Thesis Themes 2016

Research and innovation area

IP3: Cost Efficient and Reliable High Capacity Infrastructure

Energy efficiency - Development of smart metering solutions for energy efficiency increasing in railways systems

Supervisors

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Contribution to S2R objectives

Development of smart metering solutions at the railway system level using intelligent sensor networks.

Development of strategies for data acquisition, information management and knowledge creation.

Deployment of sensor networks with secure, fast and reliable data transmission and low energy consumption.

Innovation proposed

Taking into account the results of IN2RAIL project, the goal is to design a solution combining measurements at different locations and by different sub-systems, including location and temporal information used to derive detailed information on energy utilization and consumptions. So it will be mapped the energy flow for the railway system based on smart metering data and develop solutions for energy efficiency monitoring based on demonstrator user applications processing constructed on smart metering data.

Concept proposed

The main focus of the work is on rolling stock. Lack of integrated metering systems (rolling stock and infrastructure) is noticed, metering data are generally not used for energy efficiency management.

The progress envisaged includes the development of integrated smart metering solutions and strategies on system level (rolling stock and infrastructure); establishment of energy efficiency monitoring based on smart metering solutions; development of applications for smart metering data. Energy flow mappings will also be implemented.

The state of the art has shown problems with data acquisition, their analysis and the appropriate reaction. A real-time measuring and acting accordingly are the progresses to be achieved. Therefore, faster actions and less costs are the main goals.

In terms of software:

- Mapping of energy flows for railway system based on smart metering data
- Development of user applications based on smart metering data
- Decision support tools to help the drivers and infrastructure managers to consume less energy.

State of art and progress beyond expected

The state of the art has shown problems with data acquisition from different sources, rolling stock, substations and depots, their analysis and the appropriate reaction. It is expected to propose, design, evaluate, and implement measurement, communication and processing solutions that allow improving energy efficiency in railways electrical

systems. These solutions include innovative smart energy metering devices and wireless communications. The use of very low energy consumption devices, with energy harvesting, makes possible the implementation of more complex, massive and distributed measurement systems, assessing all rolling stock, vehicles in depots, electrical substations and passenger stations.

Detailed energy mappings and energy flows will become available and will give the opportunity to evaluate in detail solutions to increase energy efficiency.

Initial TRL

TRL 1

Final TRL

TRL 4