International Journal of Applied Engineering Research ISSN 0973-4562 Volume 10, Number 18 (2015) pp 38842-38844

Mechanism Selection of Subsidized Diesel Oil Pricing Policy in Indonesia Using Analytic Network Process

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Abstract
Indonesian government still provides subsidies for fuel, especially for diesel that is used in certain sectors. An increase in fuel oil consumption, particularly the subsidized diesel, results in the higher amount of the subsidy that should be delivered by the Indonesian government, which in turn makes subsidy budget for fuel takes a lot of space on the allocation of state budget. Therefore, we need the proper and more effective and efficient fuel pricing mechanism in Indonesia, especially for diesel. Analytic Network Process is the method that has been used to select the proper subsidized diesel pricing mechanism, with its related criteria filtered through the Delphi method. Five experts from a few of the Indonesia ministries related to the determination of fuel pricing policy have been involved in this research as the respondents to the distributed questionnaires. The outcome of this research is the criteria and its order of priority that must be considered by the Indonesian government in determining the price of subsidized diesel. Finally, the result of this research states that "Price Smoothing Using Price Stabilization Fund" (PSOF) is considered to be the best subsidized diesel pricing mechanism with highest priority score out of three pricing mechanism scenarios according to the method of Analytic Network Process.

Keywords: Pricing Mechanism, Diesel Oil, Analytic Network Process, Decision Science, Energy Subsidy.

1. Introduction

Indonesia's crude oil reserves can only be produced in the period of 22.99 years, 58.95 years for gas and 82.01 years for coal (Ministry of Energy, 2009). Final energy consumption in Indonesia in the period 2000-2012 increased on average by 2.9% per year with fuel as the most dominant type of energy, especially diesel, with the transportation sector as the most fuel users (BPPT, 2014). One of the government efforts in finding the solution to this problem can be in terms of fuel pricing, since the main cause of inefficiency in energy consumption is the low energy pricing policy that has been implemented by the Indonesian Government for decades. Regarding that the price of the subsidized fuel, especially diesel in Indonesia has a significant role to all user sectors, where the fuel prices have a direct impact on the cost of expenditure for all sectors and on the other hand also affect the financial condition of the country, as well as the need to consider internal and external factors in setting subsidized fuel pricing mechanism. This research will focus on the selection of the most influential criteria in determining the subsidized fuel price mechanism and the mechanism of subsidized fuel pricing policies for diesel oil in accordance with the conditions in Indonesia.

2. Literature Review

1.1. Energy Subsidies

Energy subsidies come in two main forms: consumer subsidies, which are designed to reduce the cost of consuming fossil fuels; and producer subsidies are aimed at supporting domestic fossil-fuel production, thereby serving indirectly as consumer subsidies at the same time because some producer subsidies can have the effect of lowering fossil-fuel prices (Ellis, 2010).

1.2. Energy Subsidy Reform

Reforming fossil fuel subsidies are an effective method to improve the structure of energy consumption (IEA; OECD; The World Bank, 2010). However, the reduction in energy subsidies will need to be supported by other policies that would limit the adverse impacts (Gangopadhyay, Ramaswami, & Wadhwa, 2005).

1.3. Delphi

Delphi method was first developed by Norman Dalkey from the RAND Corporation in 1950. Delphi has 4 characters that are anonimity, iteration, feedback control and statistical processing on the respondent group responses (Skumolski, 2007). Experts needed in the study, at least four experts from the field associated with the object of research, which each have a work experience of more than ten years as head of the department or office level, which reflects that the expert skilled in the art (Dachyar M., Eriyatno , Rusli, & Zagloel, 2013).

1.4. Analytic Network Proces (ANP)

ANP is a general theory of relative measurement used to derive the ratio of composite priority scales of individuals that represent relative measurement of the effect of elements that interact with respect to control criteria (Saaty T.L., 1999). ANP is most widely used MCDM, which allowed more complexes relationship between elements by replacing the hierarchy into the networks (Dachyar & Yupita, 2014).

3. Research Methodology

1.5. Collecting Data

Data collection was associated with three groups of data. The first data was downstream oil and gas industry conditions in

Indonesia, including the consumption and the subsidy portion of diesel oil. The second was mechanism of subsidized diesel oil pricing policy that has been applied in Indonesia and other country. The third was literature studies related to criteria considered by many countries when determine mechanism of fuel pricing policy.

1.6. Stage Processing and Data Analysis

Data processing is done by using the ANP method steps,as follow: (1) identification of criteria; (2) criteria selection; (3) determination of the interdependence relationship between criteria; (4) model construction based on dependency relationship matrix; (5) construct pairwise comparisons questionnaire between groups/criteria; (6) construct supermatrix (unweighted, weighted and limit); (7) establishing final priorities; (8) prioritization of subsidized diesel oil pricing mechanism in Indonesia; (9) determine criteria ranking; (10) sensitivity analysis.

4. Results and Discussion

1.7. Mechanism Selection of Subsidized Diesel Oil Pricing Policy

Results of the questionnaire from five expert using Delphi method resulting 14 criteria that influence mechanism selection of subsidized diesel oil pricing policies with Geometric Mean values above 2.75. Subsequently determined the relationship of interdependence between the criteria in one group (inner dependency) or between groups (outer dependency). Relations between the criteria described in the form of a matrix based on expert opinion through a questionnaire. Fuel pricing mechanism selection model is made based on group that has been made and the interdependence relationship between the criteria, refers to the ANP method.

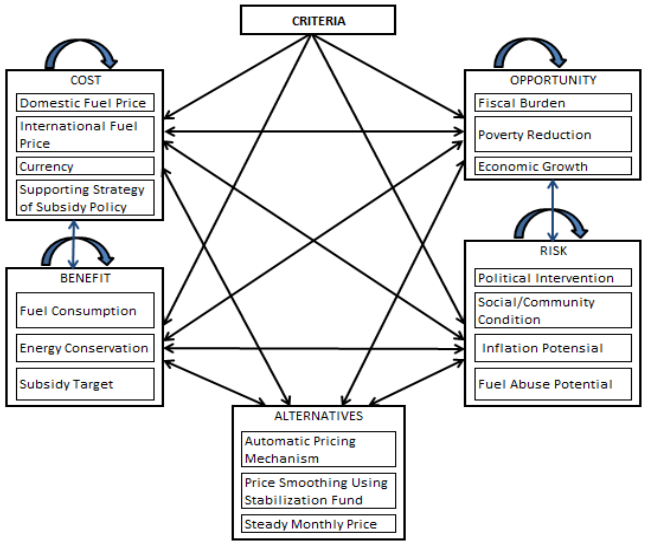

Fig.1. Model Construction

Pairwise comparisons questions made in some groups of criteria that affect other criteria. Cells were poured in pairwise comparisons are cells that have value ≥3. Furthermore, the average value were calculated from the results of the assessment using a geometric series (geometric mean) to obtain the relative importance value. Unweighted Supermatrix made based on pairwise comparisons between groups / criteria / alternatives, by entering a priority value (eigen vector) into the matrix corresponding to the cell.

Weighted Supermatrix obtained by using the value of the Group Matrix to give weight in Unweighted Supermatrix. The way to give weight is by multiplying the value in the Group Matrix cell with a value in each appropriate Unweighted Supermatrix cell. Limit Supermatrix obtained by raising Weighted Supermatrix to the limit by multiplying itself. When the priority values in each column are the same, then Limit Supermatrix has been established. Subsequently to be normalized by the group, so that the total value of priority for each group agregated one.

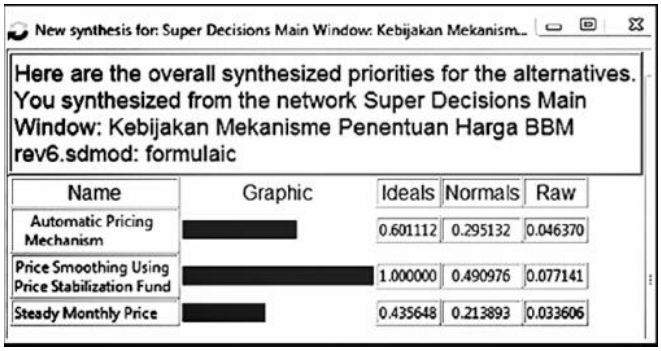

Fig.2. The rating of Subsidized Diesel Oil Pricing Mechanism

Determination of the criteria ranking was conducted by normalizing the limit priority value, Alternatives Group not included in the calculation.

Table 1. Criteria Ranking

Cluster	Name	Limiting	Normalized	Rank
I. Benefit (0.3435)	Fuel consumption	0.1274	0.1512	1
	Energy conservation	0.0430	0.0510	10
	Subsidy target	0.1192	0.1414	2
II. Opportunity (0.2722)	Fiscal burden	0.0890	0.1056	3
	Poverty reduction	0.0579	0.0687	5
	Economic growth	0.0825	0.0979	4
III. Cost (0.2090)	Domestic fuel price	0.0570	0.0677	6
	International fuel price	0.0325	0.0385	12
	Currency	0.0359	0.0426	11
	Supporting strategy of subsidy policy	0.0508	0.0602	8
IV. Risk (0.1753)	Political intervention	0.0165	0.0196	14
	Social/community condition	0.0539	0.0640	7
	Inflation Potential	0.0479	0.0569	9
	Fuel abuse potential	0.0294	0.0348	13

1.8. Discussion

Based on the results of data processing, Benefit criteria gain the greatest weight, ie 0.3435. Benefit criteria obtain the greatest weight because in Indonesia fuel subsidy including diesel oil subsidy burden fairly large on state budget, so that the experts are very concerned about aspects of benefits for the state in determining the subsidized fuel pricing mechanism. The highest priority value of sub criterion is fuel consumption (0.1512), indicating that the fuel consumption must be the primary government consideration in the selection of subsidized diesel oil pricing mechanism in Indonesia in order not to burden the government and society.

Price Smoothing Using Price Stabilization Fund has the highest priority value, ie. 0.491 which is defined as the best mechanism in determining the price of subsidized diesel oil in Indonesia. Automatic Price Mechanism mechanism is 60.11% as good as Price Smoothing Using Price Stabilization Fund mechanism and Steady Monthly Price mechanism is 43.56% as good as Price Smoothing Using Price Stabilization Fund mechanism. This mechanism is interesting to be studied further to be implemented in Indonesia, as the formula being offered seem to be able to ease the state burden of subsidies because the subsidy funds obtained from the oil fund which is the accumulated oil fund components that are part of the fuel price component or can be considered as subsidies paid with funds set aside from the sale of the fuel itself.

1.9. Sensitivity Analysis

The sensitivity analysis performed by shifting the vertical straight line to the right or left on the x-axis to the meeting point of vertical line with alternative graphic as critical point of priority order shifting. Based on the experimental results recapitulation of priority value changes of all the sub-criteria, it can be seen that the subsidized diesel oil pricing mechanism ratings in Indonesia unchanged until a certain value for each sub-criterion; i.e. (1) Price Smoothing Using Price Stabilization Fund, (2) Automatic Price Mechanism, and (3) Steady Monthly Price.

2. Conclusion

Based on the results of data processing and analysis, related to the purpose of this study it can be concluded that the best subsidized diesel oil pricing mechanism in Indonesia is the Price Smoothing Using Price Stabilization Fund. Recommendation that can be given regard to this study is a comparison needs to be done using the other pricing mechanism selection method, so that the results obtained with other perspectives.

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