



རྒྱལ་ཁབ་ལྷན་དུས་འགྲུལ་གཞུང་། བཟུང་རྒྱལ་ལྷན་ཁག་།

རྒྱལ་ཁབ་ལྷན་དུས་འགྲུལ་གཞུང་།

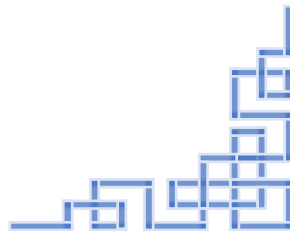
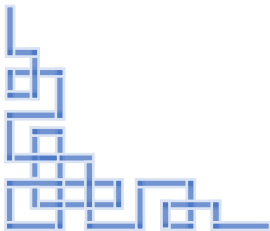
Royal Government of Bhutan  
Ministry of Economic Affairs  
DEPARTMENT OF RENEWABLE ENERGY  
THIMPHU: BHUTAN

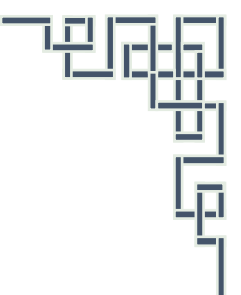
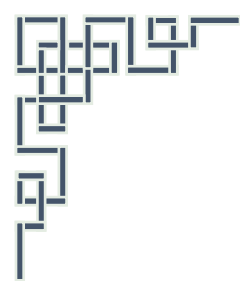


# Alternative Renewable Energy Strategy and Way Forward in Bhutan

*Towards promotion of energy source diversification for enhancing energy  
security and sustainable development*

12<sup>th</sup> January 2022  
DPG Meeting





Sustainable & equitable socio-economic development

National energy security

Access to clean, reliable & affordable modern energy

Energy Source  
Diversification



WHY?  
RE & EE

Curtail fossil fuel imports  
& reduce GHG emission

Enhance revenue generation

Climate Action &  
Environment Conservation

Energy Efficiency &  
Conservation



# Key mandates of DRE & their status

## 1. Rural Electrification

- Overall 99.97% electrified as of date (98.4% in rural areas)
- Around 1600 HHs still unconnected to grid
- 1429 HHs to be electrified within 12<sup>th</sup> FYP
- Off-grid HHs are provided with Standalone Solar Home Lighting Systems
- Lunana not in Grid connection lists

## 2. Promotion of RET (Solar, Wind, Small Hydro, Biomass)

- Around 8 MW installed capacity (mini/micro hydels)
- 0.6 MW Wind Plant installed at Rubesa
- 0.180 MW Solar PV Plant installed at Rubesa
- Around 50000LPD of solar thermal systems installed
- Domestic scale biogas plants – 7885 units

## 3. Promotion of Demand side management

- Energy Audit carried out in 40 industries and 1950 households
- Developed National EE&C Policy in 2019
- Developed EE Roadmap in 2019
- Studies for Standards and Labelling Scheme completed



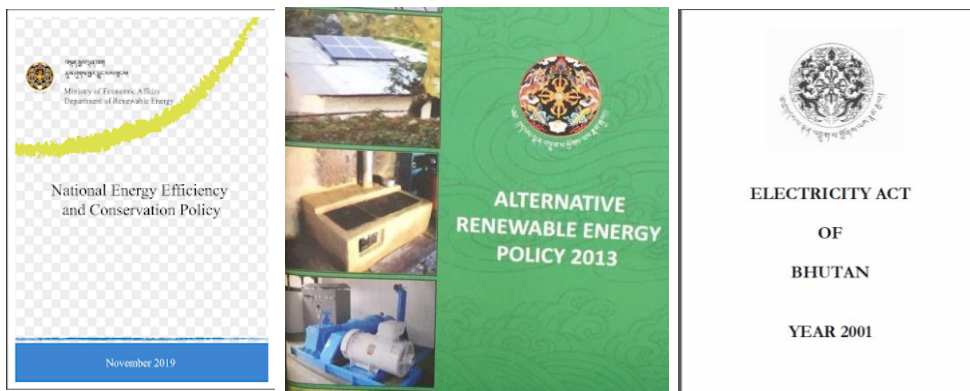
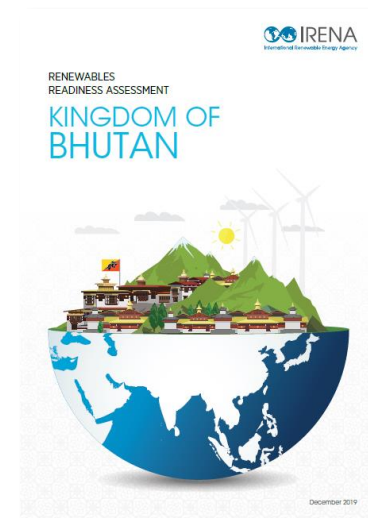
## Recalling His Majesty's 114 National Day Address

“With rapid advancements in harnessing Nuclear, Hydrogen, Fusion, Solar, Thermal and Wind energy, hydropower may soon lose its competitive edge and we may become a net energy importer. Therefore, it is imperative to seize the opportunity and enhance the capabilities of our people and strengthen the economic and governance framework to harness the potential ushered in by these rapid and dynamic technological changes”



# Laws & Policies guiding RE Sector

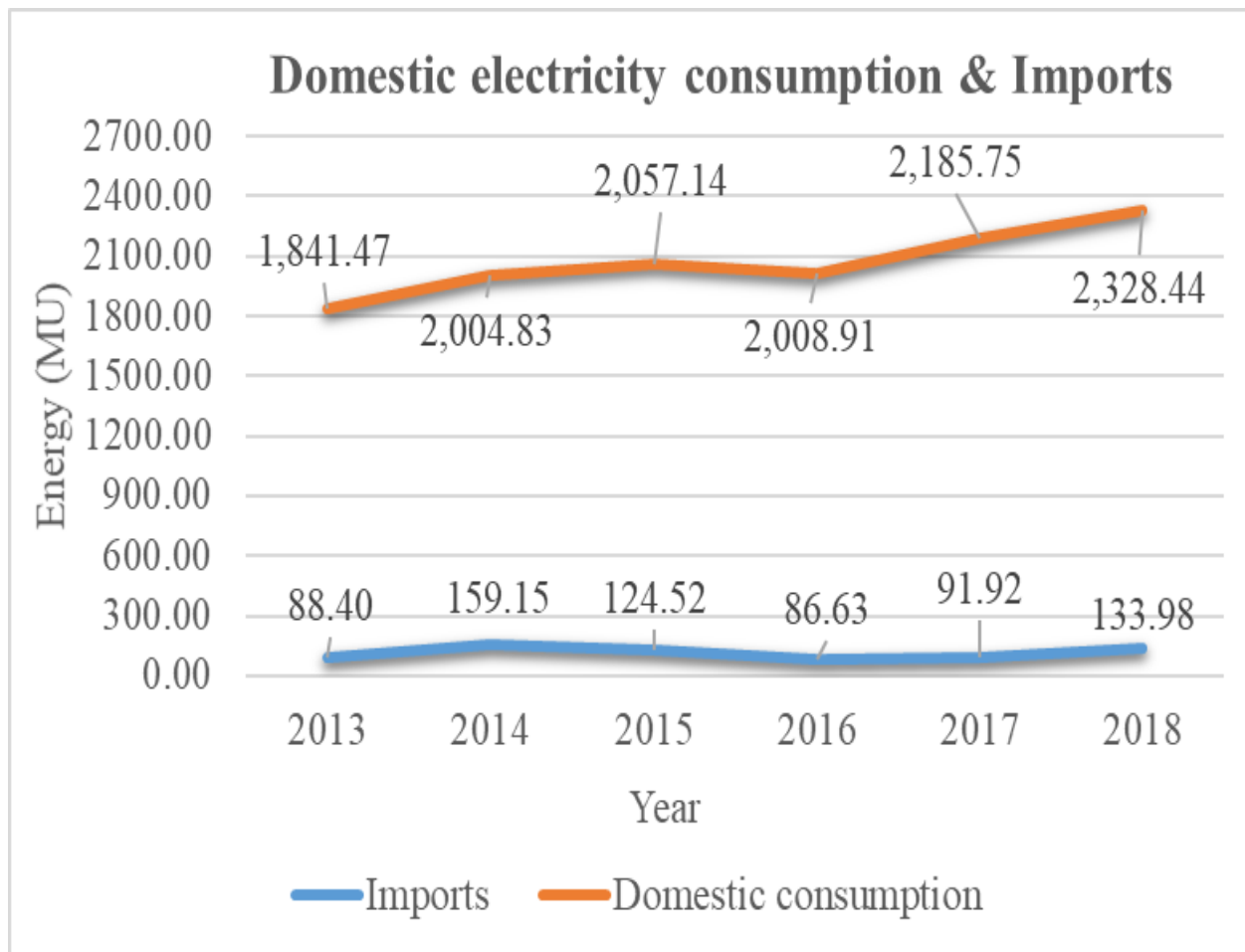
- Electricity Act – 2001
- Alternative Renewable Energy Policy (AREP-2013)
- National Energy Efficiency & Conservation Policy (NEECP-2019)
- Economic Development Policy (EDP – 2016)
- Renewable Energy Master Plan(2017-32)
- Energy Efficiency Road Map, 2019



# National Energy Security

- **Bhutan's economic development is heavily dependent on Hydropower**

- **Vulnerable to Climate Change**
- **Rapidly surging domestic consumptions**
- **Lean season deficit**

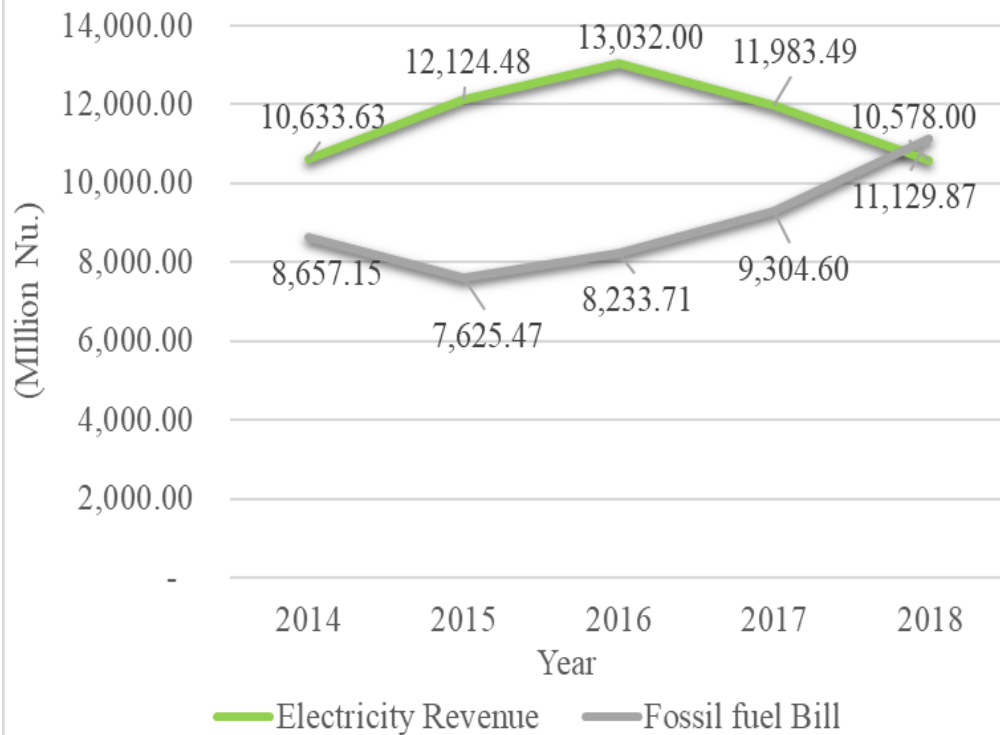


Source: Power Databook 2018

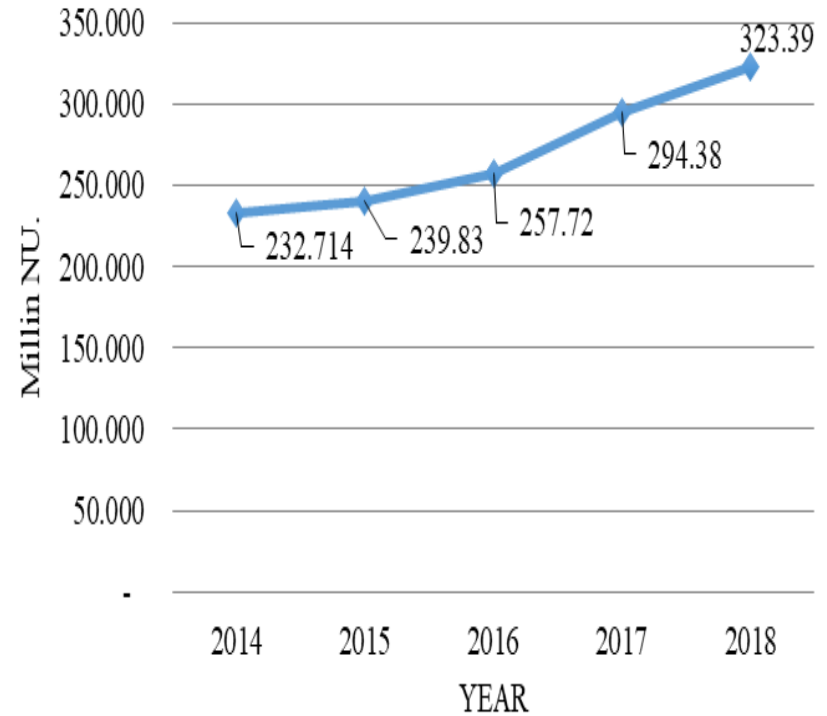


# Energy & Socio-economy

## Electricity Export Vs Fossil fuel Import



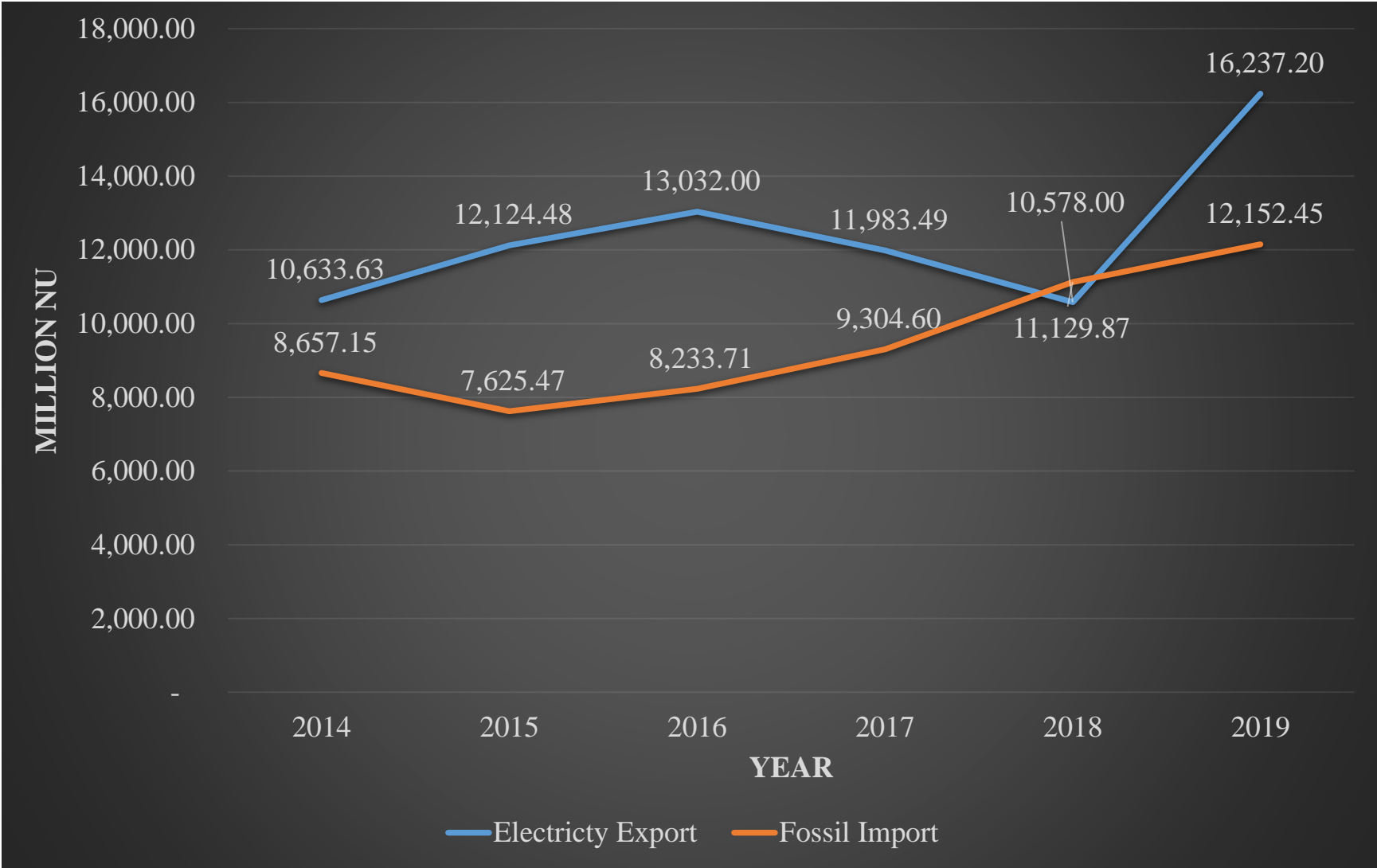
## LPG import status



Source: Trade Statistics, DoT



# Electricity Export vis-a-vis Fossil Fuel Import





# Energy Scanario in Bhutan

Figure 31: Total Energy Supply and Fuel Mix

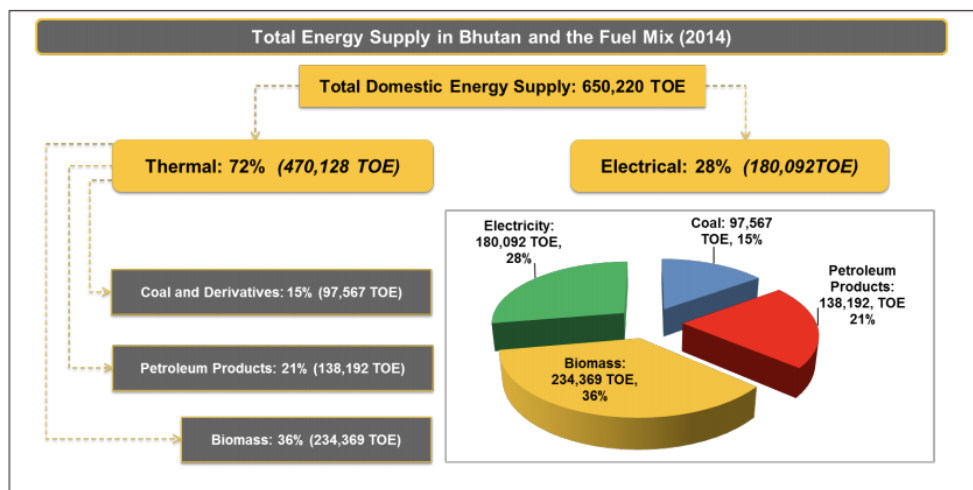
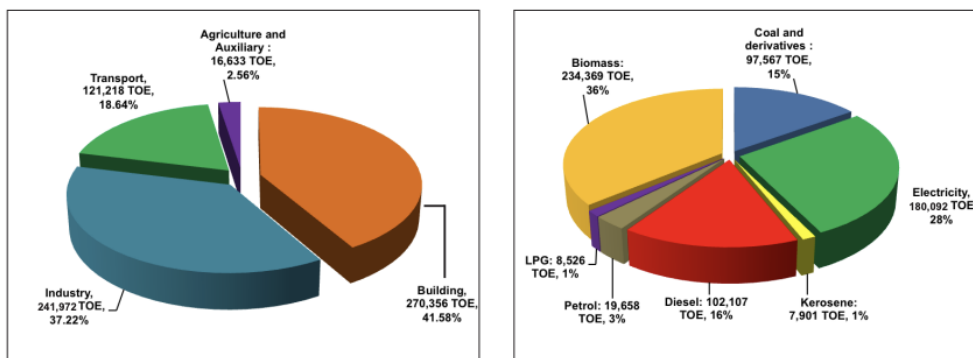


Figure 32: Energy Consumption in 2014 - Sectoral Break-up and Fuel Mix



Fuel	Amount	Value million Nu
Subsidized LPG	7873.05 MT	228.40
Non-subsidized LPG	1059.29 MT	44.05
Diesel	149,905 kl	7602.88
Petrol	50,882 kl	2342.63



# Proposed Solution

## Diversification of Generation Portfolio

### **Impact of Diversification**

- Improved resilience to extreme weather events
- Improved resilience to changing seasonal weather patterns
- Solar and Wind generation complement hydro generation in dry season
- Enhance energy security
- Reaching the un-reached

- Utility Scale Solar PV Projects
- Utility Scale Wind Power Projects
- Rooftop Solar PV
- Solar – Thermal Systems
- Decentralized ARE Projects
- Enhanced Storage Systems
- Waste-to-Energy Projects



## RE Potential (as per REMP+ 2016)

Solar	12,000 MW
Wind	761 MW
Small hydro	23,296 MW
Biomass	
<ul style="list-style-type: none"><li>• wood based</li><li>• wood residue based</li></ul>	1985 MW 695 MW
Biogas	20000



*REMP+ Renewable Energy Master Plan*



# Reaching the Unreached

- Communities such as Lunana, Aja Ney and Singye Dzong are not connected to national grid
- DRE is intervening those cut off places with Decentralized Distributed Generation (DDG) system through implementation of ARE projects as follows:
  - i. Aja Ney (80kW Solar PV system ongoing)
  - ii. Lunana (500kW mini Hydro dropped but exploring other alternatives) – Now breaking into components
  - iii. Singye Dzong & Rolmateng (Electrification through DDG solar PV system will be explored)
  - iv. Solar – Thermal Systems at Lingshi, Thanza and Lhedi



# Utility Scale ARE Projects & Roof Top Solar PV

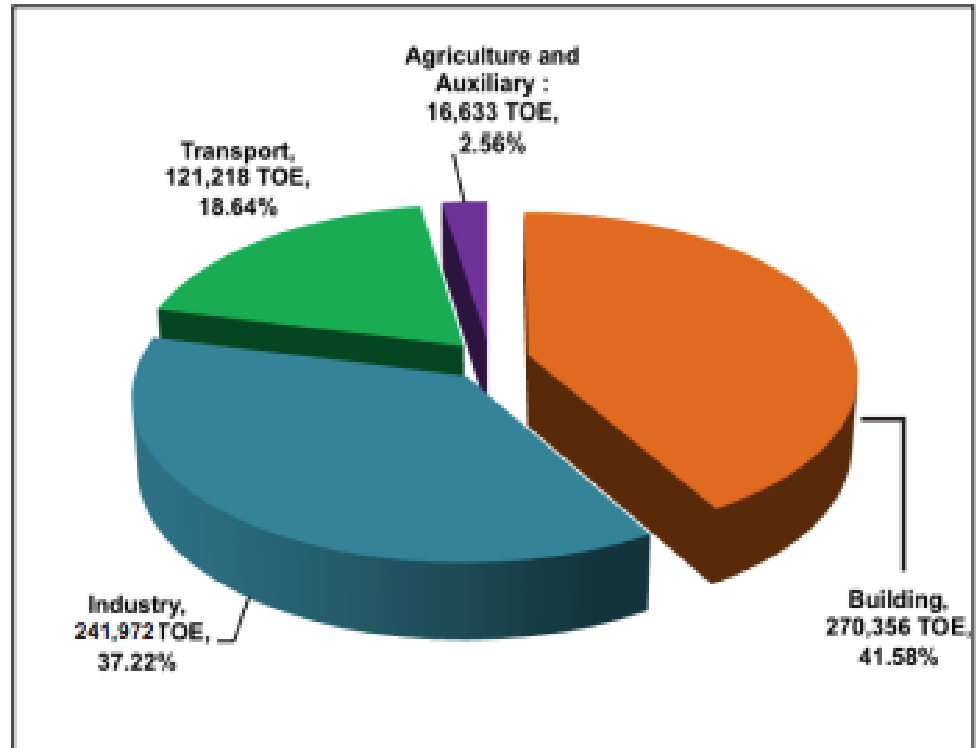
## Utility Scale ARE projects

- Project energy deficit about 200 MW in 2-3 years
  - Planning to implement installation of 200 to 300 MW ARE plants in next few years
  - Currently, the Renewable Energy for Climate Resilience Project through development of 17.38 MW Solar Project at Sephu, Wangdue is being initiated
  - 7 solar PV sites through desktop study has been completed assessing potential up to 308 MW capacity
  - 23 MW Wind Power Plant ( detailed studies ready for implementation)
- Decentralized Systems
  - Huge potential for installation of solar rooftop system
  - Developing the solar rooftop implementation guidelines for institutional buildings initiated
  - Prosumer concept project ongoing currently through installation of 2 kW to 3 kW solar rooftop PV at 300 rural households across 4 dzongkhags



# Energy Efficiency & Conservation

- Energy saving potential of 155 GWh per annum through Energy Efficiency program intervention has been assessed
- Interventions in Energy Intensive sectors like industry, transport and building has been initiated and can result in huge net energy savings
- Energy Efficiency intervention on Lingshi & Lunana
- Energy Intensity very high
- EIMS systems development



ENERGY CONSUMPTION PORTFOLIO 2014



བཀྲ་ཤིས་བདེ་ལེགས



THANK YOU