המכון הישראלי לתכנון כלכלי (ע"ר) The Israeli Institute for Economic Planning

The Use of Natural Gas in the Israeli Economy

1. Introduction

1.1. Israel is "thirsty" for natural gas.

Glass manufacturer Phoenicia is an outstanding example of Israel's potential thirst for natural gas. As the price of oil ramped up during 2008 and the global economy slowed, the company's profit was squeezed. The firm's oil-dependent energy bill increased, and at the same time the global recession took its toll, weakening client demand.

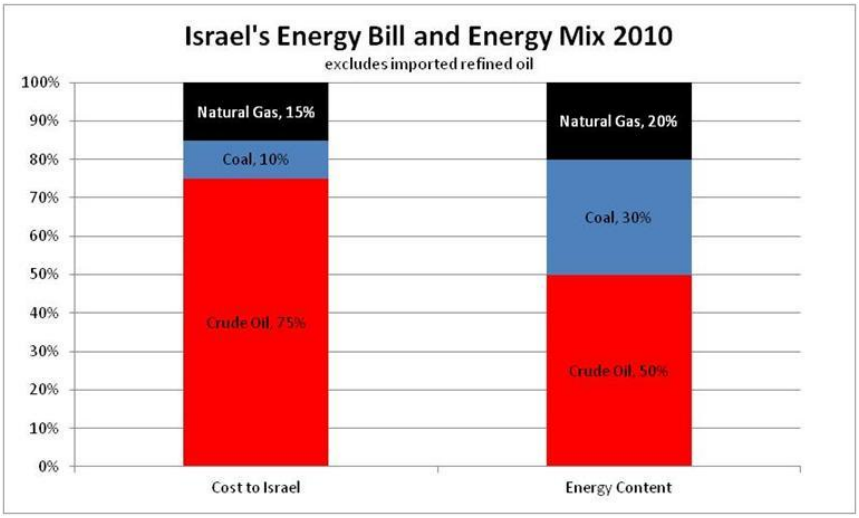
Earlier availability of gas could have taken the company out of dire financial straits. Cheaper gas could have replaced expensive oil. The Jerusalem Post reports Phoenicia CEO Eran Haimovitz

saying: *"the effect of the lack of natural gas for the company was $15m per year, for a company with $80m yearly revenue."*

In terms of business opportunities, economic productivity and national competitiveness, what is the bigger picture presented to Israel by domestic gas consumption? We are surely not discussing one company only, but rather the future of the Israeli industry, transportation as well as the cost of living.

1.2. Is Government Intervention Needed to Make Gas Work?

Gas presents a revolution to Israeli industry. For industry, the advantage of natural gas (GTE- "Gas To Energy") is clear; gas emits half the carbon dioxide pollutants per energy unit than coal and costs half as much per energy unit compared to crude oil. Furthermore, industry lies at the heart of Israel's economy. (Each person employed in industry creates three to four jobs in the service sectors; declines in industrial employment have serious repercussions to the wider economy).



Despite these clear economic benefits, as the following examples demonstrate, the market does not always "take care of itself". Inherent tensions can evolve to full-blow market failures.

Thus, government intervention is required in the gas market.

Tensions in the Gas Market Which May Lead to Market Failure			
	Interests of the Israeli Consumer / Industry	VS	Friction From:
1	**Israeli end-use consumers**	VS	Gas producers
	Enjoy the economic benefits of cheap natural gas (lower cost of energy, a greater range and abundance of consumer		Gas producers want to sell gas to the highest bidder. Currently, the highest bids come

	products enabled by gas) **and lesser pollution.**		outside Israel (e.g. Far East)
2	**Transportation: Israeli Consumer Interests**	**vs**	**Embedded Oil Interests**
	Consumers have a clear interest to seek cheaper transportation fuels, such as those based on natural gas. (In 2011, 9% of the cost of living for the average Israeli household went to the cost of gasoline and diesel, manufactured in one of Israel's two oil refineries).		Incumbent natural gas based fuels present an economic threat to embedded oil interests. Natural gas based transportation fuels risk niche players capturing market along the supply chain (from refineries to fuel retailers).
3	**Consumers Access to Cheap Gas**	**vs**	**Minimizing cost of distribution**
	An insufficient or monopolized gas supply gas transmission network may not meet market demand. This will drive up prices, making consumers pay more.		Distribution networks are expensive to establish. So to save budget, there is a will to avoid surplus (redundant) networks
4	**Equal access and pricing of gas**	**vs**	**Rapid transmission network establishment**
	A decade on, the only way small factories can receive gas is through intermediary marketing companies. They pay twice as much for the gas than the price large factories pay for the same product.		When the gas transmission (government) company INGL was established in 2003, by legal definition, only large customers would be served by the company. This enabled INGL to receive good credit and develop the transmission network relatively rapidly.

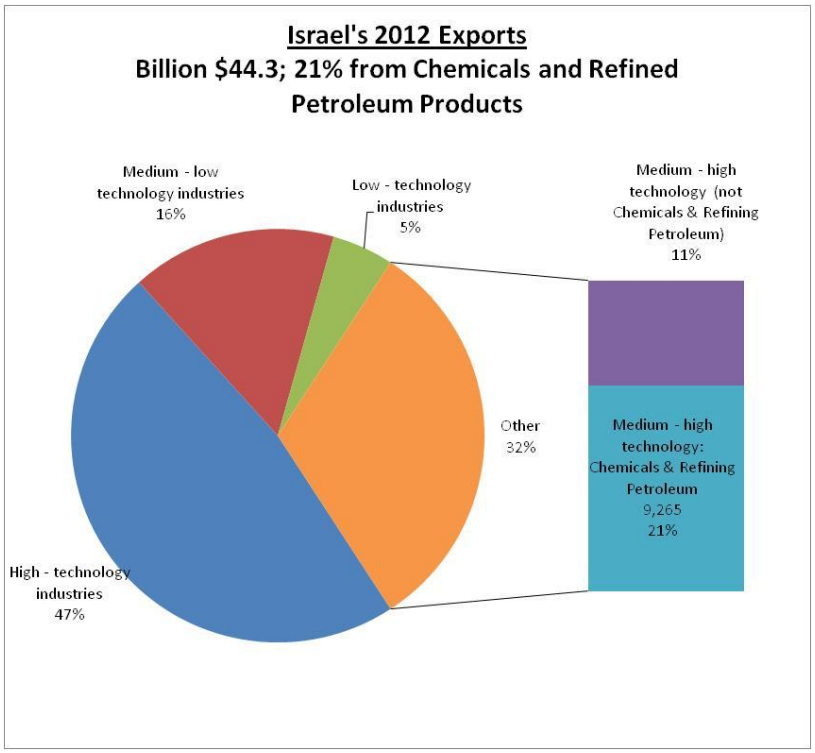
Natural Gas for Transportation: The Revolution A switch to natural gas based transportation is a huge opportunity and potential revolution for the Israeli consumer. Over half the oil consumed in Israel is directed to the road transportation sector. Transportation is a significant part of household expenditure; in 2010 gasoline alone made up, on average, the cost of household living. If all diesel and gasoline in Israel were replaced "overnight" by natural gas based fuels, this would instantly stimulate 7 BCM of gas demand per year, a greater quantity greater than has ever consumed in Israel on an annual basis. The savings – on an annual basis- would total $2.5 billion per year (2010 calculations). Therefore gas offers a huge opportunity for consumers to reduce their household expenditure and enable Israel, in line with the government policy, to push towards weakening oil dependence.

Export of GTC: The Revolution Possibly the most interesting opportunity for Israel's natural gas lies may well lie in the Gas-To-Chemicals ("GTC") industry. GTC can cover products manufactured in Israel from natural gas, rather than imported products or the manufacture of those some goods with expensive oil.

The Israeli economy, export driven, relies on over a fifth of its exports being based on the chemical and petrochemicals industry.

Natural gas can be used to maintain current levels of exports and building a new export sector, based on natural gas as a raw material.

We suggest that in GTC exports that the greatest opportunity is found.



Guide to this paper

The remainder of this paper explores how natural gas can work for Israel
Section 2 outlines lessons from around the world- America, Australia and Argentina- as a context for the relevance of the question posed by the expert consultative team.
Section 3 gives a schematic for understanding how natural gas could be utilized in the various end sectors in Israel
Section 4 outlines various demand projections for natural gas in Israel, noting the gaps in projections and understanding the reasons for these gaps
Please note than accompanying this report is the paper " *How Would Different Gas Prices Effect Israel*" in conjunction with Dr Gilead Fortuna of the Samuel Neaman Institute for National Research.
Section 5 Summary

2. Relevance of Differentiated Gas Pricing: Global Lessons

2.1. Argentina: Underestimation of Demand Creates a Gas Shortage and Price Increases to Local Industry and Citizens

Argentina underestimated its local demand, resulting in a decision to export the majority of produced natural gas to neighboring countries.

(For example, the exponential growth of natural gas in transportation was unforeseen).

Since the country could not ignore its international obligations, it was forced to hold good to its commitments for gas export sales and to import expensive gas.

Relevance for Israel

New end use sectors for natural gas and /or reducing the gas price for some end-sectors could also result a gap between projected and actual demand for natural gas.

This gap could be detrimental to Israel's net economic welfare since it could push gas prices up.

2.2. USA: Differential Gas Pricing - An Appropriate Consideration

The United States - the most free market economy in the world – is currently considering the meaning of export for the price of gas in the local market.

In the face of an economic depression, there has been a growing realization that there is more value adding to national economic productivity by using natural gas produced locally.

(Currently, only a minor percentage of natural gas export is permitted).

Recently the methanol production company Methanex transferred its methanol factory from Chile to Louisiana in the United States.

The wider question being debated is whether – as a national economic strategy- gas should be priced according to potentially profitable end-sectors. For example, in 2012 a study by the American Chemistry Council concluded that **low cost and available gas supply with a one-off $16 billion investment could increase % the United States' ethane capacity by 25 and yield a total economic output of $132 billion.**

Relevance for Israel

Different levels of gas pricing, designed to increase net economic welfare- is a legitimate debate for a free market economy to consider. It may have a positive economic spillover in areas such as the cost of living, GDP, employment, productivity gains and inter- and intra- industry competitiveness.

2.3. Australia and Anchoring Bias

If a country finds natural gas, there are two polarized decision paths which may be considered by policy makers in the assessment of the national economic benefit.

1. **Extracting gas and exporting it** –a business essentially based on market response
2. **Industry productivity from using natural gas as an input** –this covers maintenance of existing markets *and* creation of new markets through natural gas-based products

Anchoring bias can result in sub-optimal decision-making or severe policy errors.

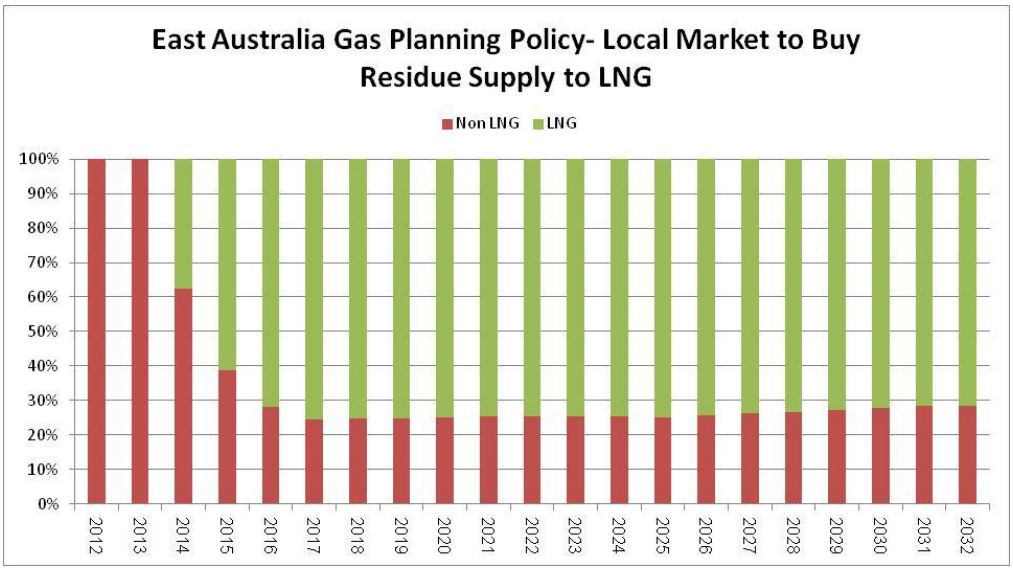
Anchoring bias occurs when analysis of risk-rewards of one decision path anchors the criteria used to analyze the second decision path.

This means a complete assessment of the unique risk-rewards of both decision paths are not accounted for.

See: The Australian Industry Group ("AIG") and the Plastics and Chemicals Industries Association ("PCIA") (*"Large scale export of East Coast Australia natural gas: Unintended consequences"*)

- This report essentially charged that the Australian government's East Coast gas policy was deeply flawed due to an anchoring bias.
- Anchoring bias was in favor of gas exports. This worked against Australia's citizens and industry.
- Australians are buying its gas, effectively, from the residue supply assigned to high priced LNG.
- This caused long term contracts to dry up and prices to rise toward the high priced LNG (which became a benchmark for local prices).
- Expectations for a 200- 300% increase in gas prices to local industry caused the CEO of Dow Chemicals[1], Andrew Liveris to call East Australian gas policy "*a travesty.*"

[1] Dow Chemicals is the second-largest chemical manufacturer in the world,



Source: Australian Energy Market Operator

The authors estimated that **each 1 Billion Cubic Meters (BCM) of gas shifted away from industrial use towards exports means, for Australia, giving up $9.7 billion lost industrial output for a $460 million gain in export output.**

See endnote for more details [i]

Relevance for Israel

1) Anchoring bias in policy formulation risks Israel suffering a net economic loss
   - Economic spillovers from various pricing scenarios should be checked
   - Israel should assess economic benefits to existing industries new market creation and export

2) Israel's future gas demand projections are not a mere paper exercise.
   Today- Prices can be materially affected by demand expectations.
   In future- Over- conservative demand projections can create a self-fulfilling prophecy, of tight supply increasing prices and strangling capacity to be reached.

2.4. Global Lessons: A Summary

Global Lesson from	Lesson	Risk
Argentina	New end-sectors for natural gas can create a gap between projected and actual demand	Unaffordable gas prices for locals

United States	Differentiated gas pricing is a legitimate debate for a free market economy	Not capturing the net economic interest of Israel
	It is essential to capture the economic effect of differentiated gas prices	High priced / unavailable gas supply
	Israel effectively has differentiated gas prices, where small industries pay about twice as much as larger industries	Lack of inter-industry competitiveness
Australia	All economic aspects of gas use in Israel must be explored.	High priced / unavailable gas supply
	The use of gas for both existing industries and new market creation must be explored	Not capturing the net economic interest of Israel
	A low expectation of Israel's gas demand – though "on paper" projections may create a self-fulfilling prophecy	Constrained gas demand / high priced gas/ unavailable gas supply

3. Natural Gas End Use - "The Black Box and the Green Box"

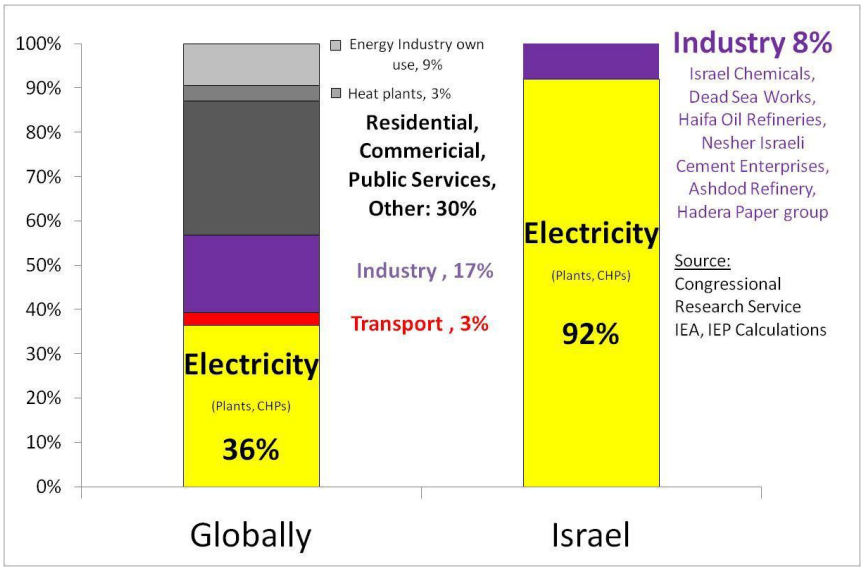
3.1. End-uses in the Green and Black Boxes

To examine Israel's potential uses for natural gas, we invoke a metaphor.

The "Black Box" is a concept in which a known input yields an output, known in both end-use and quantity. The "Black Box" represents normative ('business-as-usual') natural gas consumption patterns that occur throughout the world.

Globally, uses of natural gas are diverse, as the diagram below shows.

Compared to global consumption patterns, Israel's gas consumption is non-normalized. In Israel, approximately 90% of gas goes toward generating electricity compared to the average global level of around 35%. That difference (92%-36%) represents Israel's "Black Box opportunity".

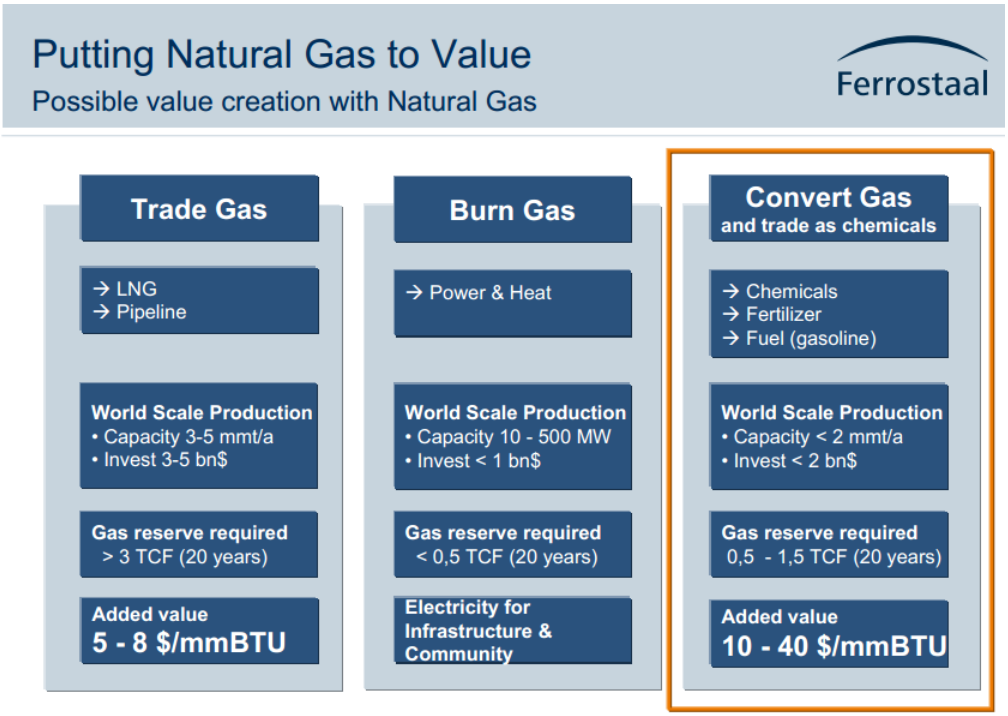


Source: Congressional Research Service, International Energy Agency,

Israel Central Bureau of Statistics and IEP Calculations

Piggy backing on the Black Box, we invoke a new metaphor - the "Green Box."

The Green Box contains Israel's as yet unrealized potential for natural gas consumption and productivity. The output is less defined; it contains potential, business-as-*un*usual. The Green Box contains potential engines for economic growth, jobs, business productivity and the opportunity to build and expand on Israel's existing intellectual capital.



3.2. Description of end-uses in the Green and Black Boxes

Black Box- Israel Electric Company, displacing oil usage and coal usage

Though over 90% of the natural gas is consumed by the Israel Electric Company, its 2010 spend on oil was $350mm (and much higher in 2011-2012). This indicates that within the Black Box there is still capacity for the electricity cost in Israel to be driven down through extended use of natural gas.

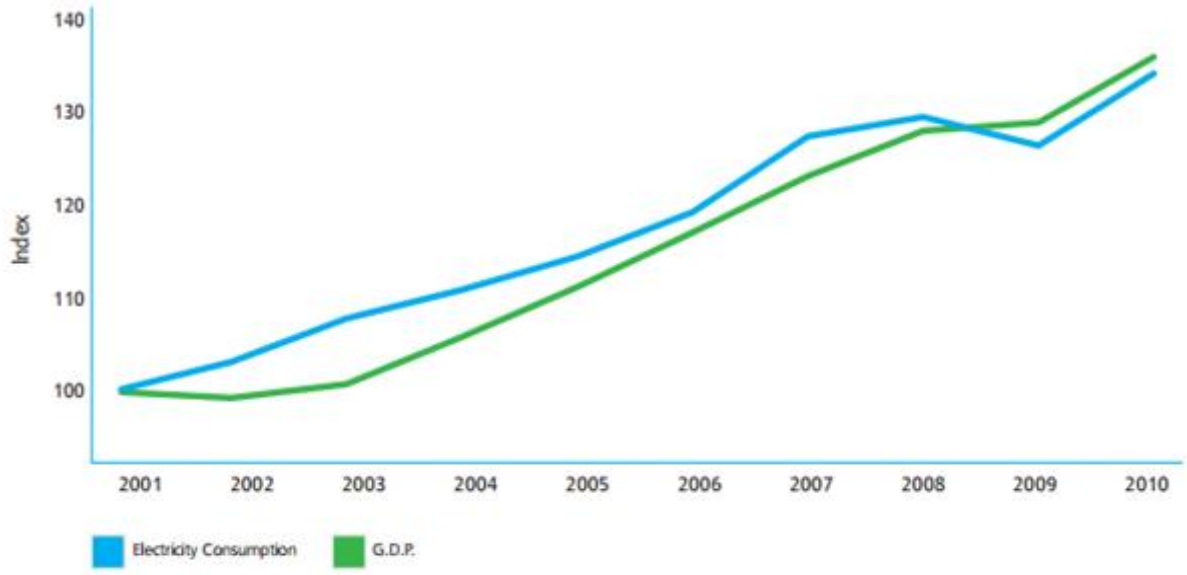
Israel's electricity grid demand has trebled since 1990 and is set to grow between another 3-4%, according to the IEC. 60% of the electricity tariff comes from costs associated with the fuel basket; whereas coal made up around 60% of the fuel mix in 2010. By 2014 the IEC expects natural gas to make up over 60% of the fuel basket.

An unstable gas supply has resulted in a decreased to Israel's net economic welfare.

The IEC reports that whilst it costs around $0.05 to generate a kWh of electricity, if that kWh of electricity is not provided to the Israeli economy, there is a net economic loss of 500 times that amount. **In other words, whilst it costs $0.05 to generate 1 kWh, every 1 kWh of supply disruption costs the economy $25.** From 2010 to 2012 the depleting gas in the Yam Tethys reservoir combined with disruption from EMG (Egyptian gas) led to supply shortages and electricity price rises.

Electricity consumption and GDP are linked in a positive loop- as Israel's GDP increases (something which may be positively affected by lower costs of energy through natural gas.

Correlation Between GDP and Electricity Consumption in Israel



Black Box- Displacement of Oil in Industry (Retrofit)

The retrofit of Israeli industry to gas from oil is top priority.

Israeli industry in 2010 used around 0.5 BCM of natural gas yet spent $850 million on oil annually, using three oil products- diesel, Mazut and LPG.

However the natural gas does not just represent a cost saving.

Manufacturing is a wealth-producing sector and it helps produce disposable income which further propels the service sector (which is generally wealth-consuming). In other words, there is a severe economic loss caused by the bankruptcy of companies such as Phoenicia, since such occurrences reduce Israel's economic health and competitiveness.

Black Box - Electricity for planned desalination plants

The Water Authority has planned desalinated water in Israel for the years ahead. These desalination plants, in generating electricity, use natural gas.

For the current planned desalination plants, around 300 MCM are required which would require ~1GWh of electricity (to be generated from natural gas).

Black Box- Heating and cooling in industry or residences

Contrary to what might be assumed about Israel's Mediterranean climate, there are areas of the country where the winter means significant spending on inefficient heating. Efficient natural gas heating can be introduced. Furthermore, as in other parts of the world, natural gas can be used for cooling through powerful heat exchangers in industrial and commercial spaces.

Black Box *and* Green Box- Ammonia; Urea (a fertilizer); PP and PE (Olefins), Methanol for industry

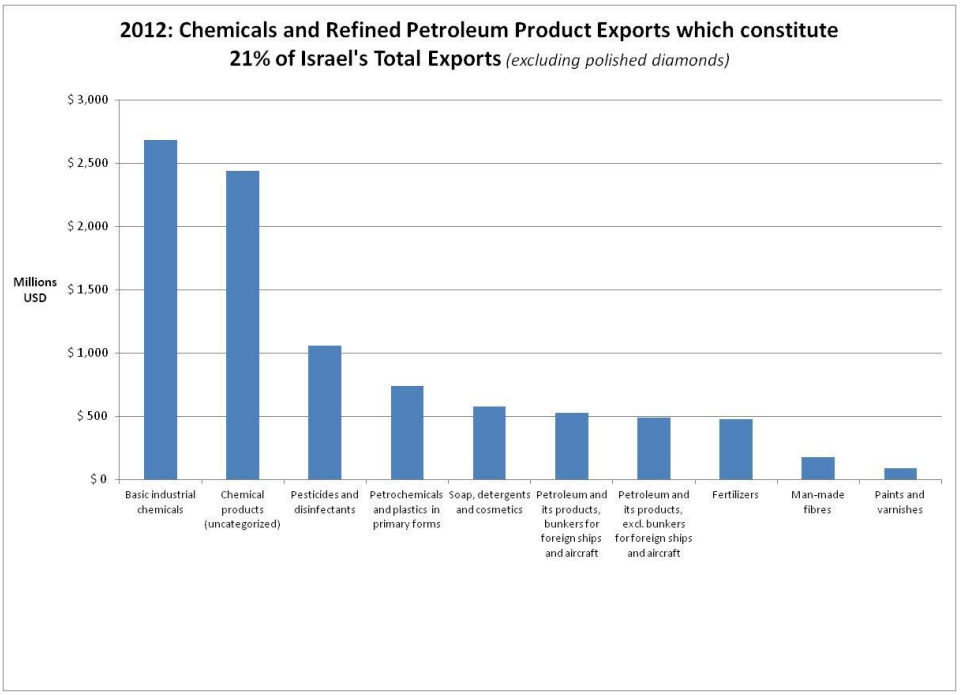
Israel's chemicals industry – covering both high tech and what is known as medium tech- actually dwarfs in size the software high tech industry. In 2008 for example, the industry enjoyed a **$25 billion** turnover. Notable companies in this sector include Teva (the world's largest generic pharmaceutical company) and Bazan (Israel's largest oil refinery which exports Israeli fuel and produces petrochemicals)

The full potential of domestic demand in the chemicals industry should and can be taken up.

Israel currently imports products such as ammonia, methanol and olefins from abroad- hence there is a place for natural gas to be used to manufacture those goods locally, creating employment.

Currently around 160,000 tons of ammonia are imported, around 700,000 tons of olefins are consumed and 65,000 tons of methanol is imported. We estimate that to manufacture these goods alone- without considering exports, would demand over 2 BCM of natural gas. A useful indicator is that at 100% capacity, extrapolated to 2040 with a 3% growth rate would give a net demand of over 90 BCM that would belong in the Black Box.

Beyond replacing chemicals currently imported focus directed toward Israeli petrochemical industries (such as Carmel Olefins Ltd), the base chemicals industry (where gas is a substantial component), phosphate and fertilizer industries as well as energy intensive industries can build up a basis for chemicals clusters and the creation of exports which would belong in the Green Box. This is important- chemicals and refined petroleum products constitute 21% of Israel's existing exports.



Green Box - Transportation

Transportation provides Israel a fantastic and unrealized economic opportunity. Due to the large potential and Israeli government will to be oil independent, we categorize natural gas for transportation as Green Box. [ii]

The 2011 Israeli government decision to create in Israel a global hub for oil independent technologies and assigned approximately $350 million over a decade for that purpose.

- The government recognizes that global oil dependence is likely to make the price of oil both higher and more volatile, in the long term. The global strategic opportunity is that the traditional correlation between oil and gas disappeared. Long term, oil is likely to increase in price and at the same time, the long term trend is for gas price decreases (what the IEA called the "global gas glut").

In January 13, 2013, the cabinet of the Government of Israel approved a program to encourage lowering dependence on crude oil for transportation. The program sets ambitious targets for Israel: cut the use of oil for transportation by 30% by 2020 and by 60% by 2025, as compared to currently projected "business as usual" oil consumption. This government resolution is an extension of the Alternative Fuels Initiative program from 2011.

Among the alternative fuels are Compressed Natural Gas (mainly for heavy duty trucks and buses), Methanol (for cars) starting with a 15% blend and advancing later to higher blends, electric mobility (mainly for buses, mass transit solutions, and inner solutions).

Thus, in the long term, transport based on natural gas fuel will become increasingly more commercially attractive than transport dependent on oil based fuels.

Penetration of FFVs to Israel's legacy vehicle fleet would not only break the after-market monopoly and increase the economy's competitiveness. It would also save the average Israeli household over 2800 NIS per year on fuel costs, equivalent to more than 2.5% of Israel's GDP.

Of course, there are a variety of natural gas based fuels that could be used to replace gasoline or diesel in the light vehicle fleet. 1 BCM of gas used to produce GTL drop-in-fuel would drive less km on the road than the same amount of gas used to manufacture methanol that would be blended with gasoline). In other words, each transportation fuel based on natural gas has a different efficiency in its production from natural gas and also different efficiency in the vehicle.

Our estimations based on multiple scenario analysis. The penetration rates for natural gas based fuels that we employ are based on empirical evidence; the Brazil case study, whereby the Brazilian light vehicle fleet increased its penetration of Flex Fuel Vehicles from zero to 50% within 7 years.

A useful indicator is that if gasoline and diesel were replaced with natural gas fuels (M85 and CNG fuels respectively) then 100% displacement from 2013 to 2040 would result in over 250 BCM of natural gas demand.

Green Box - Desalination plants additional to those planned pre-gas discoveries

Around 25% of desalination costs relate to electricity. Natural gas is the fuel of choice since it is clean and cheap.

In the big picture, desalination is an interesting card in the spectrum of water and natural gas which are essential and strategic natural resources of Israel and the region.

Jordan has a water deficit- and lack of access to seawater that can be desalinated (unlike Israel).

1) **If Israel were to desalinate sea water and export to cover Jordan's water deficit, we estimate that approximately another 8 BCM of gas would be needed, to 2040.**

2) **There is potential to review what the cost of water from the National Water Carrier is and to** analyze whether replacement by desalinated water is more worthwhile and transfer water from the Sea of Galilee, diverting it to Jordan as an export, whilst Israeli water consumption is provided by desalinated water.

The calculations for Israel's water plan are complex and with inter-dependencies (e.g. treated water for agriculture). A very rough look at Israel's current water plan, however shows that of Israel's total water demand, around 50% comes from national freshwater.

We estimate that taking this "national freshwater" off the national menu and replacing it with desalinated water not currently in the national water plan would necessitate a further **32 BCM of natural gas**. [iii]

Green Box – Jordan Natural Gas Export

Jordan is currently facing a crisis in its energy sector, including energy.

Jordan is completely dependent on imports to cover its primary energy needs. About 96% of Jordan's electricity generation is fuelled by imports, of which 80% is from Egyptian imported natural gas.

It is estimated that around 2020 Jordan will have an electricity deficit of over 2.6 TW; by 2040 that deficit is projected to rise to over 15 TW.

This presents an important opportunity for Israel to export pipeline Natural Gas to Jordan. This low cost means of monetizing from exports, if it provided for 50% of Jordan's electricity deficit needs, could sum to a further 133 BCM of natural gas demand from 2013 to 2040 and 251 BCM to 2050.

Green Box - Other industry uses

We suggest that an element should be set aside for "Black Swan" unforeseen opportunities which arise from the intellectual capital that will develop through the use of natural gas in the Israeli infrastructure. Mention the government oil replacement technologies program

Building new industries leverages Israel's extensive intellectual capital. Israel's economic lifeblood is built on its intellectual capital and cross-industry expertise. These resources need to be maximally used, maintained and grown in the decades ahead. Talents can be augmented and expanded through new industries based on natural gas.

4. Differences of Gas Demand Projections for Israel, 2013- 2040

4.1. Where are the differences of Gas Demand Projections

As the table below shows- the Tzemach Committee's projections appear conservative relative to the projections provided by our institute, the Israeli Institute for Economic Planning.

Different Projections for Natural Gas- Cumulative Demand 2013-2040 (BCM)

Green Box	Black Box	Sector	Projections 2013-2040		Projections to 2050
			Tzemach Committee Projection	The Israeli Institute for Economic Planning	The Israeli Institute for Economic Planning
	X	Israel Electric Company, displacing oil usage and coal usage	336	261	422
	X	Displacement of Oil in Industry Through Retrofit		77	126
	X	Electricity for planned desalination plants		30	51
X	X	Methanol for industry	2.8	52	96
X	X	Ammonia	See other industry uses		
X	X	Urea for fertilizer			
X	X	PP and PE			
X		Other industry uses	111	31	42
	X	Heating and cooling		This number is included in displacement of oil in industry through retrofit	
X		Transportation (non methanol)	40	166	276
X		Methanol for transportation	11		
X		Desalination extra plants	NA	39	54
X		Selling 50% of the gas needed to supply Jordan's electricity deficit	NA	133	251
		TOTAL	**501**	**790 BCM**	**1317 BCM**

Note that the amount of natural gas referred to in the last section was according to potential capacity; the numbers in the table above are less than that - a penetration rate has been applied.

4.2. Why Demand Projections Commonly Differ

There are three likely reasons why projections may differ between analysts: (a) risk aversion (b) the challenge of induction and (c) complex computation.

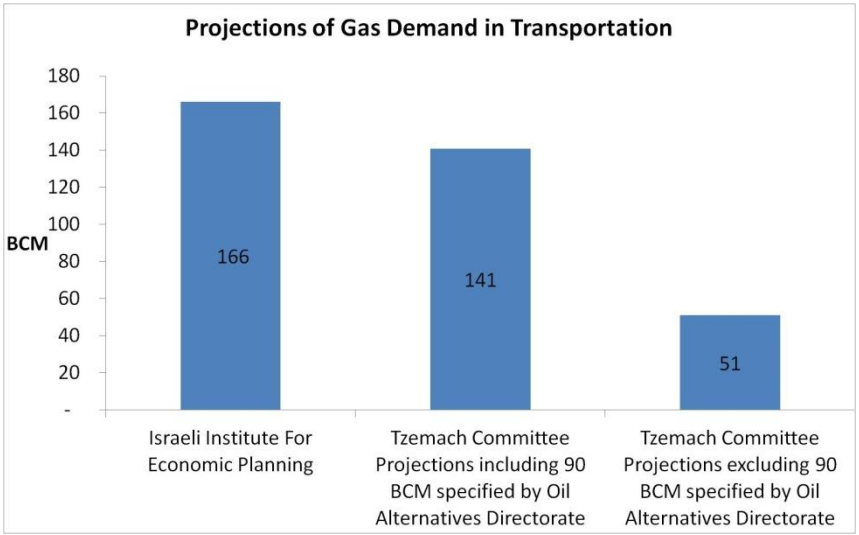
Likely reasons	Details

projections differ between analysts	
Risk Aversion	▪ End-markets with higher potential rewards carry with them higher potential risk. ▪ Risk aversion can cause potentially economically profitable uses of gas to be missed in the demand projections
Induction challenge *(potential capacity and penetration rates)*	▪ New markets with no precedent may grow more rapidly than foreseen. ▪ Where there is no direct history of demand, direct extrapolation to the future is not possible and may lead to an underestimation.
Complex Computation	▪ Natural gas can be used in multiple end-uses. ▪ Each end-use has a different risk-reward profile. This may necessitate complex multiple calculations.

4.3. The Surprising Reason for the Most Significant Demand Projection Differences

Two projections of our institute stand particularly in difference to that of the Tzemach Committee- extra desalination plants and export of gas to Jordan. They sum to a difference of 172 BCM (2013to 2040; 305 BCM to 2050). These projections are Green Box. We do not think that extra desalination plants or the export of gas to Jordan by pipeline is risky. The Tzemach Committee projections simply do not include it.

The most surprising finding has been, however the difference between the gas demand projections of the Institute and the government lies in the transportation sector.



The gap for transportation amounts to over 100 BCM, between 2013 and 2040.

This is an unexpected finding.

- It is a large proportion (~20%) of the Tzemach Committee's headline projections (501 BCM from 2013 to 2040).
- An extra 90 BCM could possible make the export of Israeli natural gas less viable.
- **Transportation is a less subjective end-sector for natural gas than green field opportunities such as GTC ("gas to chemicals").**

Closer analysis reveals the ***gap is not due to a disagreement as to whether the Israeli infrastructure has the capacity to absorb the end-product of methanol for transportation.***

The government itself – through the Directorate of Oil Alternatives- foresees that 90 BCM of natural gas would be needed from 2013 to 2014, to satisfy demand for methanol transportation blends. It is this exclusion of 90 BCM which causes the very significant gap in gas demand projections (166-51 BCM) from years 2013 to 2040. **The Israeli Government excludes the 90 BCM based on its interpretation that in a "free market" methanol for transportation must be excluded as at current prices import is cheaper.**

> "*The Committee wanted to guarantee the demand for natural gas, as this is a commodity which is not easily imported. With regard to natural gas-based alternative fuels for transport that are tradable commodities, the Committee left the economic decision to the market as to whether these will be imported or produced locally."*
>
> THE RECOMMENDATIONS OF THE INTER-MINISTERIAL COMMITTEE TO EXAMINE THE GOVERNMENT'S POLICY REGARDING NATURAL GAS)

The claim that 90 BCM must be excluded for Israel to be defined as a free market economy does not withstand rigorous examination. It is countered by experience in the United States:

- Policy which designates different gas prices to different end-sectors to increase net economic welfare is a legitimate free market approach.
- There is no certainty that local production of methanol will not in future be in Israel's economic interests. Externalities - such as the gas price in other localities, the cost of freight determined by the oil price, changes in the global methanol market- may change the future balance.

(See also Section 2.2 of this report – such an interpretation of what is "free market" is disputed).

4.4. Conservative demand projections are risky- not conservative

(1) **Conservative projections of national gas is a risky, not conservative strategy**

Underestimation of true demand can result in a greater long term economic risk since tight supply may push up prices and starve sectors from getting the gas they need.

(East Australia and Argentina indicate this)

(2) The gap between our gas demand projections and that of the government cannot be completely explained by subjective factors

Such as risk aversion, the challenge of induction and complexities in calculation.

It is arguable that the claim that 90 BCM for the transportation should be disregarded - as part of a free market approach - is not rigorous.

It may have the unforeseen consequence of

- Driving up local gas prices, making oil independence and energy security harder to attain.
- Work in the economic favor of the gas producers and not Israeli consumers.

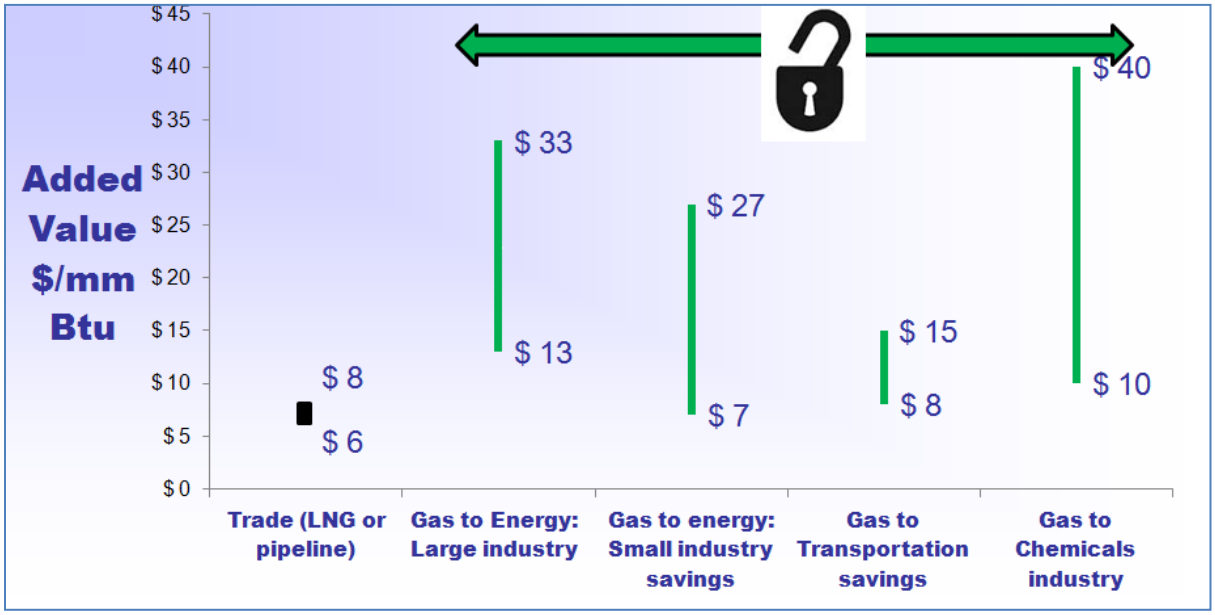
4.5. IEP Projections and The Added Value of Gas to Israel

There is a temptation, particularly in the current harsh economic environment, to view natural gas through the short term lens of trading it. The immediate value can be considerable. The Treasury recently announced (Dec 2012) that 25% of Israel's economic growth in 2013-14 is estimated to be from the natural gas finds. However, the Bank of Israel has made it clear that in this short term time frame, no increased employment is foreseen.

Numerous in-depth studies abroad have assessed the added value of natural gas.

Analyzing the economic impact of gas on Israel is a wide and relevant question which covers a wide range of issues such as employment, product availability, the effect of the cheaper cost of energy to citizens, to the manufacturing industry, innovation clusters and induced spillover effects to consumer products.

In this section we propose a "broad strokes" method to calculate the value added by natural gas to a proportion of the economy.



Rather than assess each individual component, we take a sub-section from our total demand projections. That is, of the natural gas demand in Israel not consumed by Israeli Electricity Company, we view around 60% of it. This goes to three broad sectors; transportation, GTE (gas to energy) and GTC (gas to chemicals).

Our assessment is that the net direct gain to the economy for three sectors alone, from 2013 to 2040, totals an added value of $95 between $195 billion.

(The variation reflects the fact that various end-products in the same end-sector have varying added values).

By 2050, when natural gas is more fully integrated to the economy, we estimate that the added value from GTE, GTC and transportation will lie between $158 and $487 billion.

5. Summary

Israel is thirsty for natural gas. Phoenicia's near bankruptcy showed that. But the thirst is not enough- government intervention is needed.

1. **Underestimation of gas demand introduces severe fiscal risk to Israel and reduces energy security.** Underestimation of gas demand could affect supply and squeeze gas prices up. That would bring **immeasurable economic damage to Israel's prospective gas economy.**

2. **The disregard of 90 BCM of natural gas to provide methanol for transportation by the Tzemach Committee introduces fiscal risk to Israel's economic future.** It means gasoline prices may be pushed up and bear a heavy cost on consumers.

3. **The lack of a level playing field for natural gas prices in industry is of great concern.** It would seem that in the interests of a free market economy, emphasis should be placed on ensuring that smaller factories receive natural gas at the same delivery cost as large factories.

4. **The GTC industry offers a potential revolution to Israel.** It could lead to a 100% to 600% increase in economic value compared to merely trading gas.

5. **The full impacts of Gas to Chemicals- indirect, direct, spillover and induced need to be analyzed in greater depth.**

6. **The deeper question of whether natural gas price should be lower or higher and the effect it would have on the Israeli economy is a meaningful question.** It should be investigated in greater detail.

Natural gas represents an energy source that can displace other fossil fuels like oil, a means of locally manufacturing products to replace imported ones and the ability to found a new Gas to Chemicals Industry with export opportunities.

Viewing the economic added potential for Gas-To-Energy, Gas –To-Transportation and Gas-To-Chemicals alone could add value of between $95 billion and $487 billion to the Israeli economy, depending on the end-product applied to.

Natural gas involves risk management in policy. Upside as well as downside risks must be managed. Underestimating demand opens up risks to Israel. It appears that the demand for natural gas in Israel, by the government's own admission, has been underestimated.

The price of such an error would be paid for by the future of Israel- it's citizens' pockets and industry's competitive advantage and lost opportunities.

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Author:

Ariella Berger, Head of Oil Alternatives & Energy Research
The Israeli Institute for Economic Planning
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[i] *Link here* AIG and PCIA: "Large scale export of East Coast Australia natural gas: Unintended consequences"

[iii] An approximate calculation taking assumptions as to the type of water desalinated, the power plant cycle efficiency and so on