Speaker List (confirmed as of 15 May 2008)

Dr. Jeff Allan, London, United Kingdom
Towards a European Demonstration - feasibility, funding, standards

Rail Safety and Standards Board (RSSB) undertake research and development on behalf of the UK rail industry. In 2005 RSSB carried out a feasibility study into the application of hydrogen to rail. This is felt to be a particularly important topic as the UK has a high proportion of diesel powered trains compared with the rest of Europe and a long term fuel alternative is felt to be necessary to deal with security of supply, emissions and cost issues. RSSB undertook a feasibility study in 2005 which has been widely reported. Since then, RSSB has been monitoring worldwide hydrail developments. More recently RSSB has been the voice of Europe campaigning for a hydrogen trial through being the only rail focused member of the EU hydrogen JTI industry grouping. RSSB has a good understanding of the European Interoperability Directive and associated Technical Specifications for Interoperabilty (TSI). 'Diesel and other thermal traction systems' are an open point in the high speed rolling stock TSI. This presentation explores how the standards issue will be dealt with.

Greg Ayres, (Keynote) United States, Volpe Center, Research and Innovative Technology Administration, U.S. Department of Transportation
The Role of Hydrogen in the US's Rail Transit Future

U.S. public transportation authorities agree that reducing petroleum consumption and emissions from trains and buses is a top priority. With strong support from the U.S. Department of Transportation and other agencies, hydrogen fuel cell transit technologies are moving rapidly toward commercialization. The world's first hydrogen fuel cell public bus began operating in Chicago, Illinois, ten years ago, and today more than a dozen carry passengers on U.S. public streets from Hartford, Connecticut, in the Northeast to Palm Springs, California, in the Southwest. The National Fuel Cell Bus Program, a partnership between U.S. Department of Transportation and industry, aims to double that number by 2010. Because rails in many U.S. cities do not include electric power lines, hydrogen fuel cell rail vehicles could bring electric drive train service to many Americans at a lower total cost than rail electrification. Now being created by U.S. DOT and industry, the U.S. Electric Drive Strategic Plan for transit systems will closely examine the potential for hydrogen streetcar, light rail, monorail, and commuter rail technology development and in-service demonstration and deployment. When completed in late 2008, the Plan will propose new electric drive research activities for 2013 and beyond.

Seky Chang, South Korea, Korean Railway Research Institute
Development of Transportation Technology

In South Korea, alternative energy is one of the main issues that must be solved to assure the development of nation's economy in the future. There is no domestic oil production and energy import costs are increasing rapidly.

Korea's Railroad Research Institute is a national lab supported by the government. We test and certify the railway-related products for the infrastructure, signalling, electrical equipment and rolling stock. We also conduct both overall and in-depth study in these fields. Many companies and universities are in partnerships for this research and development. We will build the railway transportation system using hybrid equipment with fuel cells and either battery or super capacity storage. We have studied and developed a propulsion system using lithium polymer batteries and super capacitors. In Korea, the study of fuel cell systems is popular but its application to passenger cars is not easy due to the high price, unsatisfactory durability and lack hydrogen stations nationwide. I think commercial use of the fuel cell system for the transportation should begin with public transportation uses such as railways, where the construction cost is supported by the government and the infrastructure for the hydrogen supply is simple, There is a demonstration program in Korea for a hydrogen bus but it's a just demonstration. It's not important just to put fuel cell system on a vehicle. What is important is to build a hydrogen transportation town, including the hydrogen supply, flow and railway vehicles, which will make it possible to realize the deployment of hydrogen transportation early. Our immediate target is to build a small hydrogen transportation system using hydrail for the 2012 world Expo in the city of Yeosu.

Jonathan Ellis, United Kingdom, Network Rail

Railway Infrastructure, impact of Hydrogen as an energy vector

Network Rail is the largest railway infrastructure manager in Great Britain. The Network Rail presentation will describe the challenges that an infrastructure manager faces in the 21st century and, from this, describe the positive impact that hydrogen as an energy vector can have in meeting them. Applications covered will include not just traction supply for rolling stock but also hydrogen's potential for remote power for construction and maintenance equipment and other issues arising from network management. Finally there will be discussion of how a business case for the introduction of hydrogen onto the railway can be created and the requirements that hydrail drives for future fuel cell and hydrogen research.

Peter Holt *(Stan Thompson presenting)***,** Canada, Fraser Valley Heritage Rail Society

Heritage and Hydrail: Bridging the 19th and 21st Centuries

The City Of Surrey aims to be the first in North America to implement hydrail passenger service and there approach is spectacular. The equipment will be a beautifully restored 1900 vintage interurban rail car redesigned to use onboard hydrogen rather than the external track electrification that powered it over one hundred years ago. The project is called the Fraser Valley Heritage Railway and it will operate on much of the original line. The train's operation is planned for 2010, in time to be an attraction during British Columbia's Winter Olympic Games. The power system will be located in a matching baggage car so the

train set will look exactly as is did a century ago. The series hybrid's prime mover traction power will come from either fuel cells or a hydrogen/methane internal combustion engine. At present the "hythane" ICE option is the likely choice because of its much lower cost. The Fraser Valley Heritage Railway Society conceived and is executing the project with funding from the City of Surrey and others. It is hoped to be the spearhead of a much larger Surrey system using modern hydrail equipment. Stan Thompson will present instead of FVHRS's Peter Holt, the Project Manager, due to a timing conflict.

Jason Hoyle, United States, Appalacian State University
Market adoption factors of Hydrail technology

Widespread reliance on personal vehicles as the primary means of transportation in the United States, especially in the rural South, has resulted in systemic rigidity and severe limits on short-term options to address increasing economic, environmental, and security threats stemming from the reliance on oil for transportation. The Appalachian State Energy Center works on oil alternatives, smart growth and planning, and other initiatives to support increasing flexibility in North Carolina's transportation infrastructure. Several market adoption factors of hydrail specific to North Carolina will be evaluated and compared across regions, countries and continents.

Giovanni Pede, Italy, Department of Energy and the Environment
The Role of Hydrail In Meeting Environmental Commitments

The Third International Hydrail Conference last year in Salisbury, NC, USA, confirmed that hydrail is gaining momentum around the world especially in Asia. Evens so, the lack of public knowledge about hydrail remains the greatest bar to progress. When cost/benefit ratios are better understood, especially concerning those areas where tracks have not yet been electrified, demand for hydrail will clearly increase. The very rapid rise in demand for petroleum and increasing world awareness of the urgency to move away from extracted carbon energy sources underscores the need to free railways from petroleum dependence. Still, too few know that hydrail, a much less costly option than track electrification, is now emerging.

Daljit Bawa, Canada, Ballard GmbH
Ballard Fuel Cells Heavy Duty Applications

Rail vehicles are a superb way to showcase the benefits of fuel cell technology to decision-makers who will more clearly envision use of the technology for mass transit. Fuel cell technology has clearly demonstrated its ability to meet public transport requirements and to reduce greenhouse gases and pollutants. Rail vehicles have the size and weight to accommodate fuel cell modules compatible with electric drive technology now powering diesel and gasoline hybrid railway vehicles. Centrally fueled and maintained,they are run by professional drivers. Government funding is available to support the cost of new technology hydrail vehicles. With increased government interest in alternative transit projects, Ballard is working actively with electric drive

integrators, railways and bus OEMs to provide fuel cell modules for heavy-duty applications. This pairing of Ballard's fuel cell technology with hybrid heavy-duty designs has improved vehicle performance, lowered costs and increased durability, providing a clear path to commercialization of hydrail vehicles.

Stan Thompson, United States, HEAT team

Hydrolleys: A Prime Hydrail Opportunity

The Hydrogen Economy Advancement Team (HEAT) is an informal group of active and retired government and business people in and around Mooresville, North Carolina, USA, who see where the hydrogen economy is headed and want to help it get there faster. We are motivated by concern for the environment, the climate and energy security. We operate by networking and seeking to attract resources to businesses which can, in turn, attract customers to sustainable, carbon-free hydrogen applications. Hydrail, hydrogen backup power, hydrogen infrastructure and hydrogen road vehicles are among the applications we support. Educating the public about hydrogen's potential as an integrating energy system is a major part of our effort. Hydrail is the easiest application of hydrogen to transportation. The hydrogen streetcar or "hydrolley" is probably the easiest hydrail application to develop and deploy. In the United States, experts say that about fifty municipal governments now have, or are planning, streetcar lines to diminish congestion, address parking probllems and make a car-free urban lifestyle an option. If communities are willing to accept the intrusion of poles, guy wires and catenaries and to pay US$2 million+ per track mile for electrification, when wireless hydrolleys become known as a option, present plans are likely be deployed sooner and more cities join the movement. Hydrolleys trump hydrogen buses four ways: (1) high-density real estate develops near rail transit; (2 streetcars carry more passengers per vehicle operator; (3) steel wheel rolling friction is about 1/7 that of rubber tires, improving range and fuel economy; and (4) customers just prefer rail transit over buses. Hydrogen buses are now deployed so the proof-of-concept for hydrolleys is effectively accomplished. North Carolina is already recruiting a manufacturer to build in the State and export hydrolley vehicles.

Claus Torbensen, Denmark, HIRC Jutland commuter rail

Plans for a Danish Test Site For Hydrogen Technology on Rails

The Hydrogen Innovation and Research Centre is a non-commercial organization dedicated to initiating demonstration projects involving promising hydrogen technologies. With approximately 70% of the Danish railways still dependant on diesel fuel and high investment costs discouraging electrification, hydrogen is indeed an interesting fuel for use in railway applications in Denmark. The VLTJ Railway is planned as a test site for hydrogen technology on rails. It is in Jutland, the North-Western corner of Denmark. It connects two small towns, Thybor[illegible]n and Vemb, via the bigger town, Lemvig. At the Vemb station it connects with the rest of the Danish railway system. The VLTJ organisation is a small one with 25 employees who manage all operations along the 59.5 km long single-track line. VLTJ Railway operates a work-shop

for train maintenance and its own rail department for maintenance of the track and a control station. In the first phase of hydrail, using surplus hydrogen from a nearby chemical plant with direct track connection with the railway line is an obvious option. Later, integration of electrolysis based on wind power in the project is a possibility. In the area where the railway line is located, more than 35% of the annual electricity consumption comes from wind power, a growing future share of intermittent power in the electricity supply.

Jan Piet van der Meer, The Netherlands, Nedstack Fuel Cells

An Opportunity for Fuel Cells

The Netherlands may have Europe's highest percentage of electrified rail tracks but now a few of these tracks are so heavily used that there is actually too little electricity to haul more traffic. This creates a great opportunity to introduce hydrail instead of making large investments to expand the electric infrastructure. Another interesting application for hydrail traction is replacement of shunting engines used in railway stations. In the Netherlands, most of these stations are located in older city centers so avoiding diesel pollution and noise would be an important gain. NedStack is a producer and developer of fuel cell stacks and systems, with an interesting platform in stacks and systems for heavy-duty transport applications. We are especially interested in deploying our first large system on a hydrail application. So far, we have only performed feasibility studies for trains but we have a 7,5 ton city distribution truck on the road, the first ship using our stacks is under construction, and the first city buses using our product are promised for early next year. In the northern part of the Netherlands, we have a 120kW peak system, using by-product hydrogen from a chlorine factory, which has run for nearly 5000 hours. While it is hard to say when and where it will be deployed first, it's certain that the PEM fuel cell is the key technology for cleaning up the automotive/petroleum world and hydrail trains are the most obvious application.

Herbert Wancura, Austria, EU hydrogen program

Hydrail and the EU's Joint Technology Initiative

The European Commission and its founding partners from the New Energy World Industry Grouping are now joining forces in a unique Public/Private Partnership focusing on accelerating the innovation cycle and making the Hydrogen Economy (HyConomy) a reality for Europe. Many options will be explored in both the transport and the stationary distributed generation fields as well as early markets. The rail sector may prove to be an excellent case for all applications. After all, it is not only hydrogen and fuel cell based propulsion systems that will form a critical component in future light rail developments, but electricity production for urban transport may well come from decentralized Fuel Cell Power Stations and critical signal and telecom links may have Fuel Cell Back-up power. In terms of vehicles, crossover-designs may become an interesting subject of studies and developments. Such crossovers could come in the form of hybrid transport trolleys using overhead where it already exists but offering a seamless transition from overhead incity centers to hydrail

suburbs, where exteneding electrification may be not economical; to alternatives to cable car designs for short route connecting traffic, or even the final crossover between individual and private transport using small vehicles that can be both guided in a real or virtual rail system and operated individually. Whatever solution proves most efficient will need to provide a balance between energy efficiency and CO2 challenges and the need for quiet zero-emission transport. The JTI on Fuel Cells and Hydrogen will work toward enabling such developments to happen.

Cesare Pianese, Italy, University of Salerno

University Research Opportunities: Elements of Hydrail Design

The rail sector should benefit as fuel cells begin reduce emissions and oil dependence in transportation. In the medium term, proton exchange membrane fuel cells could be used as auxiliary power units or for low power train propulsion for switchers and regional trains. Introducing PEM fuel cells onto trains entails trade-offs among safe operation, economy and performance. Cost and weight could impose significant restrictions but benefits from other application areas (i.e. automotive) could be gained. Scientific research will focus fuel cell technology, system configuration and design, auxiliaries and controls. Medium-long term research will focus materials technologies, vibration, crashworthiness, power density, stack durability and reducing manufacturing costs. Business will focus on the role of operators, train builders and applied researchers and definition of the optimum roles for FC's: traction, APU's, and powertrain solutions (full hybrid or range extender). Vehicle integration, on-board hydrogen storage, refueling and vehicle layouts for hydrail powertrains require study. On-board management and the control of stack and auxiliaries and diagnostic systems are key issues.

Jeff Allan, United Kingdom, Rail Safety Standards Board

Towards a European Demonstration - feasibility, funding, standards

Rail Safety and Standards Board (RSSB) undertake research and development on behalf of the UK rail industry. In 2005 RSSB carried out a feasibility study into the application of hydrogen to rail. This is felt to be a particularly important topic as the UK has a high proportion of diesel powered trains compared with the rest of Europe and a long term fuel alternative is felt to be necessary to deal with security of supply, emissions and cost issues. RSSB undertook a feasibility study in 2005 which has been widely reported. Since then, RSSB has been monitoring worldwide hydrail developments. More recently RSSB has been the voice of Europe campaigning for a hydrogen trial through being the only rail focused member of the EU hydrogen JTI industry grouping. RSSB has a good understanding of the European Interoperability Directive and associated Technical Specifications for Interoperabilty (TSI). 'Diesel and other thermal traction systems' are an open point in the high speed rolling stock TSI. This presentation explores how the standards issue will be dealt with.

Ian Williamson, United Kingdom, Air Products

To Be Announced

Subject to change