

Estimation of Energy Demand in Construction Sector of Iran Economy

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Abstract. Construction industry is one of sub sectors of industries, mining and construction sector in Iran economy. Construction sector includes activities regarding construction of residential, commercial and administrative buildings in private and public sector. Value added of this sub sector constitutes a considerable part of value added of industry, mining and construction sector. Continuous growth of production of construction sub sector requires providing timely energy and other inputs of this sub sector. Planning for secured supply of energy in construction sub sector requires exact estimation of demand for energy in this sub sector. For this reason, in this paper, long run demand for energy in 2015, and 2025 in construction sector is estimated. Demand prediction is done with the application of Model for Evaluation of Demand for Energy via techno -economy software. The findings of model evolution show that demand for motor fuel in the sub sector of construction in 2015 and 2025 is 18.12 and 30.18 million barrel oil equivalent respectively. Demand for electricity is also 16.8 and 35.29 TWH in these years. Therefore, Demand for final energy in sub sector of construction in 2015 and 2025 is equal to 28.66 and 52.34 MBOE.

Keywords: Construction Sub Sector, Value Added, Demand for Energy, Industry and Mining Sector, Iran.

1. Introduction

The first step and perhaps the most fundamental pillar of energy planning in sub sector of construction, is the precise forecasting of energy demand in this sub sector. It is obvious that if this part of program is not planned correctly the achieved result of planning in regard to the volume of required investment for secured supply of energy in construction sub sector will not be reliable. Due to the importance of subject and the role of precise forecasting of energy demand, in energy planning for construction sub sector, in this paper it is tried to forecast demand for energy in this sector using an techno economy model entitled Model for Energy Demand Evaluation. This model has many advantages in analysis of energy demand particularly, in forecasting of long run demand for energy and considering the effect of technological improvement on energy demand. Introducing of structure and methodology of MEDEE-S in construction sector, analysis of existing construction in construction sub sector and forecasting of long run energy demand are the title which is discussed directly in this paper.

2. Research methodology and data gathering

Activities in construction sector require energy consumption. Energy consumption in this sector includes fossil fuel consumption and electricity consumption in machinery and motors. For calculation of motor fuel and electricity consumption in construction sector energy intensity and construction sector value added have been used. Energy intensity of motor fuel and electricity shows the final consumption of motor fuel and final consumption of electricity for each unit of value added in construction sub sector.

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Demand for motor fuel in construction sector is obtained by multiplying fuel consumption for each unit of value added in construction sector in index of motor fuel consumption change for each unit of value added as following equation:

$$MFBUIL = (MFBUBY \times MFBUCY \times YBUILD) / U$$

The definitions of variables used in this equation are as below:

MFBUIL: demand for motor fuel in construction sector.

MFBUBY: consumption of motor fuel for each unit of value added in construction sub sector in base year in terms of Rials in 1000 kilo calories.

MFBUCY: index of change in MFBUBY variable. The value of this index for base year is equal to one. The MFBUBY is the index of consumption of motor fuel for each unit of value added in construction sub sector in base year.

YBUILD: real value added of construction sector.

U: a coefficient which states demand in terms of selected unit by user.

It is to be mentioned that the variable of real value added in construction sector is calculated by multiplying of real gross domestic product in value added share of construction from RGDP which is obtained as follow:

$$YBUILD = PYBUIL \times Y$$

Definitions of variables in above equation are as below:

Y: Real Gross Domestic Product (billion Rials).

PYBUIL: Share of value added of construction sector from RGDP.

Final electricity demand in construction sector in MEDEE-S is calculated by multiplying value added of construction sector in electricity intensity and the index of change in energy intensity, as below equation:

$$ELBUIL = (ELBUBY \times ELBUCY \times YBUILD) / U$$

The variables of above equation can be introduced as below:

ELBUIL: Demand for electricity for each unit of value added in construction sector in terms of TWH.

ELBUBY: Consumption of electricity for each unit of value added in construction sub sector in base year in terms of Rials per KWH.

ELBUCY: Index of change in ELBUBY variable. The value of this index for base year is equal to one. The ELBUBY is the index of consumption of electricity for each unit of value added in construction sub sector in base year in terms of Rials per KWH.

U: A coefficient which states demand in terms of selected unit by user.

$$TOBUIL = MFBUIL + ELBUIL / U \times 0.86$$

In above equation, TOBUIL is the total demand for final energy in construction sector. In addition, in this equation, the coefficient of 0.86 converts the amount of demand for electricity from tra watt hour units to peta calories units (10^{15} calories).

The required information for base year have been collected from journals and documents published by data producing organization. The remaining data which are mostly related to entrance data for forecasted year is also gathered through utilizing expert point of views. The data and figures related to these variables are presented in table 1 and 2.

Table 1. The amount of MFBUBY and ELBUBY variables in construction sub sector in base year

Variables	Description	Quantities
MFBUBY	Motor fuel intensity in construction sub sector (million calories over Rials)	0.015
ELBUBY	Electricity intensity in construction sub sector (KWH over Rials)	0.006

Table 2. The amount of ELBUCY and MFBUCY variables in construction sub sector

Variables	Description	Year		
		Base year	2015	2025
ELBUCY	Changes in unit consumption of electricity index in the construction sub sector	1	1.320	1.579
MFBUCY	Changes in unit consumption of Motor fuel index in the construction sub sector	1	0.780	0.740

3. Estimation of long run energy demand in construction sub sector

By entrance of the calculated amount for each entering variable in base and forecasting years and executing of Model for Energy Demand Evaluation, the amount of energy demand in construction sector are estimated. The amount of demand for motor fuel and electricity in this sub sector in 2015 and 2025 based on Model for Energy Demand Evaluation findings are showed in table 3.

Table 3. The consumption of different kinds of energy carriers in construction sub sector

Descriptions	Unit	Year	
		2015	2025
Motor fuels	MBOE	18.12	30.18
Electricity	TWH	16.80	35.29
Total	MBOE	28.66	52.34

It can be seen from above table that energy consumption in construction sub sector is high and it has an accelerating growth rate. In total the energy demand in construction sub sector on average has a growth rate of 8.3% during the period under study. Average rate of growth of electricity consumption is about 11% and for motor fuel consumption is 8.26% during same period.

4. Conclusion

The findings of this paper shows that demand for electricity in construction sub sector of industries ,mining and construction sector of Iran economy are 16.8 and 32.29 TWH in 2015 and 2025 respectively. Consumption of this energy carrier has had a growth rate of 11% during this period. It is forecasted that consumption of motor fuel in this sub sector of Iran economy will be equal to 18.12 and 30.18 MBOE in 2015 and 2025. So the motor fuel consumption will experience an 8.26% rate of growth during same period. It is also forecasted that energy consumption in construction sub sector reaches from 28.66 MBOE in 2015 to 52.34 MBOE in 2025 which means a growth rate of 8.3% in those periods.

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