



## The Potential of Electrified Urban Rail and/or Electric Vehicles

Posted by [Robert Rapier](#) on November 14, 2006 - 12:12pm

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This a guest post by [Alan Drake](#).

Liquid transportation fuels are not the only option for transportation. There is a general consensus on The Oil Drum that shifting long and medium distance inter-city freight from heavy trucks to electrified railroads is an essential "silver BB" with an implied expansion of inter-city passenger rail service on these electrified tracks.

This modal transfer trades about 20 BTUs (or joules) of diesel for 1 BTU (joule) of electricity. The massive gain in efficiency makes electrified railroads sustainable if social order can be maintained. The history of railroads in the 1800s shows that oil is not essential for railroad operation and maintenance. Some "doomers" have suggested that "running the railroads" with their essential freight and passenger service may be a key to maintaining social order.

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This consensus contrasts with two competing and overlapping memes for urban transportation; electrified urban rail and personal electric vehicles. Thus the "and/or" in the title. Bicycling has been largely overlooked in the discussions so far.

My formal position is at:

[http://www.lightrailnow.org/features/f\\_lrt\\_2006-05a.htm](http://www.lightrailnow.org/features/f_lrt_2006-05a.htm)

Walking and bicycling are the ideal post-Peak Oil urban transportation modes. But they are suitable for only a few urban trips (0.5% commuted by bicycle in 2000) and almost never used for suburban trips. And many Americans simply cannot imagine walking to the grocery store or bicycling to the post office or work due to the post-WW II changes in our urban form and habits.

Thus the most appealing alternative for most (but not all) Americans contemplating post-Peak Oil is a car or SUV that pulls up to an E85 pump or just plugs in at home or work. But I question if this is the best or even a workable solution for our society.

Suburban and exurban living requires a high energy support system for maintaining roads, providing police and postal service, package deliveries, home repair, home health care, garbage pickup, and utilities. Police can bicycle an urban beat but not a suburban one. Postal workers can walk an urban route but not a suburban one. Garbage trucks, plumber vans, UPS, and every other service and support simply travel much further over many more miles of concrete and asphalt roads to service people in suburbia. And the daily use profile for many of these service vehicles will resist electrification in suburbia. An electric garbage truck in Phoenix?

In addition, newer suburban & exurban construction is larger (requiring more energy to heat, cool, and illuminate) and lower quality (major repairs can start in just 20 years). Preserving over half of Americans in suburbia by giving them an EV to plug in at home may be feasible in the early years of post-Peak Oil (with very adverse impacts on Global Warming) but it will create a second crisis in a generation as oil supply shrinks further and perhaps as the US enters the early stages of Peak Coal.

In my opinion, which is still evolving, the magic bullet of an all EV solution to urban transportation is politically popular and leads to a trap. There is also some political support for the list of urban rails appended below but this support lacks the passion of a Suburbanite desperately searching for the easiest possible way to preserve his or her way of life and property values.

The "secret" of Urban Rail is not its direct energy savings (although excellent) but the indirect savings by changing the urban form (with smaller homes) that makes walking and bicycling (the best modes) easier. Ed Tennyson has estimated that US cities with Urban Rail systems (more than one line) use 159 gallons of gasoline less per capita per year than those without. He also noted the declines in Washington DC Metro gasoline consumption relative to the rest of the US as line and line of DC Metro opened. And this observed difference is with the generally minimal Urban Rail systems that US cities have.

I live in an ideal example of a walkable neighborhood supported by a streetcar line, the Lower Garden District of New Orleans. 5 grocery stores within 6 blocks (4 reopened), my tailor and insurance agent both 4 blocks away, bank 3 blocks away and the St. Charles Streetcar Line 2.5 blocks away. We had at least 3, perhaps 4, GEMs ( <http://www.gemcar.com> ) in use in my neighborhood or nearby.

EV supporters point to the growing renewable generation and say "This is where our sustainable energy will be coming from. What is wrong with that?"

Were it not for the new demand from electrified transportation (rail and EV) this new renewable (mainly wind) generation would largely displace natural gas and some minimal coal generation. New demand for electrified transportation in the next decade will run off of the marginal generation sources, which will be coal, natural gas, and conservation (driven by cost) for at least a decade. Of course, more gasoline and diesel would be burned (if available) in a non-electrified transportation future so a no electrified transportation future is the worst of all worlds.

A crash program (war time effort) of HV DC lines, pumped storage and massive wind turbine installation **MIGHT** have North America running 100% off of renewables and nuclear power plants for 1,000 hours/year (out of 8,760 or 8,784) in a decade. 2025 would be an optimistic date for an urgent commercial effort.

Until then, we will be trading fossil fuel generated electricity for gasoline and diesel via electrification. ~20 to 1 gains in efficiency available from Urban Rail (direct & indirect) should have priority over lower gains from large EVs. Compressed natural gas or propane vehicles would be "almost as good" as EVs at that stage.

When the marginal electrical power source comes from non-Green House Gas sources (nuclear plus wind turbine plus other renewable), those 1,000 hours (11.4% of the time) will largely be late at night when there is minimal Urban Rail demand. EVs could recharge then, for a positive improvement in reducing Green House Gases (GHG) and fossil fuel consumption.

My concept is that Urban Rail, bicycling, walkable neighborhoods, and massive wind turbine

installations are the Phase I solution to post-Peak Oil and EVs larger than GEM will lead to a second crisis. In Phase II, once a non-GHG grid is in place and suburbia is largely (but not completely) depopulated or reformed around rail stations, EVs and trolley freight may be critical in displacing the residual liquid transportation fuel use as supplies get ever tighter.

Electrified rail (inter-city and Urban) has a positive feedback with post-Peak Oil. The worse things get, the more people and freight they can carry and the more efficient they become. A crush load on a subway car or streetcar is extraordinarily energy efficient if uncomfortable. A healthy person can bicycle six miles in the rain instead of driving if they absolutely have to. This is far less true of EVs, coal-to-liquids, tar sands and other potential silver BBs. A post-Peak Oil future needs this elasticity of transportation supply which only electrified rail and bicycles can supply.

No one can precisely predict the future quantity and availability of liquid transportation fuels so crisis alternatives will be needed periodically to quickly make up shortfalls in supply. Urban Rail can expand ridership easily, EVs can only carpool sporadically.

An odd position, Phase I - EVs not good. Phase II - EVs good. My policy preference for the next decade is that all public subsidies and incentives go towards electrified freight railroads, Urban Rail, bicycling, high efficiency Transit Orientated Development, solar space & water heat, and building a renewable grid, with EVs and nuclear power left to market forces. Once a renewable + nuclear grid is in place, with a growing electrified rail system in operation, EVs should be encouraged. This delay will also allow EV technology to mature.

My views are still evolving and I have made several conceptual jumps to get to my current nuanced position. There are shades of grey in reality and I want aggressive but realistic approach to dealing with post-Peak Oil transportation and overall energy use.

What say you ?

Best Hopes,

Alan Drake

## Electric Transport Project List

The following list was composed by Lyndon Henry and the author from memory and likely overlooks some projects. The degree of engineering on file for each project varies significantly, and much of the information is dated. However, all of the projects noted below could start construction in one to three years if it was an urgent national priority.

A rough guess is that the projects below would cost roughly \$125 billion to complete.

**Albuquerque** - Light Rail and Commuter Rail plans

**Atlanta** - Beltway Light Rail, Northern suburbs Light Rail extension, downtown streetcar

**Austin** - Two Light Rail Lines plus Commuter rail and downtown streetcars

**Baltimore** - East-West Light Rail Line, 4 mile extension to current subway

**Birmingham AL** - Streetcar lines

**Boston** - All rail plans promised as environmental offset to "Big Dig"

**Buffalo** - Planned extensions to current light rail subway

**Charlotte** - All plans currently scheduled  
**Chicago** - Expansions to Metra, South Shore Line  
**Cincinnati** - Light Rail plans voted down  
**Columbus OH** - Light Rail and streetcar lines  
**Corpus Christi TX** - Streetcar line  
**Dallas** - All plans through 2015 and all 2015-2030 options (roughly 145 mile system)  
**Dayton OH** - Streetcar plans  
**Denver** - 117 miles of Light Rail and Commuter Rail (already locally funded)  
**Ft. Lauderdale** - Light Rail and streetcar plans under active development  
**Honolulu** - Line currently under development  
**Houston** - All plans voted for, 65 new miles light rail 8 miles commuter  
**Indianapolis** - Light Rail Line plans  
**Kansas City** - Light Rail Line proposed  
**Las Vegas** - Light Rail plans  
**Little Rock** - Short extensions of existing streetcar line, Light Rail line  
**Los Angeles** - Red Line "Subway to the Sea", Vermont Avenue subway, XX miles of Light Rail, electric trolley bus plan, electrify commuter rail  
**Louisville KY** - Light Rail line plans  
**Madison WS** - Streetcar and Commuter Rail plans  
**Memphis** - At least two Light Lines in comprehensive plan  
**Miami** - 103 miles of elevated Rapid Rail (subway type) + Miami Beach streetcar (already locally funded) 90% of the population would be within 3 miles of a station and half within 2 miles of a station  
**Minneapolis-St. Paul** - Central Light Rail connector between the cities  
**Missoula MN** - Commuter Rail  
**Nashville** - Commuter Rail in process  
**New Orleans** - Desire Streetcar Line, Riverfront Streetcar Line extensions  
**New York City** - 2nd Avenue Subway, 3rd Tunnel under Hudson, Penn to Grand Central connection, Staten Island Light Rail, New Jersey Light Rail extension, commuter rail improvements  
**Ogden UT** - Streetcar plans  
**Orange County CA** - Center Line Light Rail plan voted down  
**Orlando** - Light Rail plan voted down  
**Phoenix** - 90 miles of Light Rail already approved  
**Pittsburgh** - Two Light Rail Lines north from current, under construction line  
**Portland** - Green Line (both routes, one funded, other "studied" for future build)  
**Raleigh-Durham NC** - Streetcar plans  
**Sacramento** - Additional Light Rail expansion  
**San Antonio** - Light Rail plans voted down  
**St. Louis** - All plans evaluated, perhaps 100 mile system  
**Salem OR** - Streetcar plans  
**Salt Lake City** - 90 miles of Light Rail, streetcar and Commuter Rail (vote soon to accelerate)  
**San Diego** - Light Rail spur to North, another to West  
**San Francisco** - New TransBay tunnel, trolley line, BART extension, eBART  
**San Jose** - BART extension, several Light Rail extensions  
**Seattle** - Proposed north extension  
**Spokane** - Light Rail line planned  
**Tampa** - 1992 and later plans  
**Toledo OH** - Streetcar plans  
**Tuscon AZ** - Streetcar plans

**Washington DC** - Tyson's Corner-Dulles extension, Purple Line, 40 miles of streetcar lines in DC

**Winston-Salem NC** - Streetcar plans



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