

THE HYDROLLEY: LOW-HANGING FRUIT of the HYDRAIL TRANSITION

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The “hydrolley” (HYDRogen trOLLEY) does not yet exist, but it should; thus this presentation.

The first description of what I call the “hydrolley” appeared in a presentation by Jean–Paul Moskowitz of France’s ALSTOM company in his presentation to the Second International Hydrail Conference (2006: Herning, Denmark).

The battery-dominant configuration discussed here was explained to me in 2007 by Dale Hill, founder of the US transit vehicle firm, Proterra LLC.

Why hydrolleys are the “low–hanging fruit” of hydrail:

- Hydrogen FC buses are already widely deployed.
- The same power system can propel a steel–wheel version with only 1/5 to 1/7 the energy.
- Compared to the hydrolley, propelling an H₂ bus is like riding a bicycle with a flat tire.
- The full cost of tram catenaries in the US was approaching US\$ 4 million per km of track in 2007; may be *US\$ 5 million or more per km* by now.



Proterra LLC bus photo “morphed” by me into a concept hydrolley.

The “Catenary Rebellion”

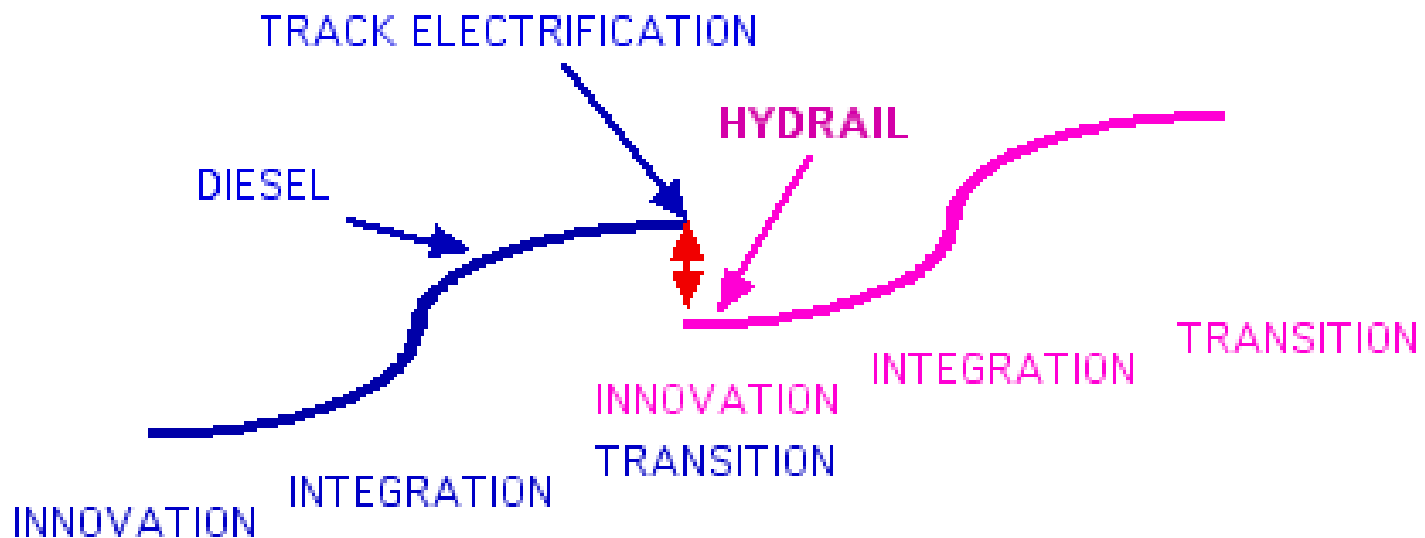
- Bordeaux, France, has the first partially wireless streetcar (by ALSTOM).
- Siemens, Bombardier/DE, Kawasaki Heavy Industries and Shanghai Transit have announced new wireless vehicles.
- Over several decades, cities have spent heavily to bury unsightly aerial utility plant; only trolley wires remain.
- The public is beginning to notice.



Why the first wireless trams are not hydrolleys:

- The first wireless systems are in cities where trams have been in place for a long time.
- There is a huge embedded investment in rolling stock that can be modified to intermittent–charging technology at much lower cost than purchasing new cars.
- It's in manufacturers' interest to “milk” embedded investment as long as possible.

THE NATURE OF TECHNOLOGY CHANGE: TRANSITION IS A DANGEROUS, AMBIGUOUS TIME.



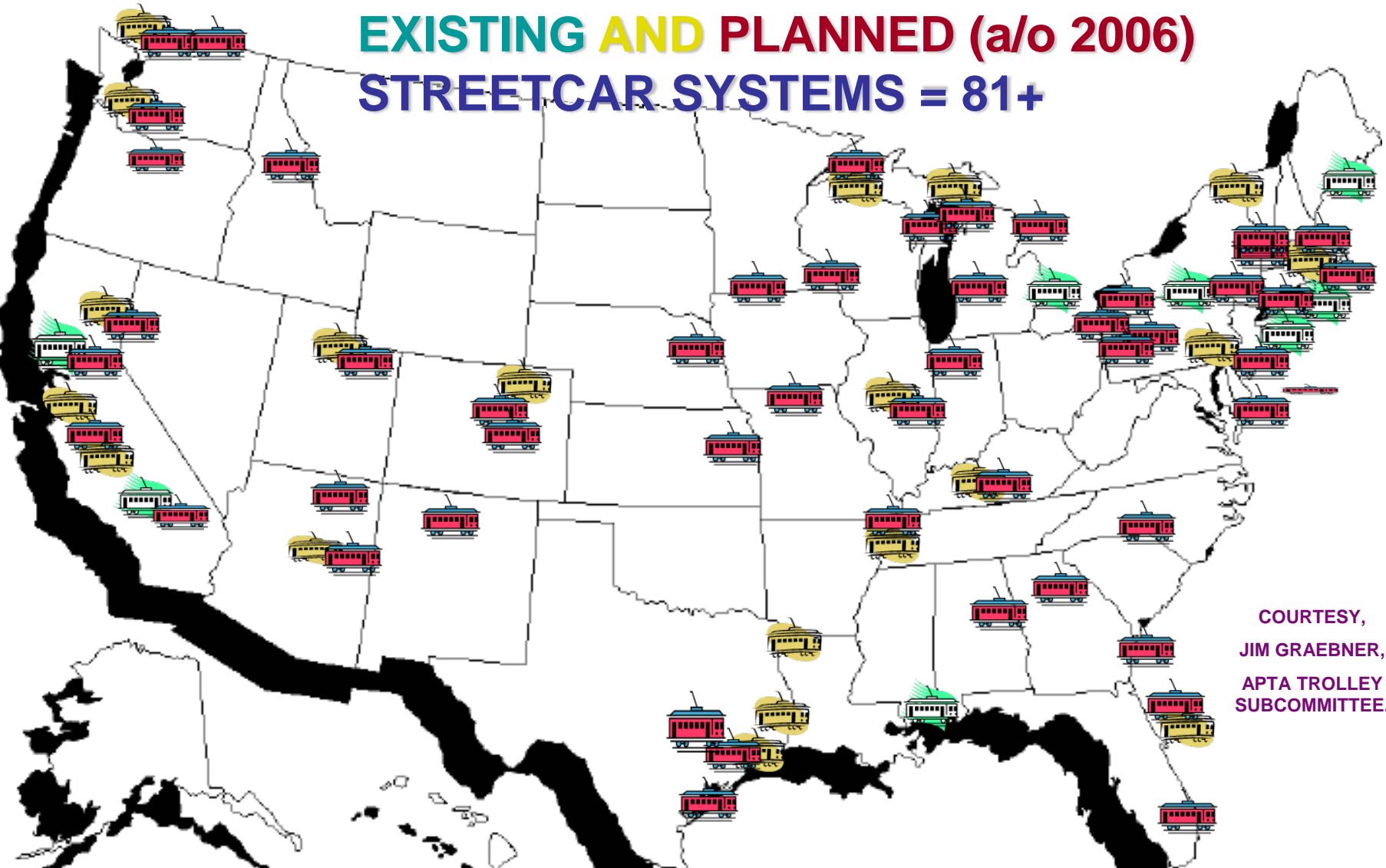
BUT AT SOME POINT, THE RISK OF HESITATING IS
ACTUALLY ***GREATER*** THAN THE RISK OF INNOVATING—
THOUGH IT MAY ***SEEM*** LESS SCARY.

WHAT'S DRIVING THE STREETCAR RENAISSANCE ?

- Our cars now “own” us: purchase, maintenance, finance, parking, fuel, insurance, our personal time.
- Personal car civil disadvantages: A/Q legislation; CO₂ climate change, growing traffic.
- Urban sprawl costs for road and utility infrastructure / capital / maintenance; commuting fuel.
- A young, growing, urban-preferring demographic sees a new and different paradigm: the car as an *encumbrance* rather than the enabler of personal freedom.
- Unavoidable tension: petroleum-powered cars versus the environment.

Seattle, Portland, Salem, San Francisco, LA, San Diego, Tucson, Phoenix, Albuquerque, Denver, Colorado Springs, Spokane, Boise, Salt Lake, Sacramento, Austin, Houston, Corpus Christi, Kansas City, St. Louis, Des Moines, Minneapolis, Kenosha, Madison, Omaha, Chicago, Little Rock, Memphis, Dayton, Toledo, Cincinnati, Columbus, Lancaster, Philadelphia, Newark, Providence, Kinross NY, DC, Richmond, Roanoke, Atlanta, Savannah, Birmingham, Miami, Tampa, Grand Rapids, Boston, Lowell, French Lick Indiana, Charlotte, NC.

EXISTING AND PLANNED (a/o 2006) STREETCAR SYSTEMS = 81+



COURTESY,
JIM GRAEBNER,
APTA TROLLEY
SUBCOMMITTEE.

San Francisco, New Orleans, Philadelphia, Newark, Cleveland, Boston, San Diego, Pittsburgh, San Jose, Sacramento, Portland, LA, Houston, Denver, Salt Lake City, Buffalo, St. Louis, Galveston, Tucson, Seattle, Dallas, Little Rock, Memphis, Tampa, Baltimore, Lowell, Minneapolis, Kenosha

THE HYDROLLEY vs. THE TROLLEY (TRAM)

- ***No overhead catenary: all municipal utility plant is buried out of sight. Onboard fuel cells & batteries eliminate the need:***
- ***no aerial poles or guys***
- ***no transformer substations***
- ***no corrosion of buried utilities***
- ***no catenary maintenance labor***
- ***but: a trackside fueling site is now needed.***

HYDROLLEY ADVANTAGES:

- Avoids **US\$4- to \$5 million** capital investment *per km. of track* by eliminating track electrification.
- Avoids visual pollution.
- Avoids problems when moving tall equipment through cities.
- Eliminates maintenance costs, shock hazards, weather, and damage vulnerability of overhead power systems.

MORE STREETCAR LINES ... AND SOONER:

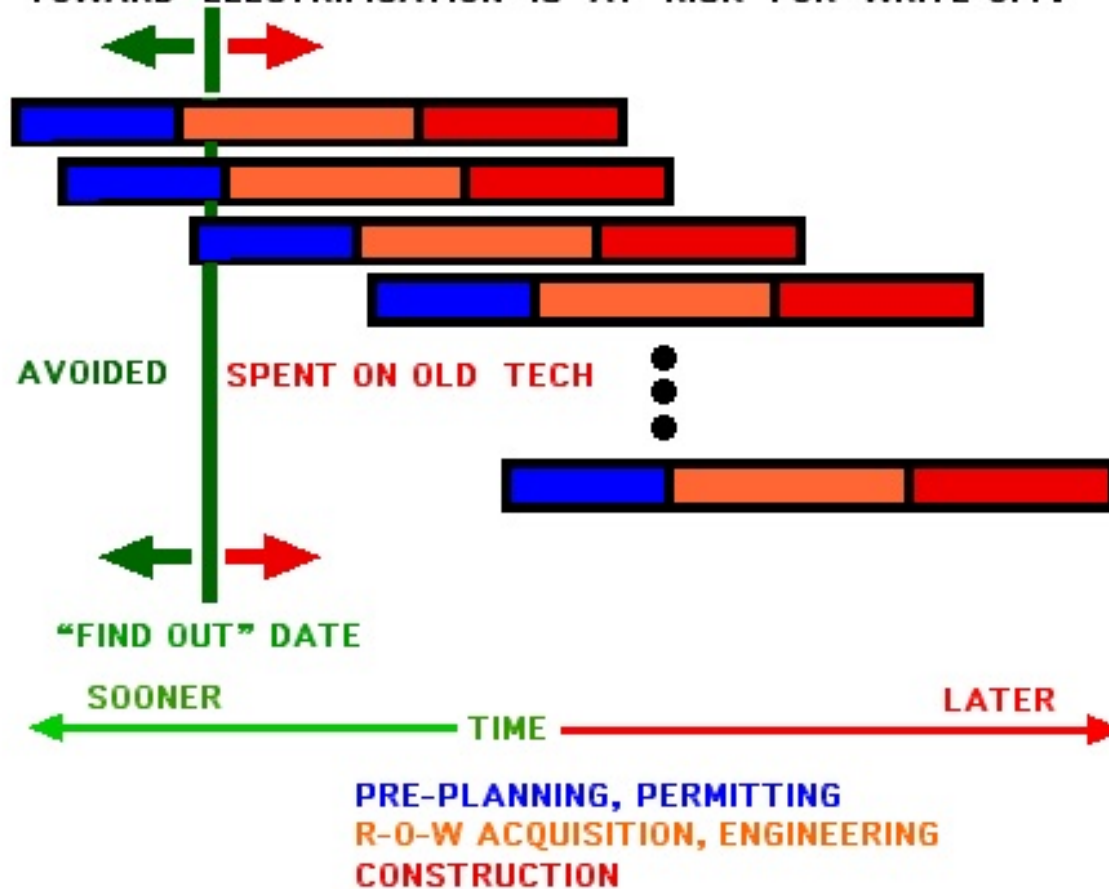
- “Lowers the bar” of capital funding by greatly reducing fixed plant cost
- Clean, hi-tech image should attract ridership by young, Green-minded generations.
- If cities now planning streetcar systems **collaborate to plan**, hydroly R&D and manufacturing can proceed rapidly since pricing scale economies will be obtained.

HISTORY FAVORS RISK ACCEPTANCE:

- Like rail's steam-to-diesel transition, change leaves the final "old tech" investments stranded (catenary plant and rail cars); unamortized; retired many years before it's worn out.
- To avoid this, what's needed is **public discussion** leading to acceptance and hydrology introduction plans and policies.

THE COST OF NOT KNOWING

THE LATER TRANSIT OPERATORS BECOME AWARE OF THE HYDROLLEY TRANSITION, THE MORE PLANNING EXPENSE TOWARD ELECTRIFICATION IS AT RISK FOR WRITE-OFF.



“It seemed like a good idea
at the time....”



Evening Star Standard 9F heavy freight engine, built 1960

- The last mainline steam engine built in Britain
- Planned to work for twenty years, only used for five

National Railway Museum, York, UK
(The last “wired” streetcars will very quickly
wind up in transportation museums.)

CONCLUSION / PROPOSAL

The least economic harm comes from starting early and *minimizing the duration* of trolley-to-hydrorolley transition.

Transition duration can be minimized by **early sharing of heads-up hydrorolley information with the public**. The transit industry can't spring hydrorolleys on the public as a surprise.

Public awareness must precede enabling policies *and* investment, both private and public.

A top priority: **cut off investment** in overhead electrification of new lines immediately! Where catenaries exist, use them until maintenance cost and public values mandate removal.

THE FREEZE-UP RISK:

If streetcar planning authorities halt new trolley construction but fear of the untested prevents hydroley innovation, the important environmental advantages of a “streetcar renaissance” are deferred or lost.

Therefore it's in the public interest to bring proof-of-concept hydroleys into existence as soon as possible.

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