

Life cycle assessment of procurement and conversion of biomass and fossil fuels - used for energy production in Denmark 1997

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The Danish energy production is partly based on fossil fuels and partly based on renewable energy sources of which biofuels is a significant element. In Denmark the cost price of fuels used for energy production is added a CO₂ tax. This tax is determined only according to the emission of greenhouse gases when the fuels are combusted. The objective of this work is to determine and include the emissions due to energy consumption during the procurement of Danish fuels in 1997. The means are to illuminate the energy consumption and emissions of greenhouse gasses (mainly CO₂, CH₄ and N₂O), NO_x and SO₂, which is not included in the regulation from the Danish government.

Life Cycle Assessment on the procurement

The study performed in this work is life cycle assessments on the pre-combustion life of fuels; straw, wood chips, Danish wood pellets, imported wood pellets, coal, oil and natural gas. The study is based on actual conditions regarding extraction, farming, cultivation, transportation, and machinery etc. for Danish fuels.

The approach to the work has been to collect information regarding extraction methods related to the fossil fuels, and characteristic data related to the cultivation of bio fuels. This was done through literature and different international research institutes, and models were built up for the individual fuels.

Results

The results are that coal and oil are the most energy consuming fuels, when it comes to the procurement. Natural gas consumes half of the energy needed for coal per GJ. The energy used for procurement of straw is 42%, wood chips 49% and wood pellets 54% and 67% for Danish produced and imported.

Results from the life cycle analysis show that when it comes to greenhouse gas, NO_x and SO₂ emissions coal is the most emitting energy resource. Oil is emitting 59% of the quantity of greenhouse gasses, which are emitted per GJ coal. Natural gas is emitting 30% of coal, wood chips and straw 22%. Wood pellets are emitting 33% and 40% for Danish produced and imported respectively. Similar tendencies have been discovered when it comes to the NO_x and the SO₂ emissions.

Conclusion

The conclusion is that the use of renewable energy sources, in terms of biofuels, results in a significant environmental benefit not only due to the actual combustion, but the tendency is enhanced if one includes the procurement into the calculations.

References

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