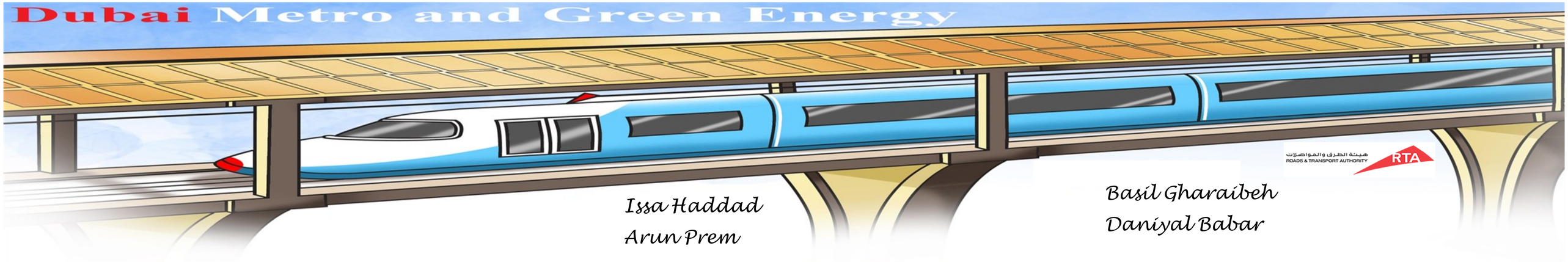
Dubai Metro and Green Energy



Issa Haddad
Arun Prem
Basil Gharaibeh
Daniyal Babar

Situation

- Due to increasing population, it is not ideal to use non-renewable energy, to power different means of public transport.
- In terms of electricity consumption UAE was ranked 37th worldwide with an annual consumption of 70.58 billion KWh[1].
- With almost 149,000 daily riders, the Metro is used more frequently and with the proposed expansion, Metro should be modified to run on green energy that will benefit the city in terms of energy consumption and it's vision towards a smart city. [2]

Figure 1: Dubai Metro On Expansion Track[3]

Solutions

- Advanced solar panels: Advanced panels produce 1000 W/m² at 46% efficiency[8].
- Regenerative braking: Saves 20% of the used energy[9].
- Battery generators: Store excess energy for later use[10].
- Energy Conservation Techniques: LED lighting, dimming the lights at night, adjusting air conditioning in empty or semi empty carts[4].
- Similar solutions would run the stations.

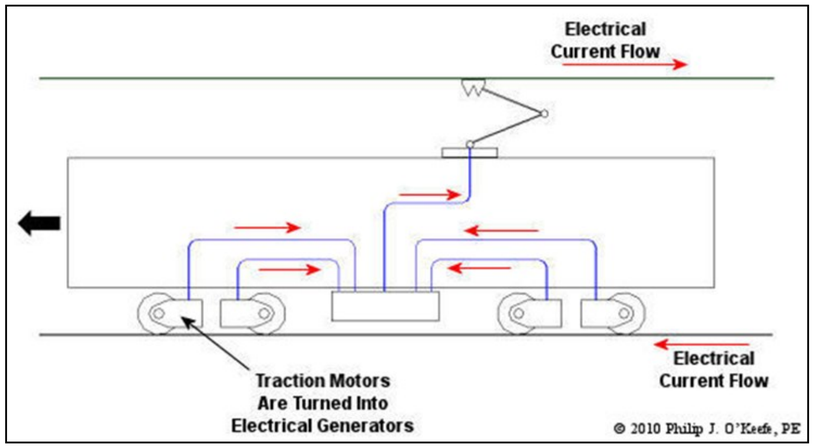


Figure 3: Kinetic Regenerative Braking

Evaluations

- Average cost per kWh will reduce significantly in the long run[11].
- Sun tracking system increases efficiency.
- No transmission costs + Hybrid stations are more efficient.
- UAE has highest per capita footprint.
- 30% of electricity to be provided by solar energy[12].

* Ultimately this also helps aid H.H. Sheikh Mohammed Bin Rashid Al Maktoum's vision to make Dubai a Smart City.

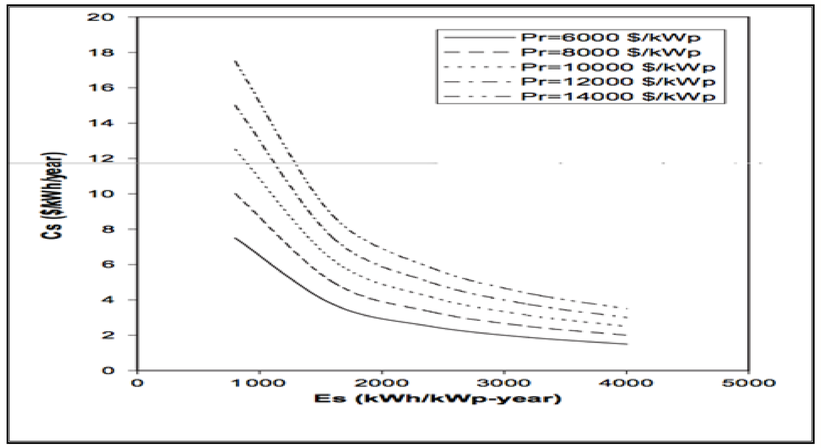


Figure 4: initial investment (Cs) Vs. electric output

Problems

- The rising cost of electricity is making it harder of the RTA to cover the cost of running the metro[4][5].
- Combustion of fossil Fuel is releasing greenhouse gasses which affect the environment and all living organisms.
- Shortages of fuel may result during peak power demand in summer [6].
- Metro uses an average power 8,300,000 kWh / month.
- An average of 2 Lb. of carbon dioxide is emitted per 1 kWh[13].

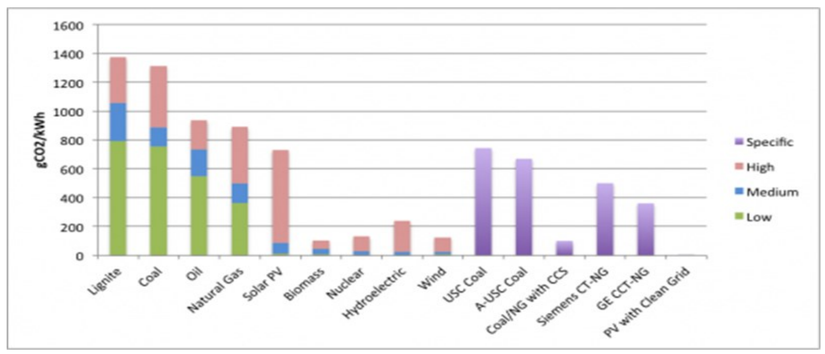


Figure 2: Carbon Emissions g/ kWh[7]

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