**OSIRIS**

**Optimal Strategy to Innovate and Reduce energy consumption In urban rail Systems**

**Funding:** European (7th RTD Framework Programme)

**Duration:** Jan 2012 - Mar 2015

**Status:** Complete with results

**Total project cost:** €7,390,177

**EU contribution:** €4,299,951

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**Call for proposal:** FP7-SST-2011-RTD-1

**CORDIS RCN:** 102008

**Background & policy context:**

For many transport modes, energy reduction strategies can be effectively formulated at the level of the vehicle. New technologies can therefore be introduced to a vehicle and the direct energy savings can be readily quantified.

However, this approach is not suitable for urban rail, where it is not sufficient to consider only the energy performance of vehicles; the energy associated with the infrastructure, as well as the influence of the mode of operation are to be considered too. In other words, urban rail systems are complex environments and their energy consumption is characterised by a wide range of inter-dependent factors. For example, whilst a new technology might yield improvements in certain respects, it might also compromise other aspects of system performance. This means that it is often extremely difficult to assess the net benefits of introducing new energy saving technologies.

OSIRIS is expected to bring positive benefits to the urban rail sector (i.e., operators and manufacturers), as well as to the community as a whole. These benefits can be summarised as follows:

**Community:**

- Energy and CO2 savings thanks to progress in real tested technologies and solutions.

**Operators**

- Common understanding with the manufacturers on energy savings and related innovative technologies (KPIs, duty cycles, TecRecs)
- Decision Support Tool methodology: selecting optimum combinations of technical and operational solutions
- Real experimental results from the field of innovative technologies to save energy (RS, Infrastructure & operational measures / thermal & electric energy)

**Manufacturers**

- Clearly defined and harmonised requirements by operators
- Extended electrical system simulations tools to integrate the new smart grid concept and new thermal simulation tool

**Objectives:**

A holistic approach is necessary for the reduction of energy consumption for urban rail systems embracing vehicles, infrastructure and operation. OSIRIS aims at enabling a reduction of the overall energy consumption within Europe’s urban rail systems of 10% compared to current levels by 2020.

**Methodology:**

In order to fulfil the objective above, the following specific objectives will be addressed:
• Define the overall needs and operational requirements allowing for the development of a global approach for the simulation, optimisation and benchmarking of the energy consumption of urban rail systems (i.e., Light Rail, Metro, Suburban)
• Define a series of standardised duty cycles and key performance indicators for urban rail systems to allow for direct performance comparisons and benchmarking of technologies
• Develop a holistic model framework assembling existing proprietary traction and power network simulation modules into a complete urban rail system model (i.e., the OSIRIS tool). It will include all the primary parameters that influence energy consumption, as well as their inter-dependencies. As part of the project, a model of thermal energy exchanges within trains, tunnels and stations will be developed as well
• Employ optimisation methodologies for the identification of efficient, reconciled strategies for realising low energy consuming urban rail systems, based on the use of the OSIRIS tool
• Propose a Technical Recommendation (TecRec – a sector-wide voluntary standard) for the use of onboard energy storage systems, addressing the issue of assessment and mitigation of safety risks for the customer and operation staff
• Evaluate specific railway technologies, operational strategies and the economic/political framework for the future reduction of energy consumption in urban rail systems
• Assess and compare the overall energy saving potential when applying new technologies or operational modes; and implementing them over both existing and new equipment
• Demonstrate energy savings through the OSIRIS tool and a number of defined demonstration scenarios based on real use cases.

**Parent Programmes:**
FP7-TRANSPORT - Transport (Including Aeronautics) - Horizontal activities for implementation of the transport programme (TPT)

**Institute type:** Public institution

**Institute name:** The European Commission

**Funding type:** Public (EU)

**Lead Organisation:**

**European Union Road Federation**

**Address:**
Avenue Louise 106
1050 BRUXELLES
Belgium

**Organisation Website:**
http://www.unife.org

**EU Contribution:** €369,992

**Partner Organisations:**

**Construcciones Y Auxiliar De Ferrocarriles Investigacion Y Desarrollo Sl**

**Address:**
JOSE MIGUEL ITURRIOZ 26
20200 BEASAIN
Spain

**Organisation Website:**
http://www.caf.net

**EU Contribution:** €278,457

**Technische Universitaet Wien**

**Address:**
Karlsplatz 13
1040 Wien
Austria

**EU Contribution:** €130,252
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<td>Via Paolo Mantovani 3-5 16151 Genova Italy</td>
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Technologies:
- Energy efficiency
- Energy efficient information systems

Key Results:
Towards energy-efficient rail networks

The energy consumption of urban rail systems is determined by a range of interdependent factors, which makes introducing new, energy-efficient technologies difficult. Researchers are now analysing the situation from every angle in order to create a decision-making tool for rail operators and public authorities.

The EU-funded ‘Optimal strategy to innovate and reduce energy consumption in urban rail systems’ (http://www.osirisrail.eu (OSIRIS)) project has taken a holistic approach to reducing urban rail energy consumption by examining issues related to vehicles, infrastructure and operation. The ultimate aim is to reduce consumption by 10% by the year 2020.

Researchers have already assessed the main environmental, political and social requirements of energy efficiency in urban rail systems for each of the relevant stakeholders. They have generated a document, which also highlights potential conflicts and mitigation measures.

In addition, OSIRIS has compiled a database of energy consumption at each point within urban rail networks. Another database composed of commonly agreed upon efficiency requirements will be used to standardise the energy optimisation and simulation process.

The project also focuses on advancing the safety as well as assessing the risks of on-board energy-saving technologies. So far, the technologies investigated include regenerative braking, on-board energy storage systems, energy-efficient traction drives and innovatively controlled comfort auxiliaries.

Furthermore, different geothermal solutions for metro systems have been studied. Here, researchers concentrated specifically on technical solutions that would reduce the energy consumption of stations and tunnel auxiliaries.
The overall outcomes that will be particularly useful to operators will include common key performance indicators, generic duty cycles and technical recommendations. These will enable them to break energy efficiency targets into manageable units and to select the optimum combinations of technical and operational solutions.

Documents:
- Final Report Conference - OSIRIS (Optimal Strategy to Innovate and Reduce energy consumption In urban rail Systems)
- Final Report Newsletter 2 - OSIRIS (Optimal Strategy to Innovate and Reduce energy consumption In urban rail Systems)
- Newsletter - OSIRIS (Optimal Strategy to Innovate and Reduce energy consumption In urban rail Systems)

STRIA Roadmaps: Infrastructure
Transport mode: Rail transport
Transport sectors: Passenger transport
Transport policies: Decarbonisation
Geo-spatial type: Urban