# Performance Assessment of a Geothermal Plant for Affordable Power Production in Cold, Remote Areas

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**Abstract:**

The need for more energy, environmental protection, and the pursuit of sustainability and decarbonization targets make the transition from traditional high-carbon fuels to low-/zero-carbon, reliable, and renewable energy sources—such as geothermal energy (GE)—vital today. In this study, the long-term performance of a geothermal power plant operating at its maximum capacity in a cold, remote area to provide clean, affordable, and baseload electricity is technically and economically assessed using HOMER and COMFAR software. The off-grid, heavily diesel-dependent community of Fort Liard (FL) in Canada's Northwest Territories (CNT) is chosen as the study site because of its suitable geological features. Utilizing real data/expenses/prices, the technical assessment illustrates

that, in addition to the provision of dispatchable, stable, and long-term (30 years) annual power for FL, the levelized cost of energy (LCOE) for operating a stand-alone geothermal plant at its full capacity is about CAD$ 0.07 per kWh—approximately ten times lower than the community's current power system cost of around CAD$ 0.70 per kWh, without government subsidies. From the economic assessment, the period of the geothermal plant's payback is found to be five years.

**Keywords:**

Geothermal plant, Levelized cost of energy, Payback, Sustainability, Decarbonization.