

Development of a Framework for Assessment of Market Penetration of Oil Sands Energy Technologies in Mining Sector

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Abstract : Alberta's mining sector consumed 871.3 PJ in 2012, which is 67.1% of the energy consumed in the industry sector and about 40% of all the energy consumed in the province of Alberta. Natural gas, petroleum products, and electricity supplied 55.9%, 20.8%, and 7.7%, respectively, of the total energy use in this sector. Oil sands mining and upgrading to crude oil make up most of the mining energy sector activities in Alberta. Crude oil is produced from the oil sands either by in situ methods or by the mining and extraction of bitumen from oil sands ore. In this research, the factors affecting oil sands production have been assessed and a framework has been developed for market penetration of new efficient technologies in this sector. Oil sands production amount is a complex function of many different factors, broadly categorized into technical, economic, political, and global clusters. The results of developed and implemented statistical analysis in this research show that the importance of key factors affecting on oil sands production in Alberta is ranked as: Global energy consumption (94% consistency), Global crude oil price (86% consistency), and Crude oil export (80% consistency). A framework for modeling oil sands energy technologies' market penetration (OSETMP) has been developed to cover related technical, economic and environmental factors in this sector. It has been assumed that the impact of political and social constraints is reflected in the model by changes of global oil price or crude oil price in Canada. The market share of novel in situ mining technologies with low energy and water use are assessed and calculated in the market penetration framework include: 1) Partial upgrading, 2) Liquid addition to steam to enhance recovery (LASER), 3) Solvent-assisted process (SAP), also called solvent-cyclic steam-assisted gravity drainage (SC-SAGD), 4) Cyclic solvent, 5) Heated solvent, 6) Wedge well, 7) Enhanced modified steam and Gas push (emsagp), 8) Electro-thermal dynamic stripping process (ET-DSP), 9) Harris electro-magnetic heating applications (EMHA), 10) Paraffin froth separation. The results of the study will show the penetration profile of these technologies over a long term planning horizon.

Keywords : appliances efficiency improvement, diffusion models, market penetration, residential sector

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