

Decarbonizing Transport – Nepal story

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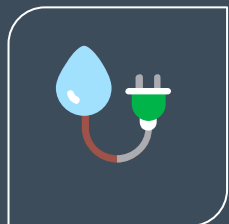
Sajha is largest Public Transport agency of Nepal, with Govt and private share, & based in Kathmandu, it has Mostly Diesel bus, but 40 electric buses now, & planning 100 more, spearheading Electric transport





Outline of presentation

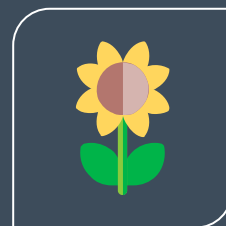
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Clean Source of Energy

Clean – Mostly Hydro, solar some & Biopower
! No Coal, No Gas, No Petrol -> all IMPORT

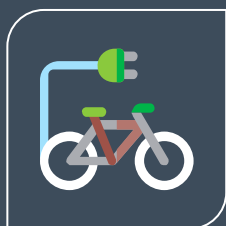
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Decarbonizing Transport - modes

Rope, Road, Rail, Water, Air
! Only Road, some Rope

03



Electric Road transport Status, Obstacles, Efforts

Private / Public
2-wh, 3-wh, 4 Wh, >4 Wh

04



Progress in Process

Policies, Technology, Going Forward



01 Grid Electricity - Energy Source is Clean

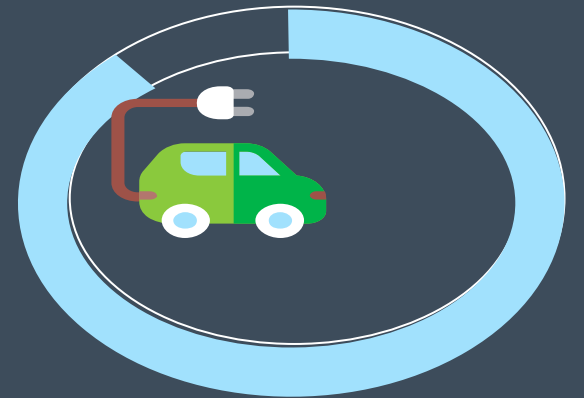
Nepal's case - Converting 'Fuel of Transport' to Electricity –No if/buts

Shifts the Energy source from Vehicle to Grid
from FossilFuel to Renewable

- Renewable and Clean Electricity 100%
- Energy Mix (2023) Hydro 99% Solar/Bagasse <1%

Ecosystem for Electrical Transport

- Access to Electricity 95%
- Access to Grid Electricity 91%
- Net Surplus production – From this Year 2023/24 - Surplus
- Import ~1500GWh from India (~60% is GHG emitting) in winter, and export more in Summer
- ✓ The Grid Electricity is just “Right and Ready” for Electric Transport and all other consumptions.



Decarbonizing Transport modes in a Mountainous Country Nepal

1 Ropeway – In mountains, Ropeway is friendly to ecology, and environment, “Energy per km per kg” is $\frac{1}{2}$ to $\frac{1}{3}$ of Road Vehicle transport, and it is electric.

- In 1964, Nepal started Ropeway for Goods transport (Hetauda-Kathmandu 42km – now Closed) and no major ropeways operational at present, except project/factory
- Cable cars for touristic purpose are increasing
- Reliable electricity has supported re-introduction and review of ropeways



2 Railways – Mountains biased against Railway. Only railway – Janakpur-Jaynagar runs with diesel engine. Candidate for Hydrogen FCEV, in next step!

- NDC 2020 plans for having 200km of electric railway by 2030.

3 Ships - Mountainous and Land-locked,, no river transports/ shipping

Air - Waiting for the world to electrify or decarbonize the Fuel

Road Transport – All the action is here!



Early History of Decarbonization – different Reasons



E-Trolley bus 1975-2001 China

Pollution

Capital Kathmandu is a valley – what pollutes stays
Eg. Safa Tempo – replacing Bikram Tempo (kerosene/ petrol)

Import Substitution

Petroleum is largest import item of Nepal
Electricity is clean & domestic

Foreign Aid

Working as a Catalyst To mobilize local spirit for Clean transport



Safa E-tempo 1993-Date USAID

Similar dynamics at present also!

Pollutant - > GHG



Nepal's Efforts at Electric Vehicles



Nepal has no vehicle-manufacturing base, but tried its hand in conversions



1992: 1st Electric car by Electric Vehicle Development Group



1993: Safa Tempo – 700 operating in KTM



2006: Electric Van by Hulas Motors



2006: Electric Van by Shree Eco Visionary

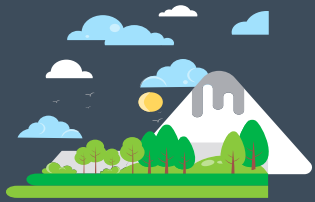


2007: Electric Bus by Himalayan Light Foundation



2008: AC-Drive Tourist Tempo by Shree Eco Visionary

Ref c/o Bhusan Tuladhar



Nepal's More Recent Efforts at EVs



A milk van from UK converted to public EV in Kathmandu 2020



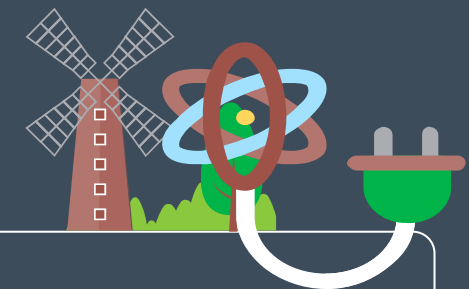
Solutions Plus – supported New Designs of Saha Tempo to improve the 3-Wheeler EV experience -2021



First 4-Wdrive Gypsy Jeep of Nepal Army converted 2023



Solutions Plus supported Sajha Yatayat (2024) – converting Nepal's first 6-wheeler – a 26-seater bus – Completed now – Looking for FIRST in NEPAL Approval and Registration



Regulatory Road Obstacles in Converting Vehicles

Despite long history of conversion efforts, Converted vehicles are not running in the Road formally

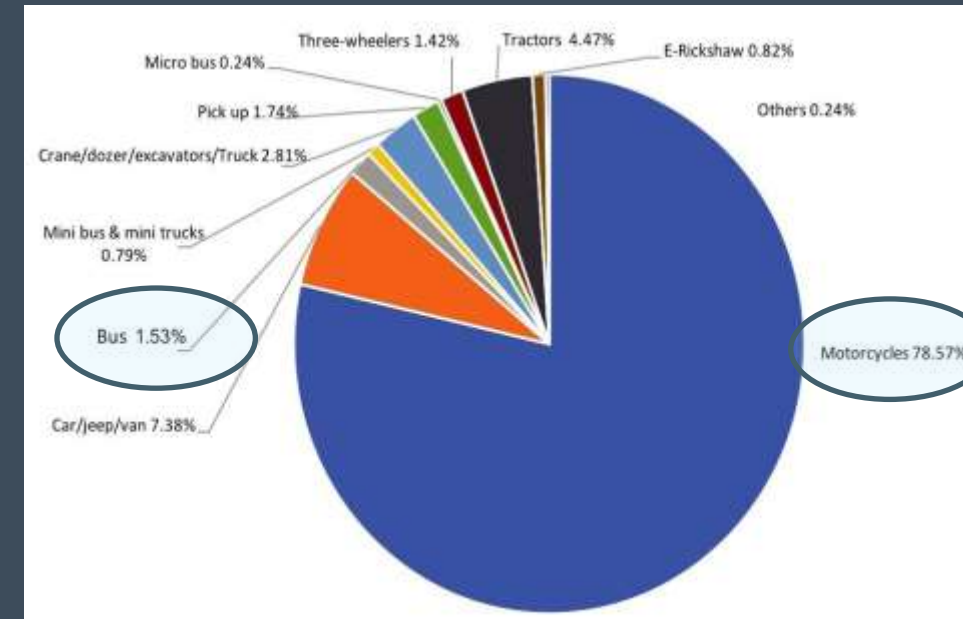
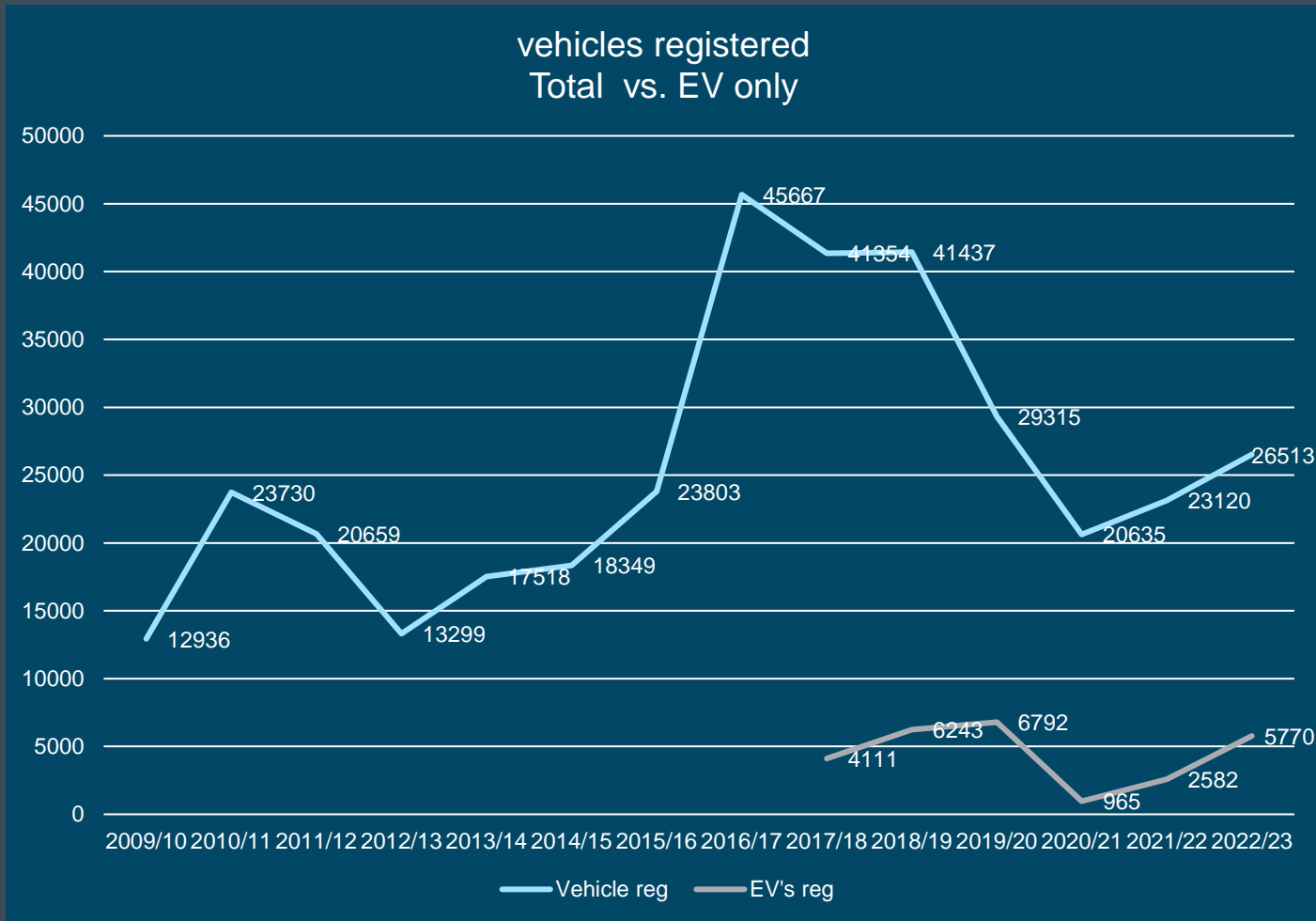
- Road-worthiness certificate not given
- Change (substantial change) of the vehicle different from originally registered is prohibited.
- Recent amendment of Vehicle act (interpretive amendment) – allowed for modification for 5 years – expiring next year. (Expected to be renewed)
- Within this window, there are no Procedures and Regulations yet for Approval and RW certification
- There are no Standards for conversion approved yet.
- But Attempts are ongoing for drafting them.
- Donors including USAID, Solutions Plus, GGGI are helping remove these road-blocks

Safa Tempo was approved with chassis and frame from Vikram Tempo and new registration, considered as Manufactured not modified.

Sajha Yatayat (converted bus supported by Solutions Plus) – is seeking to obtain the Approval upon Test operation April 2024 (hopefully).



Electric Vehicles adoption Trend



Total Vehicle = 3 million (79% 2-Wheel)

Total EV reg= 26463 (by 2023)~ 1%

Total Electric 2-wheeler =13372 (50%)

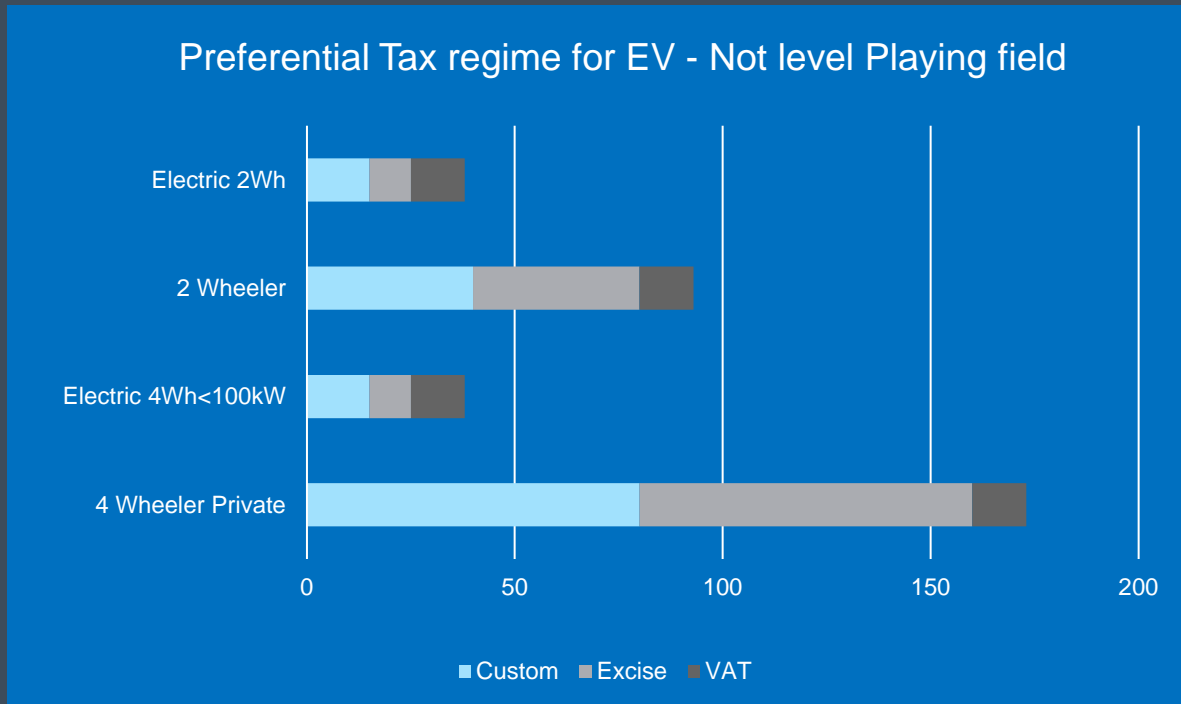
In 2022 EV = 5779 (21.8% of total)

In 2023- 6months,
EV = 3686 (60% of 4 Wheelers are EV)

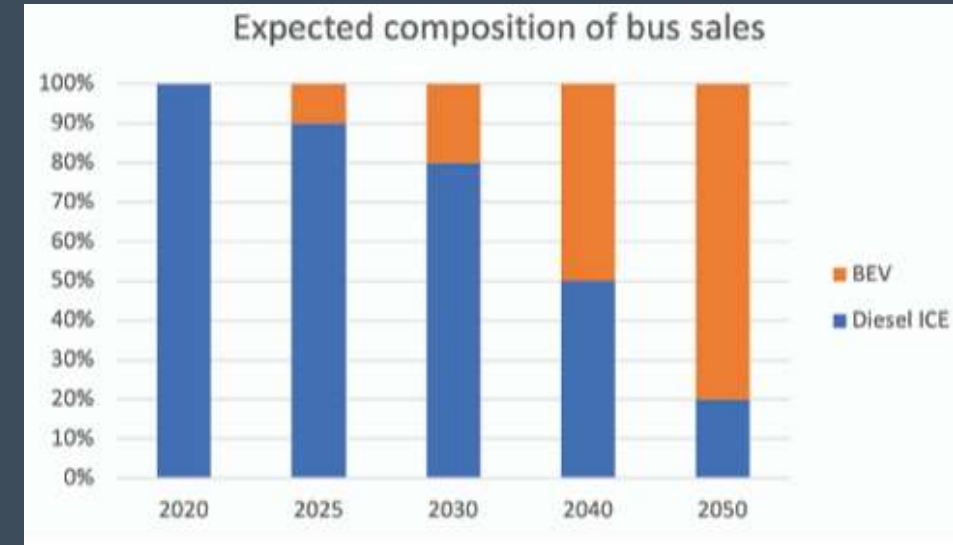
Electric bus = 40 (0.1%)

Electric Trucks = 0

Electric Vehicles Trend – Government’s promotion



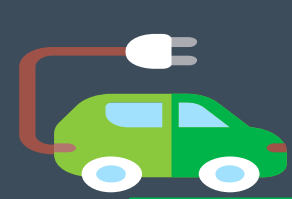
- The tax-treatment brings 4-wheelers at equal prices for private use.
 - A medium-scale SUV= MG ZS EV 55 Lakh NPR
- There is less differential in 2-wheelers, so Electric 2-Wheeler is more expensive to ICE ones @150km range
- Tax+duties is very low for public transport – Taxi, Minibus, Bus and Truck or Lorries. Hence, the Tax differential is minimal, price is high .
- The impact = High resistance to adopt EV in this sector.



One study has projection of E-bus for 2050 = 80% of new, which is optimistic.

Focus is required here

- >> Growth in E-2Wh = lagging
- >> Growth in E-4Wh Public = lethargic
- >> Growth in >4WH EV (bus/truck) = very low
- >> Conversion of ICE Vehicles before their half-life is essential for effective Decarbonization of Transport



Decarbonizing Transport – NDC and national plans



Different Goals, different times

- 2016 NDC - “by 2050, Nepal will decrease its dependency on fossils in the transport sector by 50%, 50% of the total energy used by the transport sector in 2050 will be electric”
- Bagmati Province - a target of removing all ICE vehicles from its urban centres - by mid-April, 2028
- Ministry White Paper in 2018 - by 2023, half of the vehicles imported in the country will be electric (actual 21.8%)

So, what about NDC 2020 ?

	Private E-Vehicle (incl 2 Wheeler)	Public E-Vehicles
2025 (of new)	25%	20%
2030 (of new)	90%	60%
Electric Railway		200 km

It is still Ambitious, needs action on many fronts – and by all actors

To be fair, Similar ambitions by GoI - EV30@30, and NitiAyog - 2023 all three-wheelers; 2025 all two-wheelers and by 2030 all vehicles sold be electric

- GoN has given Tax/ Duty benefits during Import
- Certain tax benefits to promote electric vehicles (EVs) when in the road
- ✓ Road tax exemption for first 5 years after EV purchase
- ✓ 50% discount on road tax after 5 years
- ✓ Waived or reduced customs duty and excise duty on Evs
- ✓ 5% tax rebate on loans for buying EVs

GoN installed

- ✓ 51 Fast Charging stations along Highways
- ✓ Lower electricity tariff for charging
- ✓ Subsidize transformer, supply network till ch. Station
- ✓

In the Works

Academia - KU

Academia - TU

International/ Donors

Solution Plus

Business/ Private Sector

Converted ICE car

Conversion of Car
and motor-cycle

USAID – Safa
Tempo, Hydrogen,
Charger
Infrastructure study

E Bus conversion –
Sajha Yatayat

15 Brands of 2-
wheelers, different
options

Procured Hydrogen
FCEV
Research in
Electrolyser, H2
Tank

Support Sajha
Yatayat in Electric
Bus Tests

GGGI – EV studies
and plan

EV Conversion –
Safa tempo, 3-
wheel cargo, 4-
wheel light cargo
(pick-up)

4-wheel market –
all major brands
Chinese, Indian,
Korean, Japanese

Supported E-Bus
conversion project
of Sajha Yatayat &
Solution Plus

Planning and
studies

Norad – support
KU in EV and
Charging complex,
software

EV manpower –
training,
EV policy,
regulation support

Nepalese own
assembly,
manufacturing
start-ups

Ecosystem for Electrical Transport in Kathmandu, Nepal

What obstructs EV growth? (from a review of the studies+literature on Nepal system -ref.annex)

Technical Barriers

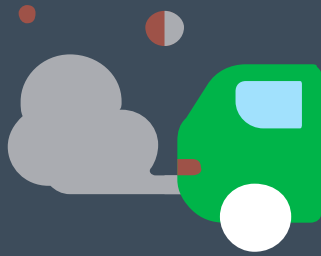
- Limited range, Limited battery life [ref 9]. (limited battery life is misapprehension, hence , not a technical but social barrier)
- Low Ground clearance coupled with battery weight is a hindrance for bumpy and pot-hole ridden roads of Nepal
- Need of skilled labor force for the qualitative aspect of the EV industry overlooked by the private sector [Ref 8]
- Battery pollution issues (these were more political than technical) [Ref 8] Transfer of batteries is illegal without express approval of India or China (Nepal's neighbors), Battery after-life service/ reuse facilities absent.

Infrastructure barriers

- Lack of charging stations, Lack of repair and maintenance workshops, No domestic industry [ref6,8,9,10,17]
- Lack of battery leasing/ renting / swaps [ref 17]
- Distribution network weakness as important hurdle [ref 6]

Social barriers

- Lack of knowledge on EVs,, Consumers' limited understanding of the product quality of EVs [ref 9]
- Opposition from econ-threat groups acted through vested interest groups – police officials, politicians, bureaucrats [Ref 8]
- Poor organization of private sector, lack of support networks among actors for, say, battery charging [Ref 8]



Ecosystem for Electrical Transport in Kathmandu, Nepal

What obstructs EV growth?

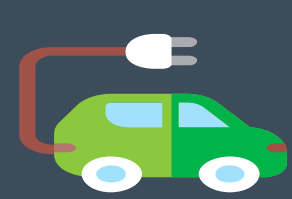
Economical barriers

- Higher purchase price, Battery replacement cost, Higher electricity price for charging [ref 9]
- Too many free-riding competitors, inhibiting investment in technology / institution [Ref 8]
- Charging stations Investment risk in developing nations, since the market is so volatile [ref 6]

Policy barriers

- Inconsistent policies, due to interplay of opposing forces and the government , such as route permit for public EV , removal of VAT exemption for EV, 20% custom duty on battery, e.g. ban of new registration of 3-wh EVs – stifle its growth [Ref 8, 9]
- inadequate policies for Tax, VAT, subsidy, routes [ref 17]
- Infrastructure is the major hurdle. Charging station availability and distribution network reinforcement are the infrastructure issues.

✓Top Barriers should be focused for remedies – Infrastructure is a top barrier (public and private EV), and economics next (public EV).

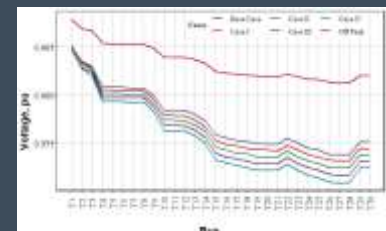


Infrastructure for Electrical Transport – Charging and its Grid impact



- High proliferation of E-bikes and E-Cars means high Home-charging, and normally connected to 1-phase supply.
- It was observed that uncontrolled or truly erratic charging is practiced by private EV owners in Nepal. Ref [18]
- Home charging around 7 PM is the most preferred method of electric vehicle charging (India)- Ref [19]
- Such charging behavior increases the peak loading and voltages dropping below the permissible level, voltage imbalance and phase imbalance with negative sequence currents, due to single-phase connection [ref 3,4] and will require smart charging system to counter this. (Ireland) Ref [3]
- The network reinforcement can reach up to 19% of total network costs, while peak time energy loss can account by 40% more than that of off-peak period. (European Union) Ref [5]

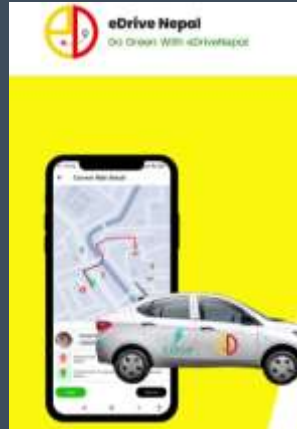
Recommendations from above study

- ✓ Public Charging stations to proliferate
- ✓ Analyze impact on network performance, and reinforce distribution network
- ✓ Apply smart metering, tariff, systems for modifying charging behaviour




Ecosystem for Electrical Transport- Further recommendations

- **Battery** 
 - Battery life concern – battery leasing or swapping services required
 - Battery swap stations can double up as service / repair stations. Battery lease/ swap will reduce the Initial cost of EV.
 - Battery repurposing should be promoted/ subsidized – it can act as Energy storage for Reliability.
 - Battery swap and renting is best suitable for bikes. (It is popular in Taiwan, Indonesia, Kenya, and expanding in India.). Fast adoption is possible. **Software and apps** required and integration of various software solutions needed.
- **2-wheeler Bike - main culprit of Kathmandu valley** 
 - Displacing existing bikes during remainder of its life through Tax and permit policies & conversion to E-bikes is necessary.
- **Public transport EVs –**
 - High capacity charging stations with sophisticated controllers can moderate the impact on grid. Planning of feeder reinforcement is needed for higher penetration of such Chargers.
 - High priority to be given for converting public EV as Taxi, micro-bus and Bus. Higher subsidy or tax discounts for public EV is justified.
 - Conversion requires Quick Policy Reform such as testing and registration, standardization of kits, and subsidy and soft-financing for conversion, technical support for workshops, etc



Perspective from where we stand now >>>

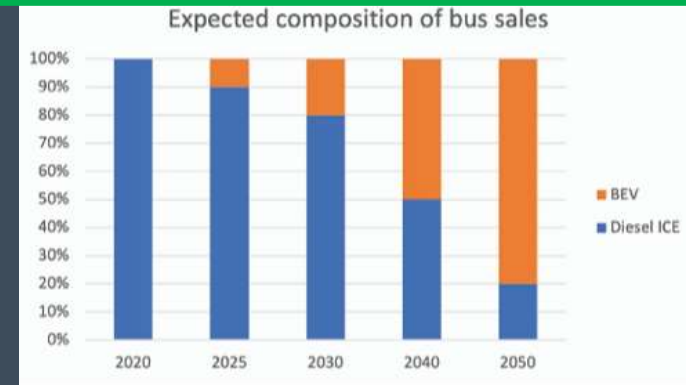
- The Goals are ambitious
- Present progress is encouraging, ecosystem is getting better
- Further Progress is conditioned to
 - Policy consistency and support
 - Invest in Infrastructure – Charging station and Grid reinforcement
 - System support – Battery Lease, Swap, Reuse, Software
 - Conversion facilitation
 - International support and cooperation – technical knowhow / Green financing 
 - Cooperation with neighbor and the region – share of tech. and regulation and policy. The impact is so much more nearby.



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THANK YOU !!!

NDC 2020	Private E-V	Public E-V
2025 (of new)	25%	20%
2030 (of new)	90%	60%



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