


Event:
Date:
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Energy in Buildings Athens Conference 2023

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Presentation title:	Effective Decarbonization of Metro Stations and Tunnels, using Energy Return to the City Grid – 20 kV and Smart Hybrid Energy Storage Systems (HESS)	
<p>Electrical energy for moving Metro trains comes from the city 20 kV Medium Voltage grid. Energy saving technologies and practices are under research and implementation for Metro systems, saving and reusing hundreds of GWh / year and preventing from emitting tons of CO₂ on a daily basis. This is done as follows :</p> <ol style="list-style-type: none"> 1. When a train brakes, its motors turn into generators, returning energy to the 3rd rail, where other trains may use it. This energy is quantified as 16% of the total traction energy for 3 min headways or up to 25% for 90 sec headways. This concept has been in operation >2 decades. The remaining braking energy is turned in heat, dispersed in tunnels and stations. 2. Based on new technologies energy not taken up by other trains, instead of turning into heat, may be returned back to the city 20 kV grid. This accounts for additional savings of up to 12% of the total train's traction energy (averaged at 1 MWh / station / day) and reducing emissions by up to 0,43 tons CO₂ / station / day to the city's atmosphere. 3. Utilizing a more advanced energy saving concept, train braking energy may be stored in series of supercapacitors / batteries and then used to power conventional energy consumers of Metro stations (eg lighting, escalators, ventilation, pumping, HVAC and other non-safety critical electrical loads) during normal everyday operation. For Metro Lines 2 & 3 in Athens, a saving of up 57,6 MWh/day or 23,6 tons of CO₂ daily is possible, powering up to 90 % of a station's stationary electrical loads and with the capability to power other public city electrical loads (e.g. lighting a city square at night). 4. Combinations of Metro systems energy saving technologies may further optimize energy saving and CO₂ reduction. 		
Short CV:	<p>Dr Mechanical Engineer, 31 years' experience in Metro/Tram Projects engineering for conventional/driverless systems. Worked for >100 Metro stations, >200 Metro Ventilation/HVAC and Electromechanical installations underground buildings, 20 Tramway stations, 10 depots, 6 bus and park&ride facilities. Currently Deputy Engineering Director in Elliniko Metro S.A. in Athens, Greece. Involved in Metro research projects within EU research frameworks. 53 publications in international journals/conferences.</p>	