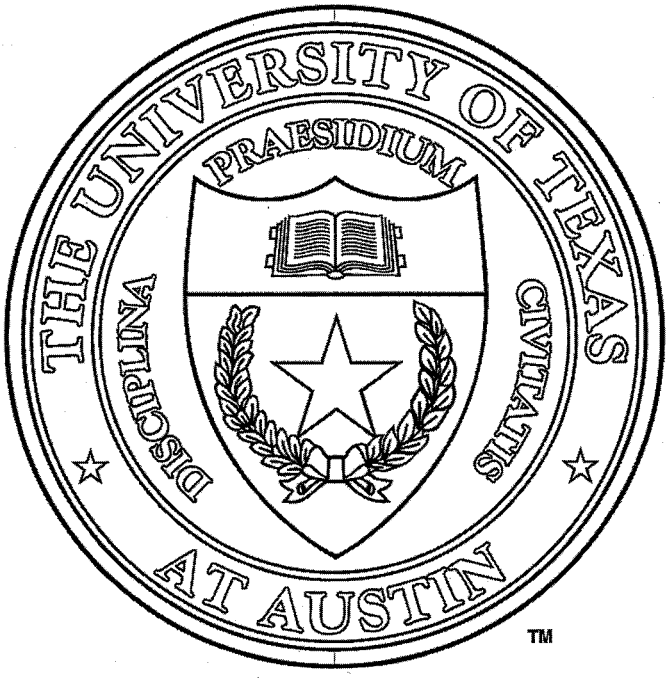
The Good News and Bad News About Electric Vehicles in Texas

Testimony of

Michael E. Webber, Ph.D.
Assistant Professor, Department of Mechanical Engineering
Associate Director, Center for International Energy & Environmental Policy
The University of Texas at Austin



Before the

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Electric vehicles offer economic and environmental benefits for Texas, but there are some downside risks and widespread market penetration of electric vehicles faces important challenges.

1. **EVs (electric vehicles) have performance benefits**
    a. Faster
    b. Quieter
    c. Easier to control
    d. Less maintenance (because of simpler powertrain that doesn't include a mechanical transmission)
        i. For example: hybridization of taxi fleets in NYC has improved maintenance costs
2. **EVs (electric vehicles) have performance drawbacks**
    a. Limited range: typical range today is 40 miles, but steadily increasing to 200 miles in the next 2 years
    b. Limited payload: EVs are more compatible with smaller, lighter cars with small payloads as opposed to large, long-haul trucks
3. **EVs are efficient and can reduce energy consumption overall**
    a. EVs shift energy consumption from liquid fuels (petroleum, ethanol) to electricity (from natural gas, coal, nuclear, wind, solar, geothermal, etc.)
    b. Energy per mile traveled can be lower for EVs compared with gasoline-powered LDVs (light-duty vehicles) because of efficient electric motors
    c. However, EVs INCREASE electricity consumption
4. **EVs offer the potential for important air quality benefits**
    a. EV cars are NOT zero-emissions cars unless the electricity sources are also zero-emissions (such as geothermal, solar, wind, etc.)
    b. EVs shift pollution from urban tailpipes during the day to rural smokestacks at night
        i. Photochemical smog is formed in the presence of sunlight, and so shifting pollution to the nighttime can help avoid smog formation
        ii. It is easier to clean up a few dozen smokestacks than a few million tailpipes

c. UT published peer-reviewed research in 2009 that concluded electric cars charged by coal-fired electricity at night yield many air quality benefits in the Northeast

   i. We hypothesize that the air quality benefits in Texas might be even larger because the night-time charging would likely be with wind or natural gas-fired electricity

   ii. That research will have preliminary results available in the next few weeks

5. EVs are cheaper to operate (per mile) but more expensive to purchase

a. Energy expenses per mile traveled are cheaper for EVs (especially true if cheap night-time pricing is used for charging)

b. Maintenance expenses are also cheaper mile traveled

c. However, up-front costs can be several thousand dollars more expensive to pay for a battery ($3000-10,000) instead of a fuel tank ($200-500)

d. Policies such as tax rebates help mitigate the up-front costs

6. EVs can be very good for some major industries in Texas

a. Utility industry: electric generators have significant spare generating capacity at night that is unused; EVs would create a customer for that spare capacity, increasing sales for utilities

b. Semiconductor industry: the electrification of transportation will increase the demand for smart sensors, chips, microprocessors, and other products of the vast semiconductor industry in Texas

c. Automation and control: complicated dynamic control systems will create new demand for software, automation and control companies

d. EVs are likely to increase demand for gas-fired electricity, which is good for Texas gas producers

e. EVs might displace some future demand for petroleum, which might be bad for Texas oil producers (though this effect is likely to be minor for a few decades)

7. EVs can be good for the grid

a. Some grid managers consider the many batteries inside EVs to be a distributed peak dispatching system, whereby thousands of car batteries can be used to send power to the grid to firm up its stability

8. EVs can be bad for the grid

a. If EV owners charge their cars right when they get home from work, peak loads will be exacerbated, which can be bad for grid stability

b. Using smart pricing and smart switches can avoid this problem

9. EVs are naturally compatible with the smart grid

a. Naturally compatible with home-charging, which is convenient for drivers

b. Naturally compatible with smart pricing and smart meters, giving consumers more control over their energy consumption

10. The infrastructure demands for EVs are small, but non-trivial

a. Most of the charging infrastructure (transmission, distribution, power plants, etc.) is already built, which gives EVs an important infrastructure advantages

b. Many home circuits might not be appropriate for home-charging

c. Many neighborhood transformers might not be ready for widespread charging

11. In conclusion:

a. EVs offer important economic, environmental, performance and consumer benefits for Texas

b. However, important economic, infrastructure and performance barriers remain

c. Because of their cost effectiveness and performance benefits, I expect EVs to see rapid market penetration; rates of adoption will accelerate further if policies to support EVs are implemented to achieve air quality goals

Michael E. Webber, Ph.D.
Assistant Professor, Department of Mechanical Engineering
Associate Director, Center for International Energy & Environmental Policy
UT Austin, 1 University Station C2200, Austin, TX 78712
webber@mail.utexas.edu | (512) 475-6867 | http://www.webberenergygroup.com
Assistant: Lauren Terzenbach | (512) 232-2754 | lterzenbach@mail.utexas.edu