

SUSTAINABLE POWER DEVELOPMENT FOR MEETING NEPAL'S ENERGY DEMAND

SAARC Dissemination Workshop “SAARC Energy Outlook 2030”

27 November 2019

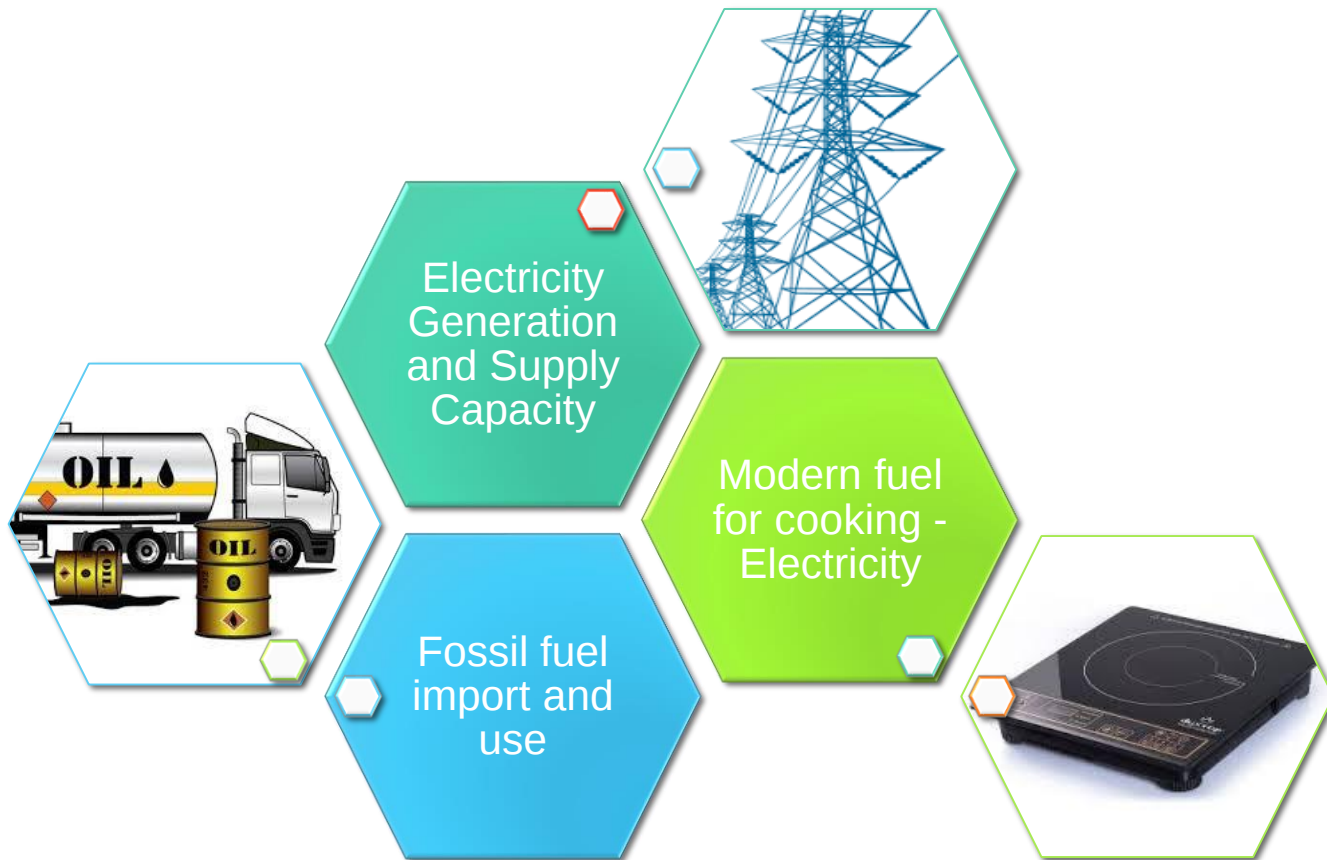
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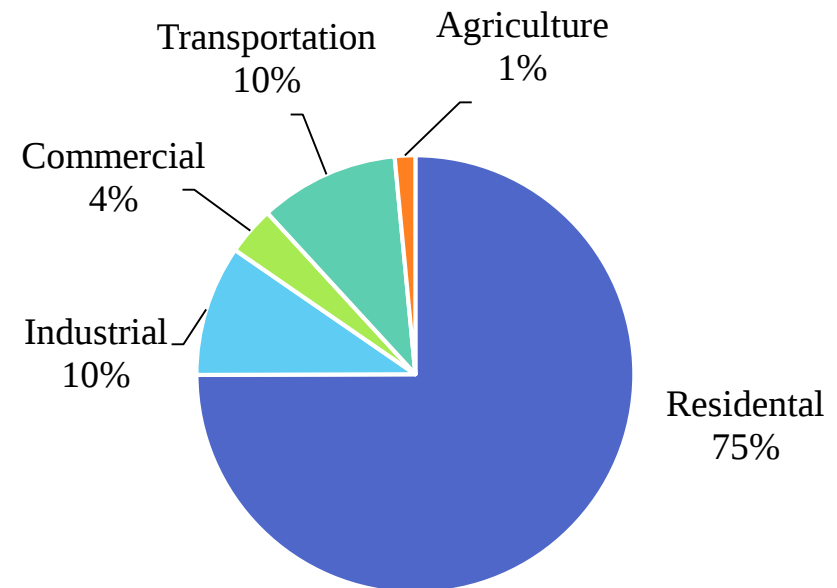
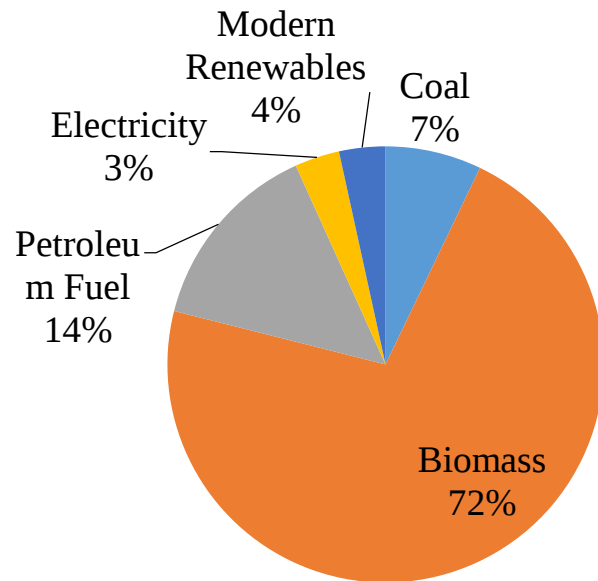
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*Member, Energy & Environment Committee, FNCCI
Member, Advisory Committee, Energy Development Council*

Main Energy Issues/Challenges



Energy Consumption in 2017



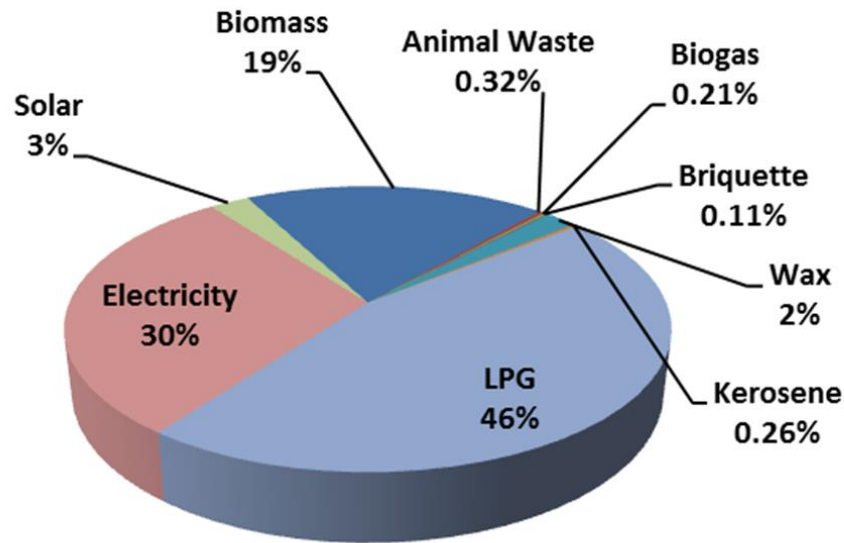
544 PJ

1 PJ = 23,890 toe

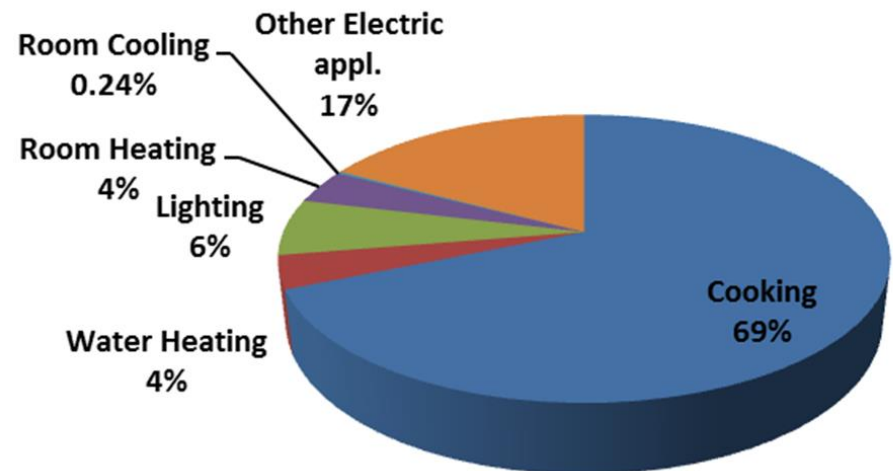
(MOF, 2017; WECS, 2010)

Primary data results in Kathmandu Households in 2014

Final Energy Share by Fueltype



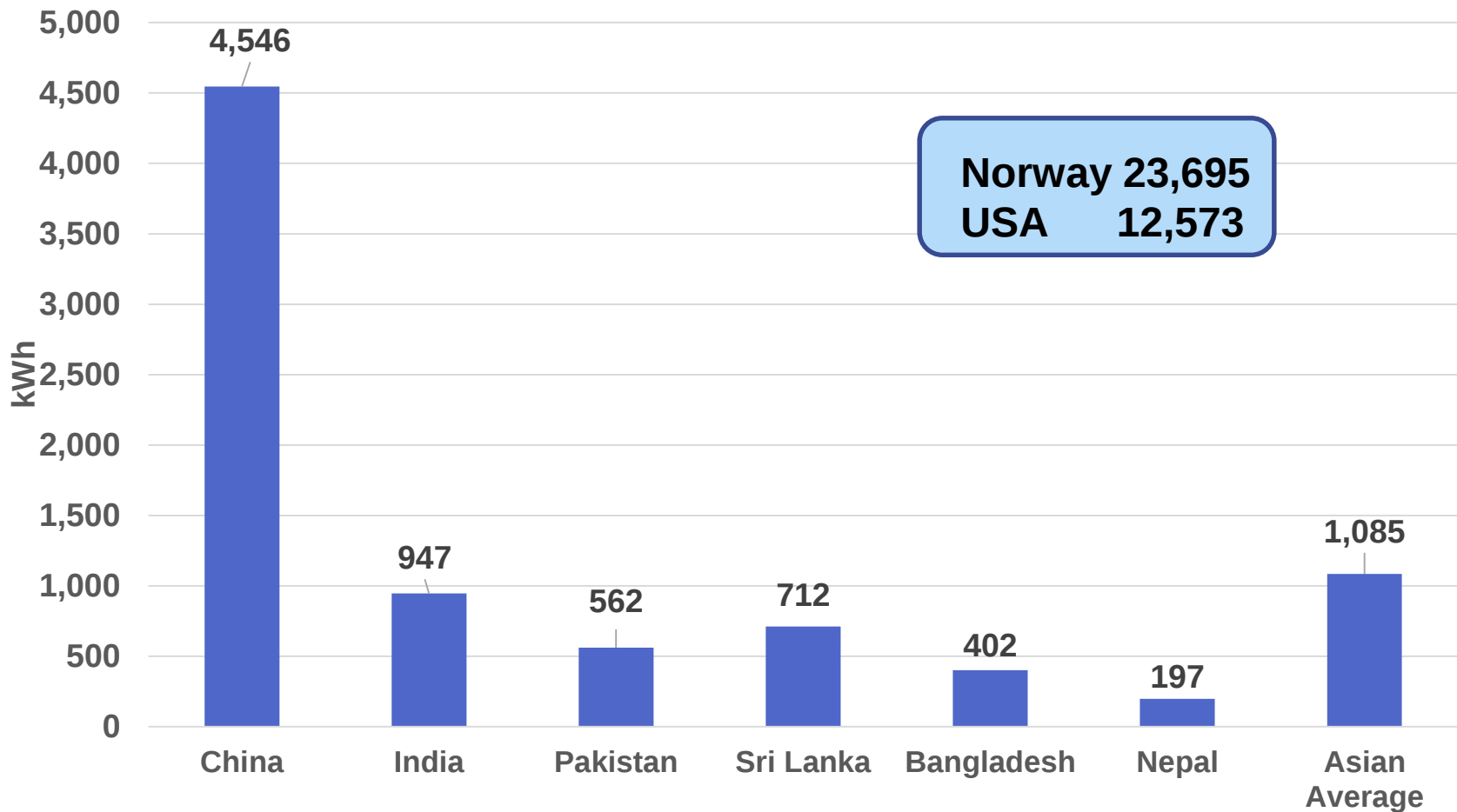
Final Energy Share by Enduse



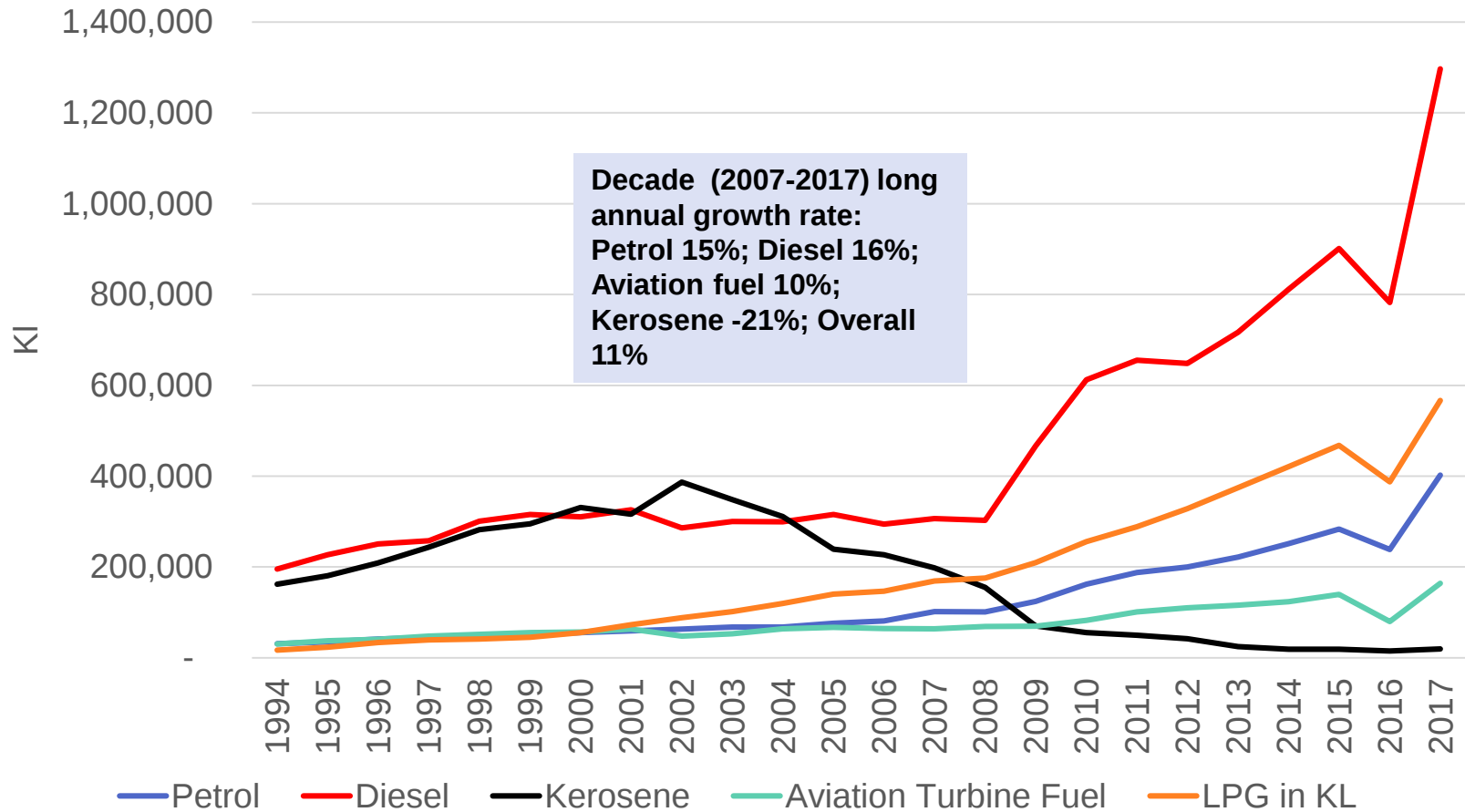
7,400 TJ

(Nakarmi and Rajbhandari, 2015)

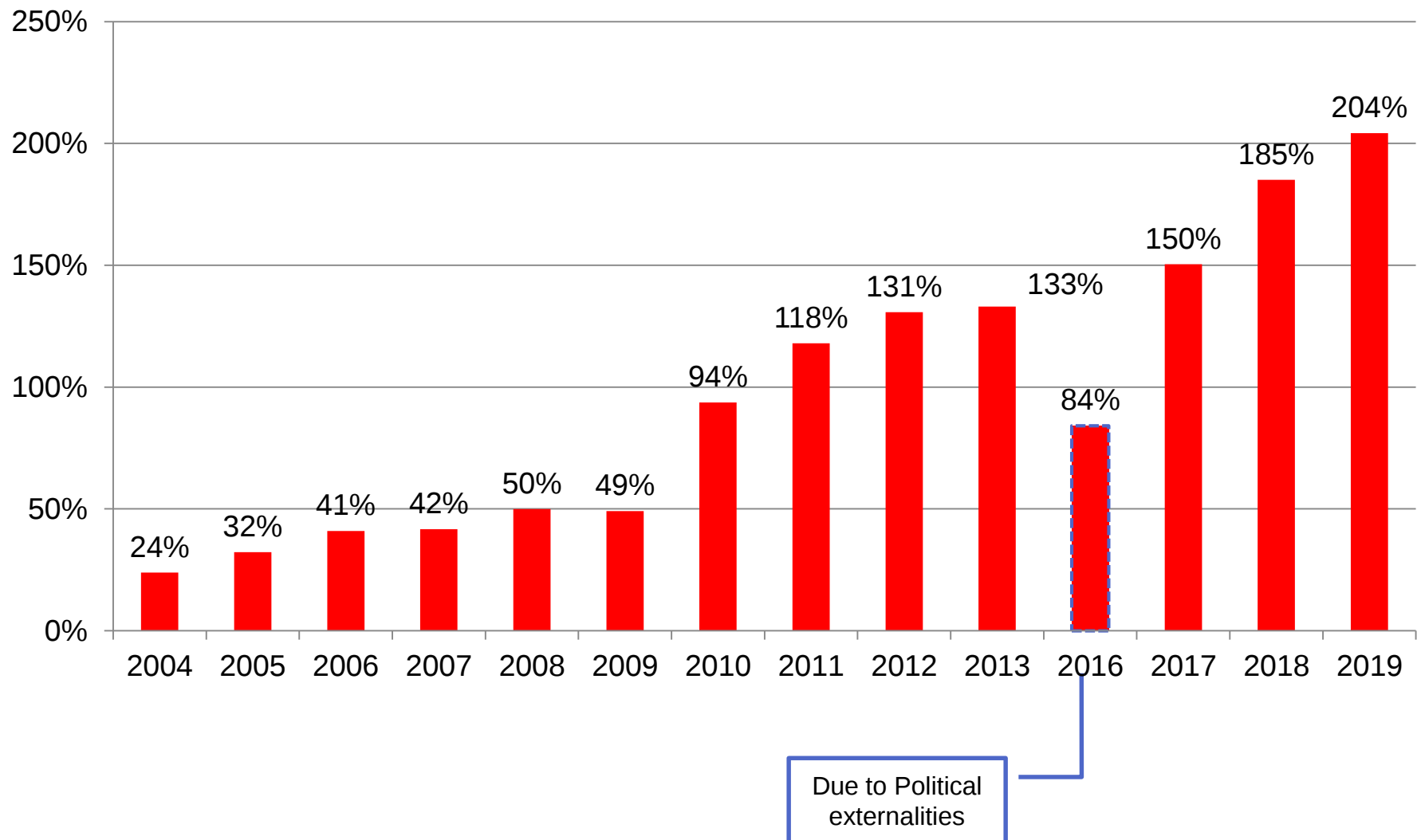
Per capita electricity consumption in 2017



Sales of Petroleum Products (kL)



Historical trend of Petro Imports vs. Goods Exports



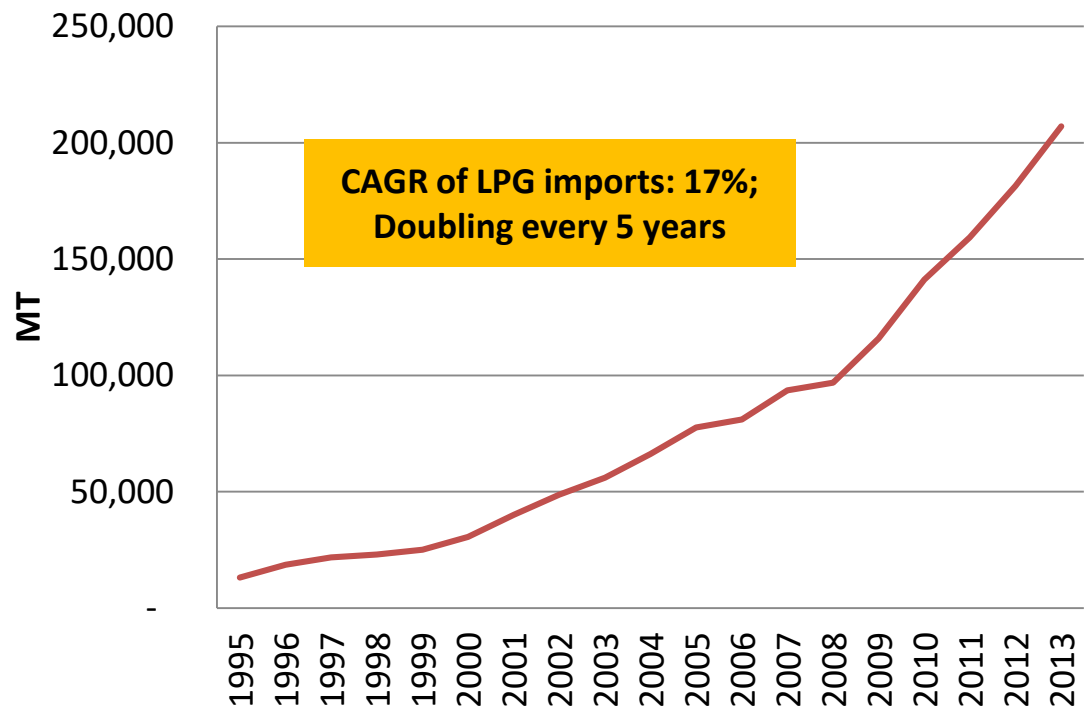
Petroleum products: Growth Rate

Growth rate	%
2007 - 2017	11
2015 -2017	16
2017 - 2018	21

Growth rate
40% in monetary terms to
NPR 151 Billions



Penetration of LPG in remote rural areas as well.





REGIONAL SCENARIO

Panoramic view of West Rongbuk Glacier and Mount Everest,

- in 1921 (top) by Major E.O. Wheeler and
- in 2009 (bottom) by David Breashears.

(Photo courtesy of the Royal Geographical Society)

Air Pollution in Kathmandu

- Dense concentrations of aerosols transported from places like India and Nepal
 - Warms the Himalayas as much as greenhouse gases
(Rose, 2012)
- Reduced albedo (2 to 10%) and increased surface radiative forcing (0 to 28 W/m²) in HKH
 - Enhance melt of snow and ice
(Gertler et al., 2016)
- Air pollution in South Asia is likely to worsen without actions firmly grounded in science and yet based on local specifics.



Air Pollution

Country data on	2013 (World Bank, 2016)	2015* (LEAP - IBC result)
PM _{2.5} concentration (µg/m ³)	46.09	47.33
Total deaths from air pollution	22,038	26,035

In 2013, 5.5 million premature deaths worldwide, or 1 in every 10 total deaths, were attributable to air pollution.

*: Calculations based on study (ICIMOD, 2017)

WHY HYDRO POWER & OTHER RENEWABLE ENERGY??

Energy security

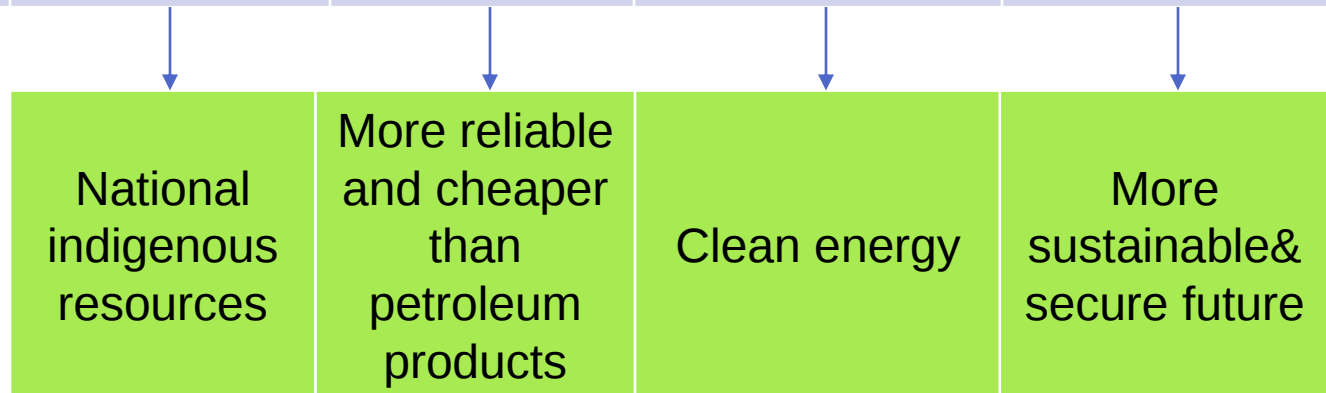
Energy Price stability

....and Environmental sustainability

Energy Trilemma Index in 2018

- Index by World Energy Council
- Ranks countries on their ability to provide sustainable energy through 3 dimensions (DDC):
 - Energy security,
 - Energy equity (accessibility and affordability),
 - Environmental sustainability

	Energy security	Energy Equity	Environmental sustainability	Overall Rank
Rank	125	104	84	118 (out of 125)



Fuel economics in urban/rural areas (cost of cooking/month for a household of 5 members) **with electricity tariff increased by 20% since Aug 2016**

Year	Kerosene stoves	LPG stoves	Electric hotplates
2000	270	430	680
2003	340	535	790
2014	1,760	1,082	960
2019	1,240	1,453**	1,114

(Banerjee, M. et al., 2016; Narasimha Murthy & Antonette D'Ssa, 2004)

For induction
heater NPR 990

** : Household has 2 cylinders in use and it includes capital cost of them (10/11/2019, NOC)

Fuel economics study in Mandan Deupur, Kavre (cost of cooking/month for a household) *in 2019 conducted by Leaders Nepal for Clean Cooking Initiative (CCI), Washington DC and author's calculation*

Particular	Cooking on LPG	Cooking on Fuelwood	Cooking on Electric Induction cooktop
Monthly cost of stove	90	13	81
Fuel qty/month kg, unit	7	60	56
Fuel Costs/kg, unit	95	10	5.70
Monthly cost of cooking Rs	755**	613	400

** : Household has 2 cylinders in use and it includes capital cost of them (Does not include under recovery of NOC: 10/11/2019, NOC)

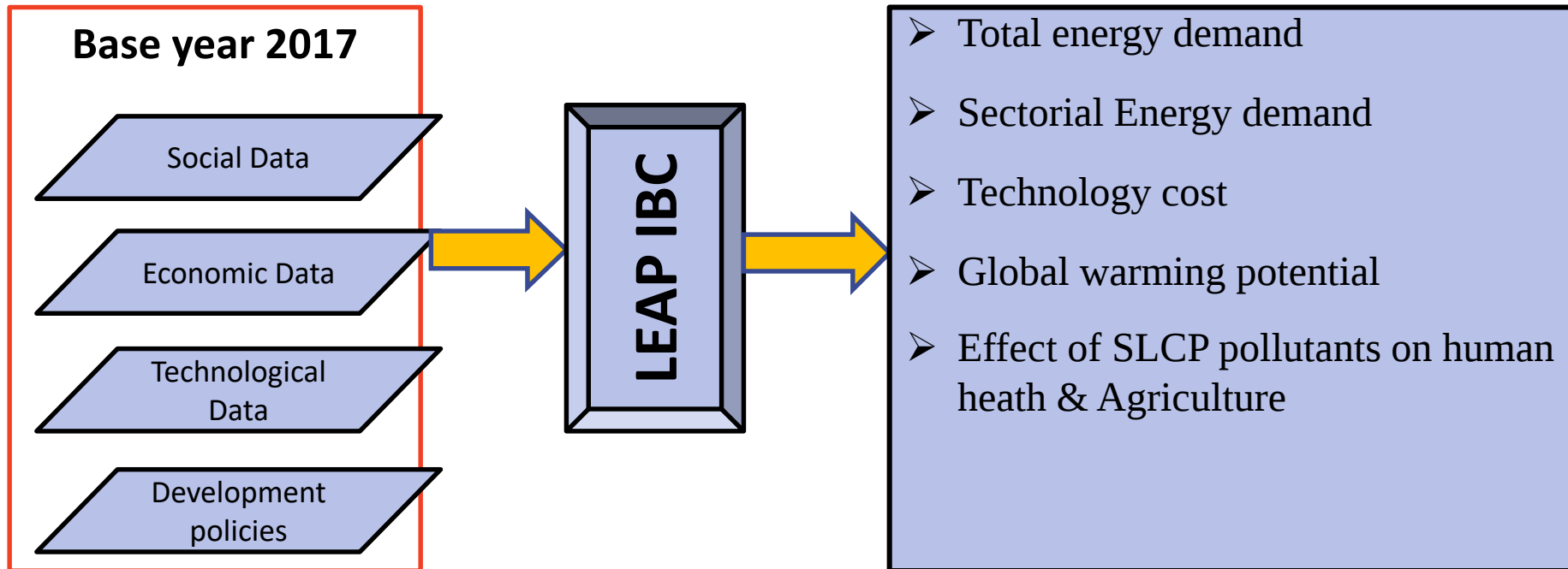
- Cooking
 - accounts for more than 60% of consumption of primary energy supply in the country.
 - LPG sales growth rate (totally imported) increasing annually at 16% in 2019.
 - LPG import cost in 2018-19
 - Household usage 50%
- | |
|-----------------|
| 33 Billion NR |
| 16.5 Billion NR |
- Electric cook stoves, especially induction cooktops are 50% more energy efficient than LPG gas stoves, and have also become economically efficient (nearly 50%) in the past few years

WHICH PATHWAY TO TAKE FOR FUTURE SUSTAINABLE ENERGY DEVELOPMENT AND ENERGY SECURITY ?

Pathway that provides

- **Security of Supply**
- **Cost effectiveness**
- **Environmental sustainability**

Scenario Analysis Framework

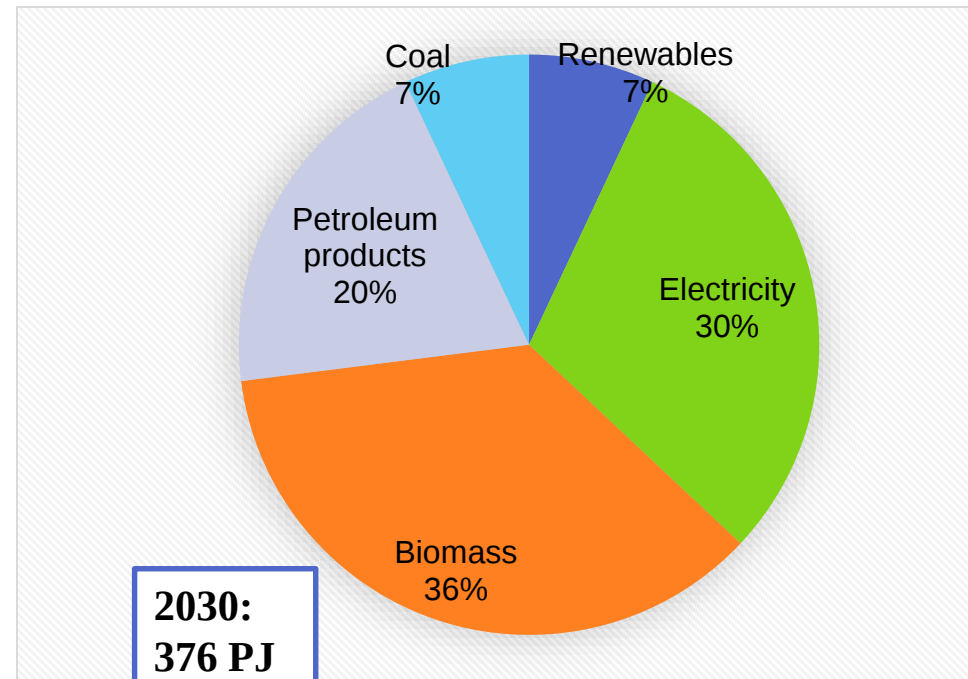
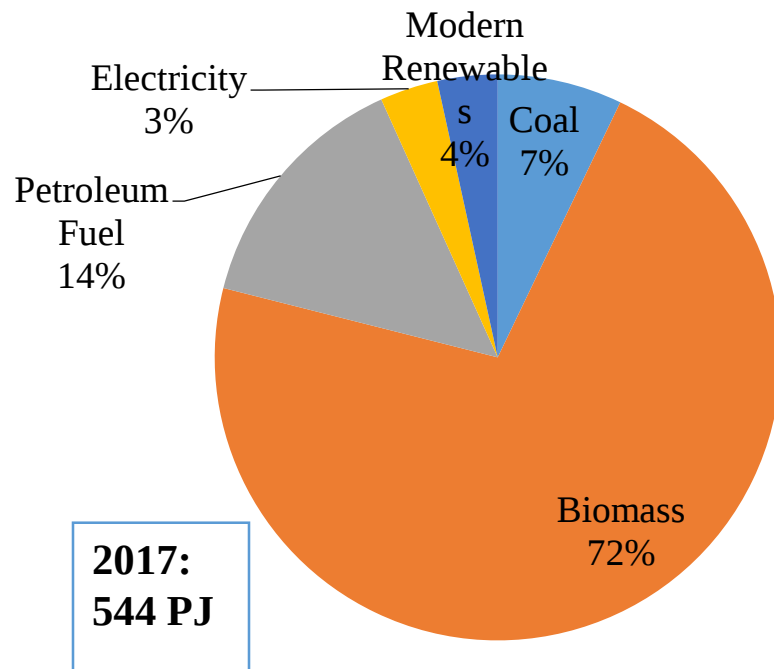


Policy Intervention in Energy Sector

Based on Low Carbon Economic Development Strategy and INDC of Nepal, SE4ALL, SDGs and World Energy Outlook, IEA, 2017 in the Long-Range Energy Alternatives Planning System (LEAP) modeling framework (ICIMOD, 2017)

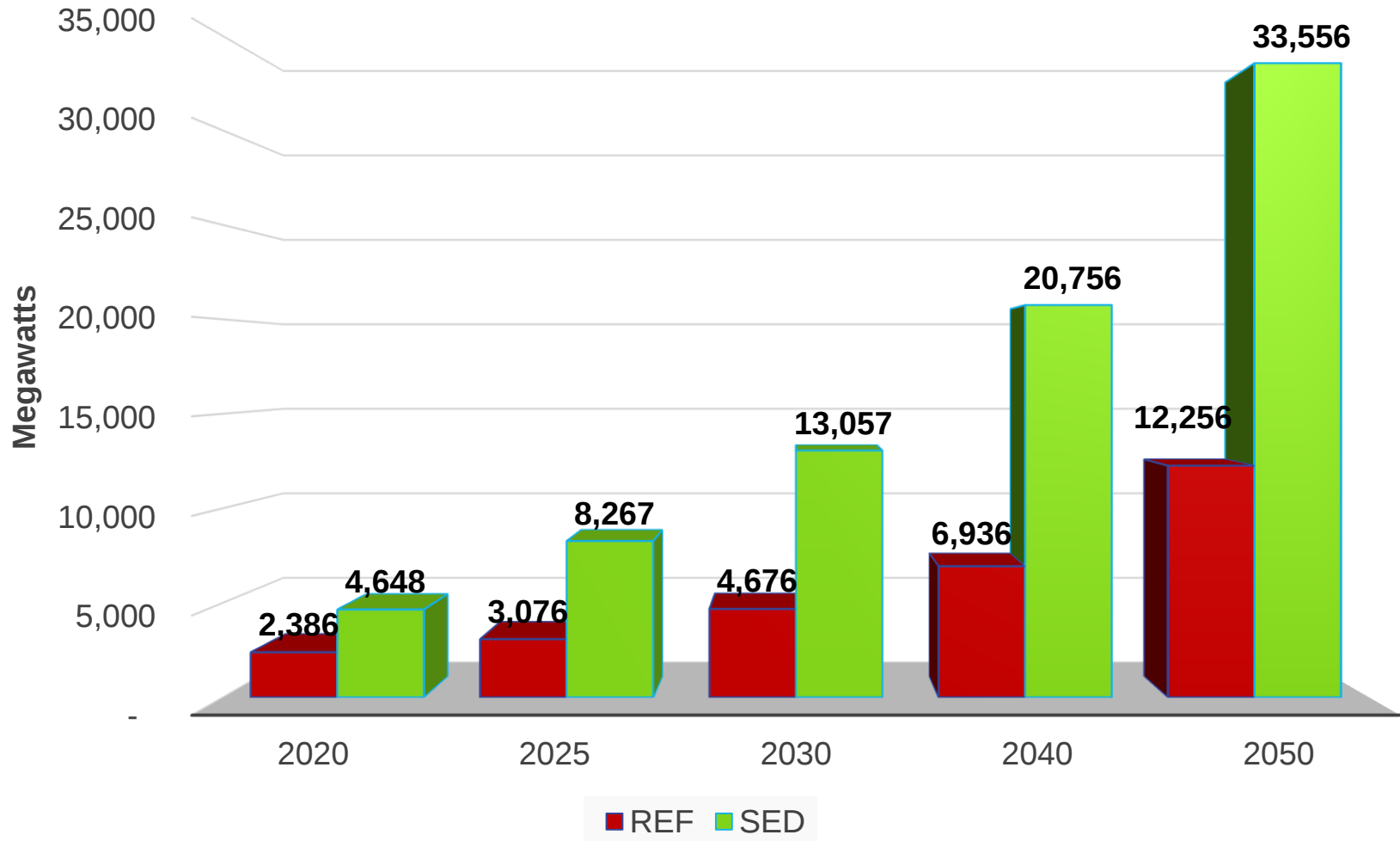


Fuel Portfolio in SED scenario

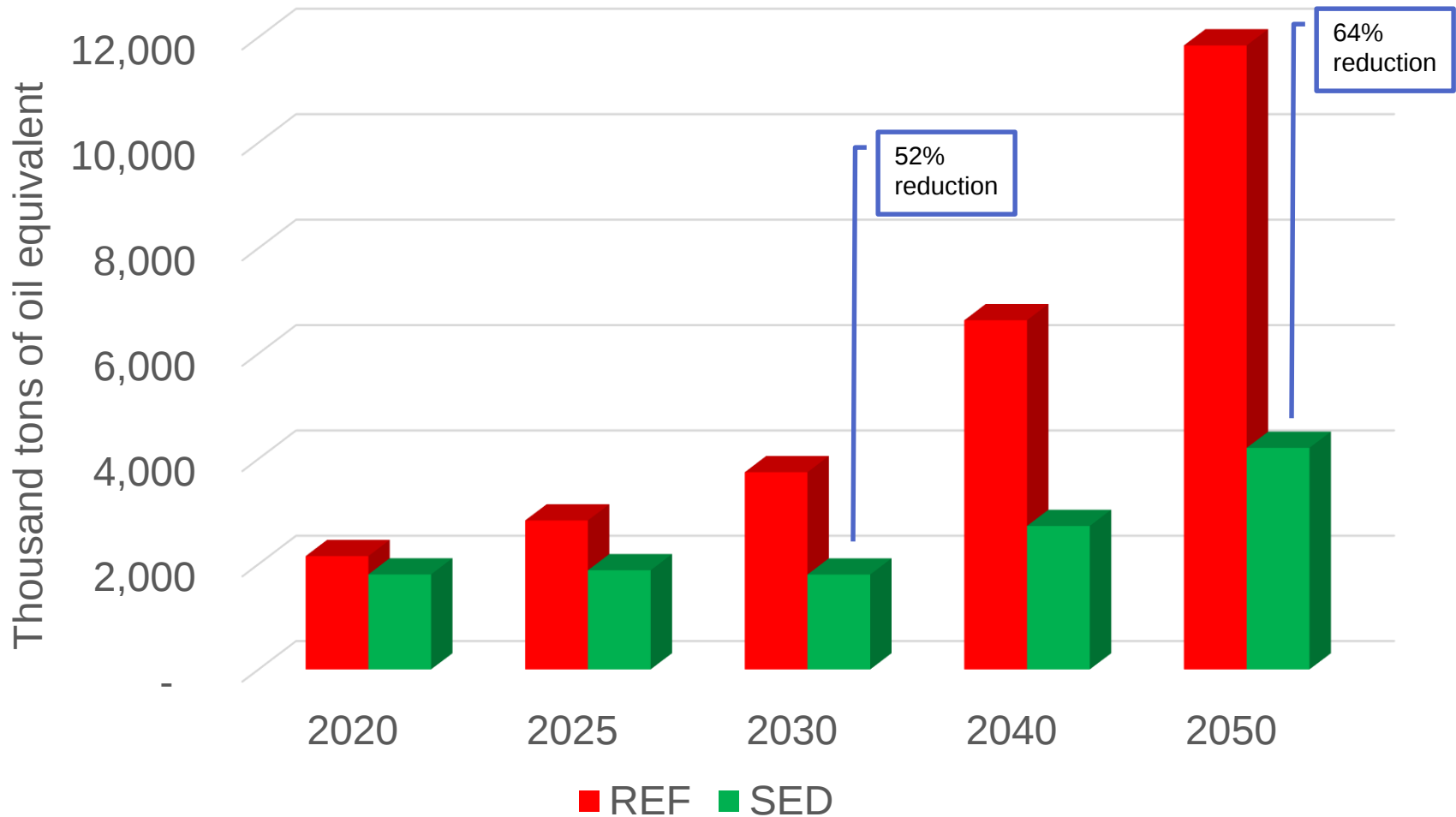


- Share of electricity increased from 3% in 2017 to 30% by 2030.
- SE4ALL Goals target:
 - Access to cleaner form of energy
 - Efficiency improvement
 - Increased share of renewable energy

Power plant requirements

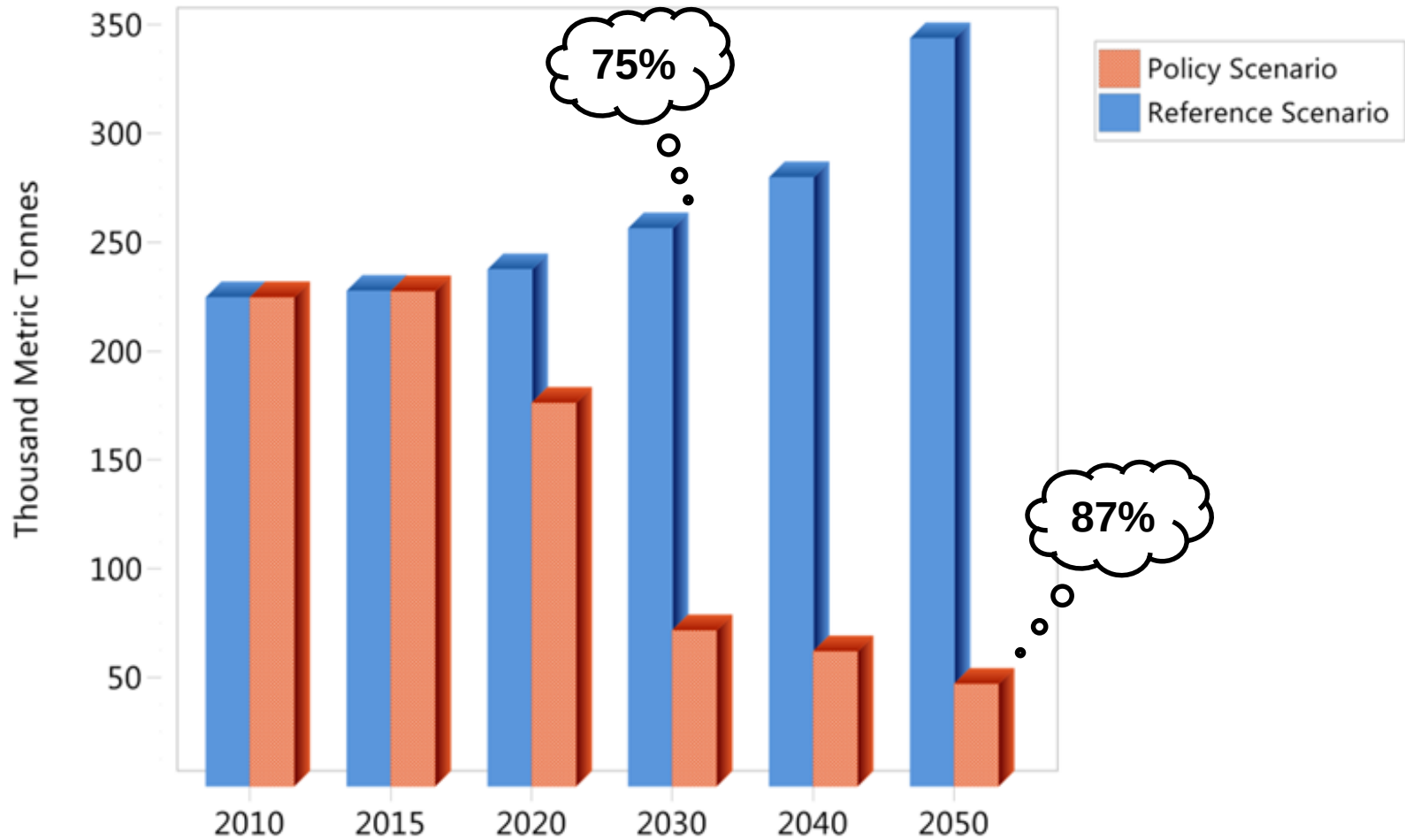


Demand for petroleum products



PM_{2.5}

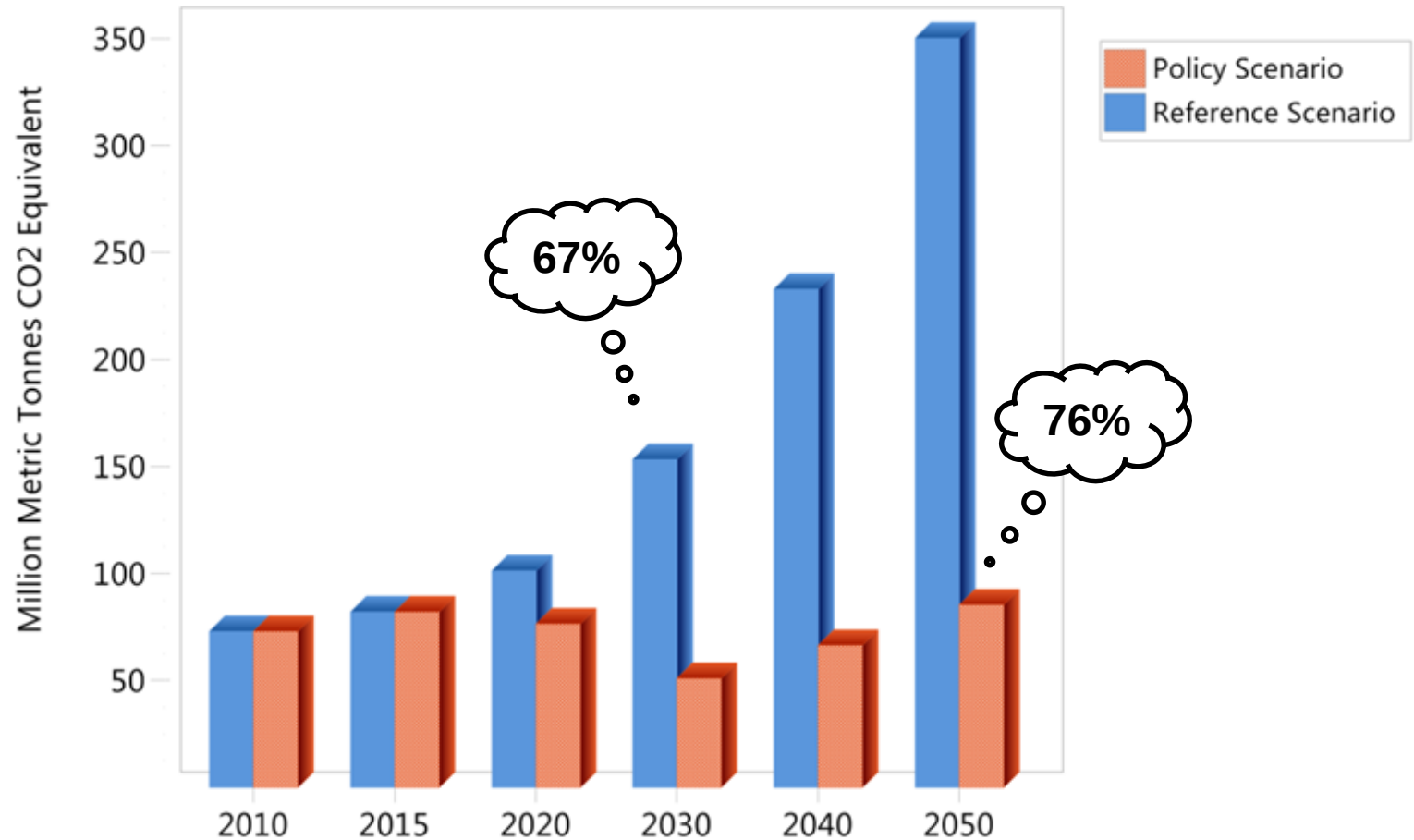
Reference and policy scenario



(ICIMOD, 2017)

GHG emissions (20 years GWP)

Reference and policy scenario



(ICIMOD, 2017)

Current efforts by Nepal Government

- For the past couple of years, things are moving in the positive direction in Nepal especially in the power sub-sector.
- Emphasis will be given to the development and expansion of hydroelectricity and all types of renewable energy to provide clean energy to all Nepali households.
- Projects will be implemented to match **2018-2028 declared as *Energy Decade***.

Which Pathway is Nepal heading on?

- Ministry of Energy, Water Resources and Irrigation (MOEWRI) 2018 white paper focuses on supply side and electrification of residential sector with campaign of
 - “***One house, One energy house***” and
 - “***One house, one electric cook stove***”.
- These campaigns need concrete steps for implementation.
Electrification is a systems solution, so both demand side must be considered along with supply solutions
- Paris Accord 2015 discourages use of fossil fuels and rapid promotion of renewable sources for meeting energy demand
- Are we moving towards green or brown ***economy?***

- GoN should take proactive actions
 - NEA gets around 50% of its sales revenue from domestic consumers
 - but almost 70% of them cannot cook on electricity, because they have low ampere connection (5 A) (induction cooktops need higher than 1.5 kW power and at least 15 A connection)
- Upgrading the connection is technically feasible and can also substantially increase NEA's revenue generation

Some Suggestions for coping up with the challenges

For substituting fossil fuels by clean energy from hydro and non-hydro renewables

- First, marketing activities to [attract consumers to induction cooktops](#) by NEA or private DisCos, if formed under electricity regulatory commission
- Second, NEA or the private DisCos have to [upgrade the distribution and transmission](#) network
- Third, It must start [digitization and optimization](#) in its network using smart meters, net metering, smart distribution and transmission systems.
- Residential rooftop solar PV will be cheaper than electricity even from hydropower by 2025 as per IRENA.
- Hence, possibility of strong [grid-load defection and prosumers](#) coming into the electricity markets and initiation of consumer to consumer payment through blockchain technology

Some Suggestions (contd.)

- Fourth, NEA, once digitization activity is completed, can have **time of the day tariff systems** for even domestic consumers and services sector
- Fifth, NEA or Private power traders can consider supply of power in the regional markets once it has met the internal demand with **reliable and resilient supply**.
- Make the **integrated energy regulatory commission** that encompasses, power, oil, and renewable energy for integrated approach



Thank you !!!