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Financing Renewable Energy in Indonesia: A CGE Analysis of Feed-In Tariff Schemes

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Abstract

This paper examines the impact of promoting clean (renewable) energy production through feed-in tariff (FIT) schemes on Indonesia's economy and on greenhouse gas (GHG) emissions. For numerical analysis, we designed a hybrid computable general equilibrium (CGE) model that explicitly incorporates electricity generation technologies. The Indonesian FITs have been stipulated in Government Regulation No. 79/2014 on National Energy Policy. We assume that the government sets a 15% subsidy rate for renewable generation technologies. Two possible financing schemes are implemented: (i) the FIT is paid by electricity consumers through the endogenous electricity tax rate; and (ii) the FIT is financed by a carbon tax adjustment. The results show that the effects of both FIT scenarios on macroeconomic and CO2 emission accounts are negligible. These negligible effects are due to the low shares of renewables (geothermal and hydro) generation load in total electricity mix. Therefore, we argue that Indonesia's

current FIT regulation is insufficient to boost the national clean energy production and therefore is ineffective to reduce the national emissions.

Tulisan ini menelaah dampak promosi kebijakan produksi energi bersih terbaharukan (EBT) melalui skema pengenaan feed-in tariff (FIT) bagi perekonomian Indonesia dan bagi emisi gas rumah kaca. Untuk analisis numerik, penulis merancang model computable general equilibrium (CGE) hibrid yang secara eksplisit menggabungkan teknologi penciptaan listrik. Kebijakan FIT di Indonesia telah ditetapkan melalui Peraturan Pemerintah Nomor 79 Tahun 2014 mengenai Kebijakan Energi Nasional. Kami mengasumsikan pemerintah menetapkan subsidi 15% bagi penciptaan teknologi EBT. Kami menelaah dua kemungkinan skema pembiayaan: (1) FIT yang dibayarkan oleh konsumen listrik melalui tarif listrik endogen, dan (2) FIT yang dibiayai oleh penyesuaian pajak karbon. Hasil menunjukkan bahwa dampak dari kedua skenario FIT pada ekonomi makro dan emisi CO2 sangat kecil. Dampak yang dapat diabaikan ini mengacu kepada rendahnya proporsi EBT (panas bumi dan air) pada produksi listrik total. Penulis menyimpulkan bahwa kebijakan FIT Indonesia saat ini tidak cukup untuk mendukung produksi energi bersih nasional dan oleh karenanya, tidak efektif untuk mengurangi jumlah emisi nasional.

Keywords:

feed-in tariff | renewable energy promotion | greenhouse gas emissions | carbon tax | hybrid CGE model | Indonesia

JEL classification:

C68 | D58 | D63 | Q21 | Q26 | Q28 | Q41 | Q43 | Q48 | Q56 | Q58

Notes

1. The studies referred to here are from peer-reviewed literature.

2. The issue of energy–capital complementarity and substitutability has been a major controversy in some economic literature related to energy modelling (Allan et al. 2008; Burniaux, Nicoletti, and Oliveira-Martins 1992). However, we justify the non-substitution

possibilities (complementar- ity) between the inter-fuel and fuel factor in non-energy producing sectors based on Burniaux and Truong's (2002) and Orlov, Grethe, and Macdonald's (2013) models.

3. For detailed explanations, see Wing (2006).

4. In Indonesia's official SAM in 2008, all types of energy fossil sectors (oil, coal, and natural gas mining) are pooled together with geothermal and metal ores in a single account — 'fossils and metal ores mining sector'. Refineries products are aggregated in a single account, namely 'chemical, fertiliser, clays, and cements products'. Electricity is pooled together with other utilities such as drinkable water and city gas products. We put forward the argument that the set comprising three energy sectors in the existing SAM will not be sufficiently applicable to calibrate the hybrid-CGE model for specific energy analysis in Indonesia.

5. We only present an example of import and tariff discrepancy of COMOIL_C given in the existing SAM and compiled data. These discrepancies appear for all types of imported energy commodities.

6. For details, see Robinson et al. (2001).