



# Sundependence

## The truth about electric vehicles - and the solar surprise.

The electric vehicle(EV) is a transformational technology that delivers superior benefits to the conventional internal combustion automobile (ICE) by virtually every important measure - economy, safety, reliability, efficiency, performance, serviceability, passenger comfort, storage space, recyclability, and the joy of driving to name a few. The public apprehension over EVs is understandable but not justifiable.

The typical conventional automobile has a design life of 150,000 miles or 10 years at 15,000 miles/year (41 miles/day). The average American automobile travels 37 miles/day, is parked 90+% of the time, and gets 25 miles/gallon. Of course, the average includes primarily short distance regular trips for work, shopping, etc., combined with less frequent long distance travel for special events, relatives, summer cabins, road trips, etc.. It is noteworthy that Michigan has 7.8M registered automobiles and 3.4M households or 2.3 cars each.

Market studies show that consumers are concerned about the “range” or how many miles an EV can travel on a fully charged battery. In the early development of EVs, a high capacity/lightweight battery was needed to meet consumer range and life expectations. An intensive global engineering effort has produced remarkable results. The new generation of EVs provide from 100 to 300 miles and even up to 400 miles of pure EV range and have exceeded 300,000 to 400,000 miles of service in high mileage EV test fleets. Longer distance travel is improving rapidly as accessible EV charging stations become increasing popular and “fast charge” stations are being installed in strategic locations. EV fast charge stations along the interstates or conveniently located in urban areas can provide a significant EV charge in 10 to 15 minutes.

Consumers rightfully have a few questions about charging their EV. A coordinated effort in the 1990's between auto manufacturers, electric utility companies, and electrical manufacturing representatives developed the EV charging infrastructure that is being put in place today. A primary method of charging is overnight at home when electric demand is low. The National Electric Code requires that a home charging circuit be installed with a standard EV plug and controls(EVSE), similar in capacity to an electric range or clothes dryer circuit. Every morning the EV driver awakes to a fully charged car. A second important method of EV charging is daytime at workplaces, retail stores, municipal parking facilities, and commuter parking lots. In both these cases, the charging stations will provide about 30 miles/hour of EV range. It is important to note that the battery is rarely fully discharged. If the daily commute is 37 miles or if the EV is charged at work and connected when arriving home the EV could be returned to full charge in a little more than an hour for use in the evening.

Because an EV is 4 times as efficient as a gasoline car, the cost of “electric fuel” is 1/4 to 1/3 the cost of gasoline. For example, the average price of residential electric energy

in Michigan is \$0.14/kWh and 6 kWh will provide 25 miles of range at a cost of \$0.84. For the same distance, a gallon of gas in a car that gets 25 mpg at a cost of \$3.00. The cost of electric fuel is 72% less than the cost of gasoline.

To be successful, an EV has to compete on every level and there is a clear path to do this. An EV has a fraction of the complicated components of a conventional car with far less maintenance required. The perceived higher cost of an EV is due to low volume battery manufacturing. The cost is expected to be lowered as volume increases to achieve cost of ownership parity with an ICE car within 5 years. In the meantime, there is a temporary Federal Tax Credit of up to \$7,500 for an EV to help increase manufacturing volume and achieve competitive cost of EV ownership now - buying, fueling, and maintaining. EVs are expected to gain a cost of ownership advantage with full electrification.

The general configuration for an EV powertrain is a low profile centrally located battery, a compact smooth sealed electric motor with one moving part - RWD, FWD, or 2 or 4 motors for AWD, a sealed power electronics system for propulsion/regeneration/charging/conditioning stored energy, and a single speed differential. Gone is the engine, transmission, exhaust system, fuel system, cooling system, starting system and associated oil changes, air filters, radiator fluids, tune-ups, and related maintenance reducing service costs dramatically and the cost of ownership. The low center of gravity from the central battery location improves both straight line performance and ride quality with excellent cornering performance and predictable handling. The electric motor can easily accelerate as fast as any ICE car and the combined effect of brakes and regeneration provides superior stopping performance - while increasing brake life by an order of magnitude. The compact motor and electronics in an EV is more space efficient and allows the engine compartment to be used for increased storage along with the normal "trunk". The low profile central battery provides more interior space for passenger comfort. The fewer simpler components in an EV require far less service and the dealer/service network can easily expand to provide the level of professional automotive service that consumers expect from dealers. The absence of a 12 to 20 gallon fuel tank reduces the fire hazard potential in an EV.

Furthermore, in Michigan an investment in a 3.6 kW solar array the size of a one car garage or standard parking space, 200+ sq. ft., will produce enough clean solar energy daily to provide 50 miles of pure EV range - with no waste heat, no environmentally destructive gases, and with a 30 year warranty and even longer life expectancy.

### **The Top 11 False Electric Vehicle Consumer Perceptions**

Range anxiety	Slow charging time
Lack of local charging availability	Lack of charging infrastructure (long distance)
High electric bill from charging	High prices
Batteries will wear out	Lack of service centers
Fire hazard	Sub-par performance
Limited cargo space	