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Ammonia production from black liquor gasification and co-gasification with pulp and waste sludges: A techno-economic assessment

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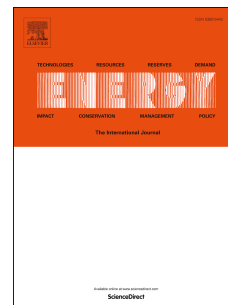
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1 **Ammonia production from black liquor gasification and co-**
2 **gasification with pulp and waste sludges: A techno-economic**
3 **assessment**

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7 **Abstract**

8 The economic feasibility of producing ammonia through the gasification of three different
9 feedstocks produced in pulp and paper mills is investigated in this paper. The first case uses
10 black liquor, the main by-product of the kraft pulping process, as the feedstock, and in the other
11 two cases pulp sludge (PS) and waste sludge (WS) are co-gasified with black liquor. For all three
12 cases, a process model in which mass and energy balances were calculated was developed. The
13 model results were used to estimate the equipment size and estimate costs. Techno-economic
14 models were developed and ammonia production costs were calculated. A case study for Alberta,
15 a western Canadian province, was conducted. The results indicated that for a 10% discount rate
16 (or internal rate of return [IRR]), ammonia production in all three cases is cost competitive with
17 current ammonia prices. The cost of production (COP) of ammonia for all three cases ranges
18 from 743-748 \$/t. Sensitivity and uncertainty analyses were conducted on the estimated COP,

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