Solar/Battery Hybrid Three Wheeled Rickshaw for India

IPRO 351
Our Team

Mission

“Our mission is to investigate the feasibility of introducing solar/battery powered auto rickshaws into India’s transportation industry.”
An auto-rickshaw is a three wheeled vehicle widely used for public and goods transportation.

It is one of the chief modes of transport in India, Pakistan, Nepal, Bangladesh and Sri Lanka.

Rickshaws are currently available in gasoline, diesel, compressed natural gas (CNG) and liquefied petroleum gas (LPG).
Oil Dependency & Pollution
“The government will support those companies which will achieve substantial reduction in energy consumption and at the same time look for use of alternative fuels including hybrids.”

Source: Minister of Heavy Industries and Public Enterprise
Transportation Industry Structure

- Bajaj Auto Ltd.—77% of 3-Wheeler Market
- Current Problems
- Barriers to Entry
- Critical Success Factors for New Technologies
Case Study:

India’s CNG battle, Delhi, 1985-today
CNG Timeline

1985-1995
Pollution

1996-2001
Solution?

2002-2006
Corrective Action, Progress Forward
Lessons Learned

What They Did Not Do

• Range in short, medium, and long-term solutions
• Only remove vehicles that you can replace
• Offer incentives
• Keep public aware and involved
The Technology
ICE Vehicle Systems

Ignition
Cooling
Exhaust
Fueling
Mechanical/Lubricating
Drive Starting

These systems all require periodic maintenance and replacement
Solar/Electric Vehicle Systems

Fueling Electrical Drive

Most of which is little or no maintenance and requires infrequent replacement
The number of batteries in an SEV conversion will depend on the voltage of the battery type to be used, the size of the battery type to be used, the desired nominal system voltage, and the size of the vehicle in which the batteries will be installed.

Greater system voltage will result in increased performance, whereas greater watt-hour capacity will result in increased vehicle driving range.
Benefits Of Solar/Electric Vehicles

Costs significantly less per mile to operate

Vehicle is reliable

Engine is quiet

Engine is simple, flexible and adaptable for upgrades

Requires only electricity, water and solar power

Uses electricity from a myriad of sources
Electric motors are more powerful than ICEs with same horsepower.

Low center of gravity allow SEVs superb handling and rapid acceleration.

Electric motors have continuous torque allowing SEVs to drive over obstacles with little effort unlike ICEs.
Zero emissions
No greenhouse effect
No air pollution gases
No solid waste (Batteries are 97% recyclable)
SEV Myths

Speed
Range
Convenience
Cost
Costs less than purchasing a new vehicle

Conversion has double benefits:  
Removal of a polluting ICE  
Addition of a nonpolluting SEV
Barriers To Entry

High upfront costs

Politics
Conversion will influence consumer acceptance and investment into SEVs.
Next Steps

- Establish design and specifications of the solar/battery conversion kits and/or an entirely new vehicle
- Design a working prototype
- Determine the cost of the solar components
- Create an implementation strategy
Final Thoughts and Questions