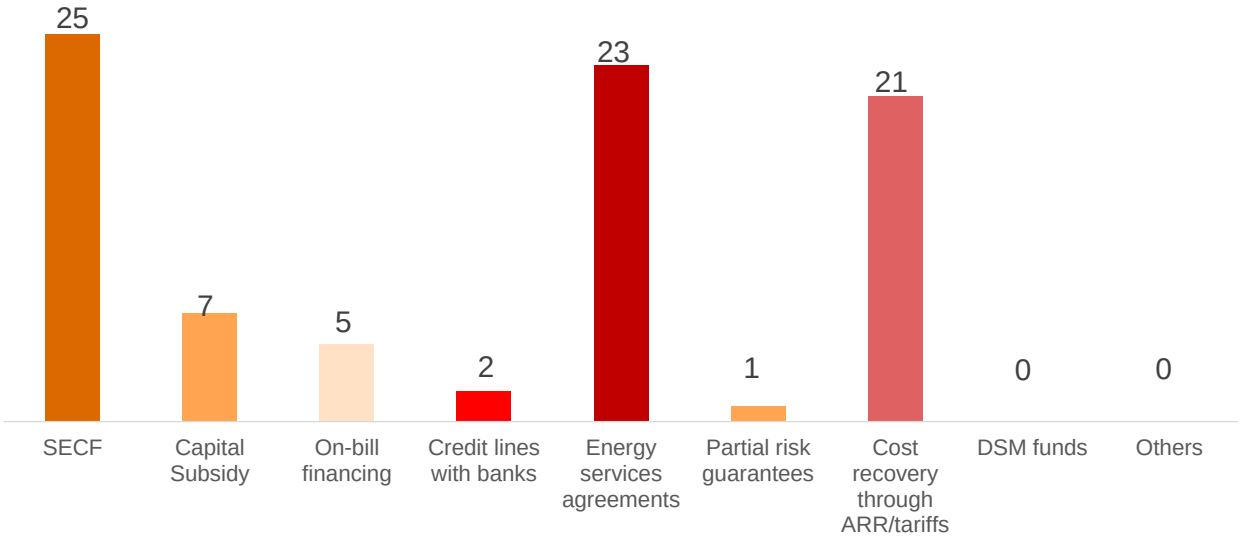
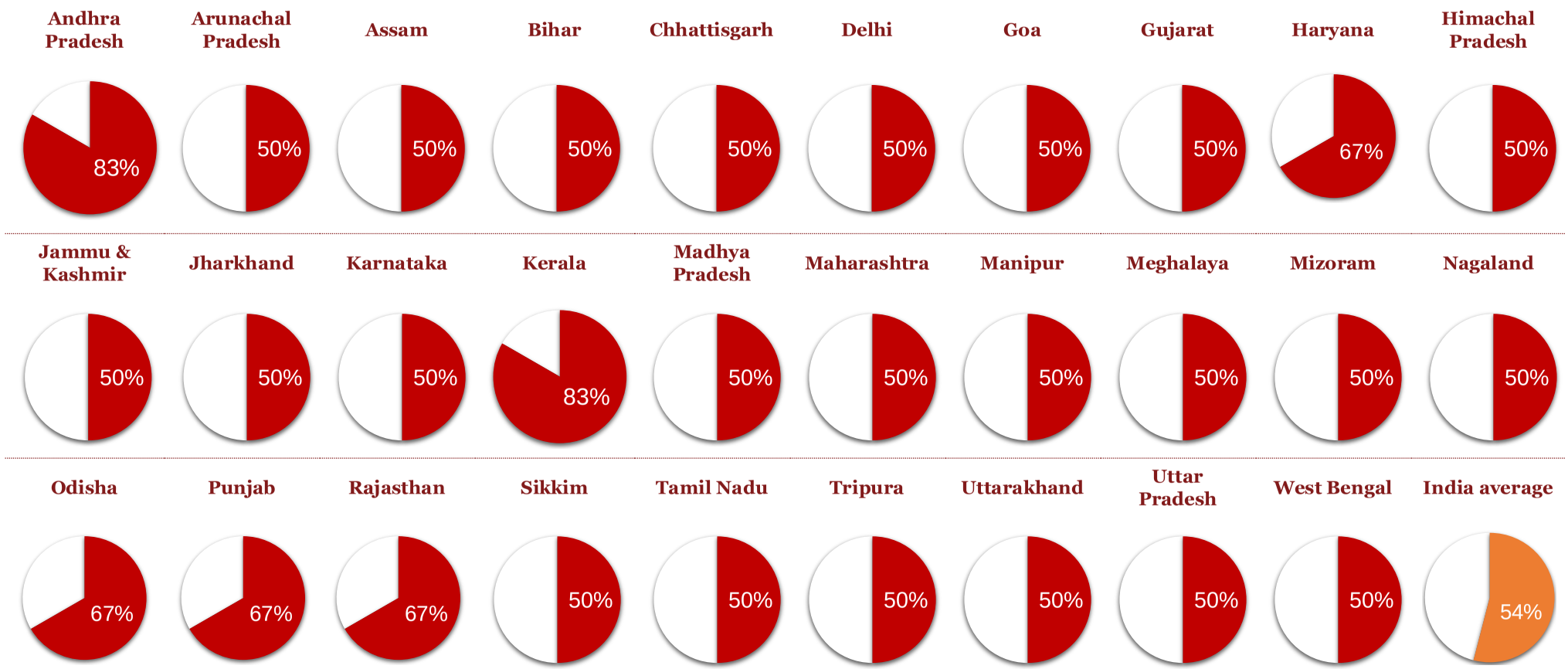


Figure 28: Number of States Where Specific Financing Mechanisms Are Available

Institutional Framework and Capacity

Figure 29 showcases the benchmark of the performance of the states in percentage scores, under the readiness factor "*Institutional Framework and Capacity*."

Figure 29: Percentage Scores of the States for Their Performance in "Institutional Framework and Capacity"



There are five primary functional areas where institutional support is required at the state-level for enhancing energy efficiency implementation readiness, in line with the provisions of the EC Act, 2001: setting energy efficiency strategy and policy, regulating energy efficiency at the supply (including distribution) and demand sides, setting equipment energy efficiency standards, and enforcing or certifying compliance with building energy codes. Although all 28 states and the National Capital Territory of Delhi have state-designated agencies (SDAs) that are vested with the responsibility of formulating states' energy efficiency strategies or policies (refer to Figure 30), their profiles are varied. Out of the 29 SDAs, the State Energy Conservation Mission (SECM), the SDA of Andhra Pradesh has the sole mandate for promoting energy efficiency. All other SDAs have been given the mandate of energy efficiency governance as an additional mission or portfolio. This creates a sense of competition between the energy efficiency and other mainstream functions of the SDAs for internal resources. In comparison to other states, Andhra Pradesh's success in driving the energy efficiency effort may be attributed to this particular institutional difference.

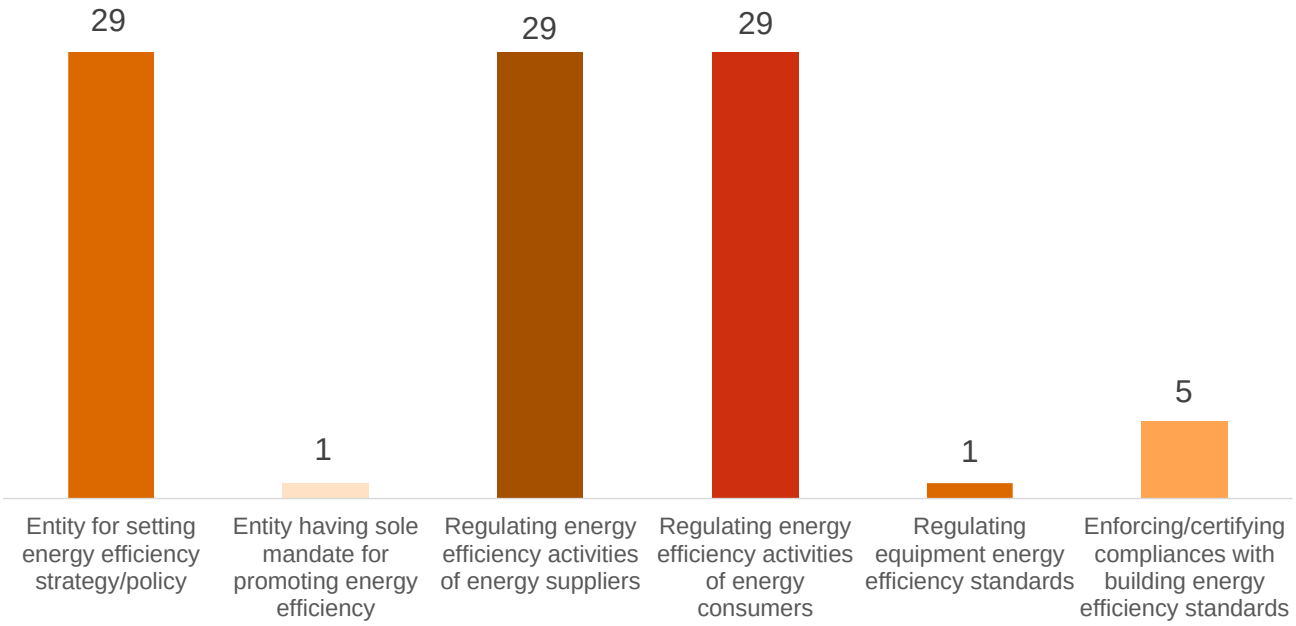
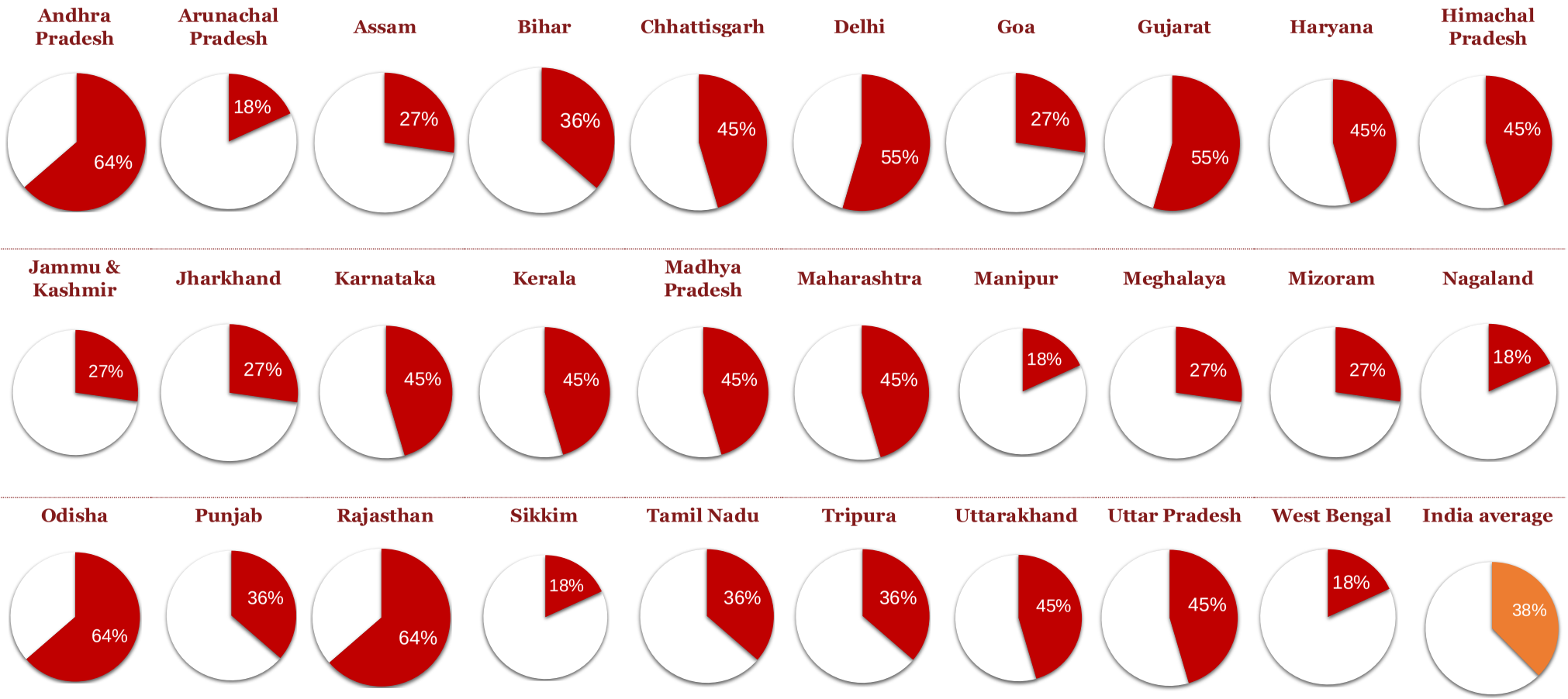


Figure 30: Number of States Having Dedicated Institutions for Energy Efficiency Policies, Regulation, and Implementation

Monitoring and Evaluation

Figure 31 showcases the benchmark of the performance of the states in percentage scores, under the readiness factor "*Monitoring and Evaluation.*"

Figure 31: Percentage Scores of the States for Their Performance in "Monitoring and Evaluation"



With regard to developing monitoring and evaluation systems, the states have fared well where they already have existing mechanisms to do so. For example, every state has state electricity regulatory commissions to monitor and evaluate performance of utilities. However, in new frontiers, such as building energy codes or empanelment of energy auditors and consultants, few states are seen to have taken necessary steps (refer to Figure 32).

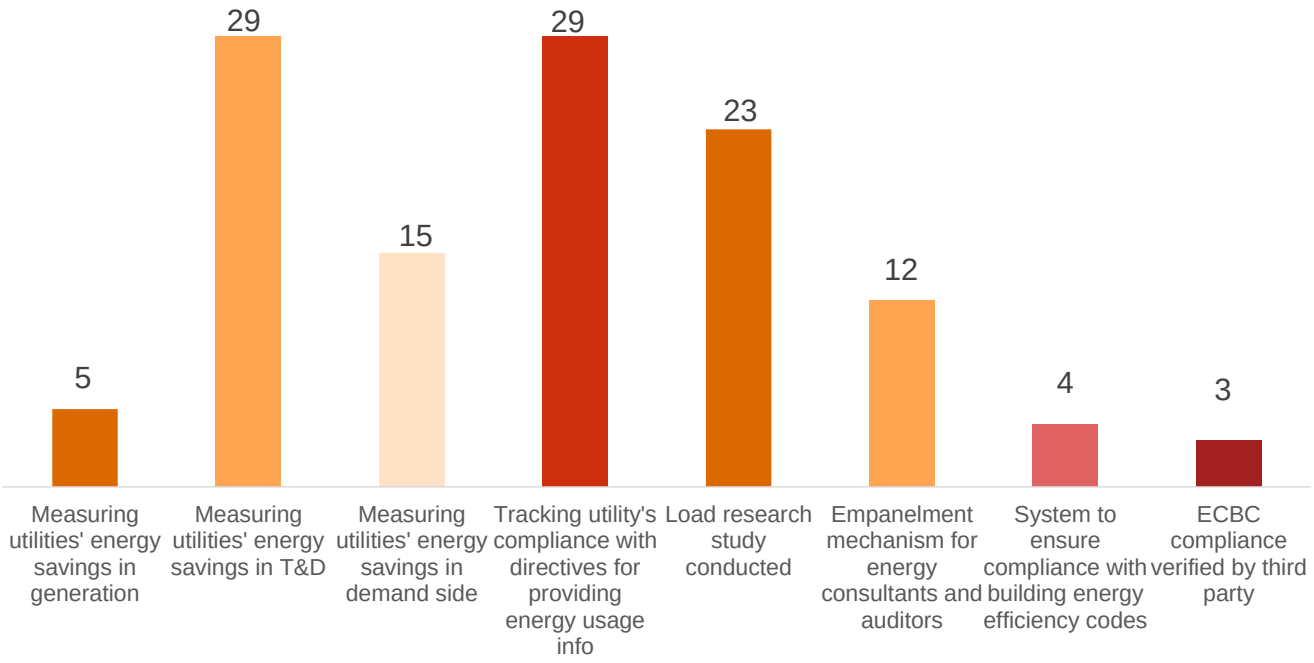
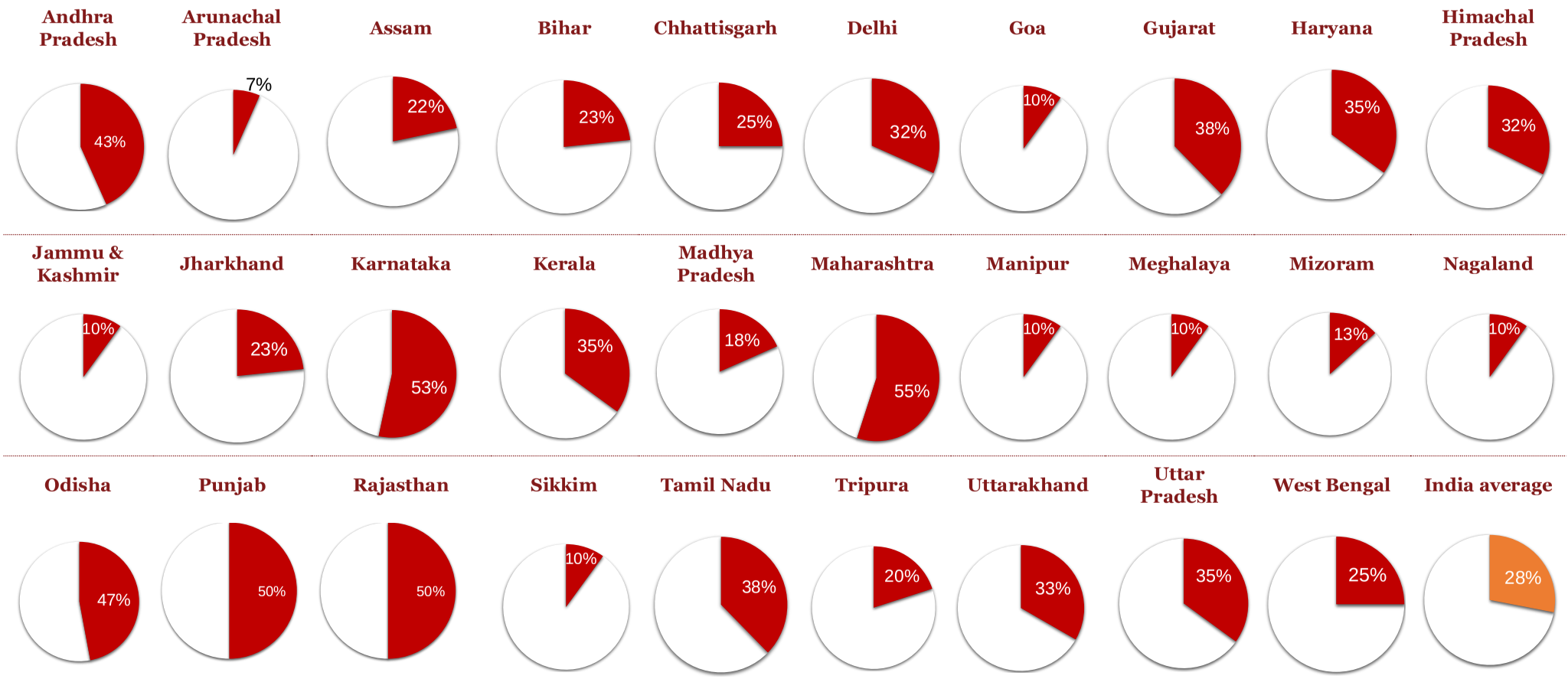


Figure 32: Number of States Taking Measures for Energy Efficiency Enforcement or Implementation

Policy and Incentives

Figure 33 showcases the benchmark of the performance of the states in percentage scores, under the readiness category "*Policy and Incentives.*"

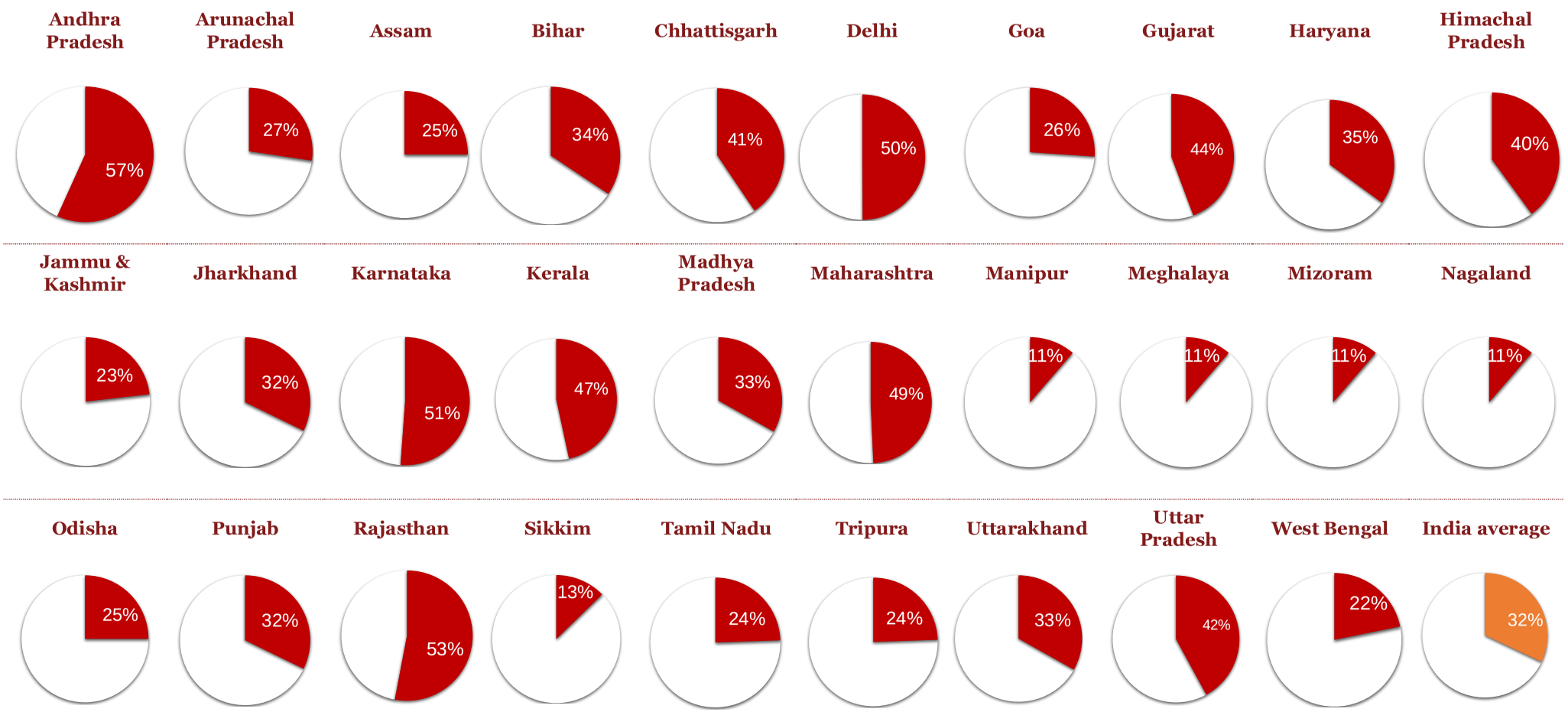
Figure 33: Percentage Scores of the States for Their Performance in "Policy and Incentives"



Market Maturity

Figure 34 showcases the benchmark of the performance of the states in percentage scores, under the readiness category "*Market Maturity*."

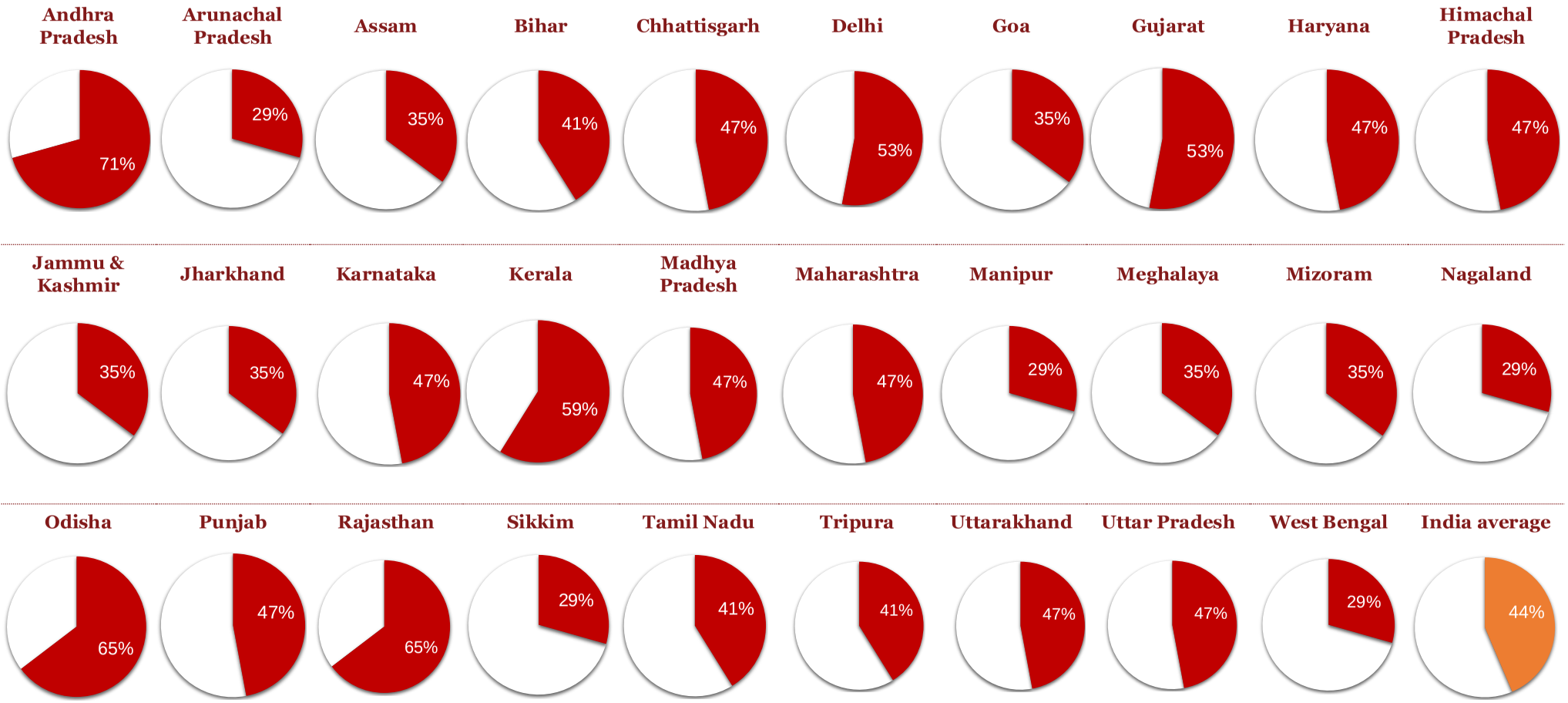
Figure 34: Percentage Scores of the States for Their Performance in "Market Maturity"



Institutional Capacity

Figure 35 showcases the benchmark of the performance of the states in percentage scores, under the readiness category "*Institutional Capacity*."

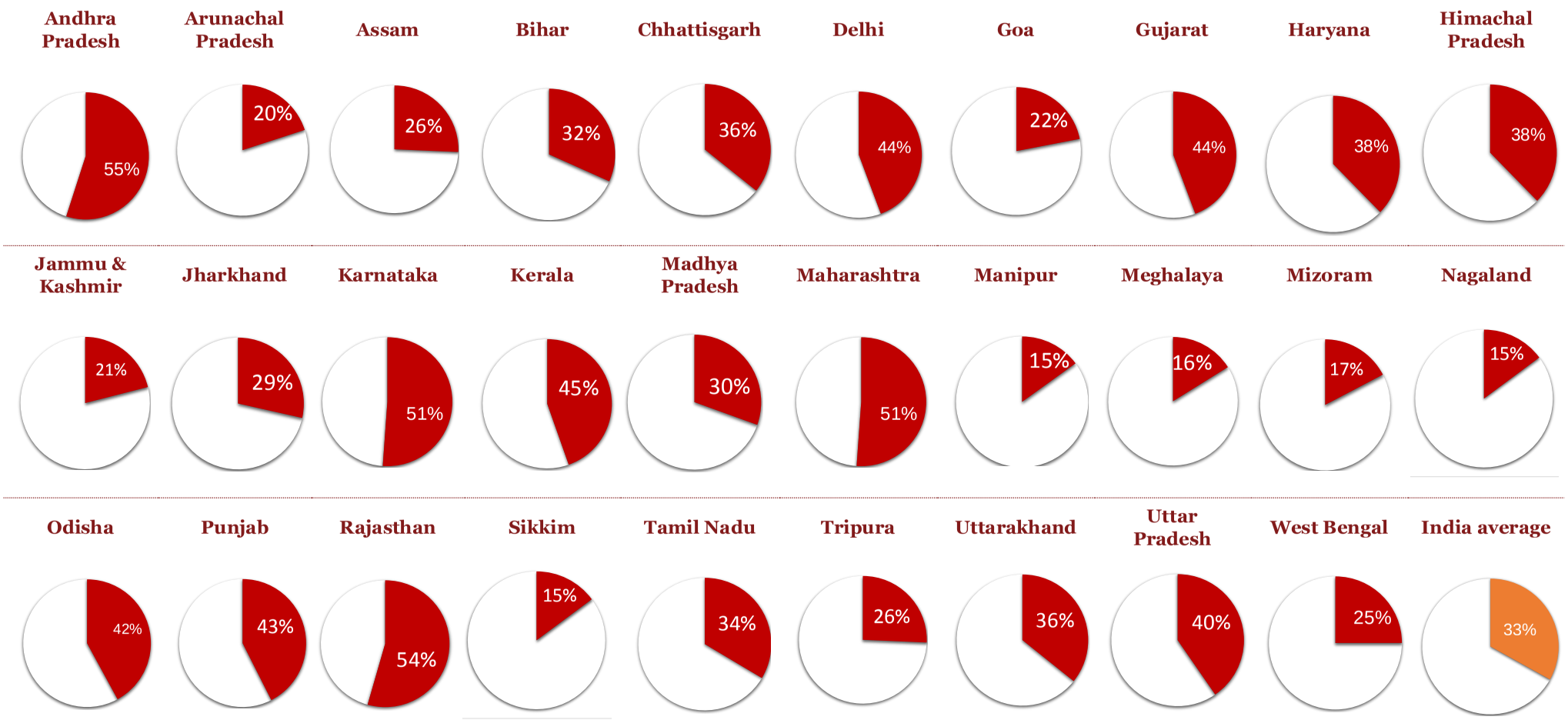
Figure 35: Percentage Scores of the States for Their Performance in "Institutional Capacity"



Overall Energy Efficiency Implementation Readiness

Figure 36 showcases the benchmark of the performance of the states in percentage scores, for overall energy efficiency implementation readiness.

Figure 36: Percentage Scores of the States for their Overall Energy Efficiency Implementation Readiness



6. Recommendations for States to Scale Up Energy Efficiency from the Current Scenario

The index-based evaluation is not only able to benchmark the readiness of Indian states for energy efficiency implementation, but it also reveals critical deficits or barriers in this respect. From the outcome, the study could derive crucial set of recommendations or action-points for the states to improve their readiness for scaling up energy efficiency activities. Because of the varied energy efficiency scenarios among the 28 states and the National Capital Territory of Delhi, proposing a separate set of recommendations for each state is beyond the scope of this exercise. The following sections highlight the key recommendations under each of the 11 readiness factors, which the states should take cognizance of.

Sector-Specific Action Plan for Scaling Up Energy Efficiency Efforts

Formulating an effective and robust action plan paves the way for actual realization of the energy efficiency potential in a state. Table 22 presents the key recommendations to frame necessary energy efficiency action plans in the states.

Table 22: Key Action Points for the States to Improve Their Readiness by Framing Necessary Energy Efficiency Action Plans

Although the states have developed energy efficiency action plans, these plans lack specific energy saving targets	Undertake a detailed study to identify plausible energy efficiency interventions across energy-consuming sectors, and estimate their energy-saving potential and corresponding investment requirements.
	Adopt achievable energy savings targets against the identified energy efficiency interventions and set a time frame to pursue these targets.
Absence of an energy efficiency policy or legislation at the state level is considered to be a key hurdle to scaling up energy efficiency investments in the states.	One may draw a contrast with the progress made by the states who have adopted targeted RE policies in developing the RE market. The states should endeavor to bring sector-specific energy efficiency policies with definite goals and timebound action plans. This can be reinforced by introducing necessary legislation.

Mandates for Utilities to Invest in Energy Efficiency

Electricity utilities are at the center of energy efficiency delivery systems in India. The quintessential approach to capturing this potential is by regulating the energy efficiency activities of utilities with clear mandates. Some key "to do's" with respect to mandating utilities are given in Table 23.

Table 23: Key Recommendations for the States to Improve Their Readiness by Mandating Utilities to Invest in Energy Efficiency

Energy efficiency in power generation is often ignored at the state level.	SERCs should notify targets to utilities (in case of thermal power generation) to achieve an optimal level of station heat rate (SHR) in power generation. This should be backed by an appropriate penalty in case of noncompliance.
There is enormous potential to scale up utility-driven DSM in India. So far, India's utility DSM progress and achievements have been primarily	Policy-level actions should include the following: - Providing a clear, unambiguous, and explicit clarification that demand-side resources can be an alternative resource option for utilities.

driven by national institutions, policies, and programs in the broader context of energy efficiency and conservation. Going forward, utility DSM growth must be primarily driven by state-level policies and regulations.	Regulatory actions may involve the following: - Stipulating and enforcing DSM targets in the form of resource purchase obligations. - Institutionalizing load research functions within the utility with dedicated resources and authority. - Directing utilities to establish DSM cells with dedicated resources.
	They should be followed by fulfilling the following: - Issuing regulations and guidelines on examining cost-effectiveness of DSM programs. - Issuing guidelines on M&V of DSM measures to evaluate the resulting energy savings.
	In order to facilitate these changes, the center should bring necessary provisions in the legal and regulatory framework to promote demand side resources with supply side options.
Off-peak time rebate is still applicable for industrial consumers only.	SERCs should also extend off-peak time rebate or ToD tariff to domestic and commercial consumers.
Currently, none of the national policies, acts, or regulations, which usually give direction to state-level actions, have emphasized mandating utilities to adopt IRP in their investment plans. Recently, the draft National Renewable Energy Act, 2015, has put emphasis on the need to move towards IRP. However, there is no clear mandate for the utilities or SERCs to undertake or enforce IRP by considering demand-side resources.	To strengthen the draft RE Act to promote demand-side resources, a simple yet effective amendment can be implemented to include a demand-side resource as a qualifying resource under the definition of RE sources along with separate definitions that clarify what constitutes a demand-side resource and meaning of DSM.
	Moreover, suitable amendments in the Electricity (Amendment) Bill, 2014, or in the EA, 2003, or both, can be made to provide an explicit impetus for DSM as a resource option for the utilities and empower state commissions to stipulate DSM resource purchase obligations.

Mandates for Public Institutions to Invest in Energy Efficiency

Public institutions can potentially play a critical role in driving energy efficiency in the states. Setting clear and effective mandates for them at the state level is necessary. Table 24 puts forward some key recommendations in this regard.

Table 24: Key "To Do's" for the States to Improve Their Readiness by Mandating Public Institutions to Invest in Energy Efficiency

Municipality services and state road transport are the prominent areas where large-scale energy-saving efforts are yet to take off.	Notify the ULBs to take energy efficiency measures, such as undertaking investment grade energy audits, replacing old inefficient pumps with star-labeled pumpsets in their water supply networks, installing energy-efficient streetlighting options like LED streetlights.
	Direct state transport corporations to include vehicle fuel economy in their vehicle procurement criteria.
	The center should formulate and notify vehicle fuel economy standards at the national level, in the absence of which states will be ill-equipped to notify transport corporations about fuel economy norms.

Incentives for MSMEs to Invest in Energy Efficiency

This study recognizes the pivotal role the MSMEs can play in realizing the energy efficiency potential at state level. Hence, some major recommendations for promoting energy efficiency in the MSME sector are presented in Table 25.

Table 25: Key Recommendations for the States to Promote Energy Efficiency in MSMEs

Till Up to now, only a few states have implemented initiatives to realize energy-saving potential in the MSME sector.	Provide financial assistance to MSMEs to conduct investment grade energy audits and to prepare feasibility studies for implementing cost-effective energy efficiency measures.
	Design schemes for demonstration projects on energy efficiency in selected MSME clusters, followed by up-scaling through an energy service contract (ESCO)–based model.
Recognizing the energy-saving initiatives among MSMEs can encourage them to adopt more energy conservation measures. However, currently, only few states have initiated such programs.	Institute State Energy Conservation Awards on an annual basis and include different categories of consumers, including the MSME sector.
	Publish the amount of energy savings realized by the awardees from implementing energy efficiency measures. This will show quantified tangible benefits to other players and motivate them to invest in energy efficiency.

Incentives for Large-Scale Users to Invest in Energy Efficiency

The EC Act (section 18) enables the states to regulate energy consumption in industries or the commercial sector. However, hardly any state government has taken an initiative on this front. Table 26 lists some key recommendations on promotion of energy efficiency among large-scale energy users in the states.

Table 26: Key Action Points for the States regarding Promotion of Energy Efficiency among Large-Scale Energy Users

So far, progress and achievements in energy efficiency among large-scale energy users have been primarily driven by national institutions, policies, or programs.	Conferred with the power to regulate norms for process and energy consumption standards in any industry (as per section 18 of EC Act), states should direct large-scale energy consumers to conduct investment-grade energy audits and prepare DPRs of possible energy efficiency interventions in their operations.
Recognizing the energy-saving initiatives among large-scale energy users can encourage them to adopt energy conservation measures further. However, currently, only a few states have initiated such a program.	Institute the State Energy Conservation Awards on an annual basis, and include different categories of consumers, including large industries and commercial entities.
	Publish the amount of energy savings realized by the awardees from implementing energy efficiency measures. This will show quantified tangible benefits to other players and motivate them to invest in energy efficiency.

Implementation of ECBCs

The study tracks that little progress has been made at state level towards implementation of ECBCs. Against this backdrop, it recommends some key action points for the states that would enable effective rolling-out of ECBCs across the states, as described in Table 27.

Table 27: Key Recommendations with Respect to Implementation of ECBCs in the States

Notification of state ECBC is limited to six states only. It is facing a myriad of challenges, such as the absence of policy guidelines for building bylaws, ineffective institutional structure for ECBC administration, a limited number of building planners who have a proper understanding of ECBC, and a lack of awareness.	Each state should develop a group of experts on ECBC, consisting of BEE ECBC experts, architects, engineers, town planners, and representatives of the state urban development department (UDD). The group of experts will be responsible for addressing the technical challenges related to ECBC implementation and for amending the code.
	To overcome the hurdles in notifying ECBC, a steering committee comprising representatives from a group of experts, ULBs, SDAs, and state officials from the Ministry of Urban Development (MoUD) is proposed. The steering committee should initiate a consultative process with other stakeholders, such as discoms, building planners, and schools of architecture. Moreover, they should make information available in the public domain on different aspects of the ECBC and drive awareness programs.
	Taking inputs from stakeholders, the steering committee should develop a model general development control regulation, which will outline the framework for land use and building bylaws.
	Following this, the UDD can amend the existing building bylaws and building approval process. These important measures can pave the way for notification of ECBC in a state.
The lack of incentives is discouraging builders from obtaining certification under a labeling scheme, such as GRIHA and BEE star labeling.	SDA, in conjunction with the ULBs, should introduce energy performance–based labeling schemes for buildings. However, there should be enough market drivers for builders to apply for labeling.
	The ULBs should offer incentives to builders to encourage them to apply for energy labeling. They may include free-of-cost additional FAR, and property tax concessions.
Notifying ECBC without enough compliance requirements defeats the purpose of the mission.	ECBC should make it mandatory for building owners and builders to disclose their properties' energy usage, verified by a third-party accessor (TPA), on an annual basis. ULBs should introduce a suitable reporting system in this regard.
	In addition, ECBC should stipulate submission of building energy performance report issued by TPAs at the time of sale or leasing of the building.

Information or Tools Available to Consumers on Electricity Usage

Informing and empowering consumers go a long way towards achieving the full potential of energy efficiency. However, this has not gotten due attention from utilities. This investigation is able to come out with a list of "to do's" to enhance consumer response to the need for energy efficiency (refer to Table 28).

Table 28: Key Action Points to Enhance Consumer Response to the Need for Energy Efficiency

Information or tools provided to consumers go a long way towards improving end-use efficiency by way of operational and behavioral changes of consumers. Certain information can help consumers make informed decisions to	Provide consumers with the right kind of information, such as comparisons of their electricity consumptions with previous billing months, and with average usage level in same category of consumers. The supply codes issued by the SERCs should include the necessary provisions to mandate utilities to provide this information.

respond to price signals or utility incentives, thereby increasing the overall capacity for DSM.	The utilities should explore implementing automated metering infrastructure to enable real-time feedback to consumers on their electricity consumptions. This will allow consumers to manage their electricity usage.

Energy Efficiency Potential and Implementation Experience

This is a critical energy efficiency readiness factor, the assessment of which has revealed some key areas to act upon at the state level, especially in AgDSM. Table 29 puts forward a set of actionable recommendations for scaling up DSM activities in agriculture.

Table 29: Key Recommendations for Scaling Up DSM Activities in Agriculture

AgDSM is one of the most promising areas to improve demand-side energy efficiency across the states, considering that about 19 million pumpsets are in use in the agricultural sector with an average capacity of 5 HP and efficiency level around 25–30%. However, there are numerous challenges to scale up the effort, such as subsidized electricity and poor-quality power supply.	Rationalize electricity tariffs following the national tariff policy, with a view to creating some drivers for energy efficiency.
	Improve the distribution infrastructure with high-voltage distribution systems to mitigate the performance risk of energy-efficient pumpsets.
	Accelerate rural feeder segregation and establish robust data collection and analytics to establish an accurate and reliable baseline for AgDSM projects.
	Develop a standardized M&V framework for AgDSM projects with pragmatic and cost-effective ways of determining baseline adjustments and stipulations of critical usage factors.
	Promote farmer cofinancing of upfront investment on energy-efficient pumpsets to enable optimal risk sharing in AgDSM investments.
	A market-driven approach based on an ESCO-utility performance contract for shared savings on account of pumpset replacement can be an alternative route. Some states, such as Karnataka (BESCOM), have adopted such a model.
	Integrated DSM solutions should be explored by considering both tariff and energy-side interventions with appropriate delivery models to maximize energy savings in the agriculture pumping loads.
	Conduct systematic awareness and publicity campaigns on the benefits of Ag DSM to farmers.

Financing Mechanisms Available for Energy Efficiency Investments

One of the major barriers in driving energy conservation effort is the inadequacy of effective financing at the state level. This study identifies some key areas that require urgent action by the states, as described in Table 30.

Table 30: Key Action Points to Improve the Financing Ecosystem for Energy Efficiency Investments in the States

Although the states have constituted SECFs, they are yet to realize the full potential of the financial support line.	Mobilize the fund for identifying potential new financing mechanisms required to overcome the barriers to investing in energy efficiency.

	Being a revolving fund, SECFs can be utilized to provide support to targeted financial instruments, such as an energy audit subsidy, interest buy-down scheme, and partial risk guarantee.
Are regulations evolving in tandem with new financing mechanisms in DSM? Adoption of new financing models: The On-bill Financing and Standard Offer program have raised serious questions about adequacy of current DSM regulations to accommodate the evolving dynamics of DSM.	An adaptive regulatory regime is paramount to support new DSM financing models. Recognizing the potential risks and liabilities of stakeholders and their legal implications, SERCs should initiate consultation with all partners and reassess key provisions of current DSM regulations from the point of view of suitability to support the On-bill Financing and Standard Offer program.
	SERCs should bring the necessary regulatory provisions to support effective application of new financing mechanisms: On-bill Financing and Standard Offer.

Institutional Framework and Capacity

Most of the states are disadvantaged by poor institutional structure, along with lack of capacity to steer energy efficiency initiatives. Considering the institutional shortcomings, the investigation puts forward a set of recommendations for the states to consider (refer to Table 31).

Table 31: Key Recommendations for the States to Improve Their Institutional Effectiveness

Although states have designated agencies (SDAs) for pursuing energy efficiency, most of these organizations are vested with other missions (ranging from RE to power distribution), even though they are not fully equipped to drive all these missions.	It is necessary for each state to have a dedicated agency with adequate resources (including budgetary) and expertise for steering energy efficiency action plans.
	Only the Andhra Pradesh SDA has the sole mandate of promoting energy efficiency in the state, which is considered key to the state's achievements in carrying out energy efficiency activities.
Enforcing energy efficiency compliance requirements, such as star labeling of appliances and ECBC, has been a challenge; currently, they are mostly centrally driven.	Kerala is only state that has issued directives (Energy Conservation Directions, 2015) on compliance of energy consumption standards of appliances and buildings (as per section 18 of the EC Act). Other states should exercise their power conferred by section 18 of the EC Act to enforce such compliance requirements.

Monitoring and Evaluation Systems

Taking cognizance of the challenges faced in enforcing energy efficiency regulations in the states, Table 32 presents some key action points that can potentially plug in the loopholes in the enforcement mechanisms.

Table 32: Key "To Do's" for Improving the Energy Efficiency Monitoring and Evaluation Systems in the States

Empaneling energy consultants or auditors can catalyze energy efficiency investments across sectors, which is essential in enforcing energy efficiency compliance requirements, such as ECBC.	Direct all states to set mechanisms to empanel certified energy consultants or auditors.
	They should be properly mobilized to pursue the states' energy efficiency goals.
Enforcement of ECBC is facing hurdles ranging from lack of proper framework and planning to inadequate capacity of the implementing agencies. BEE has an important role to make the compliance system streamlined and implementable.	ULBs should have the central role in enforcing ECBC. However, considering their limited capacity and preoccupation, a TPA system should be developed for ECBC implementation. TPAs should be ECBC accredited professionals certified by the BEE.
	BEE should lay out separate guidelines that TPAs should follow in their assessment and reporting, and on appointment of TPAs by the compliant party.

Appendix A: Selection Approach for Evidence Indicators

	Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
I. Policy and incentives							
(i) Sector specific action plan for scaling up energy efficiency efforts							
Is there legislation, policy or sector-specific action plan that aims to improve energy efficiency?	Yes. The expected result is to ascertain whether the state considers energy efficiency (EE) a key lever in state developmental planning. Clearly, articulated sector-specific actions and targets are key ingredients of an enabling ecosystem for energy efficiency implementation. Planning helps in setting a direction for all stakeholders to align their decision-making. Action plans backed by legislation shows the commitment of the government towards achieving energy efficiency goals.	Yes. These are publicized by the state governments in public domain.	Yes. Legislation, policy, or a sector specific action plan that aims to improve EE provides a strong platform to the state to pursue EE activities.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
Is there a quantified energy efficiency goal or target (for example,	Yes. The expected result is to ascertain whether the state has adopted any	Yes. Official targets can be publicized by the state	Yes. A state that has adopted EE targets can plan its EE efforts and	No.	NA	Yes. The definition of the indicator is	Yes.

	Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
kWh/toe saving)?	specific achievement target for EE. Targets help in motivating implementing agencies to be more proactive, and to measure the progress of the energy efficiency initiatives.	governments.	measure its progress periodically. Targets provide a basis for long-term EE programs and provide justification for obtaining funding. A state with EE targets has a strategic advantage to upscale EE efforts.			consistent over the time.	
(ii) Mandates for utilities to invest in energy efficiency							
Are state utilities required to carry out energy efficiency activities in the following areas? - Generation - T&D - Demand side	Yes. Electricity utilities are at the center of energy efficiency delivery systems in India. The collective potential of utilities to improve energy efficiency both at supply and demand sides is enormous. The quintessential approach to capture this potential is by regulating the energy efficiency activities of utilities with clear and unambiguous mandates.	Yes. The info can be checked from tariff orders.	Yes. Mandates to utilities are a key enabler and a differentiator for a state to progress on EE front.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
Are there penalties for noncompliance with energy efficiency requirements? - Generation - T&D	Yes. This indicator reflects how the given target is enforced.	Yes. The info can be checked from tariff orders.	Yes. A state having provision for penalty for noncompliance will have better enforcement record.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.

	Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
- Demand side							
Are DSM Regulations notified for state utilities?	Yes. DSM regulation is a critical component of an effective EE ecosystem. This indicator sufficiently reflects the desired information.	Yes. Can be checked from SERC notifications.	Yes. It allows for evaluation of which state is more prepared to take up demand side measures.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
Are there guidelines on evaluation of cost effectiveness, Measurement & Verification (M&V) of utility driven DSM measures?	Yes. Such guidelines are critical enabler for scaling up utility-driven DSM activities.	Yes. Can be checked from SERC notifications.	Yes. These regulations can prove as a real differentiator between the states in pursuing utility DSM initiatives.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
Are the utilities required to establish in-house DSM cells?	Yes. Such guidelines are critical enabler for scaling up utility-driven DSM activities.	Yes. The capacity building program for DISCOMs provides the details.	Yes. Such DSM measure is a key differentiator between the states to seriously pursue DSM.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
Does the selected utility provide customers incentives for demand response, such as peak-time rebates?	Yes. ToD is the primary tool to reduce peak demand. This indicator sufficiently reflects the desired information.	Retail tariff orders have mentions of application of ToD.	Yes. Such DSM measure is a key differentiator between the states in acting on reducing peak load.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
Are utilities required to submit an IRP to the regulators?	Yes. Stipulating utilities to submit IRP is a key enabling factor for driving utility DSM programs in a	Yes. Can be checked from SERC notifications.	Yes. This allows for identifying which state has attempted to leverage IRP to scale up utility-	No.	NA	Yes. The definition of the indicator is consistent over	Yes.

	Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
	country. This indicator sufficiently reflects the desired information.		based EE activities.			the time.	
(iii) Mandates for public institutions to invest in energy efficiency							
Are there binding obligations for procurement of energy efficiency applications for the following? - Public buildings - Municipalities (includes water supply, waste water services, and streetlighting) - State road transport corporation.	Yes. Stipulating public procurement of EE appliances or alternatives is an effective step towards promoting EE. This indicator sufficiently reflects the desired information.	Yes. One can get necessary information from state policies or directives.	Yes. This is a key differentiator between the states in promoting EE.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
Is the Energy Conservation Award given at the state level?	Yes. Instituting energy conservation awards is a major step towards advocating EE in different sectors. This indicator sufficiently reflects the desired information.	Yes. The info can be checked in the public domain (for example, the SDA's website).	Yes. This is a key differentiator between the states in promoting EE.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
(iv) Incentives for MSMEs to invest in energy efficiency							
Are there energy efficiency incentives for MSMEs?	Yes. This indicator intends to ascertain whether a state has created fiscal driver for MSMEs to adopt EE	Yes. From publicly available sources (for example, the	Yes. MSME sector houses significant EE potential in the country. Incentivizing MSMEs is a key step	No.	NA	Yes. The definition of the indicator is consistent over	Yes.

	Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
	measures.	SDA's website).	towards capturing this potential. This indicator allows for the performance of a comparative assessment of the implementation readiness of the states.			the time.	
Is there a program to publicly recognize MSMEs that have achieved significant energy savings? Are energy savings and/or financial savings publicized? Is there a program offering assistance to MSMEs to identify energy savings investment opportunities?	Yes. Recognizing selected MSMEs for their energy-saving efforts is an effective way to encourage EE investments in MSME sector. The following suite of indicators sufficiently reflects the desired information.	Yes. From publicly available sources (for example, the SDA's website).	Yes. This indicator is considered as one of the differentiators between the states in promoting EE in MSME sector.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
(v) Incentives for large scale users (industry/commercial) to invest in energy efficiency							
Are there energy efficiency incentives for large-scale	Yes. Industries represent about 38% of India's final energy use, and they	Yes. State governments usually publicize	This indicator allows for the performance of a comparative assessment	No.	NA	Yes. The definition of the indicator is	Yes.

	Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
energy consumers?	consume around 45% of electricity generated in the country. It is quite evident that this sector offers significant opportunity to reduce energy consumption through energy efficiency interventions. Offering incentives to stimulate EE investments can stimulate EE investments by such consumers. This indicator sufficiently reflects the desired information.	such incentive schemes in public domain (for example, the SDA's website).	of the EE implementation readiness of the states in industrial sector.			consistent over the time.	
Is there a program to publicly recognize large-scale energy consumers that have achieved significant energy savings?	Yes. Recognizing selected industries for their energy-saving efforts is an effective way to encourage EE investments in this sector. This indicator sufficiently reflects the desired information.	Yes. From publicly available sources (for example, the SDA's website).	Yes. This indicator is considered as one of the differentiators between the states in promoting EE in industries.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
Are energy savings and/or financial savings publicized?							
Is there a program offering assistance to large-scale energy consumers to identify energy savings investment							

	Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
opportunities?							
(vi) Implementation of ECBCs							
Status of adoption of ECBC *- Notification issued* *- Amended*	Yes. Recognizing the need to improve EE in the buildings sector, following the provisions of the EC Act, in 2007 the Government of India notified the ECBCs of new commercial buildings with a connected load of 100 kW or 120 kVA. However, this has to be complemented by the individual states through amendment and notification of ECBC at the state level to suit local or regional conditions and needs. This indicator sufficiently reflects the desired information.	Yes. From publicly available sources (for example, the SDA's website).	Yes. This indicator allows performing comparative assessment of the EE implementation readiness of the states in building sector.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
Are there energy efficiency codes for the following building types? - New residential buildings - New commercial buildings	Yes. Directive on adopting building EE codes is a critical enabler towards improving energy performance of buildings. This indicator sufficiently reflects the desired information.	Yes. This information is available in applicable building codes.	Yes. This indicator is considered as one of the differentiators between the states in promoting EE in building sector.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.

	Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
Are building renovations required to meet a building energy efficiency code? - Residential - Commercial	Yes. Same as above.	Yes. This information is available in applicable building codes.	Yes. Same as above.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
Is there a standardized labeling scheme or rating system for qualifying the energy performance of buildings (for example, LEED, GRIHA, and BEE star labeling)?	Yes. It is considered that the state-notified ECBC should make it mandatory for the buildings to achieve a minimum energy performance standard under a rating/labeling program like BEE star labeling. This indicator sufficiently reflects the desired information.	Yes. This information can be checked in state specific ECBC guideline or in SDA's website.	Yes. This indicator is considered as one of the differentiators between the states in promoting EE in buildings.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
Is the labeling scheme or rating adopted from external standards or developed domestically? Check “Yes” if adopted from international standards and “No” if developed domestically.	Yes. Adopting international building EE standards can effectively equip the state to achieve credibility of the labeling or rating scheme. This indicator sufficiently reflects the desired information.	Yes. This information can be checked in state specific ECBC guideline or in SDA's website.	Yes. The states can leverage from adopting recognized standards to stimulate building developers to apply for labeling or rating of their buildings. Thus, this indicator can be useful to undertake comparative evaluation of the states' EE implementation readiness.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.

	Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
Are commercial and residential buildings required to disclose property energy usage at the point of sale or when leased?	Yes. Such directive can be an effective tool to improve building EE. This indicator sufficiently reflects the desired information.	Yes. This information can be checked in state specific ECBC guideline or in SDA's website.	Yes. Such regulation can be one of the key differentiators between the states in driving EE effort in building sector.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
Are commercial and residential buildings required to disclose annual property energy usage?	Same as above.	Yes. This information can be checked in state specific ECBC guideline or in SDA's website.	Same as above.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
Are there incentives for individual buildings to meet high-quality energy efficiency certifications?	Yes. Such incentives can encourage builders to achieve EE certifications. This indicator sufficiently reflects the desired information.	Yes. This information can be checked in state specific ECBC guideline or in SDA's website.	Same as above.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
II. Energy efficiency market maturity							
(vii) Information or tools available to consumers on electricity usage							
Do customers receive a bill or report that shows their energy usage compared to previous bills or reports over time? - Domestic	Yes. This indicator intends to ascertain how well the consumers are informed about their energy usage. This indicator sufficiently reflects the desired	Yes. This information can be checked on SERC issued power supply code.	Yes. Insights into electricity usage go a long way in delivering end-use efficiency by way of operational/behavioral changes of consumers.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.

	Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
- Commercial - Industrial	information.		Information depicting how much, when, and at what cost energy is consumed can help consumers make informed decisions to respond to price signals or other utility incentives, thereby increasing the overall capacity for DSM. Such an indicator captures certain key industry best practices that can strengthen the readiness of states for scaling up EE measures.				
Do customers receive a bill or report which compares them with other users in the same region and/or usage class? - Domestic - Commercial - Industrial	Yes. This indicator intends to ascertain whether consumers have access to information pertaining to past and peer usage. This indicator sufficiently reflects the desired information.	Yes. This information can be checked on SERC issued power supply code.	Yes. Providing consumers such information enable utilities and consumers monitor, measure, and evaluate energy efficiency impacts in a transparent and reliable manner. States can leverage from such steps to pursue their EE agenda.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
Does the utility offer customers access to the following:							
Real-time feedback on energy usage (for either prepaid or post-paid	Yes. This indicator intends to ascertain how well the consumers are informed	Yes. This information can be checked from	Yes. Insights into electricity usage go a long way in delivering end-use	No.	NA	Yes. The definition of the indicator is	Yes.

	Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
systems).	about their energy usage. This indicator sufficiently reflects the desired information.	sources in public domain.	efficiency by way of operational/behavioral changes of consumers. Information depicting how much, when, and at what cost energy is consumed can help consumers make informed decisions to respond to price signals or other utility incentives, thereby increasing the overall capacity for DSM. Such indicator captures certain key industry best practices that can strengthen the readiness of states for scaling up EE measures.			consistent over the time.	
Ability to manage energy usage levels remotely (through apps or other technology mediums that can track real-time energy usage).	Yes. This indicator attempts to capture how well the consumers are equipped to manage their electricity consumption through new and innovative ways. This indicator sufficiently reflects the desired information.	Yes. This information can be checked from sources in public domain.	It is not just the knowledge of electricity usage; control is also an important function to leverage vital information for acting timely upon demand-side measures.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.

(viii) Energy efficiency potential and implementation experience

	Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
To what extent have the state utilities been successful in driving the adoption of LED self-ballasted lamps among households?	Yes. In view of nation-wide effort to replace inefficient household lighting systems with LED lamps, it is imperative to assess the progress of such initiative state-wise. Such indicator helps capture this information.	Yes. This information can be checked from sources in public domain (such as http://www.delp.in/).	Yes. The states are found to make progress at different scales. Such quantitative indicator allows track the real progress made by states by normalizing the lamp distribution data to compare states on a level playing field irrespective of their size, and scaled between 0 and 1. The distance to frontier approach is adopted, where the frontier represents the best performance by any state observed against that evidence indicator.	Yes.	Yes.	The result of the indicator is time dependent. That's why the states have been given scores based on the penetration of LED lamps among consumers as on a specific date: 10 December 2015.	Yes.
To what extent have old agricultural pumps been replaced with BEE star-rated pumpsets through utility driven DSM program?	Yes. Replacement of agricultural pumpsets with BEE star-rated pumps through utility-driven DSM programs is a key program to capture DSM potential in the country. This indicator reflects the desired information.	Yes. From publicly available sources.	Yes. The states are found to make progress at different scales. Such quantitative indicator allows track the real progress made by states by normalizing the pump replacement data to compare states on a level playing field irrespective of their size, and scaled between 0 and 1. The	Yes.	Yes.	The result of the indicator is time dependent. That's why the states have been given scores based on the pump replacement statistics as on a specific date.	Yes.

	Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
			distance to frontier approach is adopted, where the frontier represents the best performance by any state observed against that evidence indicator.				
To what extent have the state municipalities been successful in driving the adoption of LED lighting technology for streetlighting applications?	Yes. Installation of LED streetlights is one of the prominent DSM measures for reducing the load from municipalities or public services. This indicator reflects the desired information.	Yes. From publicly available sources (such as http://www.eeslindia.org/slnp/).	Yes. The states are found to make progress at different scales. Such quantitative indicator allows track the real progress made by states by normalizing the LED streetlighting data to compare the states on a level playing field irrespective of their size, and scaled between 0 and 1. The distance to frontier approach is adopted, where the frontier represents the best performance by any state observed against that evidence indicator.	Yes.	Yes.	The result of the indicator is time dependent. That's why the states have been given scores based on the streetlighting statistics as on a specific date.	Yes.
To what extent have the state utilities been successful in driving adoption of BEE 5 star–	Yes. In view of nation-wide effort towards demand side measures, it is imperative to assess the progress of	Yes. This information can be checked from sources in public	Yes. The states are found to make progress at different scales. Such quantitative indicator	Yes.	Yes.	The result of the indicator is time dependent. That's why the states	Yes.

	Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
rated fans among households?	such initiative state-wise. Such indicator helps capture this information.	domain.	allows track the real progress made by states by normalizing the fan distribution data to compare states on a level playing field irrespective of their size, and scaled between 0 and 1. The distance to frontier approach is adopted, where the frontier represents the best performance by any state observed against that evidence indicator.			have been given scores based on the penetration of 5 star–rated fans among consumers as on a specific date.	
Level of T&D loss (%)	Yes. It is a key performance indicator for a DISCOM regarding EE	Yes. The data is compiled by CEA annually.	States have varying levels of T&D loss. Hence, it is good indicator for state-wise comparison.	Yes.	Yes.	The result of the indicator is time dependent. That's why, the states have been given scores as on a particular period of time	Yes.
Level of peak power deficit (%)	Yes. It is a key performance indicator for a DISCOM regarding EE	Yes. The data is compiled by CEA annually.	States have varying levels of peak deficit. Hence, it is good indicator for state-wise comparison.	Yes.	Yes.	The result of the indicator is time dependent. That's why, the states have been given scores as on a particular period	Yes.

	Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
						of time	
Level of power deficit (%)	Yes. It is a key performance indicator for a DISCOM regarding EE.	Yes. The data is compiled by CEA annually.	States have varying levels of power deficit. Hence, it is good indicator for state-wise comparison.	Yes.	Yes.	The result of the indicator is time dependent. That's why, the states have been given scores as on a particular period of time	Yes.
(ix) Financing mechanisms available for energy efficiency activities							
Are the following financial mechanisms available for energy efficiency activities? - State Energy Conservation Fund (SECF) - Capital subsidy for energy efficiency programs - On-bill financing/prepayment - Credit lines with banks for energy efficiency activities - Energy services agreements (pay-for-performance contracts) - Partial risk guarantees - Cost recovery through	Yes. Following set of indicators intends to capture one of the critical elements of EE ecosystem in India: financing mechanisms. These include energy service performance contracting, on-bill financing, and partial risk guarantees. The EC Act also directs the states to constitute a fund for the purpose of promoting energy conservation in the states, known as the State Energy Conservation Fund.	Yes. From publicly available sources (for example, the SDA's website).	Yes. Availability of such financing options is considered a key differentiator between states' readiness for scaling up EE efforts.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.

		Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
	ARR/tariffs - DSM funds created by levy/cess or any notification in this regard - Others							
III. Energy efficiency institutional capacity								
(x) Institutional framework and capacity								
	Are there entities for the following? - Setting up a state energy efficiency strategy/policy. Do they have the sole mandate of promoting energy efficiency? - Regulating energy efficiency activities of energy suppliers - Regulating energy efficiency activities of energy consumers - Regulating equipment energy efficiency standards - Enforcing/certifying compliances with building energy efficiency standards	Yes. There are five primary functional areas where institutional support is required at the state-level for enhancing EE implementation readiness, in line with the provisions of EC Act, 2001. These are: setting EE strategy/policy, regulating EE at supply (including distribution) as well as demand sides, and equipment EE standards, and enforcing or certifying compliance with building energy codes. This suite of indicators reflects this vital information to evaluate a state's EE implementation readiness. Recognizing that SDA constitutes the heart of an EE governance system within a state, but	Yes. From publicly available sources (for example, the SDA's website).	Yes. The effectiveness of this indicator can be gauged from the wide variation of the existing institutional framework for EE across the states. For example, out of the 34 SDAs, 14 are renewable energy development agencies, 9 are power departments of state governments, 6 are electrical inspectorate offices, 3 are electricity DISCOMs and 2 are societies registered under the Societies Registration Act, 1860. Only the SDA of Andhra Pradesh's State Energy Conservation Mission (SECM) has been constituted with the sole mandate of promoting EE	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.

	Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
	often the entity is vested with other responsibilities that divide its focus for EE, this indicator intends to capture the information whether the SDA has the sole mandate of promoting EE.		in the state.				
(xi) Monitoring and evaluation system							
Are energy savings or other target indicators measured to track performance in meeting energy efficiency requirements? - Generation - T&D - Demand side	Yes. It is seen that in spite of stipulating energy efficiency targets to utilities in their generation, T&D or other business activities, real energy savings may not be achieved until and unless relevant indicators are measured and tracked. To this end, following suite of indicators is employed to capture this vital insight.	Yes. This information can be checked from relevant SERC orders.	Yes. Recognizing that regulations need to be backed by appropriate compliance or enforcement mechanisms for driving EE in a state, this indicator is able to reflect how well individual states have fared well on this front.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
Are the requirements measured/validated by independent third parties? - Generation - T&D - Demand side	Yes. Lack of propriety and independence in the functioning of the enforcing agencies often raise questions regarding effectiveness of the compliance mechanism. From this perspective, this indicator is deemed to be	Yes. This information can be checked from relevant SERC orders.	Yes. This indicator duly reflects the state-wise compliance enforcement mechanism with respect to power generation, T&D and demand side management.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.

	Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
	useful.						
Does the regulator track utilities' compliance with directives for providing energy usage information to customers?	Yes. Regulators tracking utilities' compliance with directives for providing energy usage information to customers is essential for ensuring compliance with the regulators' directives. Hence, this indicator is vital for the evaluation.	Yes. This information can be checked from relevant SERC orders.	Yes. This indicator duly reflects the status across states about this important compliance enforcement.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
Are load research studies conducted by the utilities to plan DSM programs?	Yes. Realizing the full energy-saving potential from DSM solutions/programs warrants undertaking deep-dive studies like Load Research. This indicator intends to capture this key information.	Yes. From publicly available sources (such as DISCOMs' websites).	Yes. Performing load research study by utilities is deemed as a key differentiator between the states as far as scaling up DSM activities is concerned.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
Has the SDA developed an empanelment mechanism for energy consultants and auditors?	Yes. Realizing the full energy-saving potential from EE solutions/programs requires a holistic approach. The latter should include creating a self-sustaining system for stimulating EE efforts. Empanelment of energy consultants and auditors by	Yes. From publicly available sources (such as the SDAs' websites).	Yes. SDA listing empanelled energy consultants or auditors will have a strategic advantage to promote EE investments in the state.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.

	Does it enable us to know about the expected result or condition?	Can this information be captured?	Will this indicator provide sufficient information about a condition or result to enable inter-state comparison?	Is the indicator quantitative?	Are data currently being collected?	Is the indicator defined in the same way over time? Are data for the indicator collected in the same way over time?	Is the indicator objective?
	a SDA is an important step towards this objective. This indicator is thus useful for assessing a state's readiness for advancing EE agenda.						
Does the notified ECBC directive specify a system for compliance with the building energy efficiency codes?	Yes. Similar to EE in power generation, T&D and demand side, enforcement of ECBCs warrants instituting an unambiguous and robust system for compliance. From this angle, this indicator is useful to carry out evaluation of a state's readiness for EE implementation.	Yes. From ECBC guidelines or building codes.	Yes. This indicator duly reflects the state-wise compliance enforcement mechanism with respect to building EE codes.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.
Is the ECBC compliance verified by independent third parties?	Yes. Lack of propriety and independence in the functioning of the enforcing agencies often raise questions regarding effectiveness of the compliance mechanism. From this perspective, this indicator is deemed to be useful.	Yes. From ECBC guidelines or building codes.	Yes. This indicator duly reflects the state-wise compliance enforcement mechanism with respect to building energy performance codes.	No.	NA	Yes. The definition of the indicator is consistent over the time.	Yes.

NA — Not applicable

Appendix B: The States' Readiness Scores

The status of the states against each evidence indicator and their resulting factor scores are presented in Tables A1 – A11. States that have reported qualifying actions against the given evidence indicators are marked as "X".

Table A1: Assessment of States for the State Plan for Energy Efficiency

States	Evidence indicators		Index
	Legislation, policy or sector-specific action plan	Quantified energy efficiency goal or target	Out of 2
Andhra Pradesh	X		1
Arunachal Pradesh			0
Assam			0
Bihar	Underdevelopment		0.5
Chhattisgarh			0
Delhi			0
Goa			0
Gujarat	X		1
Haryana	X		1
Himachal Pradesh	X		1
Jammu & Kashmir			0
Jharkhand	X		1
Karnataka	Underdevelopment	Underdevelopment	1
Kerala	Underdevelopment	Underdevelopment	1
Madhya Pradesh			0
Maharashtra	X		1
Manipur	X		1
Meghalaya			0
Mizoram	X		1
Nagaland	X		1
Odisha	X		1
Punjab	X		1
Rajasthan			0
Sikkim			0
Tamil Nadu	X		1
Tripura			0
Uttarakhand	X		1

Uttar Pradesh			0
West Bengal	X		1

Note: In case legislation, or a policy or action plan is under development in a state, the latter is awarded with a score of 0.5.

Table A2: Assessment of States for Mandates for Utilities

States	Evidence indicators											Index
	Obligation to carry out energy efficiency in:			Penalties for non-compliance in:			DSM regulations notified	Guidelines on cost effectiveness and M&V of utility: DSM measures	Stipulating utilities to set up in-house DSM cell	Incentivizing customers for demand response, such as off-peak time rebates	Obligation to submit IRP to the regulators	Out of 11
	Generation	T&D	Demand side	Generation	T&D	Demand side						
Andhra Pradesh		X	X						X	X		4
Arunachal Pradesh		X										1
Assam		X	X				X		X	X		5
Bihar		X	X		X		X		X	X		6
Chhattisgarh		X	X		X		X		X	X		6
Delhi	X	X	X	X	X		X		X	X		8
Goa		X					X		X			3
Gujarat	X	X	X	X	X		X		X	X		8
Haryana		X	X		X		X		X	X		6
Himachal Pradesh		X	X		X		X		X	X		6
Jammu & Kashmir		X					X					2
Jharkhand		X	X		X		X			X		5
Karnataka	X	X	X		X		X		X	X		7

Kerala		X	X						X	X		4
Madhya Pradesh		X	X		X				X	X		5
Maharashtra		X	X		X		X	X	X	X		7
Manipur		X					X					2
Meghalaya		X			X				X			3
Mizoram		X					X		X			3
Nagaland		X			X							2
Odisha		X	X		X		X		X	X		6
Punjab		X	X		X		X	X	X	X		7
Rajasthan	X	X	X	X	X				X	X		7
Sikkim		X			X							2
Tamil Nadu	X	X	X	X	X		X		X	X		8
Tripura		X	X		X		X		X	X		6
Uttarakhand		X	X		X				X	X		5
Uttar Pradesh		X	X		X		X		X	X		6
West Bengal		X	X		X					X		4

Table A3: Assessment of States for Mandates for Public Institutions

States	Evidence indicators				Index
	Binding obligations for procurement of energy efficient applications for:			State Energy Conservation Award	Out of 4
	Public buildings	Municipalities	Road transport corporation		
Andhra Pradesh	X				1
Arunachal Pradesh	X				1
Assam	X				1
Bihar					0
Chhattisgarh				X	1
Delhi	X				1
Goa					0
Gujarat	X				1
Haryana	X			X	2
Himachal Pradesh	X	X			2
Jammu & Kashmir	X				1
Jharkhand				X	1
Karnataka	X				1
Kerala	X			X	2
Madhya Pradesh					0
Maharashtra	X			X	2
Manipur					0
Meghalaya					0
Mizoram					0
Nagaland					0
Odisha	X	X			2
Punjab				X	1
Rajasthan	X	X		X	3
Sikkim					0
Tamil Nadu	X				1
Tripura					0
Uttarakhand				X	1
Uttar Pradesh	X				1
West Bengal					0

Table A4: Assessment of States for Incentives to MSMEs

States	Evidence indicators		Index
	Energy efficiency incentives for MSMEs	Assistance to MSMEs to identify energy savings investment opportunities	Out of 2
Andhra Pradesh		X	1
Arunachal Pradesh			0
Assam			0
Bihar			0
Chhattisgarh			0
Delhi			0
Goa			0
Gujarat		X	1
Haryana		X	1
Himachal Pradesh			0
Jammu & Kashmir			0
Jharkhand			0
Karnataka	X		1
Kerala	X	X	2
Madhya Pradesh			0
Maharashtra	X	X	2
Manipur			0
Meghalaya			0
Mizoram			0
Nagaland			0
Odisha			0
Punjab	X		1
Rajasthan			0
Sikkim			0
Tamil Nadu	X		1
Tripura			0
Uttarakhand			0
Uttar Pradesh	X		1
West Bengal			0

Table A5: Assessment of States for Incentives to Large-Scale Energy Users

States	Evidence indicators		Index
	Incentives for large-scale energy consumers	Assistance to identify energy savings investment opportunities	Out of 2
Andhra Pradesh			0
Arunachal Pradesh			0
Assam			0
Bihar			0
Chhattisgarh			0
Delhi			0
Goa			0
Gujarat			0
Haryana			0
Himachal Pradesh			0
Jammu & Kashmir			0
Jharkhand			0
Karnataka			0
Kerala	X		1
Madhya Pradesh			0
Maharashtra	X	X	2
Manipur			0
Meghalaya			0
Mizoram			0
Nagaland			0
Odisha			0
Punjab			0
Rajasthan			0
Sikkim			0
Tamil Nadu			0
Tripura			0
Uttarakhand			0
Uttar Pradesh			0
West Bengal			0

Table A6: Assessment of States for the Implementation of ECBCs

States	Evidence indicators								Index
	Adoption of ECBC	Energy efficiency codes for:		Energy efficiency codes for building renovations for:		Labeling or rating system	Disclosure of property energy usage at the point of sale or when leased	Disclosure of annual property energy usage	Incentives for high-quality energy efficiency certifications	Out of 9
		New residential buildings	New commercial buildings	Residential	Commercial					
Andhra Pradesh	X		X		X	X		X	X	6
Arunachal Pradesh										0
Assam	Amended									0.5
Bihar	Amended									0.5
Chhattisgarh	Amended									0.5
Delhi	Amended									0.5
Goa										0
Gujarat	Amended									0.5
Haryana	Amended									0.5
Himachal Pradesh	Amended									0.5
Jammu & Kashmir										0
Jharkhand										0
Karnataka	X		X		X	X		X	X	6

Kerala	Amended									0.5
Madhya Pradesh	Amended									0.5
Maharashtra	Amended					X			X	2.5
Manipur										0
Meghalaya										0
Mizoram										0
Nagaland										0
Odisha	X		X		X	X		X		5
Punjab	X		X		X	X			X	5
Rajasthan	X		X		X	X			X	5
Sikkim						X				1
Tamil Nadu	Amended									0.5
Tripura										0
Uttarakhand	X		X		X					3
Uttar Pradesh	Amended					X			X	2.5
West Bengal	Amended					X			X	2.5

Note: In case a state has amended the ECBC, it is awarded a score of 0.5.

Table A7: Assessment of States for Information or Tools Provided to Consumers

States	Evidence indicators								Index
	Customers receiving bills that show their energy usage compared to previous bills			Customers receiving bills which compare them to other users in the same region and/or usage class			Utility offering customers access to:		Out of 8
	Domestic	Commercial	Industrial	Domestic	Commercial	Industrial	Real-time feedback on energy usage	Ability to manage energy usage levels remotely	
Andhra Pradesh	X	X	X						3
Arunachal Pradesh	X	X	X						3
Assam	X	X	X						3
Bihar	X	X	X						3
Chhattisgarh	X	X	X						3
Delhi	X	X	X					X	4
Goa	X	X	X						3
Gujarat	X	X	X						3
Haryana	X	X	X						3
Himachal Pradesh	X	X	X						3
Jammu & Kashmir	X	X	X						3
Jharkhand	X	X	X						3
Karnataka	X	X	X						3
Kerala	X	X	X						3
Madhya Pradesh	X	X	X						3
Maharashtra	X	X	X						3

Manipur									0
Meghalaya									0
Mizoram									0
Nagaland									0
Odisha									0
Punjab	X	X	X						3
Rajasthan	X	X	X						3
Sikkim									0
Tamil Nadu									0
Tripura									0
Uttarakhand	X	X	X						3
Uttar Pradesh	X	X	X						3
West Bengal	X	X	X						3

Table A8: Assessment of States for Energy Efficiency Potential and Implementation Experience

States	Evidence indicators													Index
	Implementation of utility driven domestic LED program	Implementation of utility-driven AgDSM	Implementation of LED streetlighting program by municipalities	Implementation of domestic energy efficient fan program	Implementation of solar irrigation pump program	Penetration of LED lamps among households	Penetration of BEE star-rated agricultural pumps	Penetration of LED streetlighting	Penetration of 5 star–rated domestic fans	Penetration of solar irrigation pumps	Level of T&D loss (%)	Level of peak power deficit (%)	Level of power deficit (%)	Out of 13
Andhra Pradesh	X	X	X	X	X	0.26	0.94	0.37	1.00	0.67	0.79	1.00	1.00	11.01
Arunachal Pradesh											0.29	0.97	0.94	2.20
Assam											0.52	0.92	0.94	2.38
Bihar	X				X	0.02				0.04	0.32	0.93	0.99	4.30
Chhattisgarh	X		X		X	0.06		0.24		0.46	0.61	0.96	0.99	6.31
Delhi	X		X			0.43		1.00			0.63	1.00	1.00	6.06
Goa											0.74	0.95	1.00	2.68
Gujarat			X		X			0.12		0.50	0.67	1.00	1.00	5.29
Haryana	X					0.03					0.59	1.00	1.00	3.62
Himachal Pradesh	X					1.00					1.00	1.00	0.99	4.99
Jammu & Kashmir											0.26	0.85	0.85	1.96
Jharkhand	X		X			0.21		0.10			0.39	1.00	0.98	4.67
Karnataka	X	X			X	0.17	1.00			0.63	0.66	0.93	0.95	7.34

Kerala	X		X			0.26		0.03			0.73	0.97	1.00	4.98
Madhya Pradesh	X				X	0.01				0.48	0.47	1.00	1.00	4.96
Maharashtra	X	X	X			0.17	1.00	0.00			0.64	0.98	1.00	6.79
Manipur											0.43	0.99	0.96	2.39
Meghalaya											0.50	0.94	0.94	2.39
Mizoram											0.41	0.99	0.97	2.37
Nagaland											0.32	0.99	0.98	2.29
Odisha	X		X			0.02		0.11			0.27	1.00	0.99	4.40
Punjab											0.74	1.00	1.00	2.74
Rajasthan	X	X	X		X	0.18	0.91	0.25		1.00	0.56	1.00	1.00	8.89
Sikkim											0.81	1.00	1.00	2.81
Tamil Nadu					X					0.73	0.62	1.00	0.99	4.34
Tripura			X					0.85			0.55	0.90	0.95	4.26
Uttarakhand	X					0.34					0.66	1.00	0.98	3.98
Uttar Pradesh	X		X	X	X	0.06		0.01	0.08	0.29	0.45	0.85	0.88	6.62
West Bengal											0.55	1.00	1.00	2.55

Note: Scoring against the applied evidence indicators, the progress in implementation of energy efficiency projects has been evaluated based on normalization to compare the states on a level playing field irrespective of their size, and scaled between 0 and 1. The "distance to frontier" approach is adopted, where the frontier represents the best performance by any state observed against that indicator.

Table A9: Assessment of States for Financing Mechanisms for Energy Efficiency Activities

States	Evidence indicators									Index
	SECF	Capital subsidy	On-bill financing	Credit lines with banks	Energy services agreements	Partial risk guarantees	Cost recovery through ARR/tariffs	DSM funds	Others	Out of 9
Andhra Pradesh	X				X		X			3
Arunachal Pradesh	X				X		X			3
Assam				X	X					2
Bihar	X				X		X			3
Chhattisgarh	X				X		X			3
Delhi	X	X	X		X		X			5
Goa					X		X			2
Gujarat	X	X	X		X		X			5
Haryana	X	X			X		X			4
Himachal Pradesh	X		X		X		X			4
Jammu & Kashmir	X						X			2
Jharkhand					X		X			2
Karnataka	X	X	X		X		X			5
Kerala	X	X		X	X	X	X			6
Madhya Pradesh	X				X					2
Maharashtra	X	X	X		X		X			5
Manipur	X									1
Meghalaya	X									1
Mizoram	X									1
Nagaland	X									1
Odisha	X				X		X			3
Punjab	X	X			X		X			4
Rajasthan	X				X		X			3

Sikkim	X									1
Tamil Nadu	X				X		X			3
Tripura	X				X		X			3
Uttarakhand	X				X		X			3
Uttar Pradesh	X				X		X			3
West Bengal					X					1

Table A10: Assessment of States for Institutional Framework and Capacity

States	Evidence indicators						Index
	Entity for setting state energy efficiency strategy/policy	Does it have the sole mandate of promoting energy efficiency	Regulating energy efficiency activities of energy suppliers	Regulating energy efficiency activities of energy consumers	Regulating equipment energy efficiency standards	Enforcing/certifying compliances with building energy efficiency standards	Out of 6
Andhra Pradesh	X	X	X	X		X	5
Arunachal Pradesh	X		X	X			3
Assam	X		X	X			3
Bihar	X		X	X			3
Chhattisgarh	X		X	X			3
Delhi	X		X	X			3
Goa	X		X	X			3
Gujarat	X		X	X			3
Haryana	X		X	X			3
Himachal Pradesh	X		X	X			3
Jammu & Kashmir	X		X	X			3
Jharkhand	X		X	X			3
Karnataka	X		X	X			3
Kerala	X		X	X	X	X	5
Madhya Pradesh	X		X	X			3
Maharashtra	X		X	X			3
Manipur	X		X	X			3
Meghalaya	X		X	X			3
Mizoram	X		X	X			3
Nagaland	X		X	X			3
Odisha	X		X	X		X	4
Punjab	X		X	X		X	4
Rajasthan	X		X	X		X	4
Sikkim	X		X	X			3
Tamil Nadu	X		X	X			3
Tripura	X		X	X			3
Uttarakhand	X		X	X			3

Uttar Pradesh	X		X	X			3
West Bengal	X		X	X			3

Table A11: Assessment of States for Monitoring and Evaluation Systems

States	Evidence indicators											Index
	Measuring utilities' energy savings to track performance in:			Energy savings measured/validated by an independent third parties in:			Regulator tracking energy usage information to customers	Load research study conducted	Empanelment mechanism for energy consultants and auditors	System to ensure compliance with building energy efficiency codes	Is the compliance verified by third party	Out of 11
	Generation	T&D	Demand side	Generation	T&D	Demand side						
Andhra Pradesh		X	X				X	X	X	X	X	7
Arunachal Pradesh		X					X					2
Assam		X					X	X				3
Bihar		X	X				X	X				3
Chhattisgarh		X	X				X	X	X			5
Delhi	X	X	X				X	X	X			6
Goa		X					X	X				3
Gujarat	X	X	X				X	X	X			6
Haryana		X	X				X	X	X			5
Himachal Pradesh		X	X				X	X	X			5
Jammu & Kashmir		X					X	X				3
Jharkhand		X	X				X					3
Karnataka	X	X	X				X	X				5
Kerala		X	X				X	X	X			5

Madhya Pradesh		X	X				X	X	X			4
Maharashtra		X	X				X	X	X			5
Manipur		X					X					2
Meghalaya		X					X	X				3
Mizoram		X					X	X				3
Nagaland		X					X					2
Odisha		X	X				X	X	X	X	X	6
Punjab		X					X	X		X		5
Rajasthan	X	X	X				X	X		X	X	7
Sikkim		X					X					2
Tamil Nadu	X	X					X	X				4
Tripura		X	X				X	X				4
Uttarakhand		X	X				X	X	X			5
Uttar Pradesh		X	X				X	X	X			5
West Bengal		X					X					2