



“Gheorghe Asachi” Technical University of Iasi, Romania



MANAGEMENT PLANNING METHOD FOR SUSTAINABLE ENERGY PRODUCTION FROM FOREST BIOMASS: DEVELOPMENT OF AN OPTIMIZATION SYSTEM AND CASE STUDY FOR A FINNISH ENERGY PLANT

Teijo Sakari Palander^{1*}, Ari Hietanen²

¹*Faculty of Science and Forestry, University of Eastern Finland, Joensuu, Finland*

²*Stora-Enso, Fluting Mill, Heinola, Finland*

Abstract

In this study, we consider a potential Finnish solution to sustainable energy production to satisfy the European Union's forest-related energy policies related to climate change. Conventional energy production includes a number of fossil fuel, peat, and renewable fuel procurement chains that supply a combined heat and power (CHP) plant during different periods of the year. In Finland, peat is commonly used as fuel by energy plants. However, it is not environmentally friendly because it is considered a non-renewable fuel that increases CO₂ emissions and promotes climate change. In this study, we developed a management planning method for more sustainable energy production and tested it using the Finnish government's tax policy decisions to replace peat with wood and the available wood harvesting capacity to increase use of renewable forest fuels. The methodology used data from a geographically decentralized wood procurement organisation to calculate resource availability and costs. The resulting databases were then used for adaptive optimisation in a manner relevant to a decentralized organisation. We combined this approach with the CHP plant's electricity procurement and energy production objectives to describe the complexity of forest-energy flows. Using the developed management planning system, we found that meeting the peat tax and forest technology targets may not meet Finland's targets for sustainable energy production. However, forest biomass has potential rural, technical, and bio-economical capabilities for decentralized energy production by Finnish CHP plants

Key words: CHP, forest biomass, forest technology, fossil fuel, peat, wood procurement

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* Author to whom all correspondence should be addressed: e-mail: teijo.s.palander@uef.fi; Phone: +358 13 2513638; Fax: +358 13 2511111