

Metro to zip on regenerated power, cut carbon footprint

Trials On First Stretch To Start By Year-End, To Roll Out Early 2015

V Ayyappan | TNN

Metro rail has powered past more than a few setbacks to stay on course to start operating along the Koyambedu-Alandur (St Thomas Mount) elevated stretch early next year after trials are completed in December.

Corporation of Chennai is setting up a series of substations to supply electricity to metro's stations and trains. The transit system will be remarkably power-efficient: Each train will require 25kV of alternating current, but power regenerating braking systems and accurate train movement control will allow each rake to recover more than 30% of the energy it consumes.

Chennai Metro Rail Ltd engineers say trial runs between Koyambedu and Ashok Nagar have shown that the Alstom metropolis trains that will be used meet the energy saving component expected when the company selected the

French multinational firm to provide coaches for the system.

GREEN WHEELS

The city's most ambitious transport system is expected to reduce the city's carbon footprint because it will be five times more energy-efficient than other public transport options like bus networks or private vehicles and also help reduce vehicular traffic, especially once all sections are operational.

Metro rail will need a total of 70MW power to operate trains and for lighting and airconditioning of stations when trains start operations on both of the system's corridors by the end of 2015. An elaborate network of substations and auxiliary substations will light up stations and power metro rail through overhead cables. The stations will need 33KV to operate lights and communication systems. The trains will reduce the power requirement by using regenerated power for airconditioning and lighting.

The demand in Chennai during peak hours is between 3,000MW and 5,000MW.

Three substations, at Koyambedu, Alandur and Chennai Central, will

ON TRACK

Metro Rail will require 70MW power when both corridors open to traffic but the modern design of its trains will allow it to recover and reuse a large amount of the energy it uses

1 Three main substations to receive power from the grid: 110kV power from the grid will be supplied to three receiving substations at Alandur, Koyambedu and Central. These substations will convert it to 33kV for stations 25kV for rakes

2 To run trains: Power from receiving substations will be sent to three main substations to supply 25kV to overhead cables that will power metro's rakes

3 To run stations: Power from receiving substations will be sent to three auxiliary substations to supply 33kV power to stations | 33kV power will be converted to 413volts using a transformer and will be fed to the stations for lighting, air conditioning and to run other facilities

Back-up Energy | 1 diesel generator at elevated stations and 2 at underground stations

Illustration: Shirod Akkarapambal



POWER GRID



RECEIVING SUBSTATIONS



TO TRAINS



TO STATIONS



INTELLIGENT SYSTEMS SAVE ON POWER

Regenerative Braking:

► The propulsion unit of a train consists of a transformer, a converter and a traction motor. A converter-inverter harnesses kinetic energy that the wheels generate during braking and convert it into electricity

► This power is used to light the interiors of the coaches, for air-conditioning and to power the train information display and communication systems

Regenerative braking reduces energy consumption by 30%

TRACTION OF TRAINS ACCOUNTS FOR 60% TO 80% OF POWER USED BY A METRO RAIL SYSTEM. MODERN DESIGN WILL RECOVER A LARGE PORTION OF THIS

Engineer | CHENNAI METRO RAIL LIMITED

receive power from the state grid and convert it for use, while three auxiliary substations will supply power to stations. Three traction substations will transmit power to the overhead cables for the trains.

"We have connected the Koyambedu substation to the grid. All the switch gears are being put in place to supply power to the trains and stations," a senior CMRL official said. "Work is also in progress on the Alandur substation. The Koyambedu and Alandur substations

will power the line when the Koyambedu-St Thomas Mount line is opened for traffic early next year."

Unlike suburban trains, metro rail will operate on pre-programmed speeds, time and stops, requiring uninterrupted supply of power. Every station will have a back-up substation and one standby diesel power generator for elevated stations and two for underground stations.

"Traction of trains accounts for between 60% and 80% of the power consumption in a metro rail network.

But modern train design, with three-phase induction motors and converters, will help recover a large portion of the electricity consumed," a CMRL engineer said.

According to a paper by Delhi Metro Rail Corporation, metro railways worldwide save 20% of power through regeneration. "By using an intelligent blend of regenerative and pneumatic braking, optimisation of energy recovery as well as accurate control of train movement can be achieved," the paper said.