Bioenergy: Advanced biofuels

Advanced biofuels (beyond first and second generation) have been considered as they present a large scope for use as transportation fuel. Microalgal biofuels and macroalgal (seaweed) fuels (offshore) have been considered under this scenario, as AP possesses a large coastline and wastelands which can be used for these technologies. They qualify theoretically by resource assessment to cater to the magnitude of the state's transportation fuel needs. These are still in the R&D stage and are considered to be in a relatively earlier stage of development compared to lignocellulosic biofuels. Sea water has been considered to be the appropriate water source. One technology (microalgae) has been considered to illustrate the extensive production, while the other (macroalgae) has been projected for representative purpose with lower numbers. The numbers may be used interchangeably depending on whichever technology (or combination thereof) matures better. This analysis captures future scenarios of this emerging technology, starting production from 2025 onwards.

Level 1

In Level 1, no micro or macro-algae development is assumed, keeping this level at 0.

Level 2

In Level 2, no micro or macro-algae development is assumed, keeping this level at 0.

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Level 3

In Level 3, the algal fuel development is assumed to be develop, with about 375 ha of land used for micro algae, and 75 ha of sea farmed for macro algae. An area productivity of 55 g/m2 /day has been considered and Lipid content envisaged at 28% for microalgae. This relates to microalgal biofuel production of 17.3 ktoe/year by 2050. Offshore macroalgae also picks up with commercial production starting from 2025. 55 g/m2 /day productivity has been considered with energy yield of fuel conversion process increase to 52% by 2050 from the present 20% as in lignocellulosic liquid fuels. Liquid fuel production from macroalgae reaches 3.6 ktoe/yr by 2050.

Level 4

In Level 4, the most optimistic scenario is assumed where 750 ha of land used for micro algae, and 375 ha of sea farmed for macro algae. An area productivity of 75 g/m2 /day has been considered and Lipid content envisaged at 38% for microalgae. This relates to microalgal biofuel production of 64 ktoe/year by 2050. For offshore macroalgae, 75 g/m2 /day productivity has been considered with energy yield of fuel conversion process increase to 62% by 2050. Liquid fuel production from macroalgae reaches 28.1ktoe/yr by 2050.