



**USAID**  
FROM THE AMERICAN PEOPLE

# Grid-Interactive Net Zero Energy Buildings

## Last Mile Connection to the Smart Grid

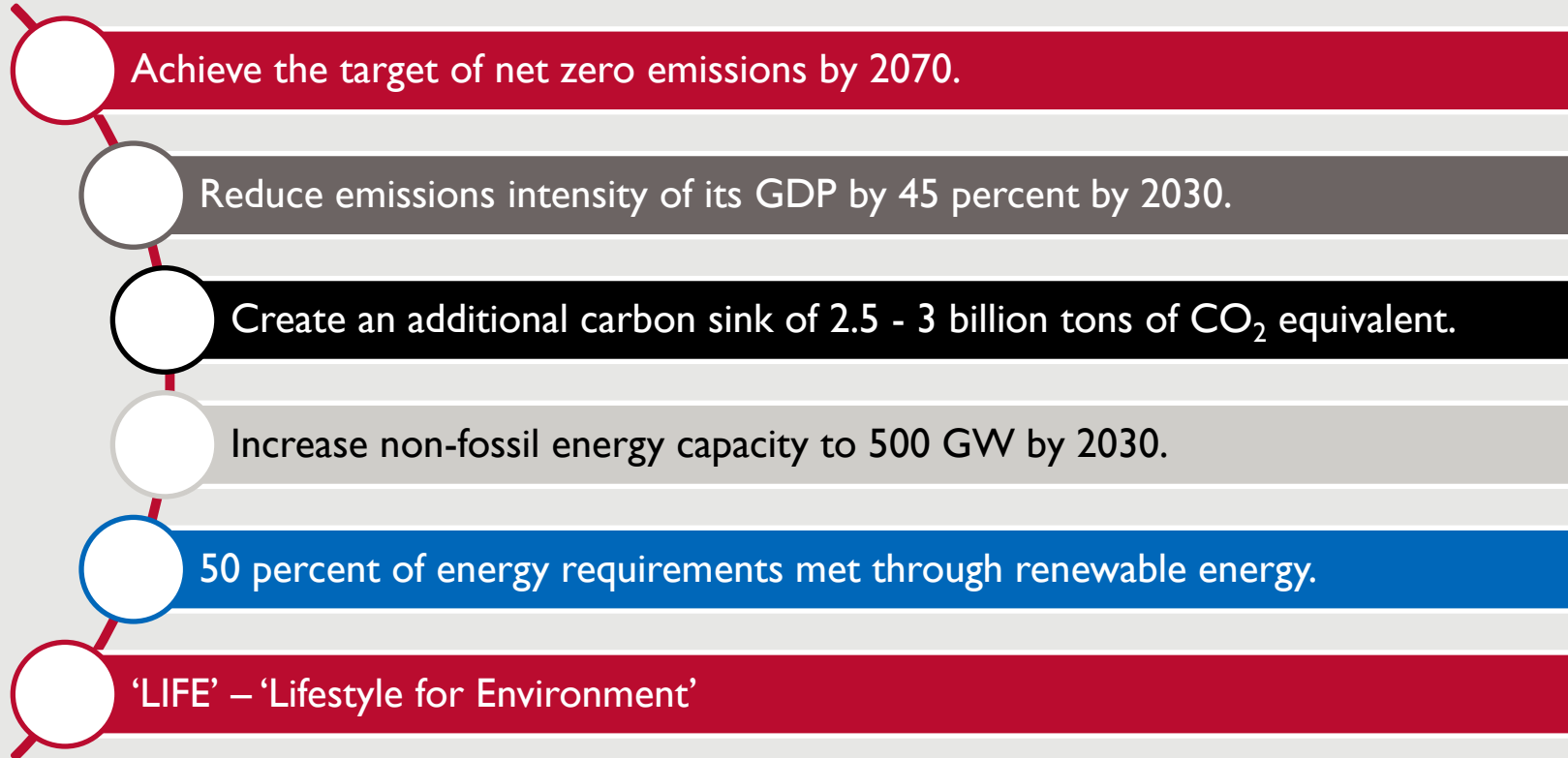
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Apurva Chaturvedi

Senior Regional Clean Energy Specialist

USAID/India

# India | Net Zero Commitments





# Approach to Net Zero : Buildings Sector

1

## Reduce Energy Use

- Codes & Certification
- EE Retrofits
- Super-efficient appliances (Cooling)
- Net Zero Energy Campus- Nalanda University
- Indian Railways' EE Policy & Action Plan
- Net Zero Energy Building Web Portal

2

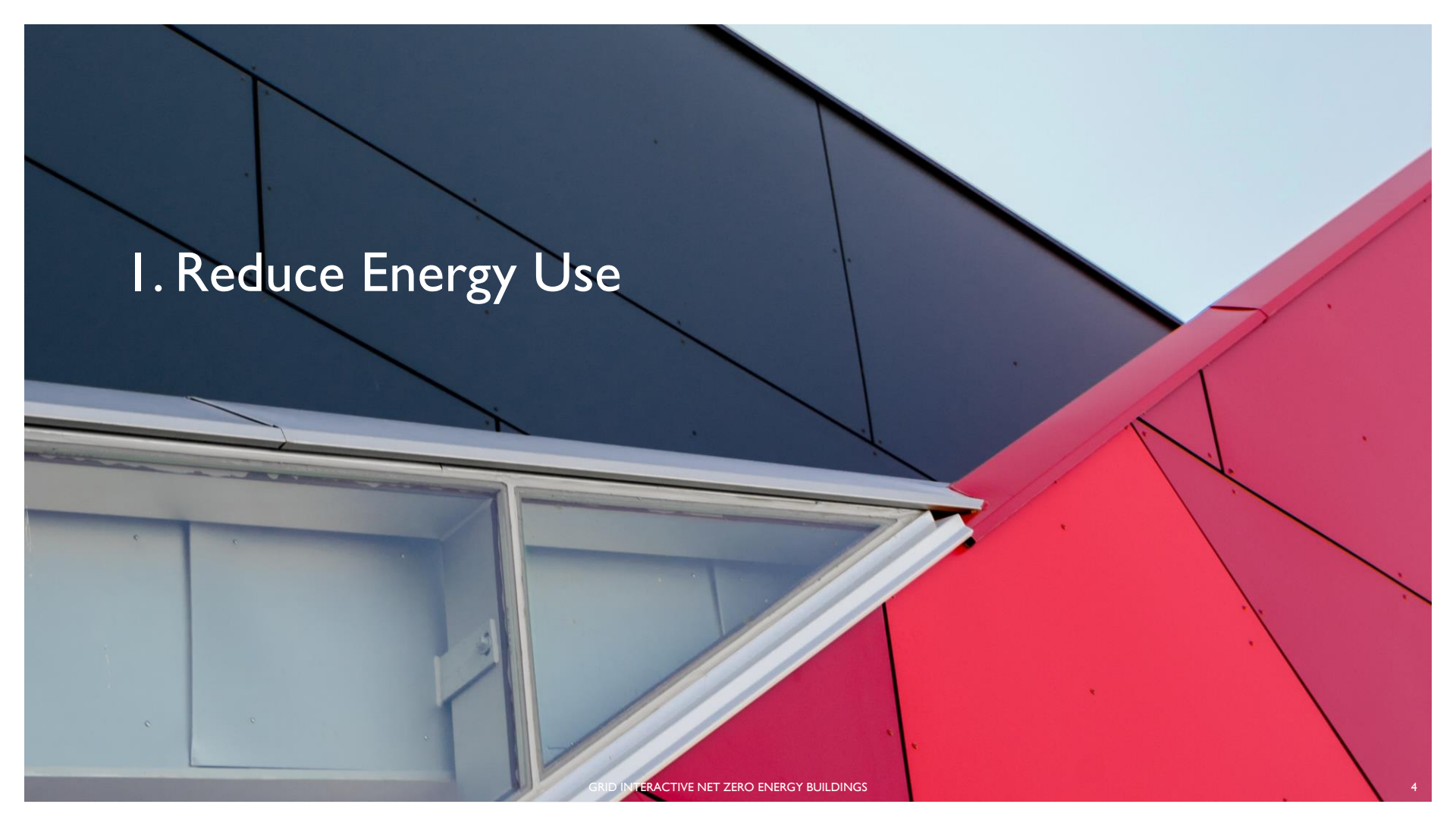
## Enable Grid-Interactivity

- Design and Construction of Grid-interactive Net Zero Energy Building (TSREDCO)
- Shifting Conversation from NZEB to Grid-Interactive NZEB through the ZerO-In Dialogues.
- Development of Building-Grid Integration Metrics.

3

## Integrate & Increase Renewables

- On-site and off-site renewables

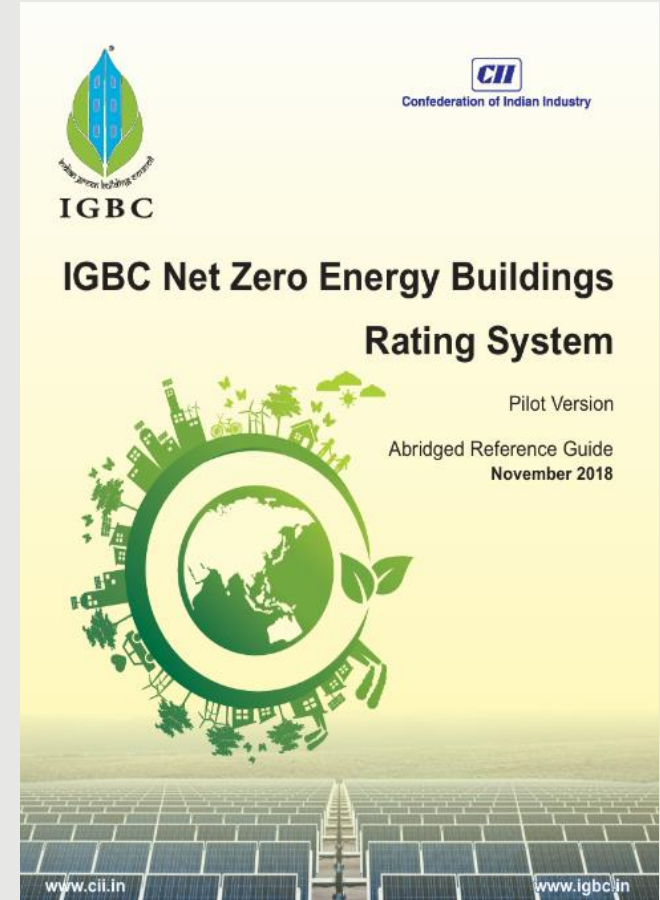
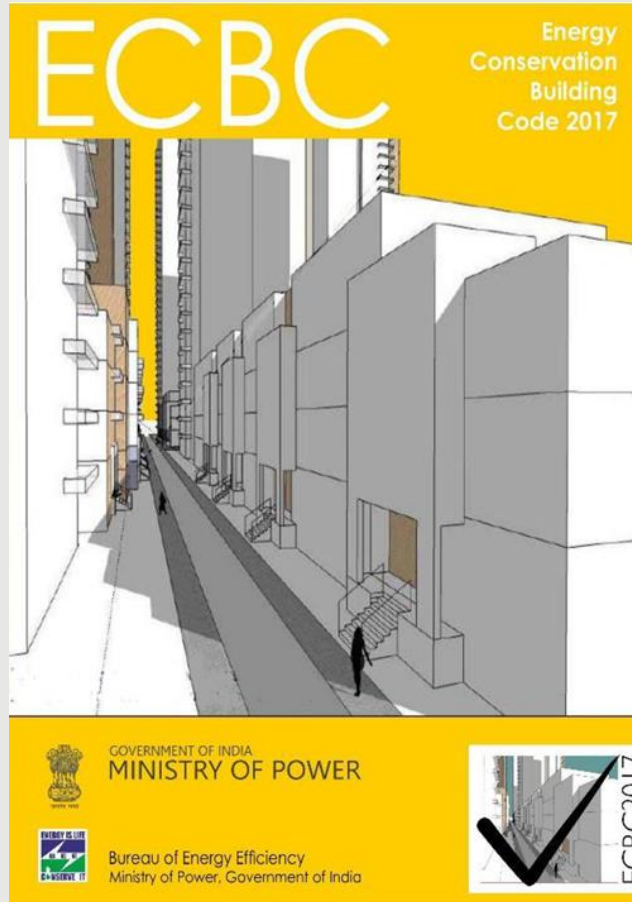


# I. Reduce Energy Use



# Energy Conservation Building Code

## Net Zero Energy Building Certification

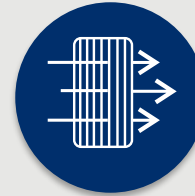


# Retrofits for Energy Efficiency



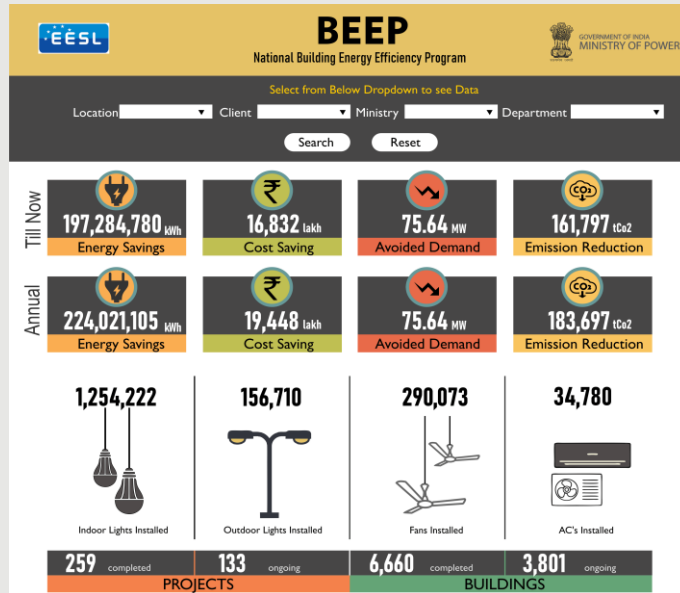
**10,000** Energy Efficient Buildings

Large scale building energy efficiency retrofit program with EESL



**RAISE** Healthy & Energy Efficient Buildings

Retrofit of Airconditioning to improve Indoor air quality for Safety and Efficiency



# Scaling Super-Efficient Cooling (EESL & Government e-Marketplace)

## Air Conditioners, Chillers and Cooling plants



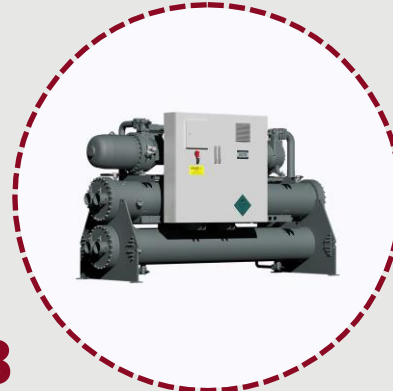
1

Super-Efficient ACs



2

Green Room Air Conditioners on Government e-Marketplace (GeM)



3

Super-Efficient Chillers and Cooling plants



4

Super-Efficient Smart ACs

# Nalanda University

## Net Zero Energy Campus at Nalanda, Bihar

Reduce Energy –  
Passive Design,  
Features Low  
Embodied Material

Integrate low energy /  
alternative  
technologies – DVAP,  
Thermal storage

Substitute with  
Renewables – On-site  
solar PV, biogas from  
waste, CHP





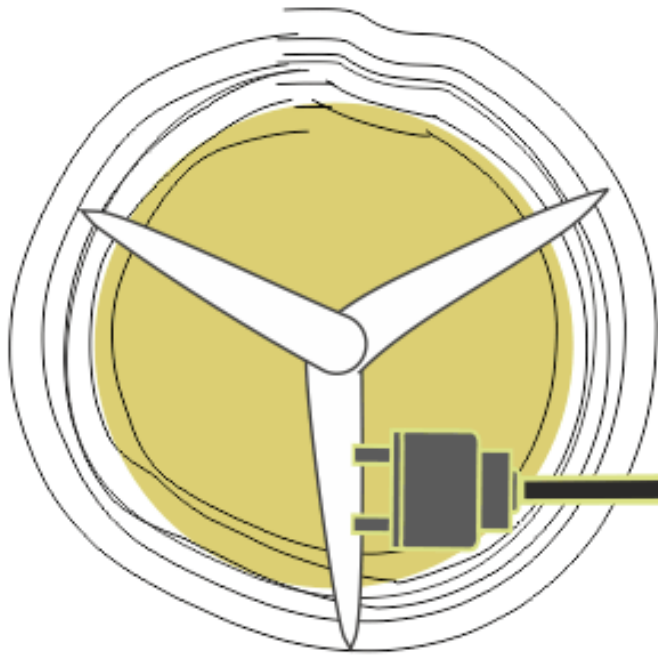
# Indian Railways

## Target of Net Zero Emission by 2030

Over 2,100 GWh of Non Traction Energy Use

### Time-bound Policy and Action Plan for Reducing Non-Traction Energy Use

1. Retrofit of all existing buildings, stations, workshops to be Net-Zero
2. All new station developments and infrastructure to be SuperECBC complaint – Net Zero Ready
3. Pilots on Energy Efficient Cooling
4. Integrated Online monitoring and control of energy use



**nzeb**  
net zero energy buildings

Regional Net Zero Energy Building Portal (nzeb.in<sup>®</sup>)  
NZEB Knowledge Series

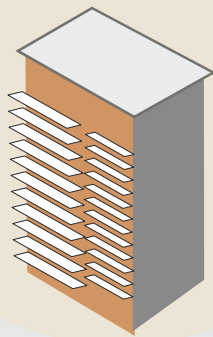
## 2. Grid-Interactive Net Zero Energy Buildings



# Grid Interactive Net Zero Energy Buildings

## G-NZEB

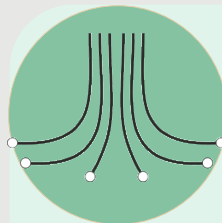
‘highly energy-efficient, grid-connected buildings that meet their energy needs through renewable means, while maintaining a two-way communication with the grid’



### Efficient

Efficient equipment and building design reduce building load

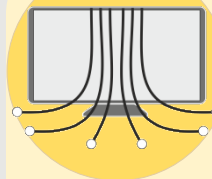
1



### Connected

Two-way communication flow between the building and the grid with Smart meters

2



### Smart

Sensors, AI controls, and analytics co-optimize efficiency, flexibility, and consumer needs

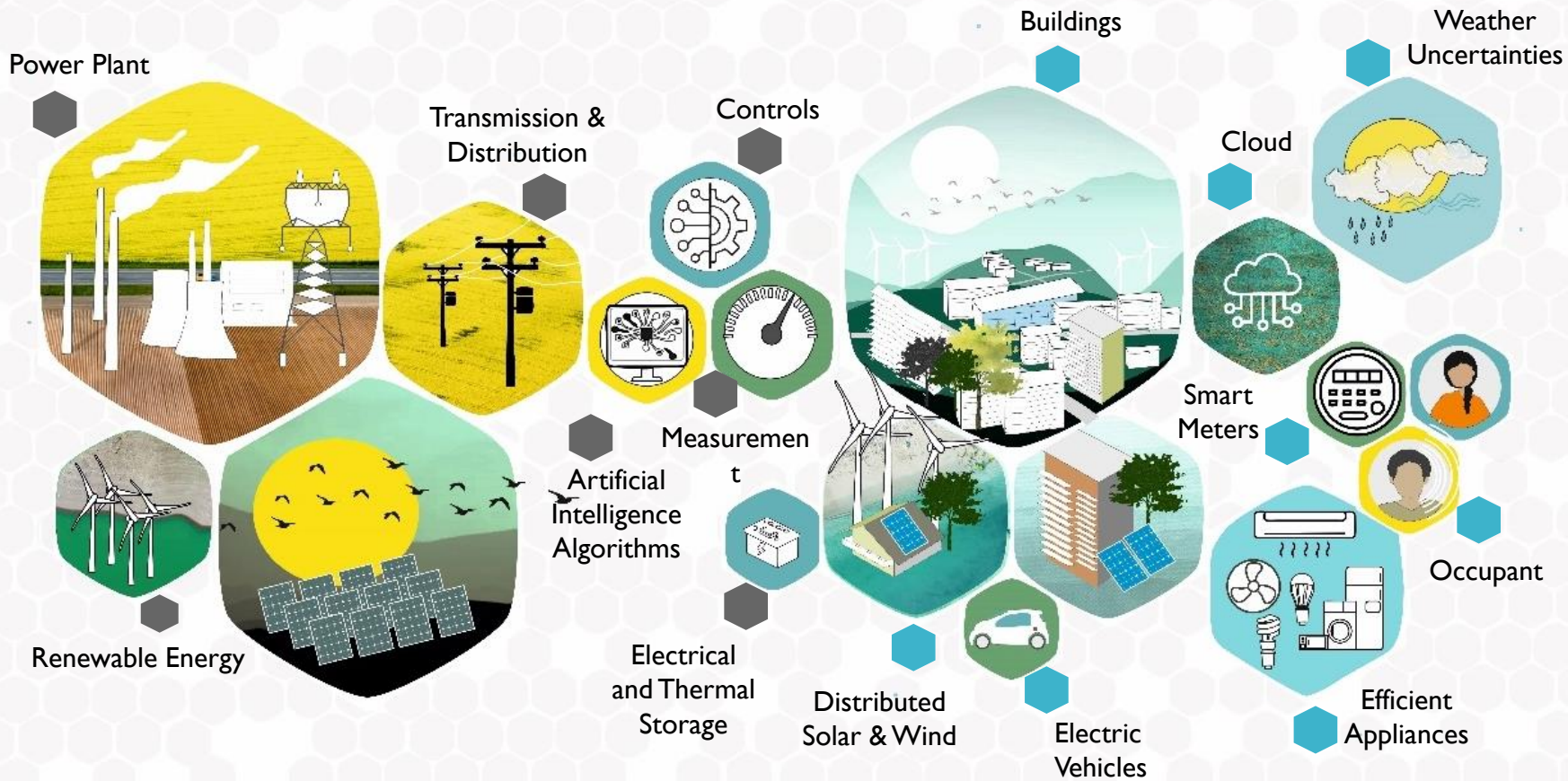
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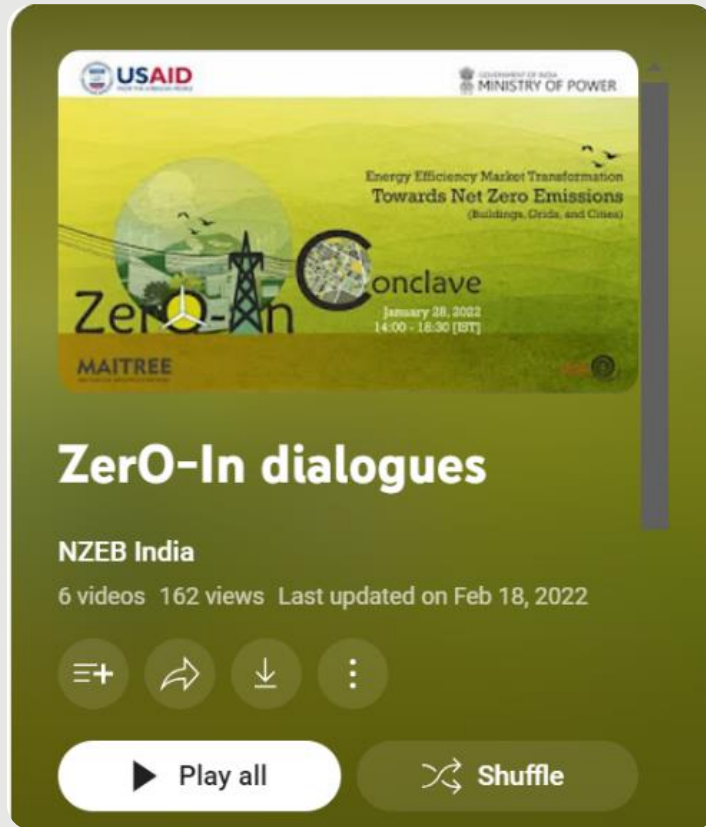
### Flexible

Ability to optimize building operations per consumer need and distributed energy resources available to offset or flatten building load

4



# NSGM partnership on ZerO-In Dialogues



The image shows a YouTube video player interface. At the top, there is a banner for the 'USAID' and 'Ministry of Power' with the text 'Energy Efficiency Market Transformation Towards Net Zero Emissions (Buildings, Grids, and Cities)'. Below this, the video title 'ZerO-In Conclave' is displayed, along with the date 'January 28, 2022' and time '14:00 - 16:30 (IST)'. The channel name 'MAITREE' is visible. The main title of the video is 'ZerO-In dialogues' by 'NZEB India'. Below the title, it says '6 videos 162 views Last updated on Feb 18, 2022'. At the bottom, there are icons for playlist, share, download, and more options, along with buttons for 'Play all' and 'Shuffle'.



01  
The First Dialogue  
Grid-Interactive  
Net Zero Energy  
Buildings  
1:56:48



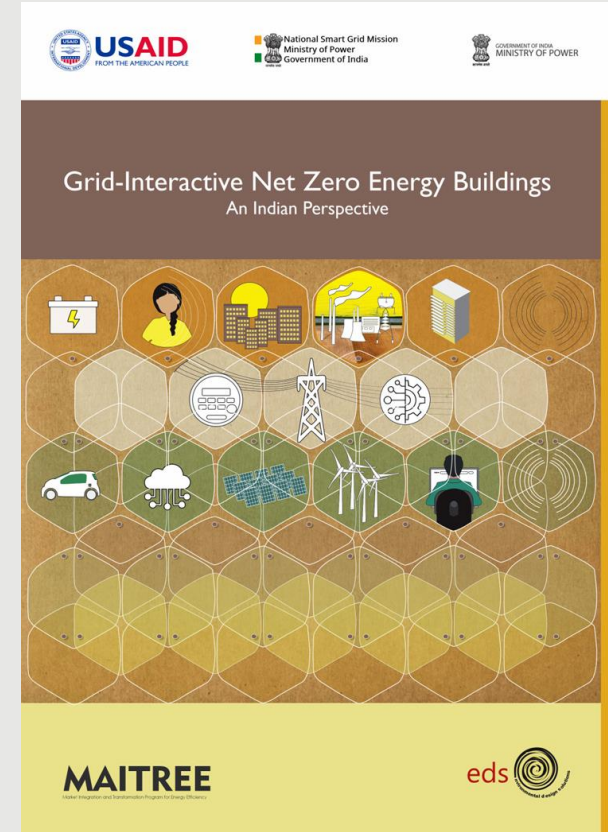
02  
Dialogue on  
Emerging Technologies  
Grid-Interactive  
Net Zero Energy  
Buildings  
2:09:07



03  
Dialogue on  
Consumer Engagement  
for  
Grid-Interactive  
Net Zero Energy  
Buildings  
1:30:53



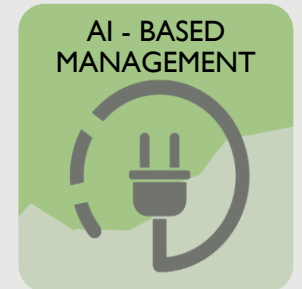
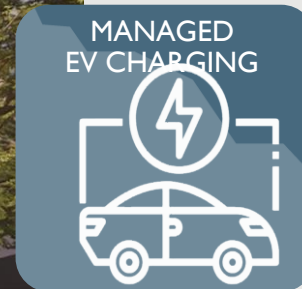
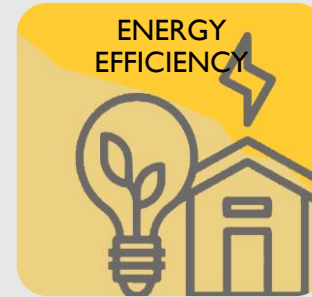
04  
Dialogue on  
Enabling Policies  
for  
Grid-Interactive  
Net Zero Energy  
Buildings  
1:56:00



The image shows the cover of a report titled 'Grid-Interactive Net Zero Energy Buildings: An Indian Perspective'. At the top, there are logos for 'USAID', 'National Smart Grid Mission', 'Ministry of Power', and 'Government of India'. The title is prominently displayed in the center. Below the title, there is a large graphic consisting of a grid of hexagons, each containing a different icon related to energy and technology. At the bottom, the logos for 'MAITREE' and 'eds' are visible.



# Asia's First Grid Interactive Net Zero Energy Building at Hyderabad (TSREDCO and TSSPDCL)



# Building-Grid Integration Metrics for Utilities



Dakshin Haryana Bijli Vitran Nigam Limited



Madhya Pradesh Paschim Kshetra Vidyut Vitaran  
Company Ltd

1. **Develop, deliver, and disseminate India-specific GridOptimal metrics and analysis methodologies to facilitate building-grid optimization.**
2. Identification of key behind-the-meter time-oriented **energy efficiency and demand flexibility strategies** in major building typologies and grid context.





### 3. Integrate and Increase Renewables



# Onsite and Off-site RE for Buildings

- Procurement support for **distributed solar** installation in railway buildings.
- Scaling the adoption of onsite and Off-site renewable energy through **policy and regulatory support** to National and Sub-national government



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**Thank you**