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Abstract

The farm settlement comprises of large hectares of crop plantation and a community of less than a hundred number of people living in low-cost buildings. The farm settlement project is a pilot public-private project majorly to facilitate crop production and encourage urban-rural settlement for the purpose of boosting crop exportation capacity of the country. There had been a difficulty in electrifying the farm settlement using the existing national grid. The nearest power station is about 1000 km from the farmland and the energy capacity available from the power booster station has already been chocked up by some closer and bigger communities. This study explored a sustainable energy source for a regular and dependable power supply for the farm settlement. The authors investigated the feasibility of having an electric power generation from a local river close to the farm settlement. Also, the econometrics for the Small Hydro Power Scheme was carried out to determine the viability of the proposed project.

Keywords

Econometrics Feasibility Hydro Power Plant Settlement

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References

1.

Bitar Z, Khamis I, Alsaka Z, Al Jabi S (2015) Pre-feasibility study for construction of mini hydro power plant. Energy Proc 74:404–413CrossRefGoogle Scholar

2.

Jawahar CP, Michael PA (2016) A review on turbines for micro hydro power plant. Renew Sustain Energy Rev 72, no. October 2015, pp 882–887, 2017. Author F (2016) Article title. Journal 2(5):99–110CrossRefGoogle Scholar

3.

Mite-león M, Barzola-monteses J (2018) Statistical model for the forecast of hydropower production in Ecuador, vol 8, no 2Google Scholar

4.

Signe K, Bertrand E, Hamandjoda O, Antoine FN, Takam G, Bertrand C (2017) Modeling of rainfall-runoff by artificial neural network for micro hydro power plant: a case study in Cameroon, pp 15511–15519Google Scholar

5.

Loots I, Van Dijk M, Barta B, Van Vuuren SJ, Bhagwan JN (2015) A review of low head hydropower technologies and applications in a South African context. Renew Sustain Energy Rev 50:1254–1268CrossRefGoogle Scholar

6.

Gaiser K, Erickson P, Stroeve P, Delplanque JP (2016) An experimental investigation of design parameters for pico-hydro Turgo turbines using a response surface methodology. Renew Energy 85:406–418CrossRefGoogle Scholar

7.

Signe EBK, Hamandjoda O, Nganhou J, Wegang L (2017) Technical and economic feasibility studies of a micro hydropower plant in Cameroon for a sustainable development. J Power Energy Eng 05(09):64–73Google Scholar

8.

Signe EBK, Hamandjoda O, Nganhou J (2017) Methodology of feasibility studies of micro-hydro power plants in Cameroon: case of the micro-hydro of KEMKEN. Energy Proc 119:17–28Google Scholar

9.

Elbatran AH, Yaakob OB, Ahmed YM, Shabara HM (2015) Operation, performance and economic analysis of low head micro-hydropower turbines for rural and remote areas: a review. Renew Sustain Energy Rev 43:40–50CrossRefGoogle Scholar

10.

Sangal S, Garg A, Kumar D (2013) Review of optimal selection of turbines for hydroelectric projects. Int J Emerg Technol Adv Eng 3(3):424–430Google Scholar

11.

Pratap Nair M, Nithiyananthan K (2016) Feasibility analysis model for mini hydropower plant in Tioman Island, Malaysia. Distrib Gener Altern Energy J 31(2):36–54CrossRefGoogle Scholar

12.

Cazzago D (2013) Technical and economical feasibility of micro hydropower plantsGoogle Scholar

13.

Singh VK, Singal SK (2017) Operation of hydro power plants-a review. Renew Sustain Energy Rev 69:610–619CrossRefGoogle Scholar

14.

Ho-Yan B (2012) Design of a low head pico hydro turbine for rural electrification in CameroonGoogle Scholar

15.

Zhou D, Deng ZD (2017) Ultra-low-head hydroelectric technology: a review, vol 78, pp 23–30CrossRefGoogle Scholar

16.

Ebhota WS, Inambao F (2016) Design basics of a small hydro turbine plant for capacity building in sub-Saharan Africa. Afr J Sci Technol Innov Dev 8(1):111–120CrossRefGoogle Scholar

17.

Nasir BA (2014) Design considerations of micro-hydro-electric power plant. Energy Proc 50:19–29CrossRefGoogle Scholar

18.

Williamson SJ, Stark BH, Booker JD (2014) Low head pico hydro turbine selection using a multi-criteria analysis. Renew Energy 61:43–50CrossRefGoogle Scholar

19.

Prajapati PVM, Patel PRH, Thakkar PKH (2015) Design, modeling & analysis of Pelton wheel turbine blade, vol 3, no 10, pp 159–163Google Scholar

20.

Nigussie T, Engeda A, Dribssa E (2017) Design, modeling, and CFD analysis of a micro hydro Pelton turbine runner: for the case of selected site in Ethiopia. Int J Rotating MachGoogle Scholar

21.

Ishola FA, Azeta J, Agbi G, Olatunji OO, Oyawale F (2019) Simulation for material selection for a Pico Pelton turbine's wheel and buckets. Proc Manuf 30Google Scholar

22.

Zainuddin H, Yahaya MS, Lazi JM, Basar MFM, Ibrahim Z (2009) Design and development of Pico-hydro generation system for energy storage using consuming water distributed to houses. Int J Electr Comput Energ Electron Commun Eng 3(11):154–159Google Scholar

23.

Khomsah A, Sudjito, Wijono, Laksono AS (2019) Pico-hydro as a renewable energy: local natural resources and equipment availability in efforts to generate electricity. In: IOP conference series: materials science and engineering, vol 462, p 012047CrossRefGoogle Scholar

24.

AHEC (2012) Standards/Manuals/Guidelines for small hydro developmentGoogle Scholar

25.

Kirmani S, Jamil M, Akhtar Y (2017) Bi-directional power control mechanism for a microgrid hybrid energy system with power quality enhancement capabilities, vol 7, no 4Google Scholar

26.

Breeze P (2019) Power generation technologies, 3rd edn. ElsevierGoogle Scholar

27.

Oyedepo SO, Fagbenle RO (2011) A study of implementation of preventive maintenance programme in Nigeria power industry—Egbin thermal. In: Energy power engineering, vol 2011, July, pp 207–220Google Scholar

28.

Ajayi OO, Ohijeagbon OD (2017) Feasibility and techno-economic assessment of stand-alone and hybrid RE for rural electrification in selected sites of South Eastern Nigeria. Int J Ambient Energy 38(1):55–68CrossRefGoogle Scholar

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