

•Developing a Sustainable  
Transport system for Jamaica

BY Noel Sinclair PE

# *Outline*

- .Introduction**
- .History of Transportation**
- .The NEED for Public Transportation**
- .The real cost of Transportation**
- .Jamaica's ability to deliver**
- .Facts of using EV in Jamaica**
- .Conclusion**
- .Questions**

# Introduction



- My professional career started as a Field Timekeeper and Chemist at Bernard Lodge Sugar Company.
- Then providing electricity to a number of rural communities through the Rural Electrification Program
- My most challenging and rewarding project was to serve as Electrical Consultant on the UTECH Electrical Up-Grade and Energy project.
- This project significantly reduced the University energy bill and provided an option for generating its own power estimated 3MW.
- I currently serve on various Technical and community bodies and still find time for our nation's education development working with CXC, HEART Trust/NSTA and the School of Engineering UTECH.
- *For what its wort first Student /Teacher at JMTI now CMI*
- *This presentation **Thank** Mike Henry for his contribution and hope it grows*

# *History of Transportation*

- The preferred mode of transport in Kingston in the 18<sup>th</sup> century was horse drawn Buggies
- Electric Trams took over after the invention of DC motors in 1886
- The idea was to replace horses with electric motors hence..they were rated in horse power Hp - (1Hp = 746W)
- This went well until the invention of IC engines, and cheap oil.
- All hell break loose, bicycles, buggies and most other modes of transport gave way to Cars and busses powered by IC engines
- Then came the oil crisis of the 70's and the screams of the Environmentalist so they had to rethink the situation
- By this time utility vehicles such as cranes, fork lifts were already changing to Electric

# *History of Transportation*

- There were two factors that limited the use of electric motors
- One was the problem of maintaining DC motors, and the other lack of adequate storage to allow for long journey
- With the invention of 3-phase motors we could replace DC motors, and the improvement in storage batteries allowed longer runs
- These new developments has allowed engineers to produce more electric vehicles
- With improvement in both range and capacity
- Solar PV Systems is an ideal energy source
- We can now get EV as toys, bikes, power chairs, cars, trucks and trains

# *History of Transportation*

## What is Rail?



- Trains
- Stations
- Staff
- Customers
- Infrastructure
- Industry Structure

# *History of Transportation*

## *Why use Rail?*



- It is the most efficient form of Transportation
- Jamaica needs to use the rail as the base of our transportation
- Stations must be equipped with park and ride facilities
- Staff -Jamaica already has the skill set and the capacity to train more
- Customers
- Infrastructure is already in place need to expand
- Industry Structure – Using rail will reduce wear on our roads, and will provide fast and direct access to our Ports

# *The Need for Public Transportation*

•Speaking as a Jamaican who has had the opportunity to experience both Pre and Post independent Jamaica

•I can categorically say we have destroyed what we inherited as a transportation system for the country.

• In June 1898, exactly 225 years ago the existing mule and buggy cart service in Kingston was phased out.

•The country made the bold step to transition to electric trams, this was operated initially by West India Electric company and subsequently taken over by the Jamaica public service, yes the same JPSCo.

•This could be a good way to bring Rail , let the First serious in EV be Rail



# *The Need for Public Transportation*

- Not all Jamaicans will have private transport hence the need for:
- Transport for children
- Transport for workers
- Transport goods & Services

# *Need for Public Transportation*

- Workers needs to move economically
  - Goods commercial and industrial need to move...ask your self who is using train and Why?
  - Jamaica has to have a competitive transport system
  - This is necessary to reduce economic impact on workers
  - And improve the countries productivity
- Route Taxi
  - Dismal Failure



# *Need for Public Transportation*

## Bus & trucks

- Jolly Bus

- Jamaica can Build



- Market Truck

- All these modes are possible



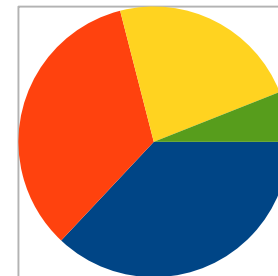
# *Need for Public Transportation*

- Rural commuters are suffering
- A trip from Irish town to Kingston \$150.00 one-way now cost \$600.00
- The operators are having a hard time.....
- You have pay the Boss, buy Gas and Pay your self
- No Country can improve with this

# The real cost of Transportation

- Transport is the largest consumer of petroleum in Jamaica's economy, accounting for 37 percent of total Petroleum consumption in 2008
- The demand for automotive fuels (gasoline and diesel oil) is growing at a rate of 4.3% per annum.
- The bauxite and alumina industry accounts for 34 per cent, while electricity generation accounts for 23 per cent.
- Jamaica needs to both reduce transport oil consumption and find more energy efficient transport mode

Transport	37%
Bauxite	34%
Electricity	23%
Other	6%



- Transportation
- Bauxite
- Electricity
- Other

# The real cost of Transportation

## •Energy Use in Jamaica

- Jamaica currently consumes about 60,000 barrels of oil per day to meet its diverse needs. Over
- the past decade, the level of annual oil imports moved from 23.6 million barrels in 1999 to
- about 22.1 million barrels in 2009, representing an overall average annual decline of one
- percent (1%) per annum. Jamaica's energy mix remains dependent on the use of imported
- fossil/petroleum fuels which account for 91% of the energy mix, while renewable resources
- account for 9%. Most of the renewable sources come from wind, hydro, fuelwood, bagasse,
- solar and ethanol (used in the transportation sector)

# Jamaica's ability to deliver

- Jamaica has the technical ability to deliver, the people has built Bus, Trucks etc
- We need a structured policy
- One that reduce our oil consumption
- PV or Wind are good energy source for transportation
- Rail and Communication are possible
- ASK Tara

# Jamaica's ability to deliver

## *Here are 5 simple steps*

- ✓Develop a national policy
- ✓Any developed plan must include Park and Ride
- ✓Get the help, The Rail is the most efficient mode
- ✓Every rail station must have adequate Parking facilities
- ✓Bus, Taxi, and Route taking must buy-in to Park/Ride concept



# Jamaica's ability to deliver Proposed TRACK



- Restore link from Gray's Inn to Port Antonio
- Expand line to Sav and south Manchester
- Portland, St. Thomas and Falmouth/St, Ann's Bay
- This will provide meaningful work and opportunities

# Conclusion

- Establish working group
- Make rail your base transport
- Use electric to power trains
- Use Renewable to the power system
- Use DBJ and International fund

# *Conclusion*

## *Facts to consider, before using EV*

- Electric vehicles require electrical energy for operation
- While in motion there can be some regenerative energy recovered, but not enough to mention hence storage batteries is the main factor
- Technology has allowed us to store more in smaller batteries, but still not good enough
- Hence the need for charging stations within close range
- In 2019 the US consumed the equivalent of 4.130 B Kwh for cars and if all cars were EV they would need 20 -50% increase in electrical capacity
- Trains require very little energy storage, the TRACK is the source

# *Conclusion*

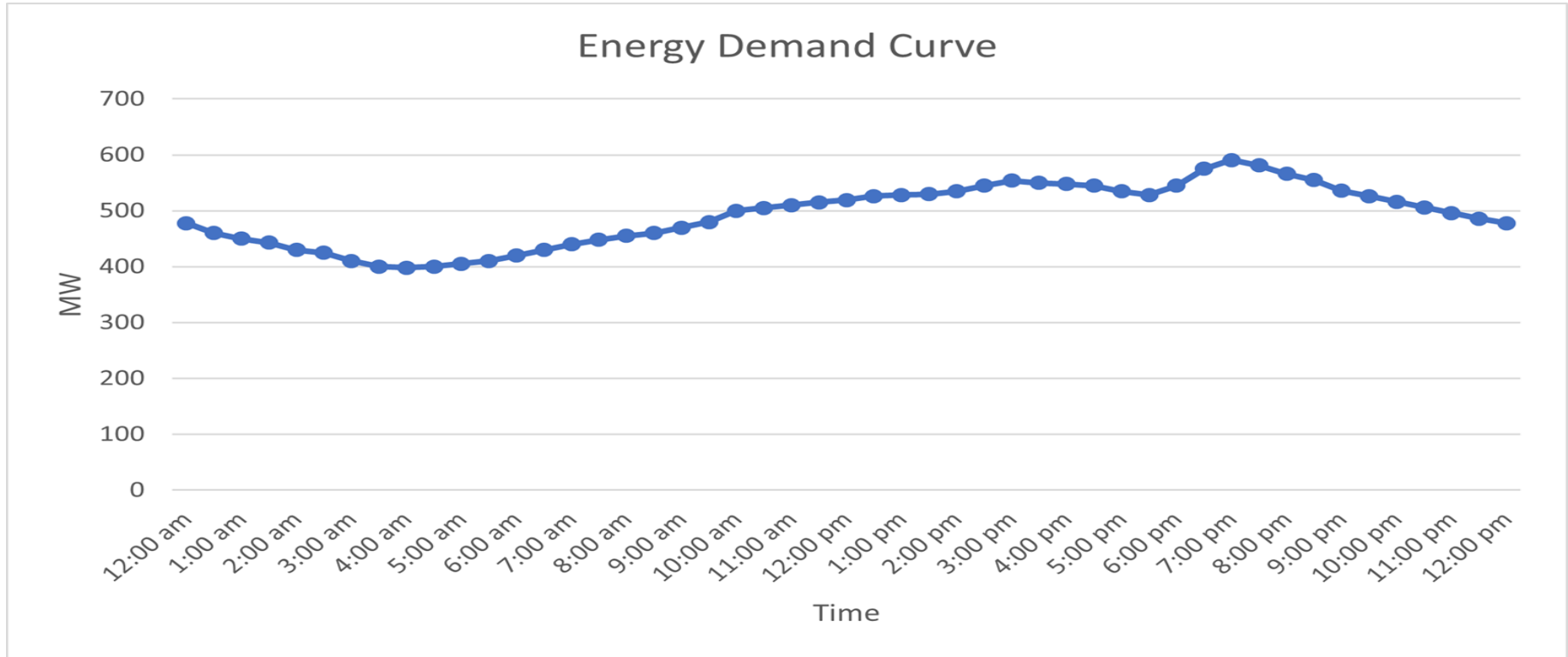
## *Real Cost of Electric Vehicle*

- Capital cost – this is your investment in purchasing this unit now about 2 times IC unit
- Operational – this cost will be with you for the life of the unit currently fuel is US 40 cent per/KWh
- Avoidance- this is difference between the cost for running EV and the cost for running similar IC now 20-30% more
- Access to charging stations and time of charge, time is money can I afford to wait 10 -12 hours for a charge
- The effect quick charge surge on the power demand and the reliability of the system

# *Real Cost of Electric Vehicle*

- How will the increase use of EV affect the power demand on the grid
- Given the current practice of everyone rushing off to a 9 - 5pm Job
- Can our power grid support the increase demand without affecting reliability, power quality and at competitive price
  - US 13c/Kwh, JA 40c/KWh

# *Real Cost of Electric Vehicle*



# *JPSCo's Ability to Deliver*

- Installed capacity- to ensure reliability the installed capacity of a power plant should be at least two times the peak demand... Jamaica's peak sits at about 650 MW with increase EV this can double overnight if not regulated
- Peak demand – this is the most a facility delivers in a given period now our daily peak is 650 MW
- Spinning reserve – this is the amount of unused power that must be readily available to meet peak demand now about 200MW, if we increase the use of EV this would have to increase by 30 - 60%

# *JPSCo's Ability to Deliver*

- Reliability – simply the ability to repeat an action without failure, this is very important in engineering and for the use of EV to be successful we must be able to ensure good reliability
- Charging stations – I think there are now about 5 stations JPSCo is planning to increase to 10 in this financial year, for EV to be the preferred choice the country need about 40 level 4 and 60 level 3 to cover the island



# *JPSCo's Ability to Deliver*

Net Gen (MWh)	2018	2019	2020	2021	2022	
Steam Slow Diesel	1354599	1229418	459696	225868	266989	
Hydro	179153	155212	135581	138431	119441	
Gas Turbine	124818	239150	60240	29350	54035	
Combine cycle	901834	815713	740009	753327	672420	
<b>Purchase</b>	<b>1795132</b>	<b>1990338</b>	<b>2831903</b>	<b>3156981</b>	<b>3311885</b>	
Total	4355536	4429831	4227429	4303957	4424770	

# *JPSCo's Ability to Deliver*

- EV charging: A primer

- EV chargers are defined by the amount of energy delivered to the vehicle's battery per unit of time. There are four "levels," with Level 4 being the fastest. As the table below shows, different levels of chargers have very different power ratings and charge times for typical Evs.

Charger type - level	Power rating - Kw	Type of installation	Charging time for required 100 miles
1	1 KW	Regular 110V/15A domestic outlet	20 hrs
2	5 KW	220V / 50A light commercial / Domestic	4 hrs
3	80 KW	415 V / 200A SP Or 415V / 120 A 3phase	40 min
4	120 KW	415 V / 290A SP Or 415V / 170 A 3phase	25 min

# *CONCLUSION*

- The proposed system uses the Train as the base
- Bus -"EV" work between station to communities
- Route taxi go from bus station to communities
- The Train would also carry cargo and it would be 24 hour



# *CONCLUSION*

- Note 1: Typical EV fuel economy runs around 200 KWh per tonne-mile, so a typical 2.5 tonne vehicle requires about 50 KWh for a 100-mile run.
- EV manufacturers typically optimize vehicles to achieve the best possible fuel economy within other constraints (number of seats, performance, etc.)
- Note 2: At very high powers, the limitation on charging rate may become the vehicle's battery management system rather than the charger's capacity.

# Questions