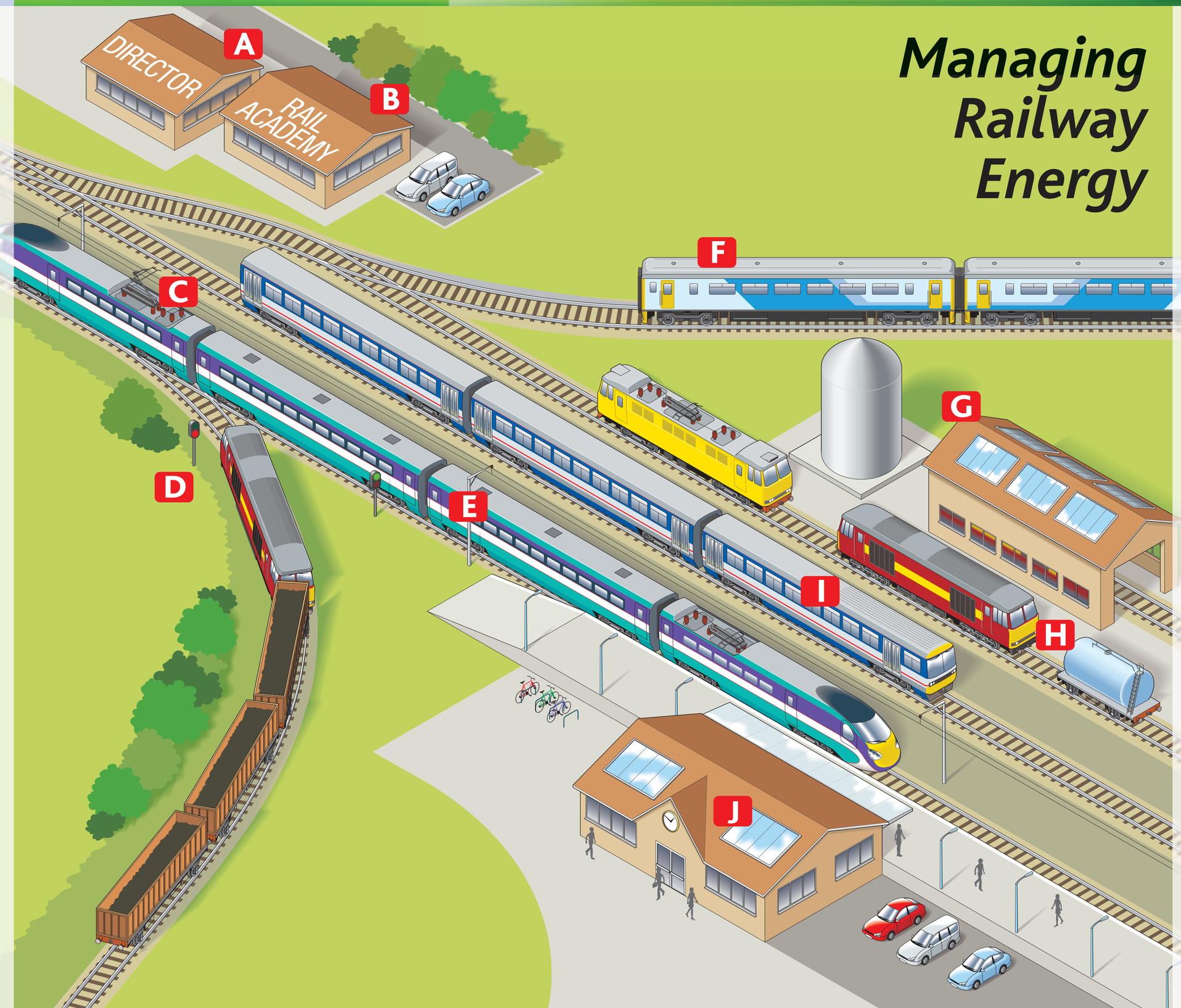
Process, Power, People

Managing Railway Energy



A

Reporting and Feedback

Give regular energy reports to senior managers

B

Training

Improve energy awareness for all staff – and give eco-driving coaching to train drivers

C

On-board Metering

Fit remote read-out systems for billing, management information and feedback to drivers

D

Traffic Management

Avoid stopping heavy freight, or slowing down high-speed passenger services

E

Electrical Power Supply

Measure and manage system transmission losses

F

Parked trains

Shut-down diesel engines and switch-off electrical systems

G

Depot and Workshop Buildings

Avoid waste and improve efficiency of heating, lighting and machinery

H

Diesel Fuel

Keep accurate records and use the data to improve maintenance as well as driving technique

I

Train Lighting and HVAC

This can comprise over 20% of total train energy use – so improve control systems to save energy in traffic, and when parked out of service

J

Stations and Offices

Apply latest building services techniques for equipment efficiency - and simply switch-off areas not in use

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 standstills are a particular risk if heating or cooling is left switched on all day – HVAC consumption while parked easily becomes 20% of total train energy demand.

- Technical solutions
  Auto switching to 'Quiet' modes with lower target temperatures 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
  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

Stations and Depots

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
  Toilets/staff rooms
  Platforms when not needed for service
  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.
- Tariffs – make sure supply agreements are correct
  Check maximum demand
- Fit smart meters at main locations - and act on the information!
- Make local station/depot managers responsible for meter reading and energy budgeting
- Heating and Cooling
  Check thermostat settings
  Maintain boilers – replace the old and inefficient
  Close doors and windows
- Use the advice widely available from government and environmental websites on energy efficiency for buildings

Operating Your Railway

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

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

A successful operations strategy includes all these elements.

It will also multiply the potential savings from technical changes.

There may be different actors and organisations that need to co-operate for success – but that is not a reason for doing nothing!

Energy management goes hand-in-hand with punctuality and smooth operation.

Avoid:

- Trains running ahead of schedule
- Trains waiting time at stations
- Trains running out-of-path
- Trains blocking junctions
- Uneconomic station stops
- Unnecessary signal stops
- Uneven line-speed profile
- Trains running empty!

Remember that Driving Simulators are a powerful way to teach eco-driving, and then help your train drivers with target speed advice systems. These can be high-tech IT solutions, but even just a sheet of paper with comprehensive route and timetable details will make a big difference!

Further information and contacts

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.iee-trainer.eu

Technology - 'Railenergy' Project
www.railenergy.org

General Principles and Building Services
- Intelligent Energy Europe Programme and BESS project
www.managenergy.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/environnement

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)

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Process, Power, People

Energy Efficiency for Railway Managers

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 shaving
  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