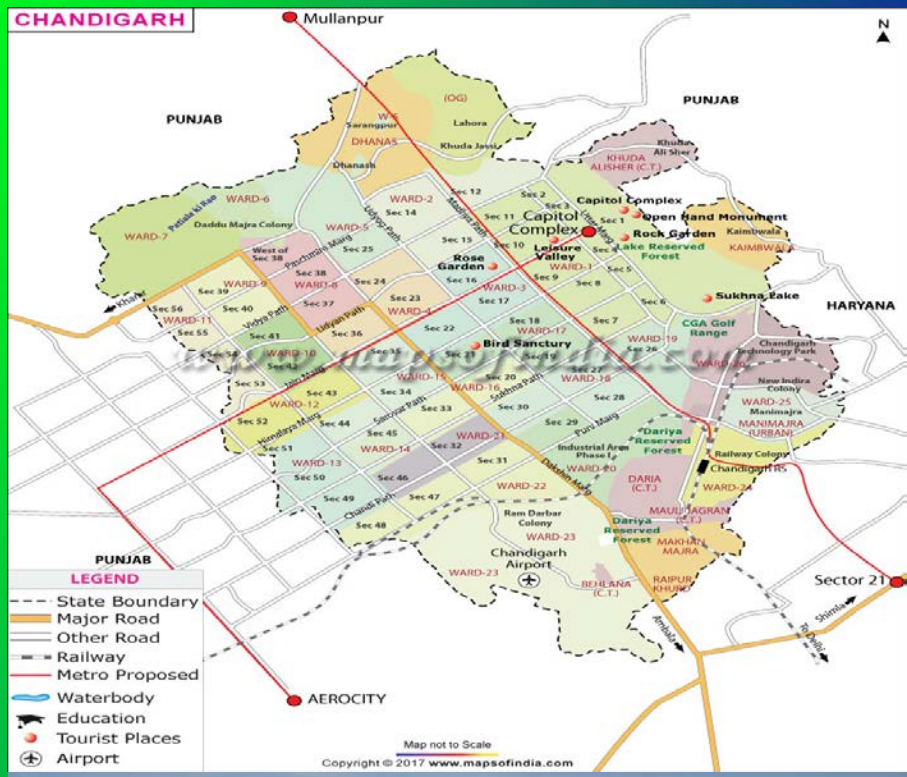
LUTP REVIEW FOR THE PROJECT REPORT ON TECHNICAL AND FINACIAL VIABILITY OF ELECTRICAL BUSES IN CITY OF CHANDIGARH

Presented by:-

Amit Gupta

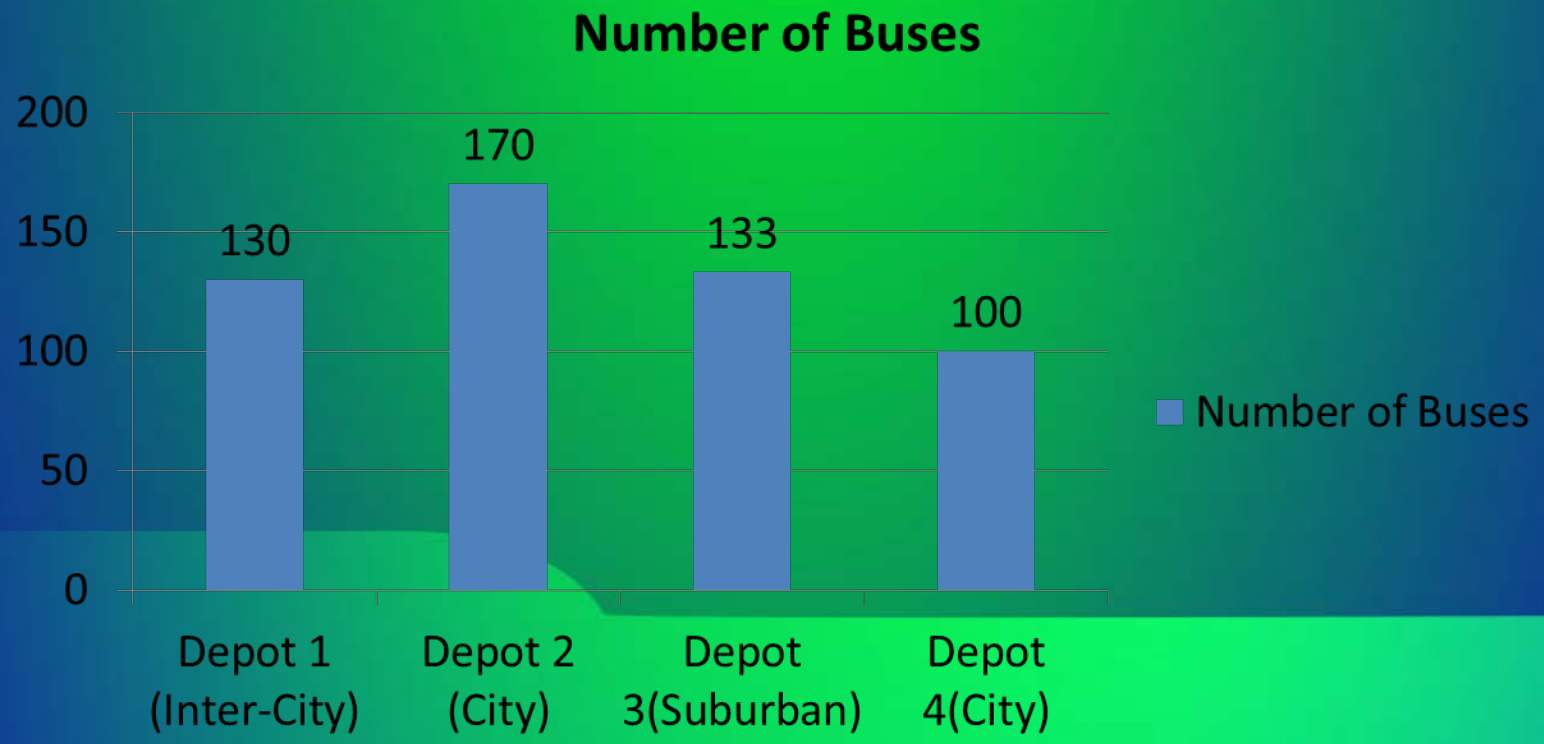
CHANDIGARH

- FORMED IN 1966 CHANDIGARH AS UNION TERRITORY AND CAPITAL OF PUNJAB AND HARYANA
- PLANNED BY FRENCH ARCHITECT LE CORBUISER
- ONE OF THE PLANNED CITY OF INDIA IN GRID PATTERN
- IT HAS AREA OF 114 SQ.KMS AND POPULATION OF 1.05 MILLION WITH POPULATION DENSITY OF 9262 PER KM^2



CHANDIGARH TRANSPORT FLEET

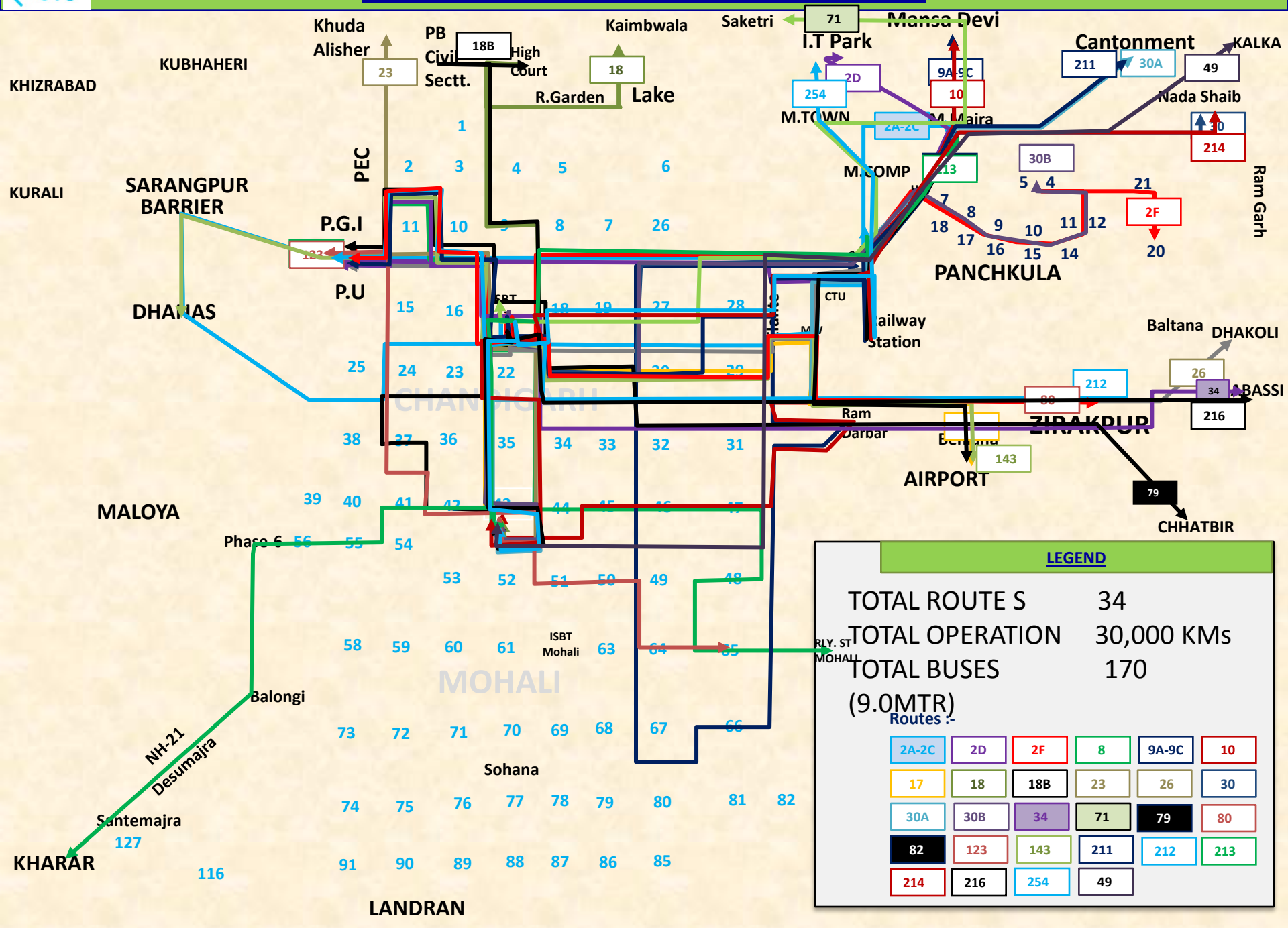
- FOUND IN 1966 WITH JUST 30 BUSES IN ITS FLEET
- PRESENTLY 533 BUSES(DIESEL) : 130 BUSES FOR INTER CITY OPERATIONS AND 403 FOR INTRA CITY/SUB URBAN OPERATIONS
- NO PRIVATE OPERATORS/BUSES



CTU ROUTES

- TOTAL OPERATION OF 1,00,000 KMS DAILY FROM 4 DEPOTS
  - 80,000 KMS IN LOCAL/SUB URBAN ON 60 ROUTES
  - 40,000 KMS IN INTER CITY OPERATION ON 54 ROUTES
  - DAILY RIDER SHIP IS 1.60 LAC PASSENGERS

LOCAL ,TRICITY ROUTES OF CTU (DEPOT-II)



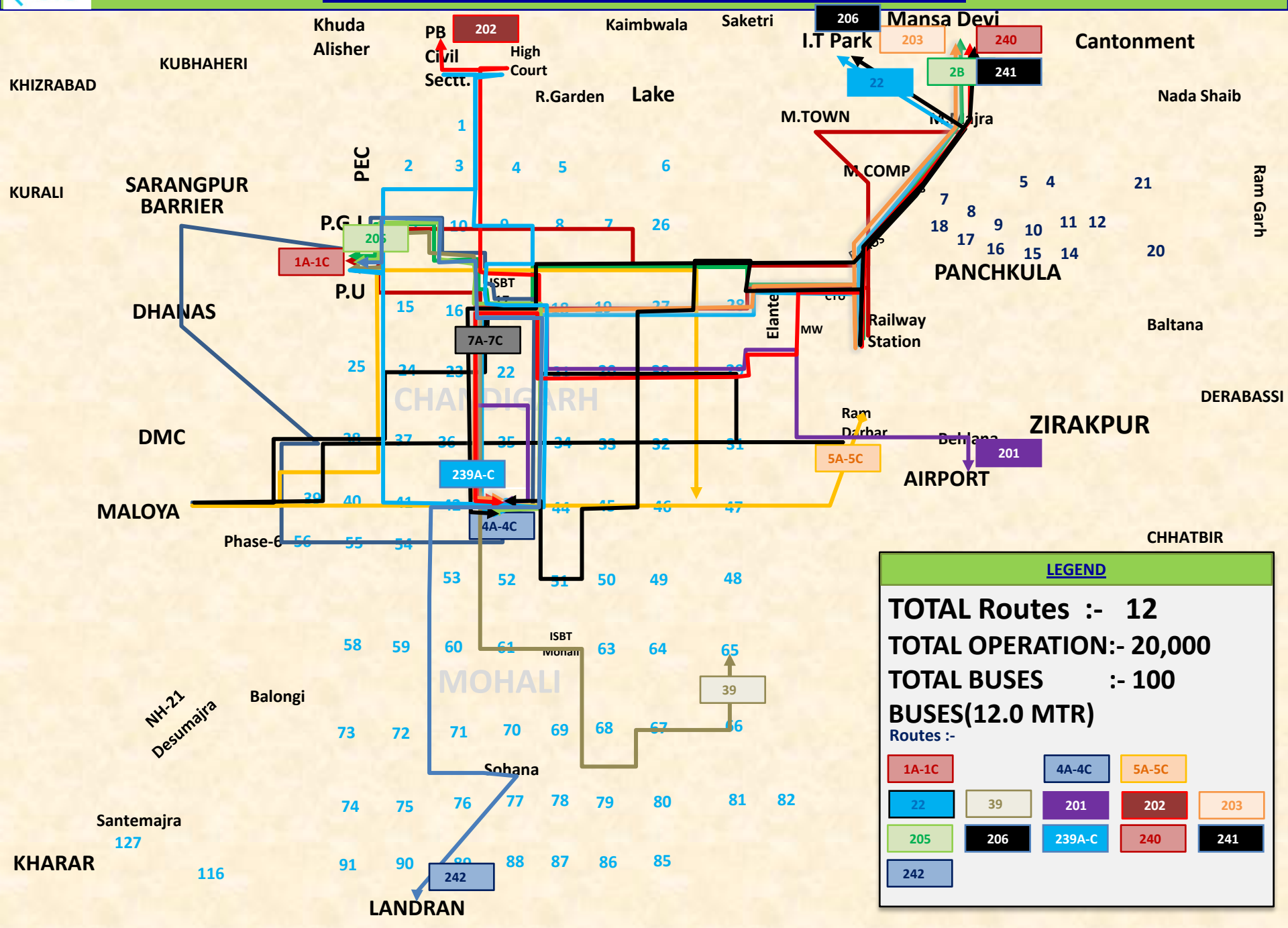
LEGEND

TOTAL ROUTE S	34
TOTAL OPERATION	30,000 KMs
TOTAL BUSES (9.0MTR)	170

Routes :-

2A-2C	2D	2F	8	9A-9C	10
17	18	18B	23	26	30
30A	30B	34	71	79	80
82	123	143	211	212	213
214	216	254	49		

LOCAL AND TRI CITY ROUTES OF CTU (DEPOT-IV)



LEGEND

TOTAL Routes :- 12

TOTAL OPERATION:- 20,000

TOTAL BUSES :- 100

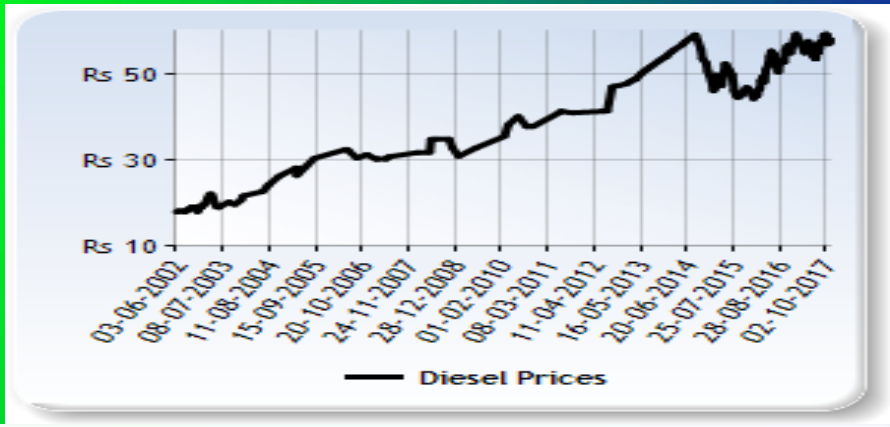
BUSES(12.0 MTR)

Routes :-

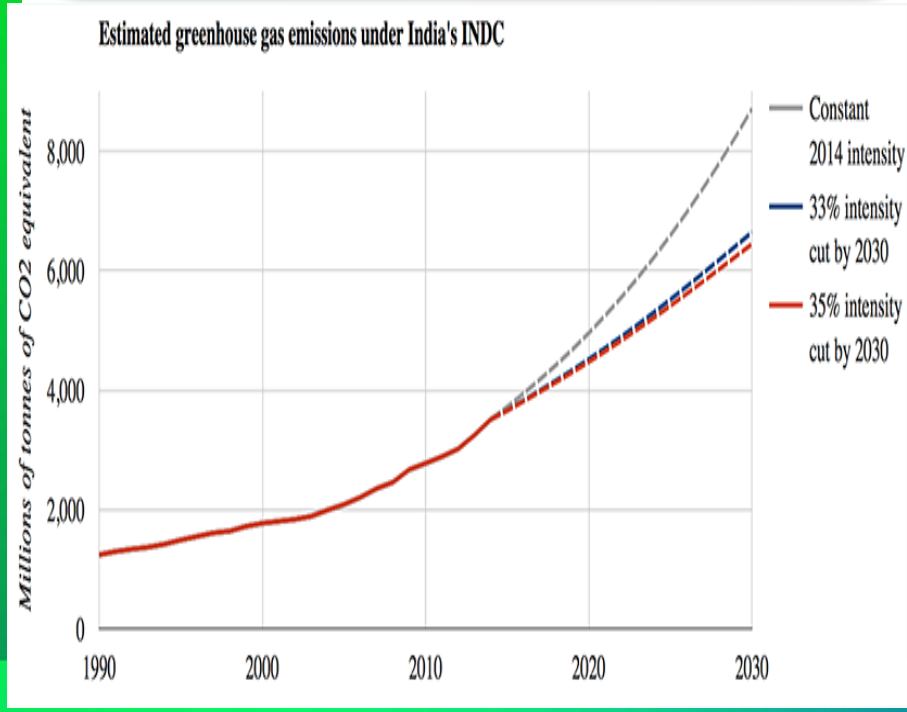
1A-1C		4A-4C	5A-5C	
22	39	201	202	203
205	206	239A-C	240	241
242				

WHY ELECTRIC BUSES.... ???

- TO CURB DEPENDENCE ON FOSSIL FUEL.



- TO REDUCE CO2 EMISSIONS
  - AS PER NITI AAYOG REPORT INDIA CAN SAVE 35% OF CARBON EMISSIONS BY 2030 THROUGH ELECTRIC VEHICLE PROGRAMME BY 2030.

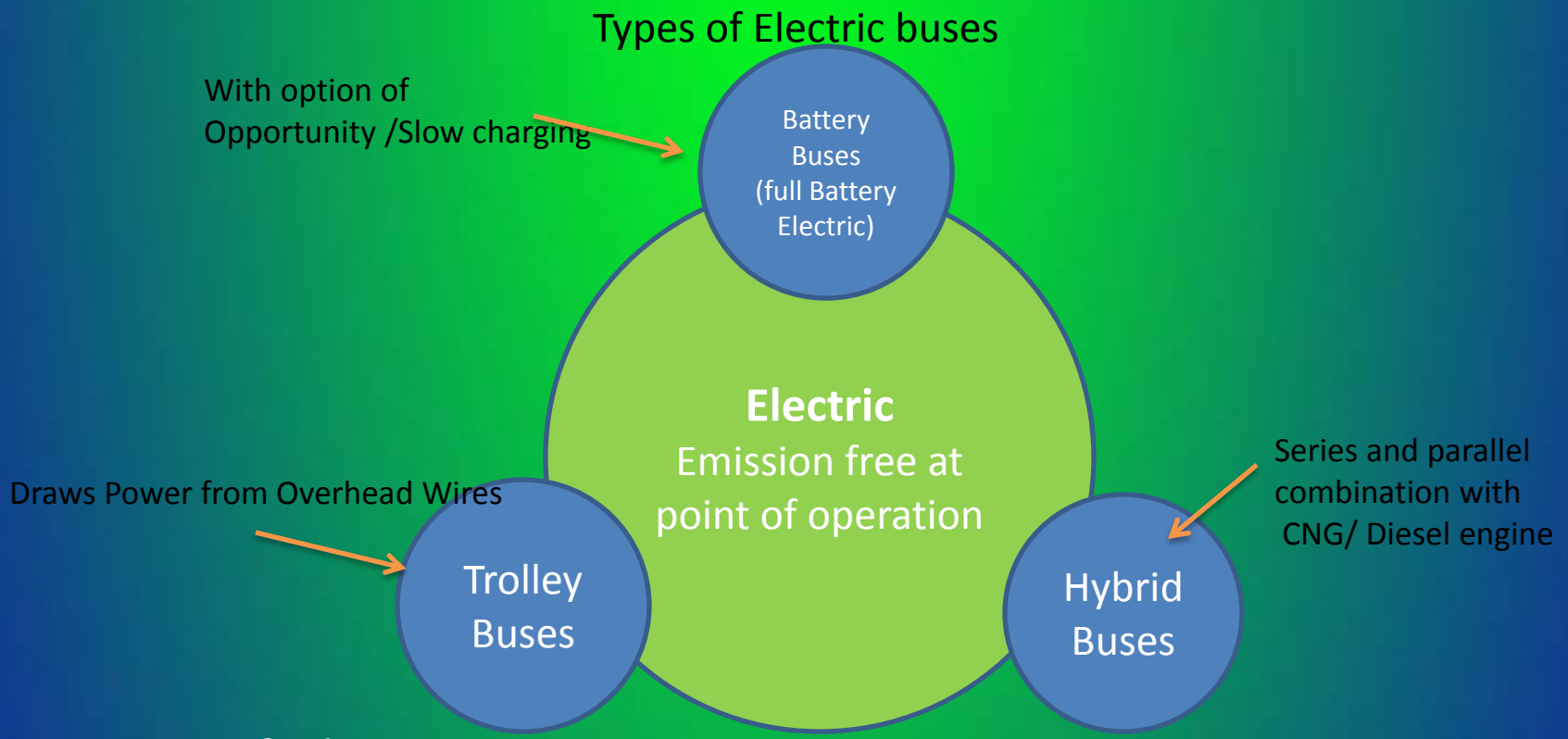


WHY ELECTRIC BUSES.... ???

- CHANDIGARH SELECTED AS SMART CITY

- FINANCIAL ASSISTANCE FROM DEPTT OF HEAVY INDUSTRIES, GOI SINCE PROCUEMENT COST IS HIGH

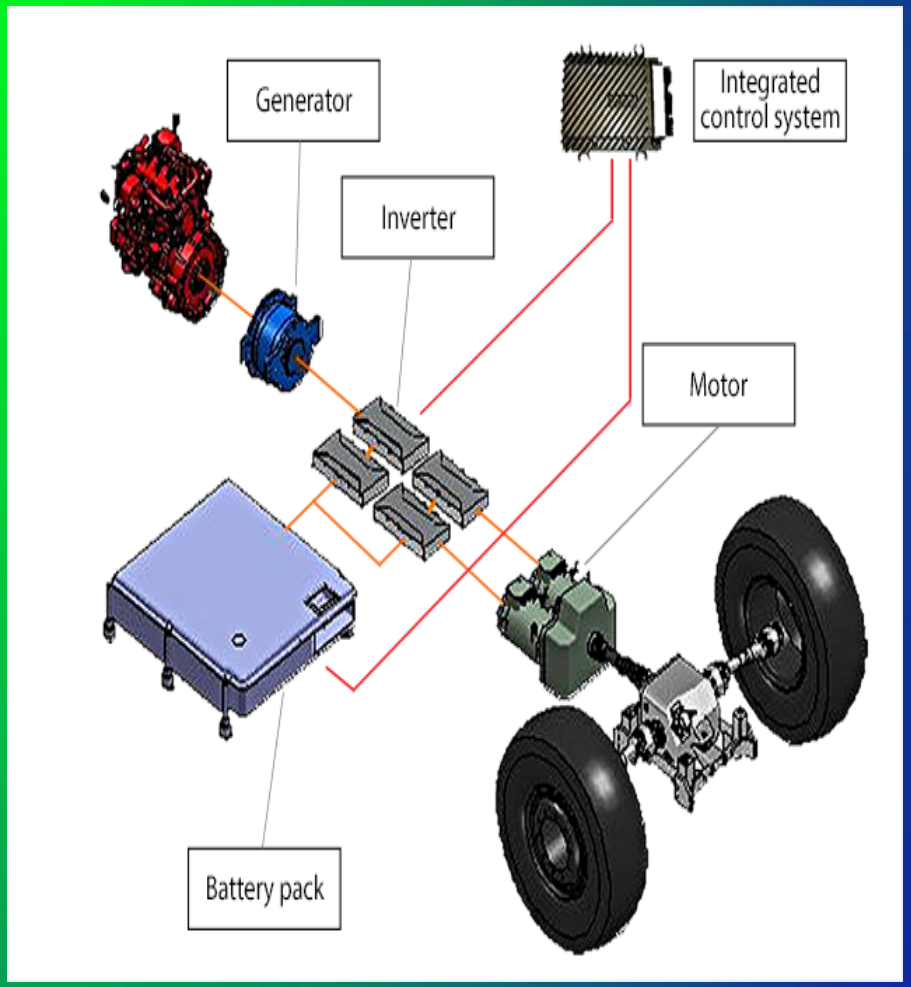
Types of Electric Buses and Charging Infrastructure



- Types of Electric Buses
  - **Electric Buses** electric motor in place of combustion engine and use electricity from the grid stored in batteries.
  - Hybrid Electric Buses which uses batteries to power an electric motors and liquid fuel such as Diesel to recharge the batteries.

ELECTRIC BUS TECHOLOGY

- Powered by electricity and propelled by traction motor instead of conventional IC Engines
- Bus components are divided into four major parts Body design, Electric propulsion system, Power accessories and Battery Charging.
  - Body design – structure, frame, suspension
  - Electric propulsion system – electronic controller, power converter, motor, wheels
  - Power accessories – brakes, steering, auxiliary supply, temperature control
  - Battery charging – batteries and charger



Types of Electric Buses and Charging Infrastructure

- Types of Charging Infrastructure
  - Slow Charging
    - Mainly done in Bus Depots.
  - Opportunity Charging
    - At end of Route
    - At Intermediate Bus Stop/Terminal
  - Battery Swapping

TYPES OF CHARGING FOR ELECTRIC BUSES

OFF BOARD TOP DOWN PANTOGRAPH CHARGING

It is useful for opportunity charging when is stops at bus stop

Charging via connector

It is Conventional method of charging used to charge the bus when bus is off route and it is more user friendly

Project Proposal

PROPOSAL OF INDUCTION OF ELECTRIC BUSES AS PILOT PROJECT

Taking Step Forward CTU conducted trails on electric buses …….

ELECTRIC BUS TRIALS IN CHANDIGARH FOR 15 DAYS

- Taking initiatives for the green city, CTU undertook couple of electric bus trials .
- These trials involved pure EV buses from two different manufacturers.

- One bus provided a maximum range of 183 kms whereas another provided range of 255 kms
- Slow Charging used.
- ARAI Approved

SUMMARY OF TRIALS

	Manufacturer 1 (NAC)	Manufacturer 2 (HVAC)
1. TOTAL KMS COVERED /Day IN SINGLE CHARGE	180 Kms	230 Kms
2. TOTAL UNITS CONSUMED	146 Units	190 Units
3. AVERAGE kWh consumed PER KM	0.81 Kwh per K.M.	0.82 Kwh per K.M.
5. COST PER KILOMETRE(@Rs 6/K.M.)	₹ 4.86	₹ 4.95

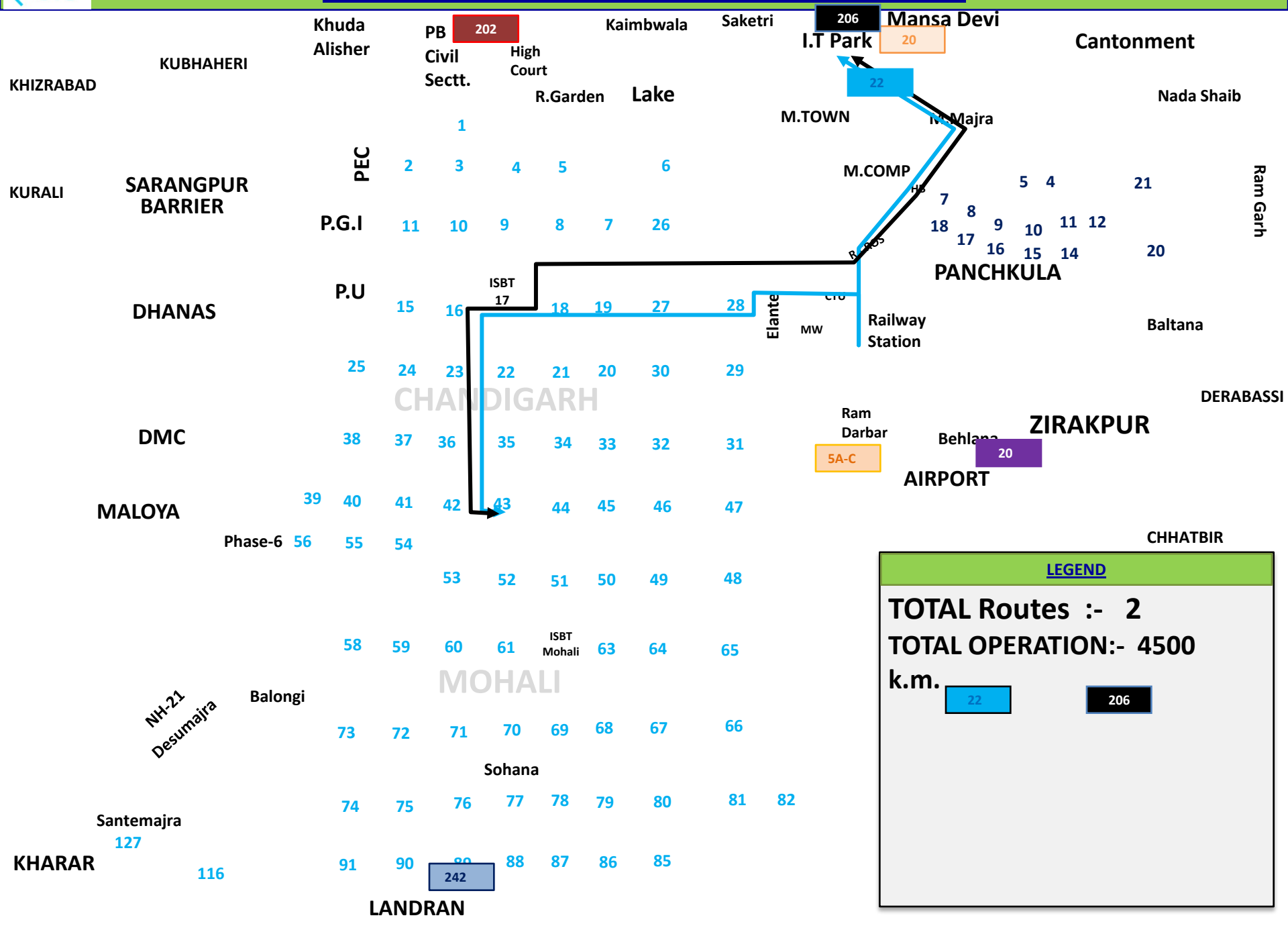
Comparison....

Parameters	BE bus	Diesel Bus
Power source	Electricity	DIESEL
Power generator	Battery	IC engine
Cost (INR)	1.9 crores (Himachal Roadways)	30.00 Lacs
Cost per Km	Rs 5/km	Rs 25-30/km
Emissions	Zero	High
Noise	Minimum	High
Maintenance	Lowest	High
KMPL	---	4
Operating Cost (Power source only)	Rs 4-5 Per K.M.	Rs 12-15 per K.M.

Parameters for Electric Bus

- Parameters:-
  - Route Length:- 22 Kms round Trip and eBus will cover approx 10 trips and will cover 220 KMs
  - Schedule
    - Proposed Two routes from ISBT-43 to IT Park, PGI to I.T. Park, shall be called as Green Routes.
  - Number of Buses
    - No. Of buses en-route shall be 20.
  - Charging Type
    - Slow Charging

LOCAL AND TRI CITY ROUTES OF CTU (DEPOT-IV)



LEGEND

TOTAL Routes :- 2

TOTAL OPERATION:- 4500 k.m.

22 206

Technical Specifications (Proposed)

- Bus Length :- 9.0 mtrs
- Range per Charge :- 220 Kms
- Charging Time :- 6-7 Hrs
- Seating Capacity :- 23 + Driver
- Floor Height :- 650 mm(Floor height)
- Gangway :- As per UBS-II (which has good standee capacity for passengers, Disabled friendly)
- Should be equipped with CCTV, Dash board camera and ITS hardware(BDC,AVLS,SCN)
- Approval :- ARAI/CIRT/ICAT Certifications
- Life Cycle of Battery :- 2500 Cycles @ 100% Depth of Discharge

CHARGING INFRASTRUCTURE Required….

- AT DEPOT NO. 2
  - 11 KVA SUB STATION
  - 2.2 MW ELECTRICITY
  - 20 CHARGING STATIONS

STAKEHOLDERS TO MAKE PROJECT SUSTAINABLE

- CHANDIGARH ELECTRCITY DEPTT FOR PROVIDING ELECTRICITY
- DEPARTMENT OF HEAVY INDUSTRIES, GOVT. OF INDIA FOR PROVIDING SUBSIDY
- OEM FOR PROVIDING OF BUSES AND TRAINING TO EMPLOYEES OF CTU

Challenges for Electric Buses

- High Procurement Cost but even though initial cost of electric bus is very high, its running and maintenance cost is really low which mean investing in electric buses is investing in future
- Setting up of Dedicated charging station for 20 electric buses will be a challenge.
- Imparting Training to Maintenance Staff for Electric buses
- Impact of ancillary loads (lights, HVAC, air compressor, power steering, battery cooling) reduces available range. During extreme weather these can be as much as the energy for moving the vehicle
- Opportunity charging can effect the bus service during inter-peak periods but Infrastructure will be issue.

Financial Analysis…

Working On ……

Thank You