THE WORLD TRANSITION TO HYDRAIL AND ITS IMPROBABLE ORIGINS
presented to the US EPA Southeast Diesel Collaborative
Atlanta: November 30, 2017

THE MOORESVILLE HYDRAIL INITIATIVE

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Mooresville/South Iredell Chamber of Commerce &
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Hydrogen Fuel Cell Railways: THE MORAL IMPERATIVE
GETTING HYDRAIL INTO THE PUBLIC CONVERSATION QUICKLY MATTERS
BECAUSE IT’S LITERALLY A MATTER OF LIFE AND DEATH.

Fine particulates from diesel train exhaust are inhaled continually by crew, passengers, station workers and residents near tracks...

They pass through the alveoli in the lungs, enter the bloodstream and eventually accumulate in the pericardium, causing illness and eventual death. The most exposed people probably live in the last areas likely to get hydral relief; that’s why getting the first hydral transitions deployed quickly is urgent—it also drives timing of the last.
TORONTO: NOVEMBER 16, 2017
THE ONTARIO HYDRAIL SYMPOSIUM

SO CLOSE TO HOME….  

BUT DID MANY OF YOU HEAR ABOUT IT?
THE MOORESVILLE HYDRAIL INITIATIVE: WHO WE ARE


With hosts, produces the annual International Hydrrail Conferences. Created the hydrrail.appstate.edu international web site

Bill Thunberg, former Mooresville Mayor; former Chamber Chairman, now Exec. Dir., Lake Norman Regional Transportation Commission.

Bill is the Hydrrail Initiative’s “Chief Information Officer”

Stan Thompson, retired strategic planner and environmental and transportation futurists, BellSouth Telecommunications (now AT&T), 12-year columnist on history and economics, The Mooresville Tribune. Coined “hydrail” in 2003
THE MOORESVILLE HYDRAIL INITIATIVE—
WHAT WE’VE BEEN DOING:

• **Expediting** the “post diesel” age to save lives from **fine particulates**.
• **Reducing** the railways’ contribution to climate harm **ASAP**.
• **Avoiding** any further stranded public investment in moribund external railway electrification.
• **Using hydral** as the easiest early access to the general **hydrogen economy** system.
• **Recruiting** hydral manufacturing **back to the USA** and, especially, to “Centralina.”
How a small-town Chamber of Commerce got in the “world-changing” business...

Statesville Record and Landmark
Iredell-born hydrail concept goes international
Group: US getting left behind on transportation technology

By James Neal j.neal@statesville.com  Jun 18, 2017  (-)

- air quality sanctions
- DOT, EPA connections
- no Mecklenburg tax funds
- nobody believed in hydrail
- 2005: invited the world to 1-IHC
- email; to China
- 2006: 2-IHC convened in Denmark
- “Easier to fix the world than CLT”
- crowd-sourcing hydrail know-how
- 2007: triggered first hydrail PhD

2013 — the tipping point!
- Hydrogenics meets Alstom
- Mooresville coaches China

2017 = 12th IHC; 13th in Rome in 2018!
THE “IHCs”

So far, Mooresville and Appalachian State have convened International Hydrail Conferences in:

- Austria
- Canada
- Denmark
- Germany
- Spain
- Turkey/UN!
- The UK (2)
- The USA (4)
- Rome Next!
Catenaries: Why hydral is emerging

The climate, pollution and geopolitical concerns with diesel railway rolling-stock are well understood; they apply to railroads—as well as marine, stationary and road applications—and won’t be discussed here.

Catenary—AKA trolley—external railway electrification...

...an idea whose time has come...and gone.
Railway Traction Timeline

- **1804**: Steam
- **1879**: Appomattox Courthouse!
- **1900**: External Electric
- **1925**: Diesel-Electric
- **1950**: Steam
- **2017**: Hydral
How old is external railway electrification?
In 1879, when Werner von Siemens invented it...
• **Jefferson Davis** was completing his Civil War history.
• **Ulysses S. Grant** was basking in retirement.
• **Brahms, Verde and Puccini** were writing music.
• **Queen Victoria** still had 22 years to reign.
• The **Wounded Knee** massacre had **not yet** happened.
• **Teddy Roosevelt** just turned 21.
• **Custer’s last stand** was just three years earlier.
IT’S BEEN ALMOST HALF A CENTURY SINCE WE WENT TO THE MOON . . .

. . . AND THIS IS HOW WE STILL ELECTRIFY TRANSIT!
The incremental capital cost of external track electrification: about $10,000,000 per mile!

Why so much?

- incremental cost: generating—to—substations
- dealing with corrosion, etc., of buried utility plant
- civil eng.: raising or designing bridges three feet higher
- civil eng.: making road approaches much longer
- safety (750 volts on CATS’ Blue Line catenary)
- copper... lots of copper
- replacing stolen copper
• There are about 233,000 miles of track in the USA’s rail network...

• At $10 million/mile (if there were enough copper in Earth’s crust to electrify it), the cost would be a quadrillion or so.

• Each million-dollar hydraid fueling station at the end of the line costs only as much as 530 feet of track electrification.
WHY HAS HYDRAIL BEEN SO SLOW ARRIVING? BECAUSE, WHEN EXTERNAL TRACK ELECTRIFICATION GOES AWAY...

...THE INDUSTRY LOSES:

• $10 million plus *per mile* extra in trackside plant construction.

• *Tenuous job security* rooted in expertise in a 19th century technology.

• Revenues from sales and *maintenance* of aerial plant.

• Revenues for *max-priced*, real-time, rush-hour *electric power*.

• ...when *hydrail becomes known*.

...AND THE PUBLIC GAINS:

• Transit at about 2/3 the capital cost.

• *New, secure employment* in an industry that will grow for decades.

• Cityscapes and countrysides free of aerial plant clutter.

• Transit energy where power use and production are *de-coupled in time* . . . minimally priced.

• ....when *hydrail becomes known*. 
Hydrail in Germany

where *the hydrogen economy is a given*: 

- Alstom Transport’s Salzgitter-built Coradia iLint hydral trains debuted on 20 September at *Innotrans 2016* in Berlin.

- Schleswig-Holstein rail network will be *100% zero-carbon* using wind turbine powered H₂ electrolysis by 2025 (solar and waste H₂ also).

- Alstom has now sold about 60 hydral trains* in Germany.

*Schleswig-Holstein’s are in addition to these.*

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The Coradia iLint hydral train. 60 will be in service in Niedersachsen, Nordrhein-Westfalen, Baden-Württemberg and Hesse by year-end 2020.
GERMANY AND HYDRAIL: A GOOD FIT

• Germany has excess intermittent renewable power that must be disposed of. Hydrogen is inherently a storage technology.

• Germany is committed to climate preservation.

• Germany has diesel rail corridors that can’t economically be electrified using legacy technology. Hydrail, using solar and wind energy, can power such corridors economically and carbon-free.

• German builds Alstom’s Coradia iLint hydral trains in Salzgitter.

• Yellow = low-traffic lines now running diesel trains: candidates for hydral.

• Germany imports oil from Russia.
MOOREVILLE HYDRAIL’S CHINA CONNECTION:

CHAIRMAN MAO* (CENTER) AND ME…

• Zong Qiang, of China’s national hydrogen association
(8 years after I wrote him to recommend hydrail cooperation)
WIND FARMS CAN BE DEDICATED TO HYDRAIL LINES
HYDRAIL LINES CAN BE BUILT NEAR HYDROELECTRIC COMPLEXES
Assuming a 25-year transit equipment amortization life, in 2040 residents in cities installing external systems will be paying-off technology that hasn’t changed fundamentally since it debuted in the 1880s! “Sunlight” on transit tech change can keep things from getting worse.
Visit the world hydrail web site at Appalachian State University:

http://www.hydraise.appstate/conferences

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