PROJECT

**HVB**

**High Voltage Booster**

**Funding:** European (4th RTD Framework Programme)

**Duration:** Dec 1997 - Feb 1999

**Status:** Complete with results

**Background & policy context:**

European railway companies are facing increasing demand for high quality services in suburban areas as well as on high-speed rail networks. Growing traffic demand calls for adaptation of infrastructure in various ways. In particular, the electrification systems throughout Europe require updates to their power supply infrastructure. Besides meeting extra demand, the development in the performance of locomotive propulsion systems means that power supply components need to be updated. The integration of new equipment also has to consider electromagnetic compatibility (EMC) with existing railway network structures.

**Objectives:**

HVB aimed to identify electrical equipment for boosting the voltage of (existing) power supply systems at reasonable cost and at lower environmental impact than solutions employing electrical sub-stations.

The main objectives of HVB have been to:

- identify the requirements for a future high voltage booster, which will providing good interoperability between various existing power supply systems;
- analyse existing and potential applications in railway and industrial fields;
- analyse and simulate possible technical solutions, and identify a feasible solution with respect to costs, reliability, availability, maintainability, and integration;
- provide an industrial specification for a future high voltage booster.

**Related Projects:**

- ERTMS - European Rail Traffic Management System.

**Parent Programmes:**

- **FP4-TRANSPORT** - *Specific research, technological development and demonstration programme in the field of transport, 1994-1998*

**Institute type:** Public institution

**Institute name:** European Commission; Directorate-General for Energy and Transport (DG TREN; formerly DG VII)

**Funding type:** Public (EU)

**Partners:**

- NA

**Organisation:** (CRT)

**Address:** Via all'Opera Pia 11a
Key Results:

HVB has produced:

- A common European knowledge base on the power supply used in railway networks by establishing a multi-national working group.
- An analysis of classical structures for voltage regulation, that are based on electromagnetic devices and/or mechanical switches. Possible solutions were identified as primary side on-load tap changers, active voltage boosters, additional feeder, capacitive compensation using mechanical switches, series capacitive compensation with protection against default currents (with a saturable inductance), and moveable core coils for parallel compensation.
- An analysis of innovative solutions for voltage regulation based on state-of-the-art power electronics. Possible solutions can be sub-divided into mixed or purely power electronics based solutions; the booster auto-transformer with load tap changer using semi-conductor devices (STCSB) and the thyristor controlled booster (TCSB) being examples of the first group; static var compensators (SVC), thyristor switched capacitors (TSC), static var generators (SVG), static series synchronous capacitors (SSSC), and unified power flow controllers (UPFC) being examples for the latter.
- Recommendations on the use of high voltage booster units for 25 kV/50 Hz electrification systems as employed, e.g. in France and the UK; one short term (SVC) and two feasible long term solutions (SVG and STCSB) have been proposed;
- Prototype specifications for a high voltage booster unit compensating for voltage drops of main power transformers used in railway electrical sub-stations.

Policy implications

The study involved major players from the railway supply industry, research institutions and universities, as well as railway operators, in order to establish a broad working platform to develop an operational high voltage booster. The further exploitation of results from the HVB project is foreseen to take place under the umbrella of the European Commission, integrating end users (railway companies), industrial consortia and research organisations in a scheme that will contribute to the efforts in establishing the future European rail traffic management system.

Documents:
- ERRAC_Project_Evaluation_HVB (Other relevant documents)

STRIA Roadmaps: Transport electrification, Network and traffic management systems, Infrastructure
Transport mode: Rail transport
Transport policies: Decarbonisation, Societal/Economic issues