Light Rail (UK) Group

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Hydrogen as a Service

"The Infrastructure that Pays!"

Light Rail UK Group Believes in the proven success of current UK tramways and that Hydrogen can pay for the Infrastructure and contribute to the "Common Good Fund".

But why Trams?

Some significant benefits:

There is a widespread recognition within the UK and Internationally of the benefits of light rail as an environmentally friendly form of sustainable mass transit.
On average there is a modal switch of 25% - 32% resulting in lower road mileage with resultant cleaner air, Nottingham does not require LEZs etc.,

That electric/hydrogen buses can only be seen as an interim measure and that rubber wheeled vehicles despite their (short term benefits) remain a source of significant local particulates & heavy metals pollution arising from the friction between tyres and road surfaces while steel wheels running on steel rails create zero emissions at point of use.

Be fully accessible to all residents and visitors including those with reduced mobility to all Tram and shared Bus stops, Public Transport Pathways (PTP). Be mindful that we have an ageing population, and the network will be fully accessible, easy to understand and use successfully to supply the last/first mile door to door connectivity to planned Heavy Rail upgrades.

A Tram Network will provide access to employment including industrial and logistics sites,
Provision of cleaner air to schools and hospitals Sports & leisure including several stadia Heritage and tourism. A "Rochdale Pattern" of transit behaviour, "Hop on, Hop Off" supporting the 15 minute neighbourhood concept.

Provide fixed links to other modes without building more unsuitable and unsustainable roads with new but smaller housing estates.
For public transport to become a force in dealing with urban congestion, carbon reduction, improving air quality and to be an attractive alternative to the car, it must be built quickly and operate affordably.
The working life of a tram system is 145 years and rising.

Tram systems have a proven history, growing the public transport market, creating modal shift in some cases as high as 32% but no less than 20%+, high passenger satisfaction.
Supporting regeneration , renewal, and inward regeneration. Can be used to re-engineer city districts.
Assisting in the creation of new urban frameworks. Re-developments include denser housing without parking spaces.

Very Light Rail (VLR) Trams are an extremely green mode of transport and support fuel security including locally produced electricity. Coventry and others with minimum utilities disturbance cost less than £10M per KM. Will drastically reduce the nations carbon footprint, reducing the need for local LEZ, CAZ, and other costly monitoring systems.

These are some of the benefits to a City which unfortunately HM Treasury's "Green Book" unlike many European Governments, disallow monetising and included in the "Business Plan."

History.

In the late nineteen hundreds, many horse trams companies were looking for an alternative form of traction to increase payload and more importantly, find a fuel that wasn't as polluting as horse traction and cheaper to operate.

It also coincided with the end of the gas lit era with a new but unfamiliar fuel to most people at the time called Electricity. In the 1890s people thought electricity had the potential to replace gas as a fuel source; that it was deadly dangerous.

However, It was now becoming clear that there was much more to electricity than the ancients had realised. In 1733/4, a French physicist named Charles du Fay (1698–1739) made the next important breakthrough when his experiments revealed that static electricity could come in two different (opposite) flavours, which he named "vitreous" and "resinous."

If you rubbed some objects, they gained one kind of electricity; if you rubbed others, they gained the opposite kind. Just as two "like" magnets (two north poles or two south poles) will repel, so two objects with "like charges" of electricity will also repel, while objects with unlike charges (like magnets of opposite poles) will attract.

Englishman Sir William Watson (1715–1787) thought there was just one kind of electricity, with an ingenious explanation much more like our modern view: if we have too much electric charge, it seems like one kind of electricity; if too little, the other kind. He was also one of the first to show that electricity could zip down very long wires, and his other experiments included passing electricity through lines of several people to give them surprising electric shocks sometimes with fatal consequences.

Although we now know this idea is correct, back in the 18th century, such a convoluted explanation of multiple variation of this power source sounded wrong to some people. As a consequence of the adoption of this new power source, many Municipalities built their own electrical power generation plants to serve their new electric tramways and supply electricity ,initially for street lighting, manufacturing and eventually for domestic lighting.

The trams contribution to the municipal Common Good Funds enabled much of the infrastructure that we have inherited today to be expanded and built in our cities. Unfortunately for this bonanza cash cow very little was set aside for its own renewal.

The efficiency of the electric tram led to its expansion so that no respectably sized city or town did not have a tram system significantly contributing to the growth and wealth of cities and nation until superseded oil based vehicles especially in the aftermath of the first world war and the first generation of electric tram ended with its demise in Glasgow, Blackpool the only survivor.

Present 2024

There is now a second generation of trams rebranded as Light Rail (8) operating in the UK carrying, Pre Covid 181.7 million passenger journeys (DfT March 2021). Passenger numbers have recovered and are slightly above this number. Passenger satisfaction remains high with

With the escalating high costs of electricity and installation costs denying the positive transport, economic, social benefits, and a significant tool in the fight for Climate Change
One of the effects of the Russian invasion of Ukraine and insecurity and high prices experienced in the aftermath of the war was to remind us that we are no longer secure or independent from negative fluctuations outside our control.

As you can see there are a number of parallels with the late 1900s but with modern and ~~emerging~~ emerged hydrogen technologies enables the modern role of Hydrogen in "Trams as a Service" (TaaS)

There are a rising number of new and mature tram systems using Hydrogen in the simple role of a Tourist shipside shuttle to an Urban Mass Transit system now operating in Gorlitz, Chemnitz, and several very large Chinese Cities with severe air quality issues.

Hydrogen, often hailed as the fuel of the future, presents an enticing alternative to fossil fuels in the global pursuit of clean energy. With its high energy density and zero-emission potential, hydrogen has gained traction as a viable candidate for decarbonising various sectors, including transportation, industry, and power generation. However, despite its promise, the widespread adoption of hydrogen faces a number of formidable challenges, particularly in its distribution.

Hydrogen, the most abundant element in the universe, holds immense potential as a clean energy carrier. When burned, it produces only water vapor, making it an extremely clean fuel option. Furthermore, hydrogen can be produced through a variety of methods, including electrolysis powered by renewable energy sources, natural gas reforming with carbon capture and storage (CCS), and biomass gasification. This versatility in production methods lends itself to a wide range of applications

To date, effective storage and distribution of hydrogen have been two of the main constraints on its development as a green fuel for decarbonisation of the economy.
However, a UK nano-technology company called Triton Hydrogen has developed a simple coating product which provides a quantum leap forward in the delivery of hydrogen as the green fuel of the future. Tritonex Barrier Coating System can be applied to new or existing infrastructure and forms an impermeable seal to the surface, preventing permeation and embrittlement. The coating can be applied to new products by OEMs or just as easily retrofitted to existing infrastructure to convert it for hydrogen usage, and it can be used for pipelines, storage, valves and event transport applications.
"We now need to change our mindset in the hydrogen industry to realise that we now can treat hydrogen gas as any other fuel, utilising buffer storage and long transport lines," said Triton Hydrogen CEO Henning Syversen.

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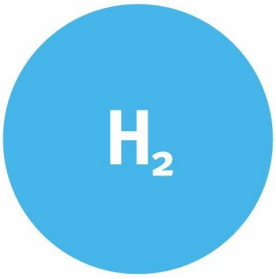
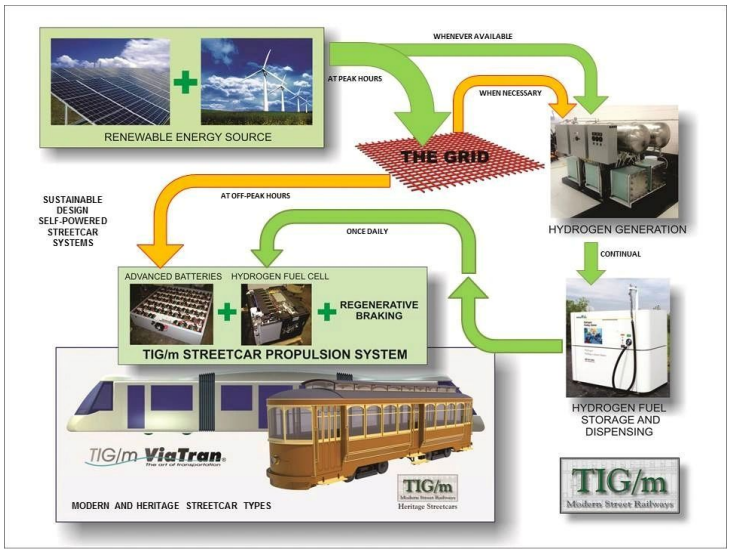
"The Infrastructure that Pays!"

At Light Rail (UK), we have developed a Consortium Package, "Trams as a Service" (TaaS), using the Triton Family of related Hydrogen products as follows:-

1) To eliminate leakage including under pressure up t…. bars, Tritonex Barrier Coating System can be applied to new or existing infrastructure and forms an impermeable seal to the surface, preventing permeation and embrittlement. ISO 17081:2014 at 0% permeation and is the final and missing piece to allow storage and transport of hydrogen gas without leakage and embrittlement.
2) A cold process plant for extracting from tip sites materials such plastic bottles, ideal where a simple deposit system can be set up locally and extracting from food waste using Anerobic Digesters which produce Bio Methane to produce green hydrogen. There is a significant volume of CO2 as a bi product which can be sold to the drinks industry amongst others where is a shortage of supply.
3) As part of the "Infrastructure that Pay" package there will be a social percentage dividend paid to the Municipality dependent on volumes of feed stocks supplied
4) The Hydrogen fuel costs of 1 & 2 would be approximately circa $10 per litre which can be delivered to the trams either by OHLE or to on board systems.
5) Using self-powered, battery only or battery-dominant hydrogen/electric propulsion system provides up to 20 hours per day of passenger service with no wayside power infrastructure of any kind.
6) Once per day the batteries are charged and balanced and the on-board generator, if any, is refueled. Battery charging equipment is carried on-board the vehicle and each night the vehicle is simply plugged in using the supplied high-voltage charge cord.
7) Using TIG/m Hydrogen Trams which are built to standard gauge and because the tracks with the exception of points, is not electrified all aspects of its design, installation, and maintainance are simplified and are significantly less costly.
8) TIG/m trams are designed, manufactured, and tested to comply with international Light Rail Standards. Passengers, owners, and Operators are protected by compliance with EN 50126,8,and 9 as well as all other applicable railway safety standards and are updated regularly.
9) It is to be noted that there are Middle East developers who are cognisant of the success of the hydrogen tram in Doha, Qatar have been involved in our proposed initial two lines and have done a satisfactory "Brown Field " assessment along the line of routes with significant investment development.
10) Political issues that need adjusting and will make this project quicker and easier are the "Treasury's Green Book" for a level playing field of infrastructure cost spreading and the adaption of the Oil & Gas legislation to ensure continuity of skills base etc., reducing redundancy and providing a train workforce for this emerging and replacement industry.



The Hydrogen Power Flow line



Vehicles from TIG/m

MRV-3 City Car single car body and is rated to carry 100 pax and can be coupled autonomously as above to a maximum of three as shown above and using suitable, safe sidings and unneeded car 2 or 3 can be parked off peaked eliminating unnecessary dead milage and wear and tear.

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MRV-4 SERIES City Runner articulated multi-body trams is rated to carry 300 pax and can be coupled autonomously to a maximum two cars giving a maximum of 600 passenger

HRT-1AC SERIES single body Double-Deck all weather convertible car 85 passenger heritage tram

And for when the sun shines??
New build old pattern used as a tourist cruise line shuttle in Aruba

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Further video details can be found on

https://www.youtube.com/watch?v=1VkuFUD3fc4

1. A modern hydrogen tram in a light density environment

2. https://www.youtube.com/watch?v=o1BTuHUwTwM

A mixture of street running and former railway line

3. https://www.youtube.com/watch?v=GYGZxE8KGDY

TIG/m Streetcar in Santa Cruz! Clean, Quiet, Just right

4. https://www.youtube.com/watch?v=-A4QxeWsXpw&list=PLa-lo2y-IMWI9Kgkp2iqPKFLG_v2Q9rvb

TIG/m City Car Street running in Doha.

5. https://applrguk.co.uk/media/files/LR-UK-Let-Glasgow-flourish-AGAIN-Mar-2021-V5apdf

Original PowerPoint why Glasgow needs this type of tram.

TramTrain

About Tram Train

The UK Government funded Tram Train programme is a partnership between SYMCA, Network Rail, Stagecoach Supertram and Northern Rail piloting pioneering technology which allows passengers to make a single continuous journey connecting street tram stops and conventional rail stations.

Passengers in South Yorkshire are the first in the country to benefit from pioneering, award winning, Tram Trains that will provide a direct service from Sheffield city centre to Rotherham Central and Parkgate, travelling on street tramlines and the national rail network.

Stadler TramTrains operate successfully in Sheffield and TfW South Wales.

NB. A Hydrogen version is under development with several manufacturers which will be compatible with our proposed infrastructure package.

Track Infrastructure

STECONFER is a global railway construction company with a skilled and experienced workforce and a plant equipment fleet for Trackwork, Overhead Catenary (and Light rail), Signaling and other rail-based systems. The company's 20+ years' experience is consistently based on core values of: - Safety for our team, our customers, partners, and clients. - Client focused value propositions. - Technical competence and high-quality standards. - Adaptability to local cultures, customs, and social responsibility. - Passion for Equality and Diversity. - Environmentally conscious and caring.

STECONFER are qualified, willing, and able to provide comprehensive solutions to the market and all its clients regarding the system installation and maintenance of: - Tramway and LRT - Metro and MRT - Heavy Rail Infrastructures Local Company Although part of a larger Global Group based in Lisbon, Portugal, Steconfer has a fully registered (11146299) standalone company in the UK.

Steconfer Rail Ltd has been registered since 2018, with its own Quality & Management System compliant to and verified by RISQS (registration no. 6683) with its registered office at International House, Mosley Street, Manchester, M2 3HZ.

What We Can Do for ***"The Infrastructure that Pays!" VLR***

Whereas we can provide trackwork, power distribution, and signaling systems we believe that the concept for **"The Infrastructure that Pays!"** Bristol is to have and benefit from the environmental sustainability and technical advantage of a 21st-century Ultra Light Self Powered Tram System. This means that Bristol would not require a lineside traction power supply system in the form of a Third Rail, or Overhead Line System.

Although our area of expertise does include Overhead Line installation, we do have experience in delivering this type of forward-looking transit solution having worked with, partnered with, and built a successful relationship with the Global Leader in terms of Self Powered Tram Systems. It therefore would be our privilege to limit our potential scope of supply to the installation of the trackwork, including the preparation and construction of the track bed.

Trackwork Concept Proposal for Bristol Revision 00 The slab is set at a depth of 500mm from finished rail level with allowance for a 150mm C8/10 blinding layer as a working platform.

The choice of structural concrete for blinding is made to allow for construction traffic after an appropriate curing time and to provide sufficient strength for anchoring the props required to guarantee rail alignment. As with most light rail systems the rail can be encapsulated to counteract the effects of stray current. Sophisticated rail setting jigs allow for a top down method of construction whereby the rails are suspended at their finished alignment to very exacting tolerances.

A live quote for the Gloucester Road (A38), Bristol Tram Project
"Using Very Light Rail (VLR) technology, we can install a double track tramway at less than £10M per track kilometre."

a) https://applrguk.co.uk/media/files/LR-UK-Moving-Bristol-Forward-Janpdf
b) https://applrguk.co.uk/media/files/LR-UK-Bristol-Tram-Steconfer-Track-Concept-Proposal-June-21-v2a-3-of-3pdf
c) ***https://applrguk.co.uk/media/files/LR%20UK%20Bristol-Tram-Feasibility-Study-2021%20Kindle.pdf***

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The major unseen threat from rubber wheeled transport, all modes.

Doctors writing in the International Journal of Public Health want the limits met by the end of the decade, but the European parliament wants to wait till 2035, the European Commission wants to set weaker limits for 2030 without setting a date to align with the WHO, and the European Council wants to let poorer countries wait till 2040.
"Every year of delay of reaching limit values directly translates into more death and disease," said Barbara Hoffman, the chair of the European Respiratory Society (ERS) advocacy council and head of environmental epidemiology at Heinrich Heine University in Düsseldorf.

Hoffman and colleagues from several public health institutes found that 330,000 more people would die early if EU member states with fine particulate levels greater than 10 micrograms per cubic metre were to delay bringing their pollution down to that level by a decade from 2030 to 2040. The WHO limit is 5 micrograms per cubic metre. "These numbers make it clear that allowing delays will impose a substantial, unjust and unacceptable loss of human lives in Europe," the scientists wrote.

Doctors call bad air an invisible killer. Each breath a person takes draws in pollutants small enough to seep from the lungs into the bloodstream. Once in the blood, they flow through the body, hurting the organs.

In Conclusion

This outline draft document briefly shows that using Hydrogen Technology, VLR technology, it is definitely possible for Metro and other operations including smaller cities and towns, to afford more steel on steel lines including compatibility with heavier TramTrain operation which we think that this technology outlined above would be a more affordable, quicker build and greater street option where your customers are option on many of the proposed Strathclyde Metro Routes for Heavy Rail vehicles.

Incidentally, our Hydrogen Plant when operational would be able to fuel in house hydrogen road fleet vehicles as well.

Yours aye

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Light Rail (UK) Group. Warrington, Cheshire, United Kingdom, WA4 6UE.
" A not for profit organisation promoting steel on steel sustainable Public Transport."

Member: of The Scottish Cross Party Parliamentary Group for Sustainable Transport
Secretariat &Technical Advisors: The (UK) All Party (Parliamentary) Light Rail Group,

Light Rail (UK) Group.
"The past we inherit, the future we build."

TRITON Hydrogen
Solving Impossible Problems