

# 8<sup>th</sup> National Science Day 2020

## Prospects of Renewable Based Distributed Generation in Nepal

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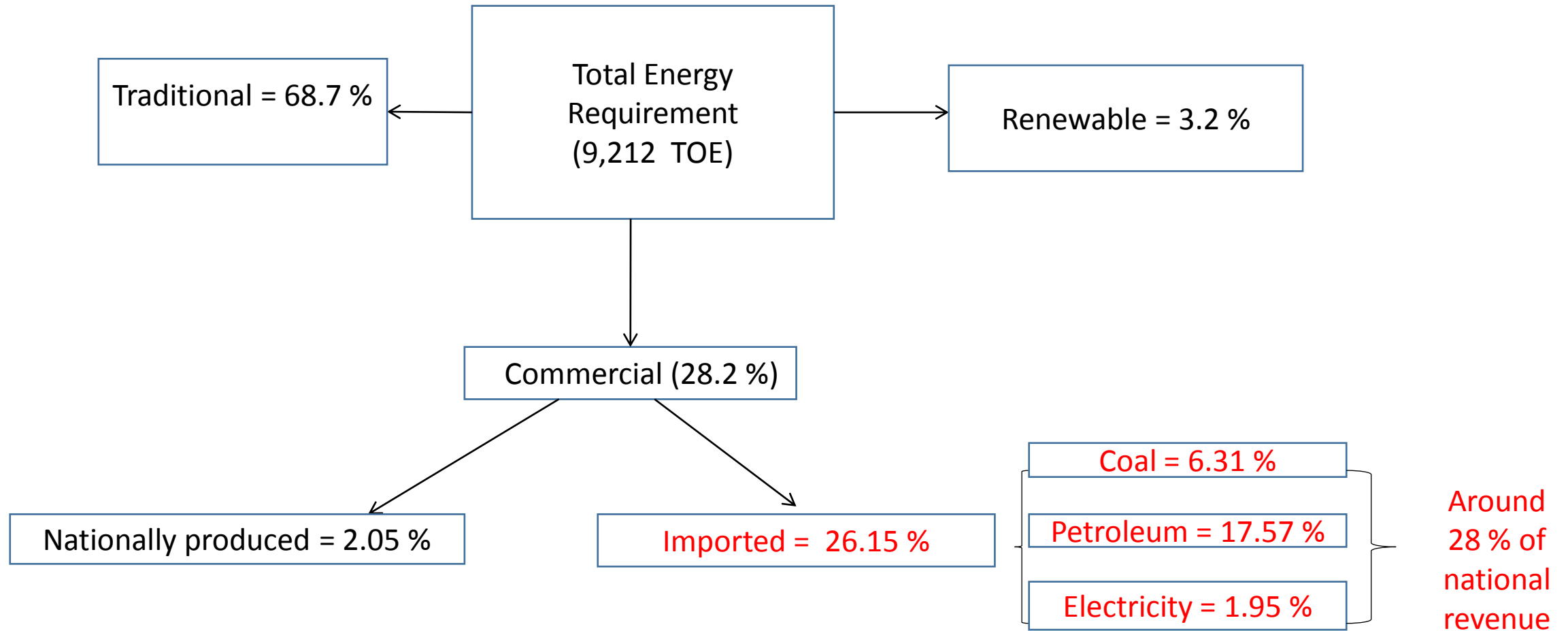
28 September 2020

# Presentation Outline

- Context of Energy in Nepal
- The Changed Structure
- Distributed Renewable Energy Systems
- Experience from AEPC
- Opportunities Ahead

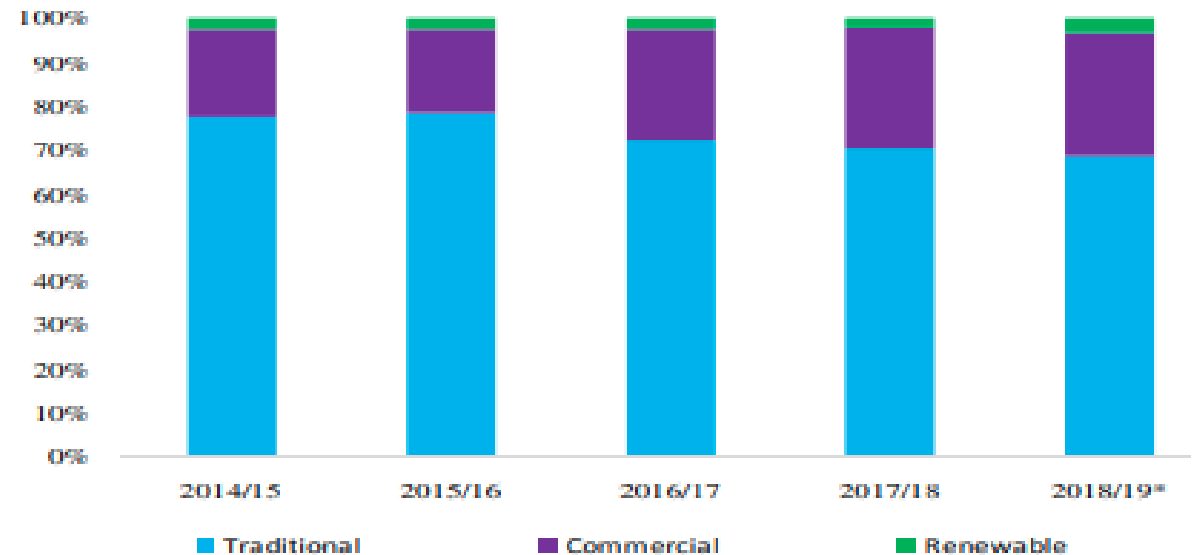
# National Energy Consumption Statistics (First 8 months of 2018/19 FY )

(Source : Economic Survey, MoF )

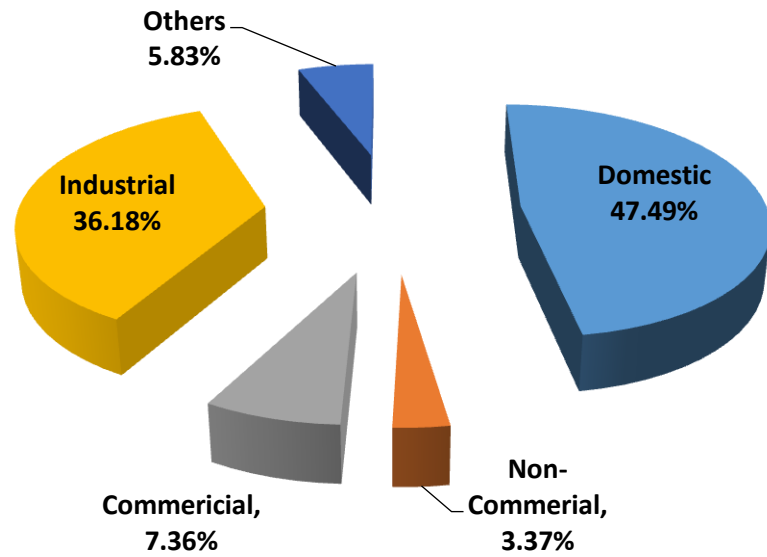


# Despite Huge Resources, the Country has A strong dependence over Traditional Fuels

- Nepal has an Economical Potential of about **42,000 MW** of Hydropower Electricity
- SWERA estimates a potential
  - 3000 MW from Wind,
  - 2100 MW from grid connected PV



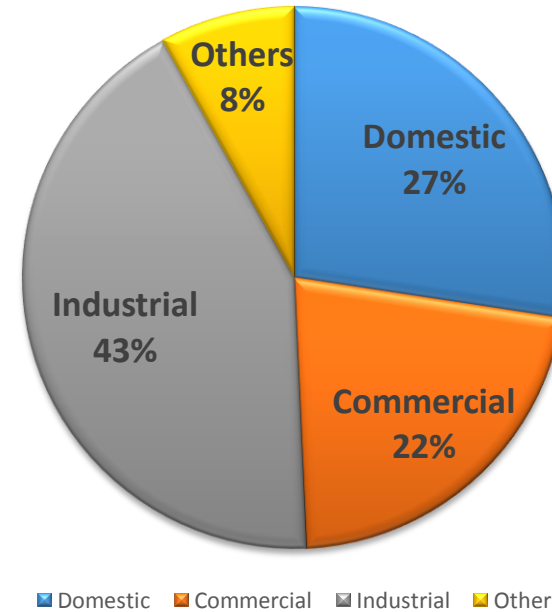
# Sector-wise comparison of Electricity Consumption



## Sector-wise electricity consumption of Nepal,

Source: NEA Annual Report 2018/2019

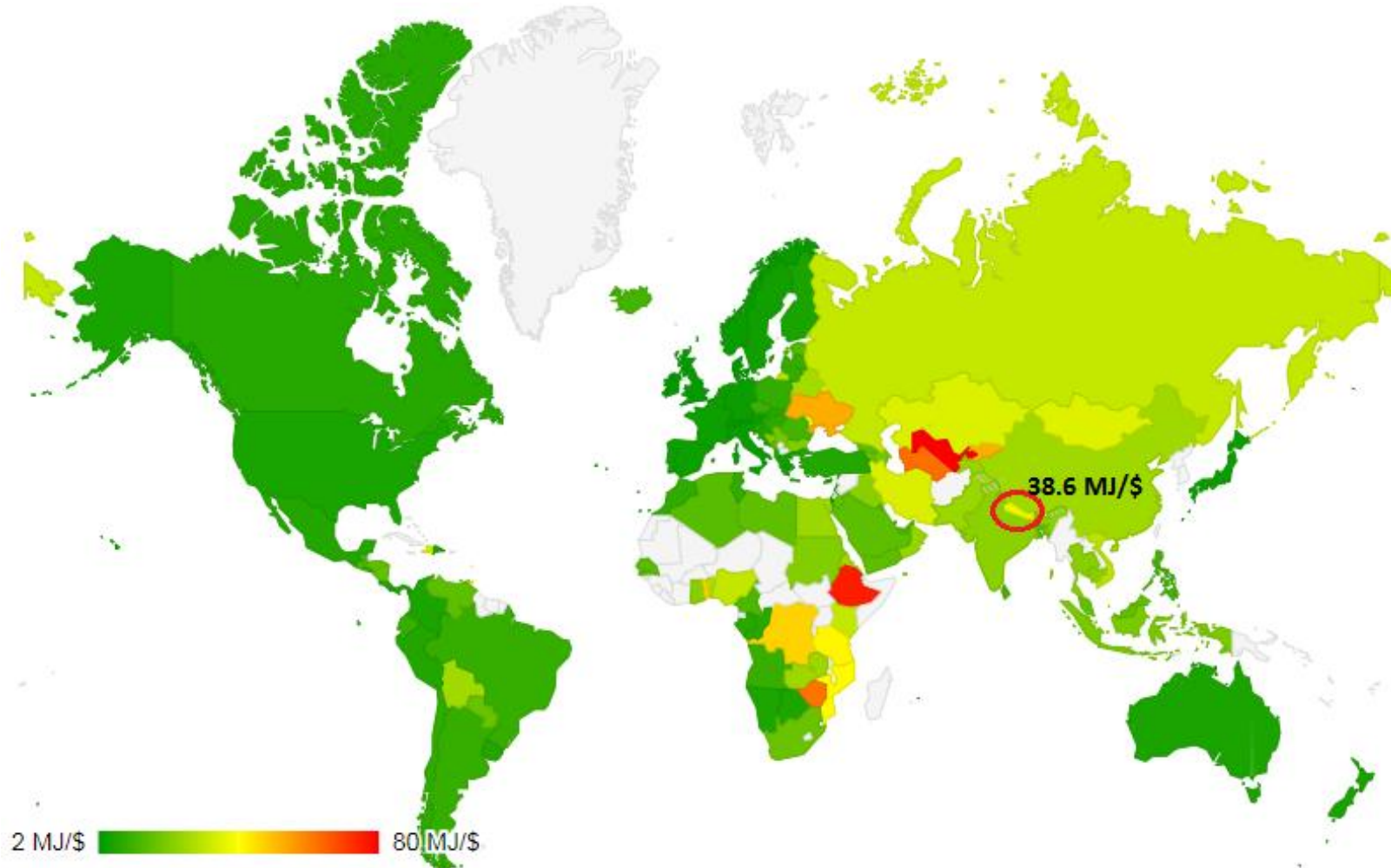
- 47.49% of Nepal's total consumption is consumed by the domestic sector while the World average is seen to be around 27%.
- Consumption in domestic sector doesn't contribute directly in GDP (unproductive)
- Day time consumption need to be improved for increase in consumption by the productive sector
- Day time generation has to increase



## Average sector-wise electricity consumption of world, Source: IEA 2018

# Energy Intensity (MJ/\$)

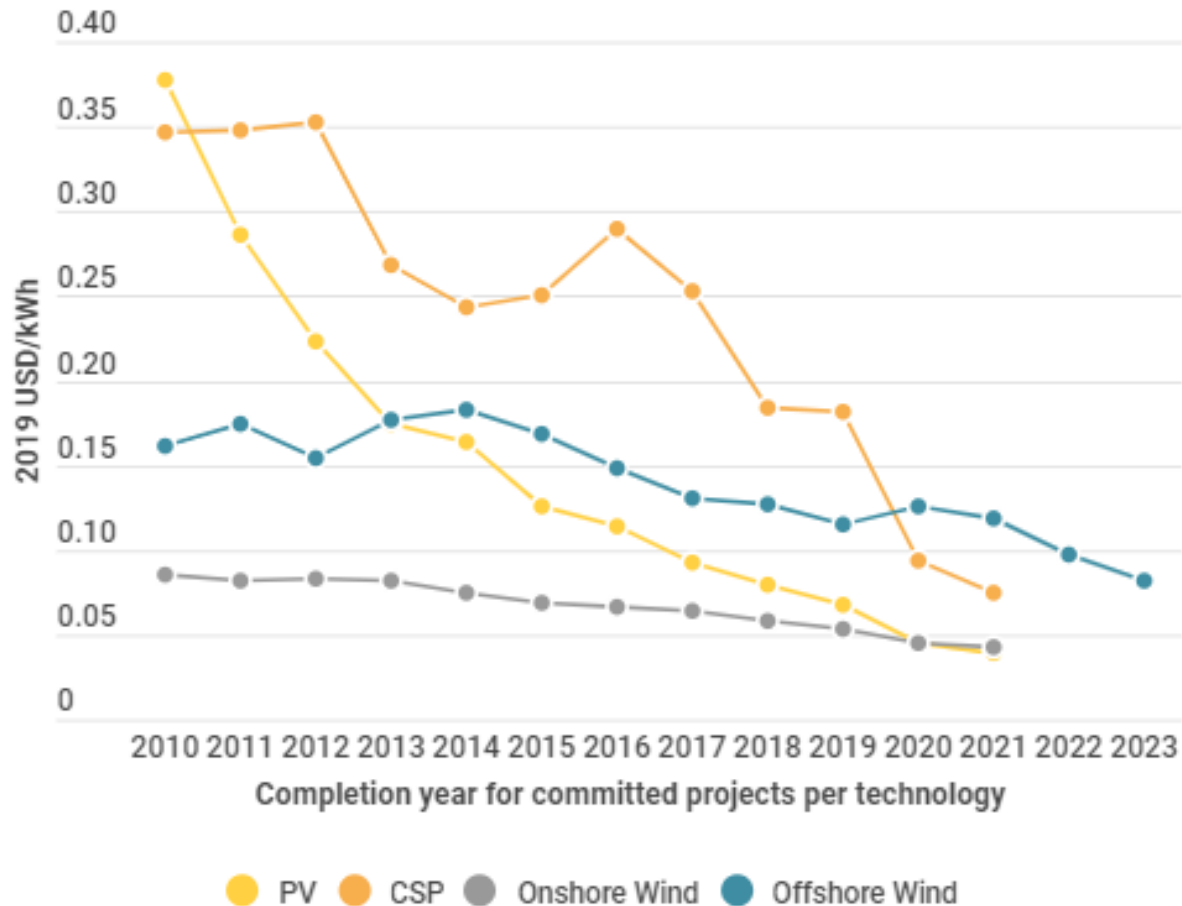
- Higher EI indicates Inefficient Energy Use
- Nepal has higher EI in the region



# Needs in Energy sector

- Clean Energy Access to All by 2030
- Reduce energy import (dependency)
- Demand side management – Manage peak load demand especially during dry season
- Lowering energy intensity
- Climate resilient energy services
- Lay foundation for achieving “Prosperous Nepal, Happy Nepalis” (annual per capita income of 12,100 USD by 2100 BS)

# Falling Prices of Solar PV and Wind Systems



82%

Solar PV generation costs declined 82% over the last 10 years (2010-2019)



56%

of capacity additions for utility scale RE in 2019 achieved lower electricity cost than cheapest new coal plants-**grid parity**



# Mandates from the Constitution 2015 and Local Governance Operational Act 2017

“The state shall pursue a policy of developing and producing **renewable energy**, ensuring cheap, easily available and dependable supply of energy, and making an appropriate use of it to meet the basic needs of the citizens.”

घ. खानेपानी, साना जलविद्युत आयोजना, वैकल्पिक ऊर्जा

- (१) स्थानीय खानेपानी सम्बन्धी नीति, कानून, मापदण्ड, योजना, कार्यान्वयन र नियमन,
- (२) खानेपानी महसुल निर्धारण र खानेपानी सेवा व्यवस्थापन,
- (३) एक मेगावाट सम्मका जलविद्युत आयोजना सम्बन्धी स्थानीयस्तरको नीति, कानून, मापदण्ड, योजना तर्जुमा, कार्यान्वयन, अनुगमन र नियमन,

ग. विद्युत, खानेपानी तथा सिँचाइ जस्ता सेवाहरू

- (१) विद्युत वितरण प्रणाली र सेवाको व्यवस्थापन,
- (२) खानेपानी महसुल निर्धारण र खानेपानी सेवाको व्यवस्थापन,
- (३) स्थानीय साना सतह तथा भूमिगत सिँचाइ प्रणालीको सञ्चालन तथा मर्मत सम्भार, सेवा शुल्क निर्धारण र सङ्कलन सम्बन्धी व्यवस्थापन।

- (४) स्थानीय तहमा वैकल्पिक ऊर्जा सम्बन्धी नीति, कानून, मापदण्ड, योजना तर्जुमा, कार्यान्वयन नियमन,

- (५) स्थानीय विद्युत वितरण प्रणाली र सेवाको व्यवस्थापन, सञ्चालन र नियमन,

# Energy Mix for a Energy Security

- Balance Energy Demand with Supply from Energy Sources including Distributed Renewable Energy Sources
- Adequate, Available, Accessible and Affordable Energy from Distributed Sources would reduce cost of transmission and improve energy security at Local Level
- Provide opportunity for Local Government to increase revenue sale of electricity
- Fully utilize the existing isolated MHPs to connect and become an important economic asset



# A Giant Opportunity for Renewable Energy

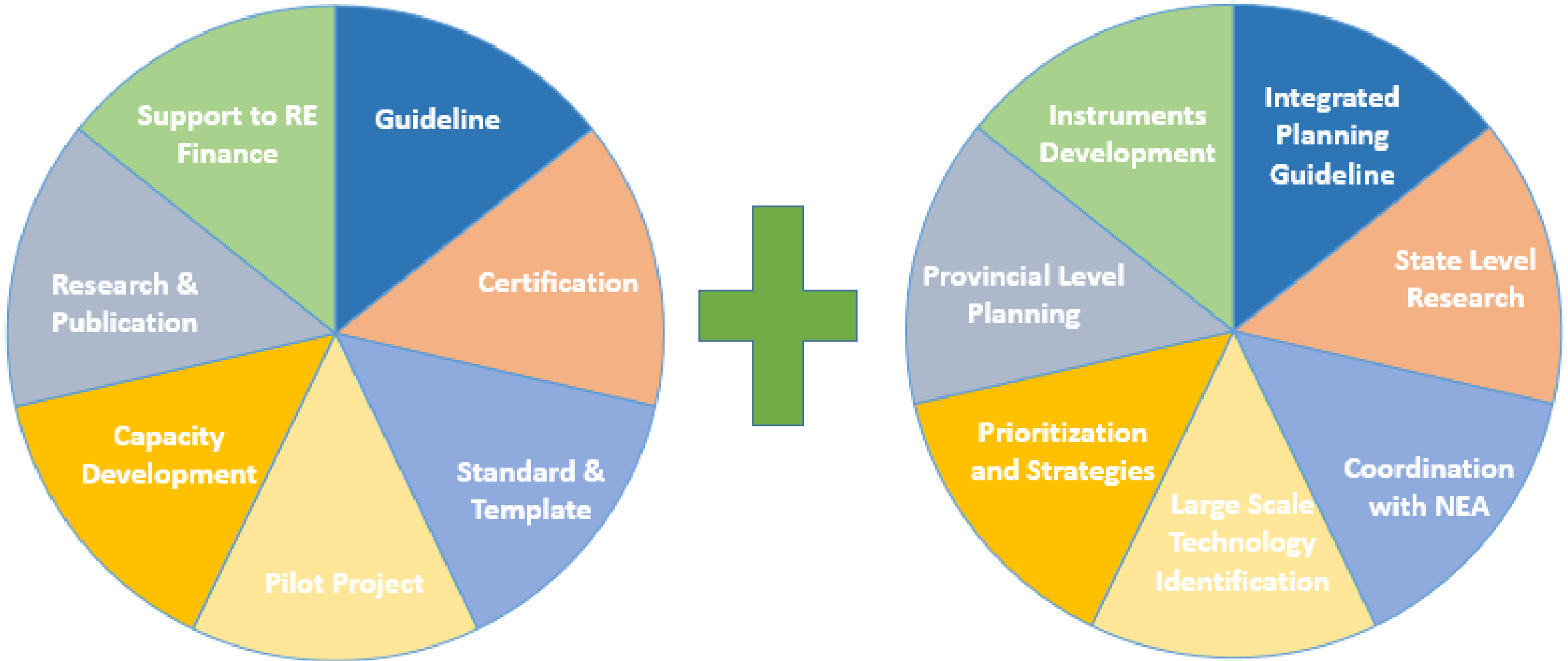
- Direct and Strong Roles and Responsibilities for implementation and expansion of RE at Local Level
- A strong commitment for interconnecting Distributed Energy Sources with national grid
- Untapped Renewable Energy Sources and Increasing Energy Demand
- Provision of Banks at all Local Level increasing the potential for a Strong Financial Linkage
- RETs becoming for Affordable, Accessible with improved Quality
- Stronger Private Sector, Skills and Employment



# Some key RE policies

- Rural Energy Policy, 2063
- RE subsidy policy, 2073
- RE subsidy policy and delivery mechanism, 2073
- Biomass Energy strategy, 2073
- National Energy Efficiency Strategy, 2075
- White paper endorsed by MoEWI , 2075
- 15<sup>th</sup> National Plan (2076/77 – 2080/81)
- Financial Act, 2019 – Exemption of VAT & Custom Duty in RE equipments/materials
- Central Renewable Energy Fund

# IDENTIFICATION of KEY SUPPORT AREAS



# Rich Experience in Diverse RETs in Nepal

- Mini/Micro Hydropower Plants and Community Electrification
- Solar PV- Utility Scale, Mini Grid, Institutional and Home Systems
- Solar PV Pumping System- Irrigation, Drinking and MUS
- Biogas and Improved Biomass
- Wind, Hybrid and Grid Connected System

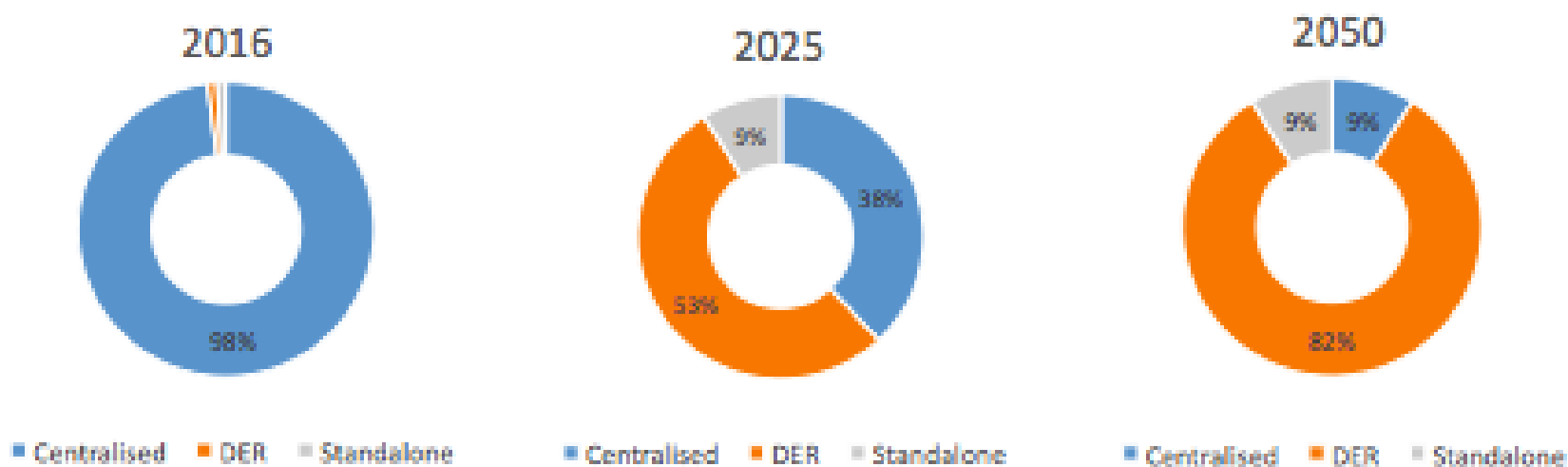




# Grid Connection of Distributed Renewable Energy Technologies



# The World is heading towards Distributed Generation



Source: [reneweconomy.com.au](http://reneweconomy.com.au)

**Centralized Generation:** Grid connected system of typically few hundreds MW **far** from load center

**Distributed Generation:** Grid connected system of typically few hundred kW **near** the load center

**Standalone:** Off-grid system in the vicinity of load center

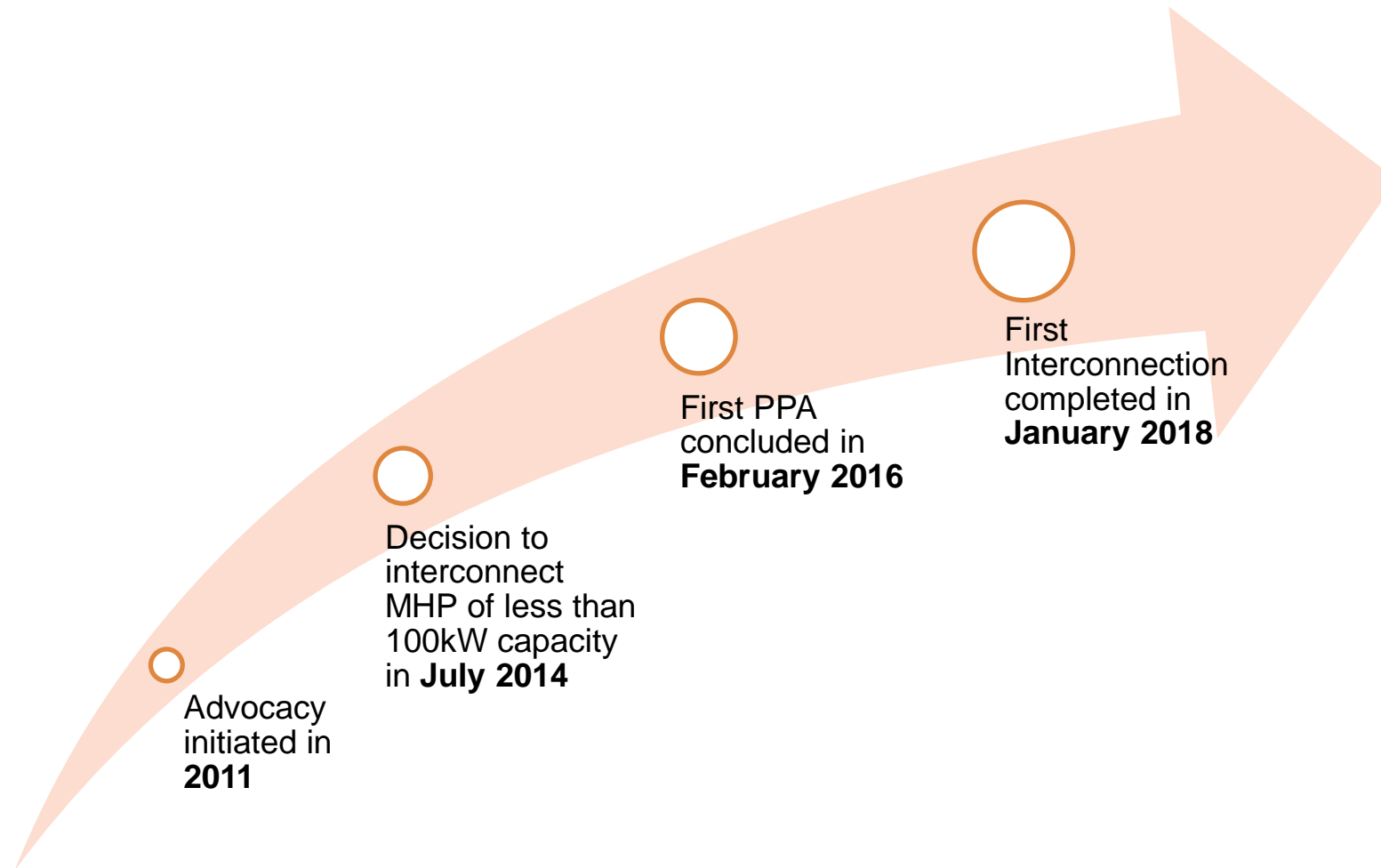
## What about Nepal?

Based on Nepal's long experience in off-grid RE sector, it has been now realized that decentralized community based RET development and grid extension would be the best approach for reliable and quality electricity supply for socio economic development of rural areas

Standalone RE  
to  
Distributed  
Generation



# Policy Breakthrough of Grid Interconnection of Micro Hydropower(MHP) in Nepal



# Grid Interconnected MHPs

S.N o.	Name of Project	Capacity (kW)	District	PPA Year	PPA Rate (NPR)		Interconnecti on Year
					Dry	Wet	
1	Syaurebhum	23	Nuwakot	Feb 2016	8.4 for four months	4.8 for eight months	Jan 2018
2	Leguwa	40	Dhankutta	Mar 2016	8.4 for four months	4.8 for eight months	Jun 2018
3	Midim	100	Lamjung	Aug 2013	5.73 for four months	3.28 for eight months	Dec 2018
4	Chimal	90	Taplejung	Feb 2017	8.4 for six months	4.8 for six months	Oct 2018
Total (kW)		253					

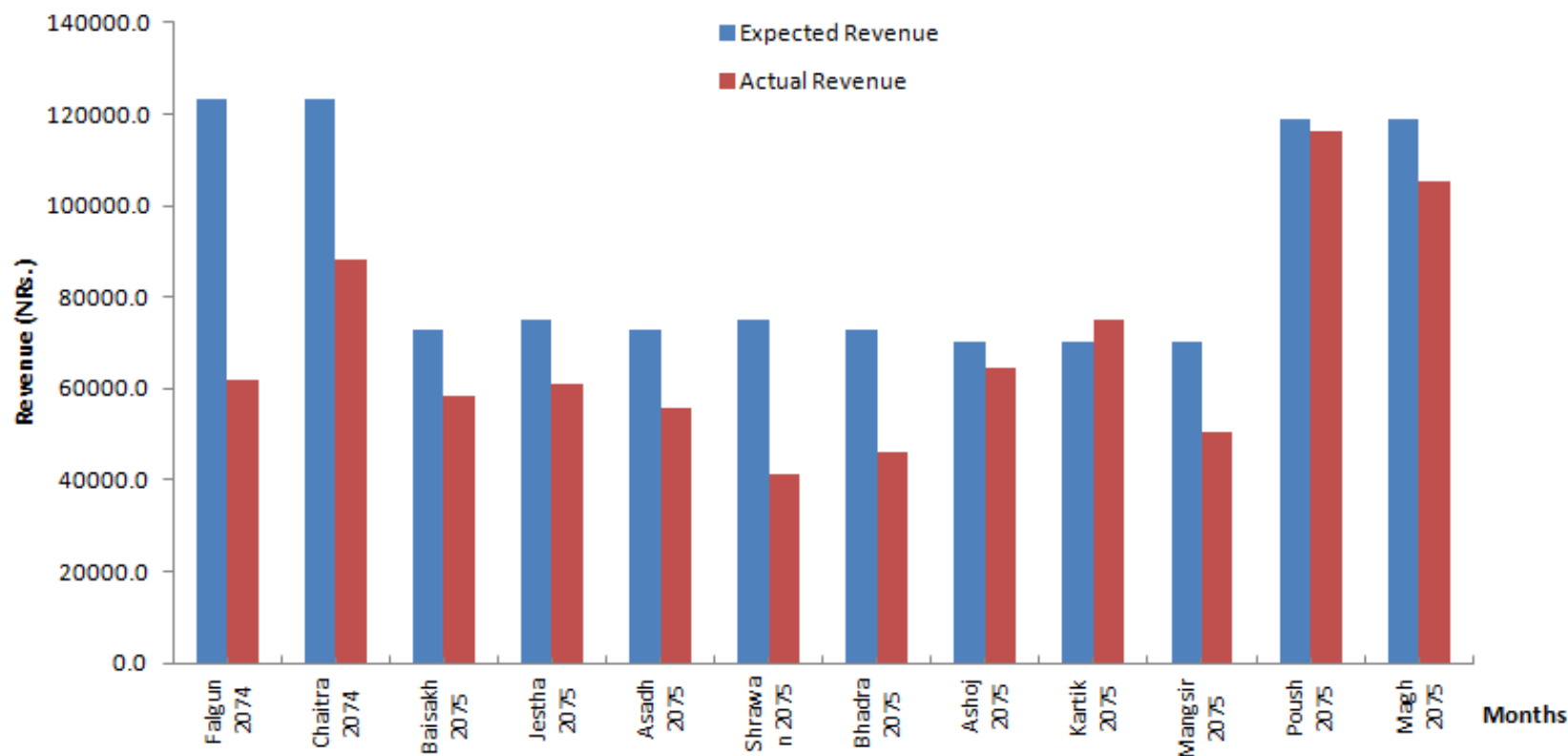
24 MHPs are awaiting for grid interconnection

# Impact of grid interconnection of first ever 23kW MHP (Distr. Gen.) in Nepal

➤ By injecting just 23kW in 11kV feeder line, voltage increased from 370V to 382V.

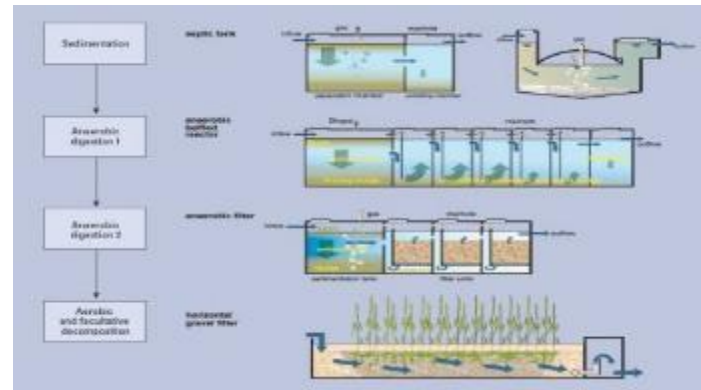
➤ Plant Load Factor increase from merely 25% to 77%.

➤ Increases the revenue by 3 fold



# Technologies for Large Scale Biogas

- CSTR: (Continuously stirred tank reactor)
- **Biogas-Induced-Mixing-Arrangement** (BIMA systems)
- MBT (Mechanical- Biological Waste Treatment)
- UASB ( Up-flow anaerobic sludge blanket)
- Decentralized Wastewater Treatment Systems (DEWATS)







Pic: Envipower Phase 1, Photo source: CIF and Evnipower Energy and Fertilizer Pvt Ltd

Daily Gas Output: 5500 m<sup>3</sup>

Gas Use: Bottling and distribution especially in industries and commercial hubs.



# RE for Rural Farming and Irrigation



# RE for Climate, Health and Education

- Connecting remote Health and Education Institutions with Renewable Energy
- Water for Drinking and Irrigation for improved health, local economy and employment
- Services to clean cooking from Electric and other renewable energy sources for reduced Indoor Air Pollution





# DIVERSE RE SOLUTION for THE COMMUNITY





# Areas of technology transfer

- Technology manufacturing industries
- Demand side management
- Establishment of renewable energy repair and maintenance centers
- Ensuring sustainable operation of RE projects
- Linking use of RE into productive uses

# THANK YOU

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