[14] Do not include marketing margin and taxes. According to Israel's Law on Commodity Price Controls, the maximum price of refined products is set based on the Med Lavera cif hub price plus a marketing margin and taxes.

LPG prices

The price delta between imported and locally produced LPG is ~[redacted]ILS/ton of local discharge and storage fees. We evaluated the impact this would have on consumer prices by calculating the effective (weighted) price of LPG.

[redacted]

Bitumen

Importing bitumen is not practical due to complex and costly import costs, likely doubling the landed cost per ton. To replace Bazan's production, a standalone bitumen plant will have to be constructed. A plant capable of meeting local demand, would require a fuel oil feedstock of ~300kT/year, and is expected to cost ILS ~105M-175M[15]. Such a plant has a small physical footprint, requiring 200-300 Sq.m.

[15] Based on reported capex costs and M&A costs from 5 recent projects; for M&A deals, construction cost assumes 200% premium over M&A value

A bitumen plant can be constructed in either of the following locations:

- The **Ashdod refinery** would be the simplest solution [redacted]
- The **coastal power plants** have available fuel oil infrastructure allowing direct imports from tankers and would allow locating the bitumen plant within an existing industrial zone.
- The plant can also be constructed in **the Negev,** likely providing easy zoning and permitting. Under this scenario, fuel oil would have to be trucked from Ashdod, adding transport costs of ~42ILS/ton[16].

Polymers and aromatics

Required imports

Local demand for polymers produced by Carmel and aromatics produced by Gadiv will have to be met through imports. [redacted]

Using the ICIS Supply and Demand database we expect demand for the polymers to reach 600kT/year (~80% PP and ~20% LDPE) and aromatics to 0.35kT/year (~60% mixed xylenes and ~40% toluene) by 2030.

We assessed expected available excess supply for 2030 in global markets. As polymer transport is relatively cheap we assume that purchase prices, rather than geography, will be the deciding factor. Based on expected excess supply the USA, S. Korea, Thailand and Singapore are the likely sources of import. Israeli imports would represent ~5% of expected excess supply in these countries.

As transport costs are significantly higher for aromatics, we prioritized markets based on geographical proximity. Under these parameters, the primary source of imports would likely be in the European market (e.g., Germany, Spain, Serbia, Portugal and the Netherlands). Israeli imports would represent less than 1% of expected excess supply.

In terms of import infrastructure, polymers are imported in containers, not requiring dedicated import facilities and the low volumes of aromatics could likely be imported through the existing chemical terminals in the Ports of Haifa and Ashdod.

[16] Large tanker trucks with a capacity of 33.7 kL (~318 ton), costs are for a 100km trip, not including loading "truck loading fees"

Impact on prices

To evaluate the price impact on the polymers and aromatics. we used the average import price, excluding outliers, based on the customs tax database (מכס) as the domestic price. There is no available data to determine the domestic price of aromatics, however, low quantities suggest that any change will not generate a significant economic impact.

To determine import prices, we added the price of acquisition from likely sources of import, and the cost of transport cost to Israel:

- **Polymers:** the acquisition price is based on the average FOB price in S. Korea, Singapore, and Thailand[17]. Transport cost reflect standard container costs from Asia to Israel, no significant local logistics cost are to be expected.
- **Aromatics:** the acquisition price is based on the average FOB price in Germany and the Netherlands. Transport cost reflects chemical tanker costs from the port of Antwerp to Israel and local logistics cost are an estimate of local bulk chemical unloading.

[redacted]

[17] ITC trade map prices

2.3.1.2 Import infrastructure

Assuming global markets can supply local demand at similar prices, we evaluated the ability of local import infrastructure to support such a substantial increase in imports.

[redacted]

[redacted]

[redacted]

- [redacted]

- [redacted]

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[18] Assuming 25% of total consumption of diesel and gasoline, no consumption of kerosene as civilian consumption is mostly in central Israel

[19] 75% of total diesel and gasoline consumption, 100% of kerosene consumption

[redacted]

[redacted]

[20] CAPEX ~665-875 ILS/m²

[21] PEI estimate for a distribution hub, collocated with Bazan, is estimated at ILS 70M. We assume an additional ILS 52.5-87.5M for piping to an inland location)

[redacted]

Total Investments

Avoided investments in a shutdown scenario

In addition to the aforementioned investments, government investment in two large projects will be avoided in case of a Bazan shutdown:

- **"Karkaot Hazafon"** – relocation of refined products and crude oil terminals ("20 acres" and "Kiryat Haim" respectively) at a total cost of ~ILS[redacted]
- **Pipeline relocation** – EAPC Haifa-Ashdod pipeline pipeline from the coastal plain to Highway 6 at a total cost of[redacted]

In the case of a shutdown of Bazan, crude oil would only have to be provided to Paz Ashdod, canceling the need to have crude oil storage facilities in the Haifa Bay. Under such a scenario the share of cost of the "Karkaot Hazafon" project attributable to rebuilding the Kiryat Haim crude terminal would be avoided, generating savings of ~815M. The remaining cost, associated with dismantling and cleaning the Kiryat Haim site, and possible reconstruction of refined product storage, will still be required. The cost of the pipeline relocation, a total of ILS [redacted] would also be avoided, as there would be no reason to pipe crude from EAPC to the Haifa bay.

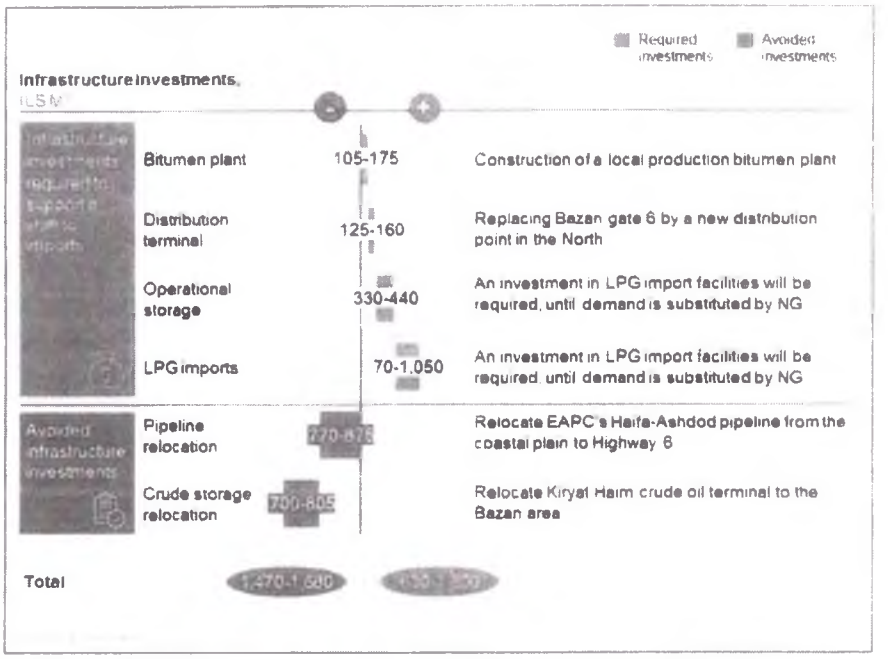
Taken together this would save the government ILS ~1.62B.

Summary of all investment in a shutdown scenario

In summary, there is potential benefit from avoided investments which may be larger than investments required to support a shift to imports:

- Increase capacity of LPG storage expected to take 3-4 years at a cost of ILS 70-1,050M
- Build a local bitumen plant, expected to take ~1 year at a cost of ILS 105-175M
- [redacted]
- [redacted]

[22] Ministry of Finance input



Balancing required and saved investments suggests potential savings of up to ~ILS 1,000M

2.3.2 Shutdown costs and benefits

In the previous chapter we examined the feasibility of a Bazan shutdown and the required infrastructure investments. In this chapter we focus on the direct shutdown costs and on potential benefits from releasing the land.

2.3.2.1 Shutdown and remediation

To assess the shutdown costs, we used cost benchmarks from similar complexes' abroad. The total cost for shutdown and remediation is estimated at 3,150-3,850M ILS and is expected to take ~10 years before the land can be used for residential development. It should be noted that land in the buffer zone is not expected to require remediation and can likely be marketed at an earlier stage.

The benchmarks cover two relevant components:

- **Dismantling cost:** The net dismantling cost is expected to cost 1,900-2,300M ILS and take 3-4 years. Physical dismantling and removal of installed elements (above and below ground) are estimated at ILS 230-268 per ton of installed crude capacity (9.8mtpa). Out of this cost, ~35 ILS per ton can be recovered through sales of scrap metal.
- **Land remediation cost:** full land remediation, to a degree required for residential usage, is estimated at ILS 1,225M-1,575M[23] typically requiring 5-10 years. Remediation costs can vary widely between sites and require further, detailed, corroboration

2.3.2.2 Released land value

The main quantifiable benefit from a Bazan shutdown is the revenue from marketing the released land for alternate uses. Our analysis is solely focused on the net value of the land released, including the buffer zone. We do not account for the potential increase in value of real estate in adjacent areas. We also do not account for the additional indirect value is likely to be created by increased economic development of Haifa as a northern metropolis, this value is not captured in this study.

We based our analysis on the Israel Land Authority's (REMI) initial estimate of land value, utilized for residential development. REMI is currently refining its analysis, once made available, updated figures should be used. Due to the dominant impact of land value on overall shutdown economics, we built several land value scenarios, under all scenarios land value remains constant over time, assuming the annual increase is roughly equivalent to the governments discount rate (3%):

[23] Benchmark estimate of 630-700 ILS per sqm for remediation to residential standard (2.130K sq.m)

A. Aggressive scenario – land value of ILS ~20B
   - Land yields 100,000 residential units
   - Unit market value is ~200,000 ILS
   - 2,500 units p.a. can be sold at market price (over 20 years)

B. Base scenario – land value of ILS ~13.1B
   - Land yields 75,000 residential units
   - Unit market value is 175,000 ILS
   - 1,500 units p.a. can be sold at market price (over 30 years)

C. Conservative scenario – land value of ILS ~7.5B
   - Land yields 50,000 residential units
   - Unit market value is 150,000 ILS
   - 1,500 units p.a. can be sold at market price (over 50 years)

Please note that this estimate assumes use of land for residential development, additional/alternate uses may change the land value. Additionally, this estimate does not reflect an increase in value of existing real estate, adjacent to the Bazan complex.

[redacted]

[redacted]

C. "Arnona" – Municipality taxes

The municipalities surrounding the Bazan complex – Haifa, Kiryat Ata, Nesher and Zvulun – receive a small portion of their income from "Arnona" taxes paid by Bazan. In 2015 Arnona income paid by Bazan was:

- Haifa – 32.4M ILS representing ~1.5% of total income
- Kiryat Ata – 11.8M ILS representing ~6% of total income
- Nesher – 10.5M ILS representing ~8% of total income
- Zvulun – 4M ILS representing ~10% of total income

Municipal revenue would be lost in the short-term, before being replaced by Arnona revenue from new real estate development.

[redacted]

3 Shutdown under various timeframes

3.1 SHUTDOWN SCENARIOS – COMPARISON

Leveraging the aforementioned analyses, we evaluated Bazan's impact on the various parameters under the four alternate scenarios:

- **Business as usual** – Bazan's operations continue indefinitely, all figures are calculated until 2040
- **Value optimized 2030 shutdown** – [redacted]
- **MARPOL optimized 2023 shutdown** – [redacted]
- **Immediate shutdown (2020)** – Bazan is closed as soon as possible

In addition, all four scenarios were assessed with and without Gadiv.

We assessed each scenario by evaluating the expected impact on the following parameters:

- Expected revenues from:
  - Land sales
  - Bazan profits[24]
  - Bazan's corporate tax
  - Net income tax generated by Bazan[25]
  - Avoided government investments on no longer required projects
- Expected costs:
  - Shutdown and remediation
  - Import infrastructure
- Socio-economic impact:
  - Bazan's contribution to GDP
  - Bazan's contribution to employment in the Haifa area
  - Bazan's contribution to municipal tax revenues

[24] Not included in government cash flow

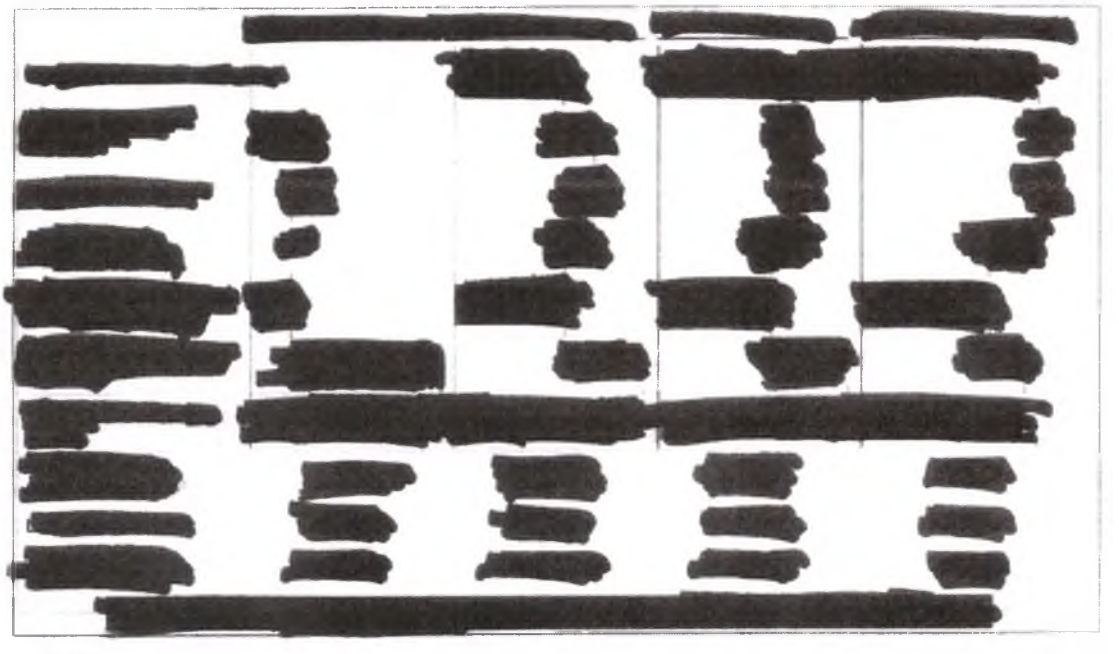
[25] [redacted]

– Emissions in the Haifa area

To compare the various scenarios in today's terms, we evaluated:

- NPV of total economic value created (in 2018 value)
- NPV of lost GDP contribution (in 2018 value)

[redacted]



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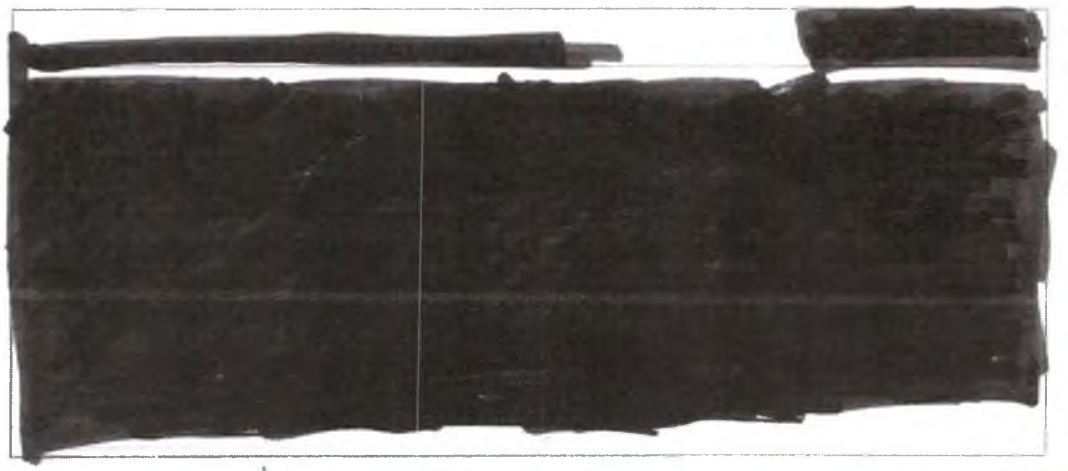

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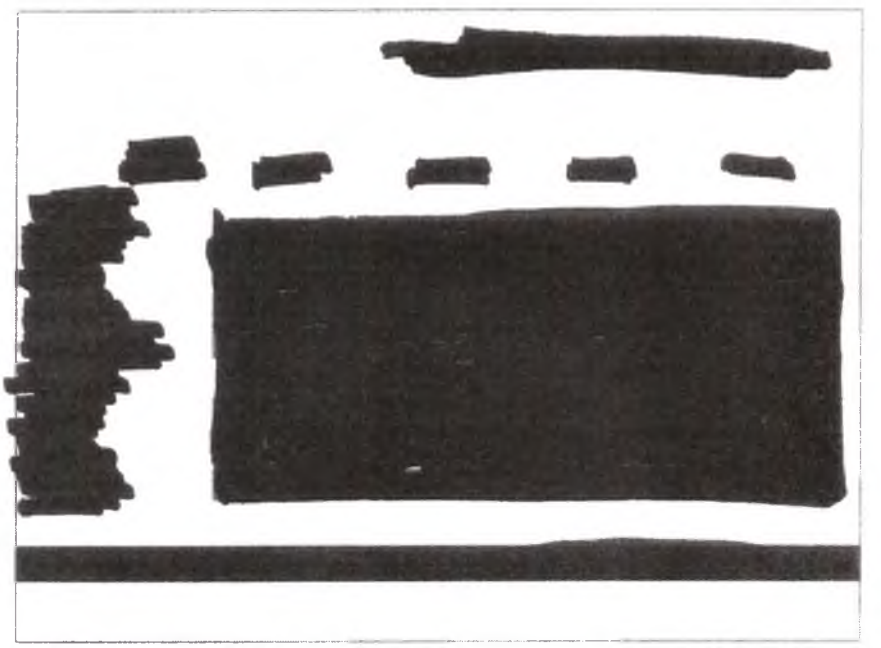

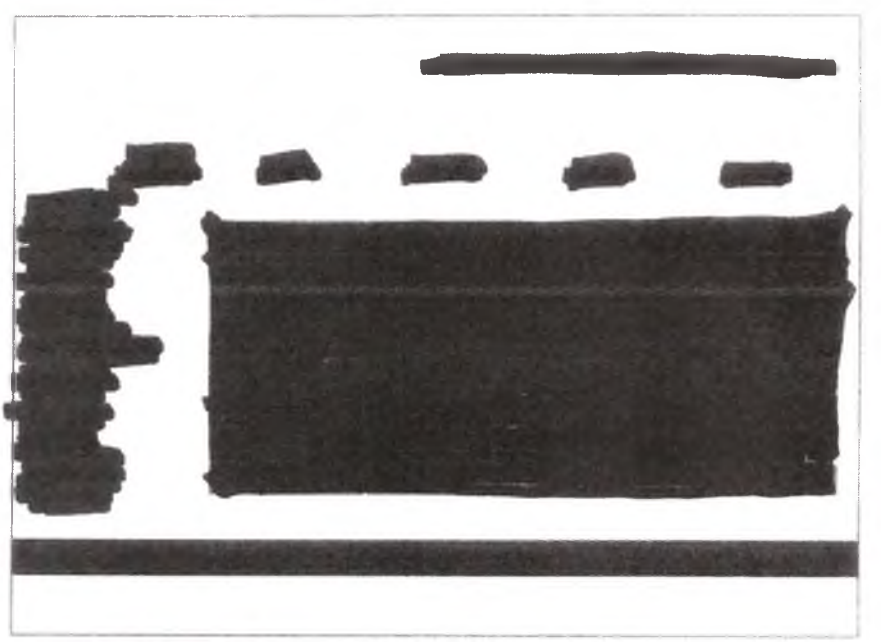

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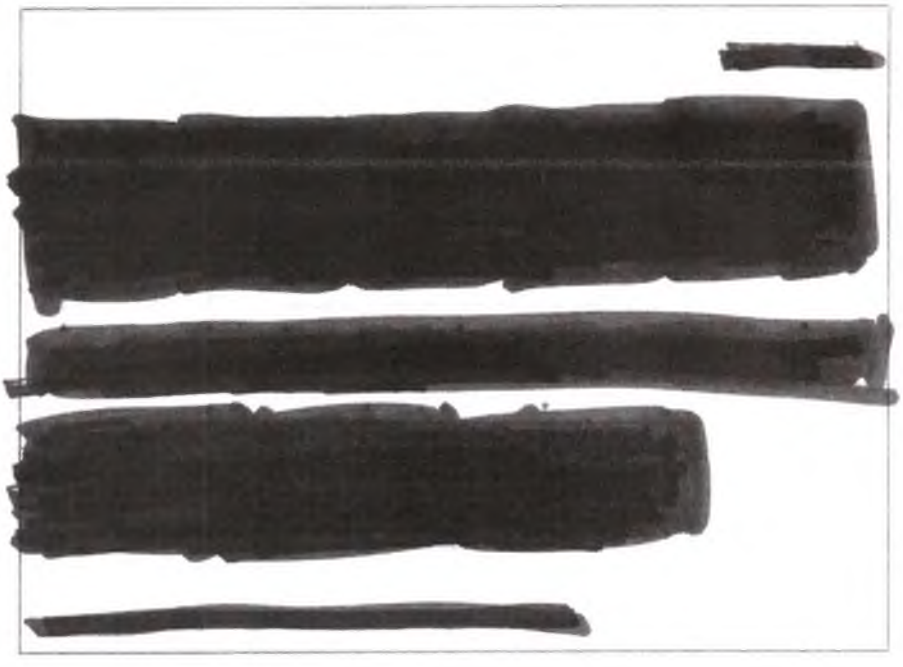
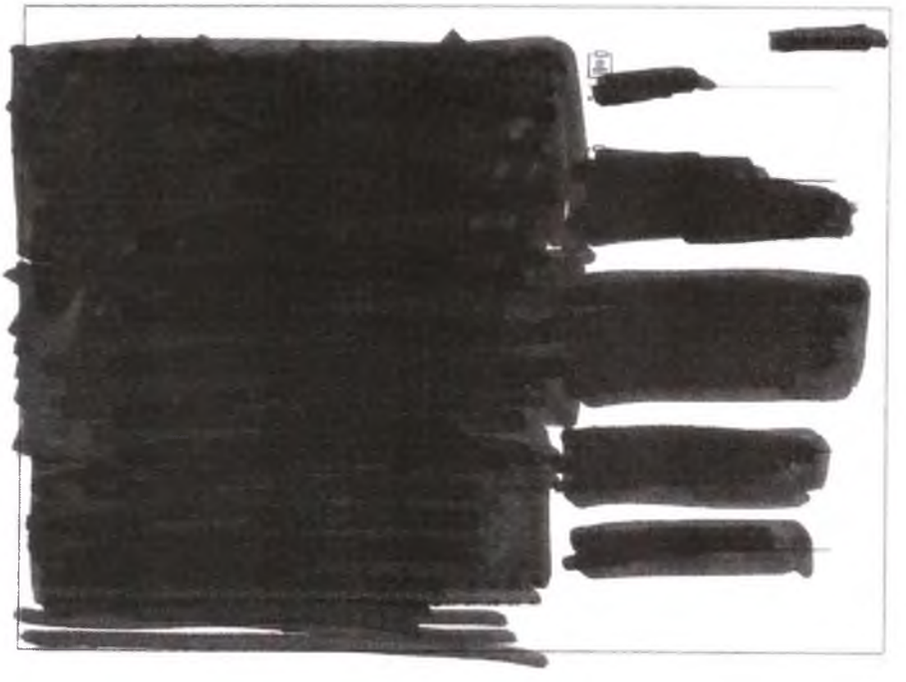


[redacted]

3.2 Shutdown scenarios – evaluation

To better understand the four alternatives, we conducted a detailed analysis of each alternative, across the aforementioned parameters.

[redacted]



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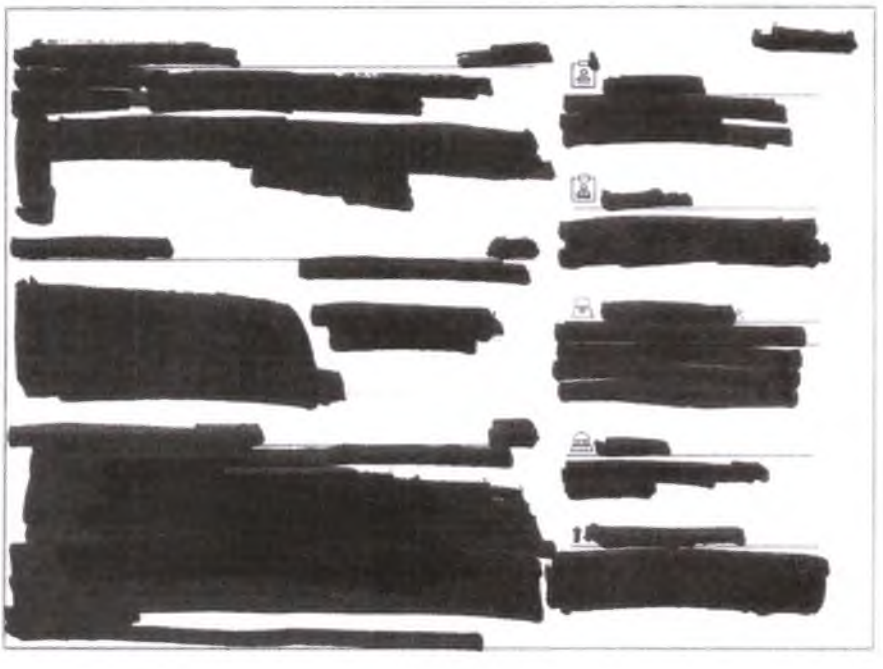

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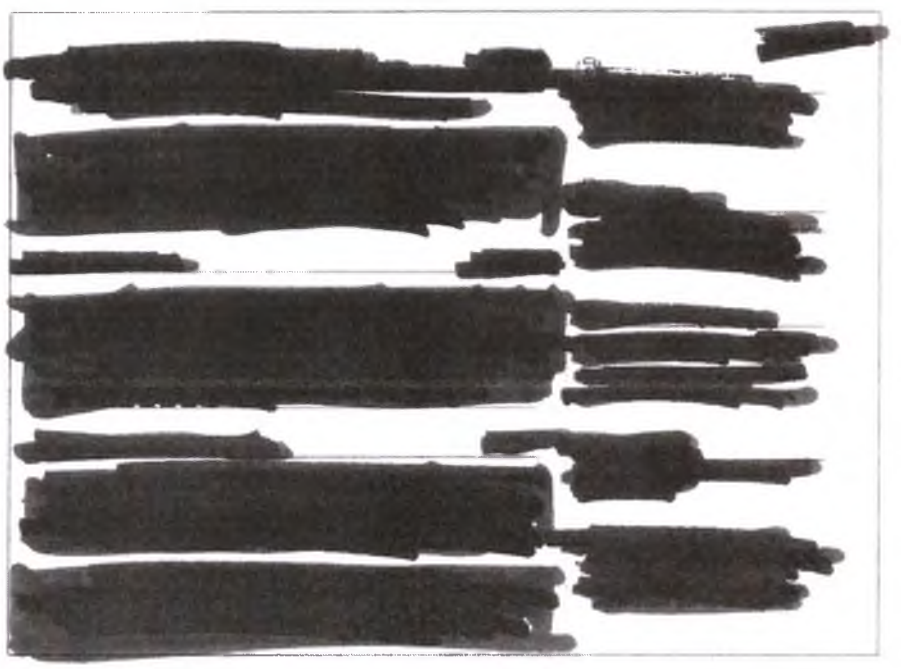

[redacted]

Summary

Over the course of the study we worked with the various stakeholders, and leveraged our international experience and benchmarks, to develop an outlook on:

- Bazan's future profitability and contribution to the local economy, based on our European outlook for refined product demand and refining margins
- The impact on local prices of refined products, and required investment in import infrastructure, resulting from replacing Bazan's production with imports
- The expected costs and benefits of 4 alternative scenarios:
  - Retaining Bazan in its current location and configuration
  - Reallocating Bazan to a non-urban location
  - A partial shutdown of the Bazan complex, within the same location
  - A full shutdown of the Bazan complex, under different timing scenarios

Our analysis indicates that:

- [redacted]
- Relocating Bazan is not economically viable. An investment of over 18B ILS will be required, with the new refinery coming online only after the decrease in refining margins is expected to kick-in (2026), generating a negative ROI (25-50% through 2040)
- Local demand can be supplied through imports. A shift to imports will require investment in storage infrastructure and construction of a stand-alone bitumen plant. Construction of required investment is expected to take ~4-years.
- A partial shutdown is feasible, yet expected to impact Bazan profitability [redacted]
- [redacted]

- [redacted]
- [redacted]
- [redacted]
- [redacted]

Several of the analyses are based on initial or incomplete data, therefore, before making a decision, refining/updating some of the analyses would be advised:

- Bazan's full environmental impact and compliance with regulation should be determined, as well as expected performance after full BAT/BREF implementation
- Land value estimates should be refined, taking into account the demand for real estate in the Haifa area
- Land remediation costs should be refined, accounting for site-specific factors
- Actual available storage capacity should be verified to assess the need for additional investment in storage expansion
- Detailed capex estimates for the required import infrastructure should be assessed
- The progress of LPG-to-Natural Gas substitution should be assessed to examine actual import infrastructure needs
- The European refining margin outlook should be updated to changes in the market
- Unemployment estimates should be reevaluated based on the prevailing macro-economic environment
- A detailed valuation of Bazan should be conducted to support potential compensation negotiations

Assuming the government would choose to pursue a Bazan shutdown, substantial effort would be required to ensure that all infrastructure development required to support a shift

to imports is put in place, prior to the shutdown. Such an effort would require cross-government collaboration to ensure rapid zoning, permitting, funding and construction of the required facilities. Additionally, detailed plans and execution capabilities are required to dismantle the current complex, remediate the land, and efficiently develop the released area.

We believe that several strategic initiatives can support a potential shutdown:

- Formulate a strategy for increasing EV penetration across vehicle fleets, addressing infrastructure, incentives and more
- Build a roadmap for substituting LPG with natural gas and electricity, including rapid infrastructure zoning and investments, conversion grants for industrial users, and more
- Mitigate potential spillover effects on industry by developing a strategy for industrial development, aligned with CO_2 and emission reduction targets

However, and as expressed throughout this document, a decision on shutdown is a complex policy decision which should balance a variety of considerations, not all of which were addressed within the scope of this economic analysis.

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Preparation of this document required intensive cooperation and support from a wide variety of stakeholders across both government and the private sector. We would like to thank the NEC, REMI, and the Ministries of Energy, Economy and Environmental protection for their collaboration throughout the study. We would also like to thank PEI (Tashan) for their availability and assistance along the way. Special thanks to the Bazan management team for providing us with meaningful insights and inputs, all within a very brief period of time.

Appendix

GAS-BASED OLEFINS PRODUCTION

Olefins can be produced via a methanol route, leveraging local deposits of natural gas. However, such a plant is not expected to be economically viable at Israeli natural gas prices:

- **Available technology:** Olefins are typically converted from naphtha, as a byproduct of refining processes. On-purpose olefin production can be achieved by methanol conversion. However, China is the only region currently applying this technology (coal conversion)
- **Construction cost:** Construction costs of a methanol-to-olefin plant range from $1,000-1,500 per ton.Replacing Carmel's current capacity will require investment of $600-900M
- **Feedstock prices:** Competition with crude based production requires feedstock prices of 1-2.5 USD per mmbtu, dependent upon prevalent crude prices. Planned methanol-to-olefin plants in the Persian gulf, fed with subsidized natural gas (0-1 USD per mmbtu) are expected to constrain future margins

P&L ASSUMPTIONS

General:

- [redacted]
  - [redacted]
- Discount period of 23 years (2018-2040)
- Inflation of 2%
  - Based on the Bank of Israel inflation target of 1-3%
- Terminal value
  - Assume terminal value based on turnaround and maintenance cost depreciated to 1 year
- [redacted]

Refinery:

- Gross margin
  - NWE Brent hydrocracking margin; delta of margin outlook applied to 2017 EBITDA to project future EBITDA
  - Gross refining margin on a variable cash basis (product revenue net of variable operating costs (chemicals, catalysts, utilities) and crude and other feedstock costs
- Europe product demand
  - -0.7% demand growth from 2020-2040 in the Base Case and -0.3% in the High Demand Case ("High Case")

Chemical:

- Aromatics gross margin
  - Based on IHS estimate for benzene and xylene to 2022; reverts thereafter to long run average taking into account cyclicality
- Polymer gross margin

– IHS outlook on Western Europe LDPE to naphtha price differential plus stand alone PP margin – both to 2022; reverts to long run historical average thereafter

GOVERNMENT CASH FLOW ASSUMPTIONS:

Revenues from land sale:

- Release land yields 50-100k residential units, depending upon scenario
- Units are valued ILS 150-200k per unit
- Units are marketed at a rate of 1,500-2,500 units per year
- Land value is not discounted, as the discount factor is offset by increasing land value