

DRAFT FINAL REPORT

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AN ENERGY DEMAND FORECASTING MODEL FOR ISRAEL AND
THE MARKET POTENTIAL FOR NATURAL GAS

BY

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I. INTRODUCTION

Israel faces a number of choices in securing reliable, clean, and efficient sources of energy over the next 25 years. Recent discoveries have generated interest in developing natural gas for domestic consumption to reduce dependence on coal and petroleum. The overall merits of developing these gas reserves involves a number of trade-offs involving energy security, the environment, and cost. For example, the recently discovered natural gas deposits are largely off the coast of the Gaza Strip, controlled by the Palestinian Authority. Clearly, the Israeli-Palestinian conflict casts a substantial risk premium on developing these resources. On the other hand, continued reliance on heavy fuel oil and coal involves economic and environmental risks as well, especially if carbon emission trading becomes widespread.

The first step in assessing these risks is to establish the future of energy demand in Israel and, thereby, the market potential for natural gas. To establish the boundaries of this future, this study develops a simple econometric model that identifies and measures the sensitivity of energy consumption to economic growth and energy prices. The model represents end-use energy demand in all sectors of the Israeli economy, including households, manufacturing, services, agriculture, water pumping, and electric power generation. The demand for primary fuels; such as fuel oil and coal in power generation, is derived from the demand for end-use electricity consumption. Moreover, end-use electricity prices are determined from marginal generation costs and transmission and distribution charges. The overall model provides a tool for policy makers to assess the impacts of different economic growth and energy price scenarios on energy demand, the market potential for natural gas, and the opportunity cost – in terms of higher fuel oil costs – of not developing natural gas reserves.

Developing a model of energy demand that provides stable forecasts and sensible policy analysis requires a combination of economic analysis, data measurement, and econometric modeling. Empirical models consistent with economic theory often ensure that policy and market shocks yield sensible results, such as consumption falling with increasing prices. Practical knowledge of the structure of energy consumption and the forces affecting its development is also critical to successful model development. The judgments made on the basis of these guidelines are discussed in this paper.

The next section provides an overview of energy consumption trends in the Israeli economy and discusses the methods employed to disaggregate fuel use by end-use sector. The presentation of the model appears in section three, discussing the mathematical formulation of the energy demand equations in the residential, goods and services, transportation, agriculture, water pumping, and electric utility sectors of the economy. The econometric estimates of price and income elasticities of energy demand by sector appear in section four. These estimates provide the basis for developing the energy demand forecasting simulation model discussed in section five. The model is simulated from 2002 through 2025 under three different scenarios for prices and economic growth. Another set of simulations that assume no natural gas market penetration are compared with the base simulations to estimate the fuel expenditure savings generated by

Table 14: Energy consumption forecasts by type of fuel, 2003-2025

		<i>Thousand metric tons, Electric - Million Kwh</i>					
	2001	<u>2002</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>	<u>2020</u>	<u>2025</u>
Electricity							
Low	42,678	43,696	45,574	51,941	58,361	65,258	72,871
Medium	42,678	43,820	46,890	56,305	67,228	80,166	95,580
High	42,678	43,666	48,646	66,090	90,918	125,451	172,730
Liquefied Petroleum Gas							
Low	444	440	469	525	431	496	572
Medium	444	436	482	576	589	719	858
High	444	440	509	711	941	1,320	1,817
Gasoline							
Low	1,954	1,922	1,943	2,094	2,275	2,475	2,694
Medium	1,954	1,922	1,949	2,122	2,337	2,581	2,851
High	1,954	1,922	1,958	2,217	2,575	3,008	3,516
Gas Oil & Diesel							
Low	2,541	2,754	3,222	3,685	3,926	4,266	4,634
Medium	2,541	2,752	3,235	3,719	4,034	4,410	4,809
High	2,541	2,754	3,276	3,922	4,500	5,171	5,925
Kerosene & Jet Fuel							
Low	1,027	930	803	791	841	908	983
Medium	1,027	929	1,177	1,437	1,638	1,840	2,061
High	1,027	930	1,195	1,544	1,885	2,276	2,742
Light Fuel Oil							
Low	425	764	614	63	18	10	6
Medium	425	803	620	75	35	22	14
High	425	755	628	103	76	63	49
Heavy Fuel Oil							
Low	3,231	3,387	1,816	517	172	111	71
Medium	3,232	3,388	1,911	714	415	329	251
High	3,232	3,388	2,035	1,185	1,216	1,376	1,480
Naphtha, White Spirit							
Low	968	958	988	561	642	736	843
Medium	968	958	1,002	584	685	805	946
High	968	958	1,026	649	835	1,076	1,387
Other Petroleum Products							
Low	761	776	857	1,048	1,280	1,564	1,910
Medium	761	776	896	1,170	1,527	1,992	2,599
High	761	776	954	1,465	2,251	3,457	5,311
Natural Gas							
Low	5	5	2,026	3,628	5,827	7,174	8,627
Medium	5	3	2,732	5,547	9,548	13,668	18,666
High	5	2	3,275	8,627	15,627	24,233	38,391
Coal							
Low	11,566	11,521	11,521	14,377	14,377	14,377	14,377
Medium	11,566	11,521	11,521	14,377	14,377	14,377	14,377
High	11,566	11,521	11,521	14,377	15,805	18,661	20,090
Total primary energy use							
Low	22,922	23,457	24,286	27,471	30,034	32,412	35,061
Medium	22,922	23,488	25,551	30,503	35,430	41,040	47,778
High	22,923	23,446	26,404	34,983	45,956	60,938	81,055