SUMMARY: Green platform chemicals and biofuels(s) can be produced from wet biomass pretreatment integrated with supercritical water gasification. This is a novel biorefinery concept. However, the utilization of low grade heat to improve economics has been a challenge. This article describes a process model and simulations in which an Organic Rankine Cycle (ORC) was combined with Supercritical water gasification (SCWG) system. The working fluid used in this study is CO₂. It has many advantages, low cost, low toxicity, is nonflammable and has no environmental impact. In this modeling, water temperature in the range of 170 – 200 ºC and a flow of 7200 kg/hr was used as the low-grade heat source. CO₂ is biomass derived in the same process which can be produced about 1300 kg/hr. Aspen Plus™ process modeling software is used to model this system. The efficiency of the process is evaluated.

**CONCLUSIONS**

- Organic rankine cycle can be operated on low temperature heat source in a (wet) biomass supercritical water gasification (SCWG) system. The applications can be divided into two different working fluids, were operating on the same heat source.
- Toluene has been chosen as the step in an extraction unit in the same process. The working fluid used as Toluene in ORC, can be operated on low temperature heat source in a (wet) biomass SCWG system and the result show relatively high power output.
- The working fluid used as CO₂ in power cycle, is biomass derived in the same process. It has many advantages, low cost, low toxicity, nonflammable and no environmental impact.
- Work net of CO₂ flow rate at 1300 kg/h in CO₂ power cycle is relatively low, therefore limiting the CO₂ production in this process. However, the increasing of work net can be increased by employing CO₂ flow rate.