INTRODUCING THE INTERNATIONAL RAIL TECHNOLOGY CENTRE

The International Rail Technology Centre (IRTC) will create a world-leading research and development hub for the rail industry.

An industry-led partnership with three leading universities in Scotland, it will drive cutting-edge research into technologies to deliver innovation and disruptive thinking to the expanding global market.

The IRTC will leverage the expertise of UK industry and cutting-edge research and testing in Scotland with the significant market opportunity of UK high-speed rail and global rail growth.

It will create a new location for innovation investment, technology development and skills training.

It will take the UK from being a passenger to a global driver of rail technology.

Phase 1 of the IRTC will see the creation of a £100 million-plus project to create the largest and most advanced laboratory for track testing in the world. It will then build capacity across other rail technology areas, link to other UK and international research locations attracting further investment.

The IRTC represents a unique opportunity for public-private sector R&D investment to transform a vital sector of the economy, create highly skilled jobs and improve the cost efficiency of the UK’s transport infrastructure.

The IRTC will enable a transformational shift in UK rail research and development, recapturing the radical engineering spirit of Stephenson, Brunel and Watt to deliver 21st century innovation for 21st century railways around the world.
RAIL - WORLDWIDE GROWTH, GLOBAL OPPORTUNITY

The global railway sector is currently going through a renaissance.

This is being driven by population growth and the ongoing demands of urbanization, coupled with the rapid growth of emerging economies across Asia, the rise of high-speed rail and modern metros and the need to decarbonize transportation.

New rail infrastructure is opening new markets, creating new jobs and unlocking economic growth.

Global market expansion
The current global rail market is worth an estimated £128 billion per year with predicted annual growth of 2.7 per cent.

Growth is across all major markets
The European market is valued at £40 billion per year, with Asia valued at £35 billion per year and rising, combined with substantial growth in the Middle East and Americas.

High-speed rail is a key driver
Investment in high-speed rail is expected to be more than £380 billion up to 2022.

Freight is also a growth opportunity
Freight volumes are more than 11 trillion tonne-km per year and growing, especially in Asia and North America. 20 per cent growth is predicted for the UK alone by 2030.
The need to innovate and improve railway systems has never been greater.

However, despite the UK undergoing the biggest rail investment since the Victoria era, there are real challenges for renewal and growth. The IRTC will tackle these challenges and deliver the breakthroughs needed to turn them into high-value opportunities.

**High Speed Rail**
Current plans for the UK – High Speed 2 (HS2) – estimate a significant majority of the cost will relate to track infrastructure. De-risking the project through advanced testing and new technologies, made possible at the IRTC, offers a major market opportunity and route to reduce costs. The IRTC also includes the only test facility capable of testing track and trains to the demands of HS2.

**Sustainable Railways**
Current spending on track maintenance in the UK is over £1 billion per year. Improved rail technologies will be required if we are to shift from maintenance to renewal and growth. The latest developments from the universities involved in the IRTC, including advanced telematics and digitization, will help UK and overseas operators to significantly enhance track and train lifecycles and capacity.

**Modular Construction**
Off-site modular manufacturing is now a billion pound industry and will make a major contribution to the global rail industry by increasing speed of construction, improving logistics and creating new improvements in rolling stock. The IRTC will develop and test new technologies and techniques to deliver new infrastructure and improve quality control.
THE IRTC - GLOBAL VISION

Bringing together leading companies involved in the rail sector alongside three leading universities, the IRTC will enable a transformational shift in rail research, design, development and testing in the UK.

In doing so it will help recapture UK market share of the global market, whilst delivering a vibrant and skilled workforce that will deliver world class engineering capability and technologies that can be exported around the world.

Delivering innovation for business
Creating a world-leading research and innovation hub to give UK-based businesses a leading edge in the global rail market.

De-risking UK and global rail expansion
Including significant and immediate benefits from the potential infrastructure cost savings to HS2, supporting the expansion of high-speed rail in the UK and worldwide.

Uplifting engineering skills
Training apprentices, technicians, graduates and postgraduates in the skills industry needs to fulfill the UK ambition for rail building.

Supporting advanced manufacturing
Helping anchor and attract greater engineering activity in Scotland and the UK.

Building an innovation-led economy
Establishing an international reputation that will attract industry investment, spur new enterprise and supply chains, and grow research and innovation expertise.
The IRTC represents a unique opportunity for public-private sector partnership.

Working together, business, industry and universities will transform a vital sector of the economy, create new products and services that can be exported globally, develop crucial engineering skills and improve the cost efficiency of infrastructure investment.

Through its partnership approach, the IRTC offers business-critical services and support to leading businesses across the rail industry.

Industry-led research and product development
Genuine collaboration in pioneering R&D programmes, combining world-class academic expertise and consultancy with the largest and most powerful track testing facility in the world.

Skills and training at all levels
Industry-relevant, responsive educational and training, from apprenticeships, graduate and post-graduate courses to professional development and specialist technical-level training.

Supply chain development
Bringing together multi-national businesses, project commissioners and operators, supply chain companies and SMEs, with well-structured engagement across the value chain.

Business networking & showcasing opportunities
An inclusive programme of industry events promoting IRTC partnership achievements and cross-industry networking.
Phase 1 of the IRTC will see the establishment of the largest and most advanced track-testing facility in the world. Combined with the expertise and capabilities across the universities, this will provide unrivaled support for the development of modern rail in the UK and around the world.

Key areas of work will include:

Design and Construction (Infrastructure)
Accelerated and realistic full-scale testing of track dynamics under extreme stress and speed to optimise design and assess performance of new technologies and materials.

Design and Manufacturing (Rolling stock)
Developments in new materials such as low cost titanium to reduce the weight of rail vehicles and impact on rolling stock and also improve track life.

System Monitoring Maintenance and Control
Creating advances in remote, wireless and intelligent sensing and data analysis will provide the potential for real time train control on new and existing networks.

Enhanced Modelling for Design and Operation
Utilizing the Centre’s knowledge of computation fluid dynamics analysis related to aerodynamic challenges around high speed rail to contribute to new train designs.

Power Delivery and Power Economics
Improving pantograph-catenary dynamics and alternative power systems to deliver sufficient power to trains travelling at high speed.
IRTC PHASE 1 - **2016-2026**

**GRAFT (Generation III):** Unique track and train testing facilities and modelling

- Simulating up to 400km per hour
- 70 hydraulic actuators
- 1.5 MW power
- Pulsing up to 60 times per second
- 20m length of track - for high speed simulation
- Shockwaves created and measured by multiple sensors
- 5M high full scale embankment & reinforced structures

**Rolling Rig:** High performance train system & wheel testing

- Simulation of track & train interaction
- Sensors measuring train dynamics & performance

**Supercomputer data modelling & analysis**

**Numerical modelling**

**Industry Hub:** Engineering, skills & economic development centre

**GRAFT III & Rolling Rig Control Room**

**Modelling & data analysis**

**Engineering innovation workspace**

**Partner companies engineering offices**

**Spinout Incubator Units**

**Rail & industry events space**

**Scottish & global Industry hub area**

**Skills & Training Centre**

**Bespoke software development**

**Technology development & verification**
SKILLS DEVELOPMENT - FROM CRADLE TO GRAVE

The IRTC will have an education and skills programme informed by its core research themes and directly linked to the universities’ undergraduate degrees in civil, electrical and mechanical engineering.

Graduate-level expertise
A ‘High Speed Train and Track Systems’ MSc degree programme to provide graduates with the skills and knowledge in advanced scientific and engineering aspects of the railway sector. A key component of this programme will be to utilize the universities’ international outreach to recruit the best students from both the UK and overseas.

Modern Apprenticeships
Exploiting the expertise of the three Universities, in partnership with industry, to create new innovative college level apprenticeship qualifications across Foundation Apprenticeships, Modern Apprenticeships and the emerging Advanced Apprenticeships.

These courses will provide industrial-relevant, responsive educational and training opportunities to young people, providing a clear pathway from schools and colleges to HNC or HND to degree level.

Training & Upskilling
Delivering post-graduate professional development, including specialist technical training for qualified engineers and scientists working in the rail centre and skilled trade and technical-level courses for existing rail industry workers to meet the growth of high speed rail in the UK.
A TRUE PARTNERSHIP

The IRTC will combine research institutes with unrivalled expertise in developing award-winning technology to market with internationally renowned rail infrastructure companies, organisations and colleges.

Heriot-Watt University
At the forefront of rail systems R&D and commercializing technologies, like Xitrack. It hosts the only sponsored chair for high-speed rail and is already working with HS2 Ltd and Network Rail.

Strathclyde University
A proven pedigree working with industry, including on power supply and electrical engines. It also hosts the renowned Advanced Forming Research Centre.

Edinburgh University
A global leader in sensor technology, at the forefront of the application of big data analysis and with a track record in award-winning rail industry-sponsored research.

Current Core Partners:

Affiliate Partners:

Skills Partners: