

The Challenge of Energy Management

Energy is set to dominate the transport agenda around the world in the coming decades for two inescapable reasons:

- ◆ Energy costs will continue to rise as demand outstrips the development of new supplies
- ◆ The carbon footprint of energy used will be of increasing concern as the causes and consequences of global warming become clearer

Railway Managers must meet the challenge of delivering an efficient, modern train service while learning to use energy more efficiently. We need to keep rail's green edge as an environmentally friendly transport system.

This leaflet introduces the new UIC booklet Process, Power, People which is a first guide to the subject of energy management for railways. The booklet covers diesel fuel, electricity for traction and the energy consumed in stations and depots.

But it is not just about technical solutions. It is also vital to have management processes, operational programmes and enthusiastic staff who can put the technology into practice.

We hope the poster on the other side of this leaflet will give you some ideas!

The Process of Power – how to Manage Energy

Energy efficiency should not be left to chance!

Energy needs a management process, just like any other aspect of your railway business.

To manage energy successfully you will need to work through this checklist. Do you have these items in your energy programme?

- ◆ An Energy Policy
Vision and Motivation
- ◆ An Energy Plan
Actions to deliver the Vision
- ◆ A Baseline and a Target
Defining the starting point – and the destination
- ◆ Measurement Systems
Measuring the consumption, and relating it to production
- ◆ Operational Control
Managing activities to get consistent results
- ◆ Feedback
Reporting, reviewing and improving the process

The Power itself – where does the Energy go?

Making savings means understanding the basics!

Understand the driving factors of traction consumption:

- ◆ Top speed
Energy for acceleration increases with the speed squared
- ◆ Stopping patterns
More stops burn more energy to restart – and stopping at signals is just as significant as stops at stations
- ◆ Train weight
Energy for acceleration is in direct proportion to weight
- ◆ Line Speeds and Gradients
Opportunities for energy recuperation and good driving technique!
- ◆ Aerodynamic drag
The main factor for high speed operation

Heating and ventilating of the trains is also crucial – it may account for 10-20% of the total on-train usage. Remember it varies with weather and time of year.

For buildings and infrastructure, understand the 'state of the art' from other industries – railway buildings obey the same principles as shops and hotels!

'People Power' – getting staff involved

Technical fixes are only half of the story!

Operational skills are a major input to successful energy plans.

Motivate staff by explaining the reasons behind the plan.

Even the technical solutions need staff commitment.

Make energy 'visible' by including it in job descriptions, budget reports and staff briefs. Check these points:

- ◆ Roles and Responsibilities
Who is in charge of the energy budget?
Ensure energy targets fit with other company goals
Describe how everyone can support the goals
- ◆ Training and Competence
Train to motivate
Train for understanding
Train for skills
- ◆ Communication and Feedback
Brief the Plan
Share progress reports
Celebrate success!

Typically, at least half of your energy saving potential may come from 'people-based' action; driving technique, traffic management and simply switching off equipment not in use.

Technology for Traction

How technology can help!

- ◆ Measurement
On-board meters
Cab Interfaces for feed-back to Drivers
- ◆ Quick hits
Diesel Engine management – auto-shut down and auxiliary load sharing
Optimising the Electrical Supply Network
Limiting Maximum Power Demand
'Fine-tuning' Traction Control software
- ◆ Major modifications – new build opportunities
Re-engining diesel traction units
Replacing electric traction controls (IGBT vs GTO)
Improved gearboxes and drive trains
Lightweight construction
- ◆ Energy Recovery and Hybrid Systems
Regenerative Braking
Dual Power Systems – Electric and Diesel
Supercapacitors - Batteries
Lineside storage

Process, Power, People Energy Efficiency for Railway Managers

This leaflet and the *Process, Power, People* booklet can only signpost the route to efficient management of railway energy.

The responsibility now lies with railway managers to put in place the discipline, organisation and effective management processes to really improve financial results and environmental impact.

Here are some useful links and contacts:

Driver Training - 'Trainer' Project
www.railenergy.org

Technology - 'Railenergy' Project
www.railenergy.org

General Principles and Building Services
Intelligent Energy Europe Programme and BSS project
www.manageenergy.net and www.bess-project.info

Railway contact - UIC (International Union of Railways)
www.uic.asso.fr

UIC Environment and Sustainability Platform
www.uic.asso.fr/environment

The following publications are available from UIC:
Buying Energy-Efficient Trains – UIC leaflet 345
Environmental Performance Indicators – UIC leaflet 330
For further information please contact Henning Schwarz,
UIC Environmental Advisor (schwarz@uic.asso.fr)

This leaflet has been produced for UIC by ATOC in association with other UIC members and industry partners

Further information and contacts

Plan and operate your train service with Energy Efficiency as a basic consideration. Check these four themes:

- ◆ Traffic management
- ◆ Train Composition (length and type)
- ◆ Timetabling
- ◆ Eco-driving

A successful operations strategy includes all these elements.

It will also multiply the potential savings from technical changes.

Platforms/staff rooms
Toilets/staff rooms
Depot lighting when trains are out in traffic

◆ Shut down computers and other equipment when possible

◆ Other users – manage, meter and bill tenants, shops, coffee bars etc.

◆ Automatic door-closing – also helps passenger comfort

◆ LED and other energy-efficient lighting technology

◆ Maintenance

- ◆ Check thermostat settings
- ◆ Clean heat exchangers
- ◆ Prevent refrigerant leakage
- ◆ Operating Arrangements
- ◆ Review light and heat needs for train cleaning
- ◆ Agree 'turn off' rules with train staff, cleaners, shunting personnel, maintenance engineers

◆ Heating and Cooling

- ◆ Heating and Cooling
- ◆ Agree 'turn off' rules with train staff, cleaners, shunting personnel, maintenance engineers

◆ Use the advice widely available from government and environmental websites on energy efficiency for buildings

Operating Your Railway

Stations and railway depots conform to the same principles as other buildings – so use techniques and information applied in other industries.

- ◆ Low energy lighting – replace old equipment
- ◆ Ensure lighting is off in daylight
- ◆ Switch-off areas not in use, e.g.
- ◆ Auto switching to 'Quiet' modes with lower target temperatures
- ◆ Technical solutions
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- ◆ when train not in public traffic
- ◆ Optimising HVAC software – stabilise controls to avoid heating and cooling systems fighting each other!
- ◆ CO2 metering and other techniques to regulate fresh air intake
- ◆ Heat pumps
- ◆ Automatic door-closing – also helps passenger comfort
- ◆ LED and other energy-efficient lighting technology
- ◆ Maintenance
- ◆ Check thermostat settings
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Stations and Depots

Heating and Ventilation (HVAC)

A major opportunity for energy saving – one railway company saved 30% of its consumption by getting this under control

Commuter trains with long standsills are a particular risk

while parked easily becomes 20% of total train energy demand.

◆ Technical solutions

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