

8 November 2016

Fred Vellacott

request-364154-a335da27@whatdotheyknow.com

Our Ref: 16/FOI/033

Your Ref:

Direct Dial: 0141-333-3787

Email: foi@spt.co.uk

Dear Mr Vellacott

Request for Information - Energy Use and Regenerative Braking

I refer to your e-mail dated 11 October 2016 wherein you requested information as follows:

"I would like reports and data from any computer modelling relating to energy use and recovery when the new rolling stock is in operation.

Specifically I am interested in:

How much (percentage and/or absolute) regenerated energy will be transferred train to train, and how much will be 'burnt' in resistor banks

Are any measures being taken to increase receptivity of the DC network to braking energy e.g.

- *timetable optimisation*
- *two way substations*
- *energy storage- either on board the new trains or installed lineside.*

While these are specific outputs which interest me I would be interested in full reports and data on any modelling for the new system."

As the information you have requested is environmental information for the purposes of the Environmental Information (Scotland) Regulations 2004 ("EIRs"), Strathclyde Partnership for Transport ("SPT") is required to deal with your request under those Regulations. We are, therefore, applying the exemption at section 39(2) of the Freedom of Information (Scotland) Act 2002 ("FOISA"), so that we do not also have to deal with your request under FOISA.

As this exemption is conditional we have applied the 'public interest test'. This means we have, in all the circumstances of this case, considered if the public interest in disclosing the information under FOISA outweighs the public interest in applying the exemption. We have found that, on balance, the public interest lies in favour of upholding the exemption, because there is no public interest in dealing with the same request under two different regimes. This is essentially a technical point and has no material effect on the outcome of your request.

SPT's response to your request is as follows:

A number of possible measures which may be used to optimise the use of regenerated braking energy include:

- Energy storage systems (e.g. super-capacitors, flywheels or batteries, on-board and trackside);
- Inverting substations;
- Increase nominal system voltage;
- Change the third rail to a low resistance type; and
- Interconnect and reconfigure all supply sections including bi-directional power distribution.

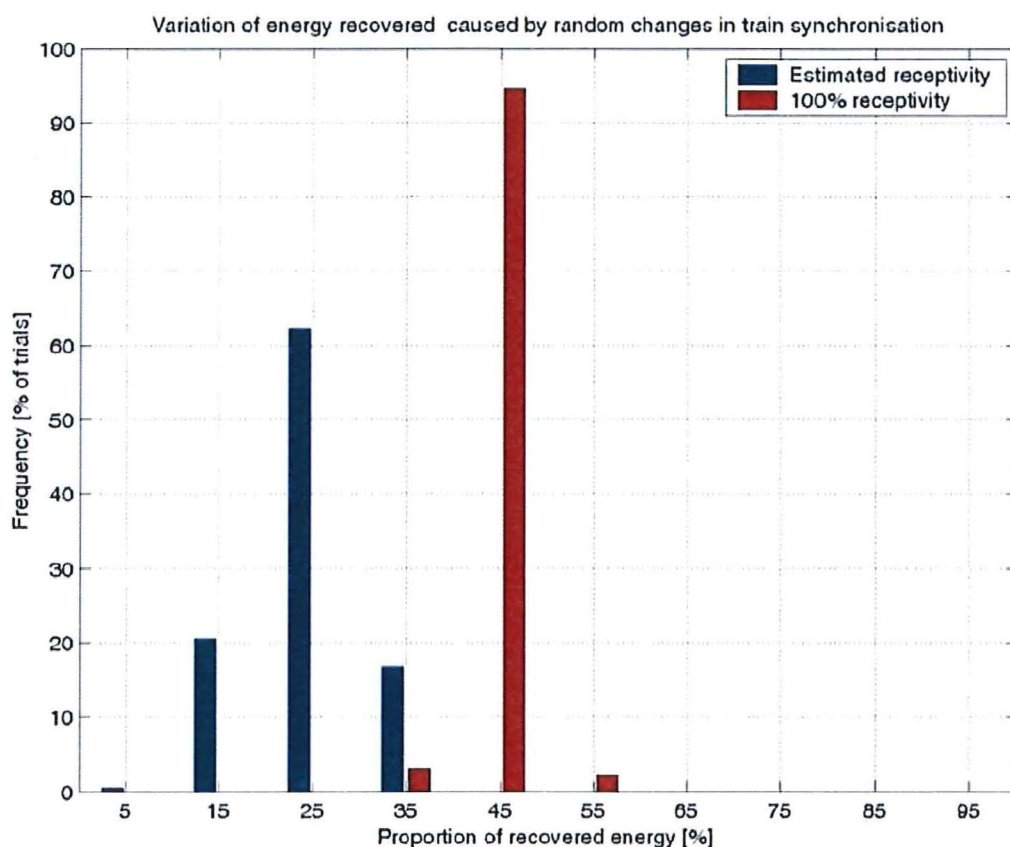
The recovery of regenerated braking energy can also be optimised by synchronising the motoring and braking phases of all the trains, this may be considered as part of the concept design of the automated train.

In a conventional DC traction supply system, energy regenerated by the trains must be used within the DC network as it cannot return through the rectifiers to the AC supply. This means that a train can only regenerate current if there are other (accelerating) trains nearby to consume the current.

SPT have undertaken a simulation based on operation of the new trains in the Subway system to assess the effect of train synchronisation on system receptivity by random variation of train starting and stopping times (with the present power supply configuration).

The results are shown in the histogram below where the blue bars show the distribution of actual energy recovered (i.e. regenerated current used by motoring trains) and the brown bars show the distribution of the maximum available regenerated energy (i.e. if the network was 100% receptive). The plot shows that the actual proportion of recovered energy is around 25%.

The theoretical maximum with 100% receptivity is around 45%.



In practise only part of this regenerated energy could be exploited. Some improvement can be made over the random result by the use of clever algorithms in the automatic train operation system: e.g. by holding a train at a station until a train is arriving on the other track. However, there is a limit to the effectiveness of this optimisation without delaying the timetable too much.

Please note, these possible measures for regenerative braking optimisation are conceptual at this stage, bearing in mind that the new rolling stock is not yet fully designed and discussions remain on-going in relation to these matters.

SPT's Subway Engineering/Projects sections would be happy to discuss the matter with you further. Should you wish to take up this option, please contact Eileen Russell, Head of Engineering and Maintenance (Telephone 0141-333-3205; E-mail Eileen.Russell@spt.co.uk).

cool

I hope this information is of assistance to you.

If, however, you are dissatisfied with the way in which SPT has dealt with your request, you are entitled to ask SPT to review its decision. Please note that for a review to take place you must:

- Lodge a written requirement for a review within 40 working days of the date of this letter;
- Include a correspondence address and a description of the original request and the reason why you are dissatisfied.

Any request for review should be made to:

Valerie Davidson
Assistant Chief Executive (Business Support)
Strathclyde Partnership for Transport
131 St Vincent Street
Glasgow G2 5JF.

You will receive notice of the results of the review within 20 working days of receipt of your request. The notice will state the decision reached by the reviewing officer as well as details of how to appeal to the Scottish Information Commissioner if you are still dissatisfied with SPT's response.

You must request an internal review by SPT before a complaint can be directed to the Scottish Information Commissioner.

If you have any further queries regarding this process, please do not hesitate to contact me.

Yours faithfully



Karen Millar
Paralegal