Jaunoji energetika 2008, Kaunas, 2008 m. gegužės 29 d.
CYSENI 2008, 29 May 2008, Kaunas, Lithuania
ISSN 1822-7554, www.cyseni.com

METHOD TO CALCULATE UNTAPPED REGENERATIVE BRAKING ENERGY IN URBAN ELECTRIC TRANSPORT

L. Latkovskis, L. Grigans
Institute of Physical Energetics
Aizkraukles Street 21, LV-1006 – Latvia
Phone: +371 25967501
E-mail: linardsgrigans@gmail.com

ABSTRACT

Nowadays all modern trams and trolleybuses are capable of recuperating the obtained kinetic energy back to overhead power supply network. However, it is impossible to return this energy back to the grid if none of the substations is equipped with a reversible rectifier. In this case the only time when regenerative braking energy is not dissipated in braking rheostats is when in the same overhead line section there is another electric vehicle which is consuming energy. Otherwise the braking energy is converted into heat and it is lost. This wasted energy is the untapped energy reserve. There are several solutions how to utilize this energy (e.g. equip substations with reversible rectifiers; install energy storage devices on vehicles; set up stationary energy storage devices connected to overhead line). Hovewer, to find out economic justification for implementing any of them, first, it is necessary to determine how extensive is the amount of unutilized regenerative energy.

The paper presents a method to calculate reserves of untapped regenerative braking energy in the urban electric transport power supply network. First, in the method, for each type of electric transport its typical power probability density function is obtained by registering power consumption over a sufficiently long time period. Second, according to electric transport timetable these functions of probability density are added together by applying the principles of probability theory. Finally, from resulting power probability function, it is possible to obtain mean wasted power. To calculate the untapped energy this power has to be multiplied with time. The method allows to estimate the economical aspects of utilization regenerative braking energy not only for the current situation, but also for the future reposing on plans for renewing electric transport fleet and changes in transport organization.