

# The Dangerous Delusion of Optimal Global Warming



Aug 1, 2019 ADAIR TURNER

The Nobel laureate economist William Nordhaus believes that global warming should be limited to 3.5°C, which is much higher than the 2°C targeted by the Paris climate agreement. But Nordhaus's approach represents a misguided application of sophisticated modeling to decision-making under extreme uncertainty.

LONDON – The United Kingdom is now legally committed to reduce net greenhouse-gas emissions to zero by 2050. Opponents in Parliament argued for more cost-benefit analysis before making such a commitment; and Nobel laureate economist William Nordhaus argues that such analysis shows a much slower optimal pace of reduction.

The 2015 Paris climate agreement seeks to limit global warming to “well below 2°C” above preindustrial levels, while the Intergovernmental Panel on Climate Change recommended in 2018 that the increase be capped at 1.5°C. By contrast, Nordhaus's model suggests limiting warming to 3.5°C by 2100. If that were

the objective, net zero emissions would be acceptable far later than 2050.

But Nordhaus's approach represents a misguided application of sophisticated modeling to decision-making under extreme uncertainty. All models depend on input assumptions, and Nordhaus's conclusions rely crucially on assumptions about the additional harm of accepting 3.5°C rather than 2°C of global warming.

For some types of climate impact, quantitative estimates can be attempted. As the Earth warms, crop yields will increase in some colder parts of the world and decrease in hotter regions. Any estimate of the net economic impact is subject to wide margins of error, and it would be absurd to imagine that benefits in one region will be transferred to others that have been harmed, but at least modeling can help us to think through the possible scale of these effects.

But it is impossible to model many of the most important risks. Global warming will produce major changes in hydrological cycles, with both more extreme rainfall and longer more severe droughts. This will have severe adverse effects on agriculture and livelihoods in specific locations, but climate models cannot tell us in advance precisely where regional effects will be most severe. Adverse initial effects in turn could produce self-reinforcing political instability and large-scale attempted migration.

To pretend that we can model these first- and second-round effects with any precision is a delusion. Nor can empirical evidence from human history provide any useful guidance for how to cope with a world that warmed to Nordhaus's supposedly optimal level. After all, 3.5°C warming above preindustrial levels would take us to global temperatures not seen for over two million years, long before modern human beings had evolved.

Modeled estimates of adverse impacts are also incapable of capturing the risk that global warming could be self-reinforcing, creating a nontrivial risk of catastrophic threats to human life on Earth. Recent Arctic temperature trends confirm climate model predictions that warming will be greatest at high latitudes. If this produces large-scale melting of the permafrost, huge amounts of trapped methane gas will be released, causing climate change to accelerate. The higher the temperature attained, the greater the probability of rapid and uncontrollable further warming. Models always struggle to capture such strongly endogenous and non-linear effects, but Nordhaus's 3.5°C point of optimality could be a hugely unstable equilibrium.

Before the 2008 financial crisis many economists, including some Nobel laureates, believed that sophisticated "value at risk" (VaR) models had made the global financial system safer. Then-US Federal Reserve Chair Alan Greenspan was among them. In 2005, he reassuringly observed that the "application of more sophisticated approaches to measuring and managing risk" was one of the "key factors underpinning the greater resilience of our largest financial institutions."

But those models provided no warning at all of impending disaster. On the contrary, they deluded bank managers, central bankers, and regulators into the dangerous belief that risks could be precisely foreseen, measured, and managed. VaR models could not capture the danger of catastrophic collapse resulting from endogenous self-reinforcing feedback loops within a complex and potentially fragile system. The same is true of supposedly sophisticated models purporting to discern the optimal level of global warming.

The economic costs of achieving carbon neutrality by mid-century are also uncertain. But we can estimate their maximum order of magnitude with far greater confidence than is possible when assessing the costs of adverse effects of climate change.

Achieving a zero-carbon economy will require a massive increase in global electricity use, from today's 23,000 TW hours to as much as 90,000 TW hours by mid-century. Delivering this in a zero-carbon fashion will require enormous investments, but as the Energy Transitions Commission has shown, it is technically, physically, and economically feasible. Even if all those 90,000 TW hours were provided from solar resources, the total space requirement would be only 1% of Earth's land surface area. And in real-world competitive energy auctions, solar and wind providers are already committing to deliver electricity at prices close to and sometimes below the cost of fossil fuel generation.

Total cost estimates must also account for the energy storage or backup capacity needed to cover periods when the wind doesn't blow and the sun doesn't shine, and for the complex challenge of decarbonizing heavy industrial sectors, such as steel, cement, and petrochemicals.

Added up across all economic sectors, however, it's clear that the total cost of decarbonizing the global economy cannot possibly exceed 1-2% of world GDP. In fact, the actual costs will almost certainly be far lower, because most such estimates cautiously ignore the possibility of fundamental technological breakthroughs, and maintain conservative estimates of how long and how fast cost reductions in key technologies will occur. In 2010, the International Energy Agency projected a 70% fall in solar photovoltaic equipment costs by 2030. It happened by 2017.

Rather than relying on apparently sophisticated models, climate-change policy must reflect judgment amid uncertainty. Current trends threaten major but inherently unpredictable adverse impacts. Limiting global warming to well below 2°C will cost at most 1-2% of GDP, and those costs will come down if strong commitments to reduce emissions unleash technological progress and learning-curve effects. Given these realities, zero by 2050 is an economically rational target.

---

# Siemens Is Latest Casualty of European Manufacturing Slowdown



German industrial giant Siemens AG became the latest casualty of Europe's economic slowdown, warning a sharp deterioration in some markets hurt quarterly profit and has put financial goals at risk.

The shares dropped as much as 5.9% on Thursday, the most in more than three years, after the region's largest engineering company reported a disappointing set of results, joining ArcelorMittal, Rheinmetall AG and BMW AG in providing evidence of the gathering storm.

The earnings are a sign that a deepening slump in the global car industry and a more general economic malaise are reaching further into corporate Europe. Until now, Siemens was able to rely on its digital industries division supplying factories

with equipment to automate to make up for a protracted slump in the power and gas sector. In the latest quarter, even orders and sales at that unit dropped.

“It is difficult to reconcile owning Siemens for its world-class automation, software franchise when this is driving negative earnings,” Morgan Stanley analyst Ben Uglow wrote in a note.

### **Downbeat Figures**

Manufacturing in the euro area shrank for a sixth month at the start of the third quarter, dragged down by Germany’s worst slump in seven years. The downbeat figures come in the wake of reports showing slower economic growth in France, Spain and the euro area, with Italy stagnating. While part of the weakness is linked to troubles in the automotive industry, a continued downturn could spell more trouble.

Behind the economic statistics, an increasing number of companies like Siemens are also sounding the alarm. The German company is in the midst of an overhaul and is already shedding thousands of jobs. During the latest reporting period, profit declined a worse-than-expected 12% and the company said a target for sales growth will be harder to reach and another for profit margin will be at the lower end of a range.

“The assumptions we made in the first two quarters about the economic and political environment are no longer true,” Siemens Chief Financial Officer Ralf Thomas said, adding that the auto sector won’t improve for at least three quarters. “We’re taking countermeasures to secure our business’s profitability to the greatest extent possible.”

Chief Executive Officer Joe Kaeser has supervised a large-scale breakup of Siemens’s conglomerate structure, starting with a merger of the wind turbine division and a listing of the health-care division. The planned spinoff of the gas and power unit will be completed in 2020. The German executive

also tried and failed to merge the train-making operation with that of rival Alstom SA. The move was partly motivated by the fate of rival conglomerate General Electric Co., which is showing signs of emerging from a troubled period.

Siemens's new structure has greatly reduced the company's need for people in central operations, where 2,500 job cuts are planned. In total, the company plans to cut more than 10,000 jobs, although Kaeser has said company also plans to hire about 20,000 in the same time.

---

## **India set to increase energy imports from US: Minister**



Bloomberg/New Delhi

India will step up oil and gas imports from the US as the third-biggest oil consumer looks to diversify its supply sources and secure energy for its 1.3bn people.

“When we came to power in 2014, we were not taking any energy from the US and last financial year it was \$6bn,” India’s Oil Minister Dharmendra Pradhan said at the Bloomberg NEF Summit in New Delhi. “I’m saying with full responsibility, this is just the beginning and a lot more would be spent in the near future.”

Indian refineries started buying American oil after the US reversed a decades-old law that restricted exports of unrefined crude in late 2015. The processors imported 6.4mn tonnes of crude worth \$3.6bn from the US during the financial year 2018-19, according to data from India’s Directorate General of Commercial Intelligence and Statistics. Indian companies also have long-term contracts for purchasing liquefied natural gas from the US.

Some infrastructure constraints in the US Permian Basin are likely to be removed later this year, which will increase supply and may result in India being able to reduce its reliance on the Middle East, the head of Hindustan Petroleum Corp, one of India’s biggest state-run refiners, told Bloomberg last month. Middle Eastern producers supply every two barrels out of three that India imports to meet its crude requirement.

Higher energy purchases from the US will help correct the trade imbalance that President Donald Trump has spoken about. New Delhi’s trade surplus with Washington fell sharply to \$17.12bn in the year ended March 31 from \$21.26bn a year ago, according to data from India’s trade ministry.

India, which imports 85% of its oil requirements, is also seeking to harness other non-conventional energy sources such as bio-fuels to reduce exposure to oil price volatility, Pradhan said. The goal of becoming a \$5tn economy will boost the nation’s energy demand, making it necessary to tap every source, he said. The government has introduced a new policy that encourages bio fuel production from non-food feedstock such as solid and industrial waste and biomass. “Utilising the surplus biomass capacity, India can replace 1% of oil-import dependency,” the minister said.



---

# LG Chem set to build 2nd US EV battery plant, say sources



Reuters/Seoul/Detroit

South Korean electric vehicle (EV) battery maker LG Chem is considering building a second US factory, three people familiar with the matter said, accelerating a race to add capacity to meet growing global demand for green vehicles.

LG Chem, one of the leading EV battery makers in the world that counts General Motors and Volkswagen among its customers, is weighing investing about 2tn won (\$1.70bn) in the plant that could begin production in 2022, one of the people said.

Kentucky and Tennessee are among the candidates for the plant's site, the person said.

A decision on the plant's site is expected to be made by the end of this month, another person said.

Automakers are pushing ahead with billions of dollars in investments in electric vehicles to meet global regulatory

requirements.

A new plant by LG Chem would come as South Korean companies have stepped up US investments, moves that have been praised by US President Donald Trump.

LG Chem's new factory would primarily supply to Volvo, Fiat Chrysler Automobiles, and potentially to Hyundai Motor, GM and Volkswagen, one of the people said.

LG Chem, the most valuable company of the LG conglomerate, said in a statement issued to Reuters it is reviewing various ways to meet its global clients' orders, but there are no concrete plans at the moment.

The sources declined to be named as the plan is confidential.

A second US plant would come amid a growing rivalry between LG Chem and crosstown rival SK Innovation, which recently broke ground on its \$1bn US EV battery plant to primarily supply to Volkswagen.

Earlier this year, LG Chem sued SK Innovation in the United States for alleged theft of trade secrets by hiring its former employees.

"We are currently pursuing another production base," LG Chem's new CEO Shin Hak Cheol told reporters this week, without elaborating on the country.

Electric vehicle sales are projected to reach 1.28mn vehicles by 2026 in the United States alone, compared with less than 200,000 in 2018, according to market researcher IHS Markit.

Trump praised US investments by SK, Lotte Group and other South Korean conglomerates and raised hopes that Korean companies will continue to expand in the US. "Thank you very much. Congratulations. It's a great job," he said during his meeting with South Korean business leaders in Seoul on June 30.

The participants included group holding company LG Corp's vice chairman Kwon Young Soo.

LG Chem, the battery supplier for GM's Bolt, currently operates an EV battery plant in Michigan.

LG Chem also has production bases in South Korea, China and Poland.

It drew attention during the groundbreaking of its first US production facility in 2010, when former president Barack Obama travelled to Michigan for the event. LG Chem is also being wooed by the government of South Korean President Moon Jae-in to build a new domestic factory to create jobs – one of Moon's top priorities.

CEO Shin said LG Chem is in talks to build a production facility for cathode materials used in EV batteries in the southeastern city of Gumi in South Korea, but details have not been finalised.

---

## **Oil Tankers' Tracking Signals Are Vanishing in the Strait of Hormuz**



Oil tanker owners are finding a way to reduce the risks of navigating the Strait of Hormuz, the world's most important – and lately most dangerous – energy chokepoint: vanish from global tracking systems.

Copying from Iran's own playbook, at least 20 ships turned off their transponders while passing through the strait this month, tanker-tracking data compiled by Bloomberg show. Others appear to have slightly altered their routes once inside the Persian Gulf, sailing closer than usual to Saudi Arabia's coast en route to ports in Kuwait or Iraq.

Before the latest increase in tensions with Iran, ships were more consistent about signaling their positions as they passed through a waterway that handles a third of seaborne petroleum. Once inside the Gulf, shipping routes took them fairly close to the Iranian coast, skirting the offshore South Pars/North gas field shared by Iran and Qatar. Most still do, but a growing number appear to be trying something new.

It's little surprise that ships are doing everything possible

to minimize risk. The Gulf region has witnessed a spate of vessel attacks, tanker seizures and drone shoot-downs since May, all against the backdrop of U.S. sanctions aimed at crippling Iran. War-risk insurance soared for tanker owners seeking to load cargoes in the region.

Two British warships are now situated in the waters around Hormuz where they were recently escorting the nation's ships. The U.S. 5th Fleet also permanently operates in the region. On Wednesday, the Norwegian Maritime Authority advised the country's flagged vessels to minimize transit time in Iran's territorial waters. Tanker captains have become increasingly nervous about the risks of getting caught up in the conflict.

See QuickTake on the Strait of Hormuz

At least 12 vessels loaded in Saudi Arabia and shut off their transponders while passing through the strait within the past month. They include the supertanker Kahla, which turned off its signal on July 20 before passing through the strait. It reappeared two days later on the other side of the waterway.

Likewise, at least eight vessels that loaded in Iraq and Kuwait went dark while leaving the Strait of Hormuz. A vessel shipping from the U.A.E. also dropped off tracking systems.

The apparent shutdown of signals coincides with a slew of disruptions in the region. On July 11, the Royal Navy intervened to prevent Iran from impeding a tanker operated by BP Plc from passing through Hormuz. Three days later, Iran seized a Panama-flagged vessel. On July 19, Iranian forces took control of a British-flagged tanker in retaliation for similar action by U.K. authorities. The vessel, the Stena Impero, remains impounded.

---



# Climate Changed Turbines in Landfill Trigger Debate Over Wind's Dirty Downside



Wind turbines may be carbon-free, but they're not recyclable.

A photograph of dozens of giant turbine blades dumped into a Wyoming landfill touched off a debate Wednesday on Twitter about wind power's environmental drawbacks. The argument may be only beginning.

Fiberglass turbine blades – which in some cases are as long a football field – aren't easy to recycle. And with BloombergNEF expecting up to 2 gigawatts worth of turbines to be refitted this year and next, there could be heaps more headed for dumps.



A technician repairs a wind turbine blade in Adair, Iowa.

Photographer: Daniel Acker/Bloomberg

Cynthia Langston, solid waste division manager for the city of Casper, declined to say where the turbine debris came from. But she's happy to have it. The 1,000 blades will bring in about \$675,000 for the landfill, helping keep trash costs low for local residents. Plus, Langston said, wind-farm junk is less toxic than other garbage.

"It's much cleaner than the contaminated soil and demolition projects from the oil and gas industry," Langston said in an interview. "These are about as non-toxic as you can get."

Wind turbine blades represent a "vanishingly small fraction" of overall waste in the U.S., according to the American Wind Energy Association.

Sachin Shah, chief executive officer of one of the world's largest clean-power operators, Brookfield Renewable Partners LP, said "there will be an aggressive effort to re-use

materials” in the years ahead.

---

## US sanctions Iran's Foreign Minister Mohammad Javad Zarif



The US Department of the Treasury has imposed sanctions against Iranian Foreign Minister Mohammad Javad Zarif.

The sanctions freeze any assets Mr Zarif may have in America, the department said.

“Javad Zarif implements the reckless agenda of Iran’s Supreme Leader (Ayatollah Ali Khamenei),” Treasury Secretary Steven Mnuchin said.

Mr Zarif tweeted the US had imposed sanctions on him because it considered him as a threat to its agenda.

- Iran-US tensions: What’s going on?



- US-Iran relations: A brief history
- Gulf crisis: Are we heading for a new tanker war?

Tensions between the US and Iran have heightened since the US last year withdrew from the 2015 nuclear deal that aimed to curb Iranian nuclear activities.

There are growing concerns that a number of recent incidents in the Gulf could lead to a military conflict in the vital shipping region.

On Wednesday, the US extended waivers which allow Russia, China and European countries to continue civilian nuclear cooperation with Iran.



Media caption Iran's Foreign Minister: We cannot leave our own neighbourhood

White House security adviser John Bolton said on Wednesday that it was a "short 90 day extension".

"I think the idea here is we are watching those nuclear activities very, very closely," he added.

## What did the US say?

Mr Mnuchin described Mr Zarif as the Iranian “regime’s primary spokesperson around the world”.

“The United States is sending a clear message to the Iranian regime that its recent behaviour is completely unacceptable.

“At the same time the Iranian regime denies Iranian citizens’ access to social media, Foreign Minister Javad Zarif spreads the regime’s propaganda and disinformation around the world through these mediums,” Mr Mnuchin said.

## How did Mr Zarif respond?

Mr Zarif said the US move “has no effect on me or my family, as I have no property or interest outside of Iran”.



“The US reason for designating me is that I am Iran’s ‘primary spokesperson around the world. Is the truth really that painful?” he asked.

“Thank you for considering me such a huge threat to your agenda.”

# What about the 2015 nuclear deal?

Last year, the US unilaterally withdrew from the agreement between Iran and world powers.

Washington has since reimposed tight sanctions affecting the Iranian economy, and also

The other parties of the 2015 deal – China, France, Germany, Russia and the UK – criticised Mr Trump's decision and said they remained fully committed to the deal.



Media caption Inside Iran: Iranians on Trump and the nuclear deal

Iran responded by breaching the limit on its stockpile of low-enriched uranium set under the nuclear deal.

Tehran stepped up production of enriched uranium, used to make reactor fuel but also potentially nuclear bombs, in May.

- Is the Iran nuclear deal finally dead?
- Why do the limits on uranium enrichment matter?
- Iran nuclear crisis in 300 words
- Iran nuclear deal: Key details

Last week, talks were held in Vienna to try to save the nuclear deal.

After meeting representatives from Britain, France, Germany, Russia and China, a senior Iranian official said the atmosphere had been “constructive”.

## **And what about recent tanker incidents?**

Tensions between the UK and Iran rose in July after British forces seized the Iranian tanker, Grace 1, off Gibraltar. It was alleged to be carrying oil to Syria in breach of EU sanctions, a claim denied by Iran.



Media captionFootage released by Iran’s Revolutionary Guard-affiliated Fars news agency appears to show Stena Impero being seized

Several days later the British-flagged Stena Impero was impounded by Iran, which said it had been “violating international maritime rules”.

Britain sent a second warship on Sunday to escort its ships

sailing through the Strait of Hormuz.

---

# Sweden's Biggest Cities Face Power Shortage After Fuel-Tax Hike



Sweden's introduction on Thursday of a tax aimed at phasing out the nation's last remaining coal and gas plants to curb global warming comes with an unintended consequence for some of its biggest cities.

Hiking threefold a levy on fossil fuels used at local power plants will make such facilities unprofitable and utilities from Stockholm Exergi AB to EON SE have said they will halt or cut power production.

The move means that grids in the capital and Malmo won't be able to hook up new facilities including homes, transport links and factories. While Sweden doesn't have a shortage of power, there's not enough cables to ship it to the biggest cities.

"We don't have a problem with generating enough power in Sweden, we have a problem with getting it to where its needed," Magnus Hall, chief executive officer of state-owned utility Vattenfall AB, said in an interview. "This law was added with short notice and I am not sure a proper analysis of it was made."

The tax was introduced in January in a budget deal between the Center Party, Liberals, Social Democrats and the Greens after record long 18 weeks of negotiations. As only one of 73 points hashed out between the political fractions to reach a compromise, time for thorough analysis was probably slim.

---

## **Israel, Saudis Talked Gas Deals, Netanyahu Ally Says**





Saudi Arabia has looked into buying Israeli natural gas, according to a former member of Prime Minister Benjamin Netanyahu's cabinet, the latest sign of warming ties between two formally hostile nations.

The countries have discussed building a pipeline that would connect Saudi Arabia to Eilat, former Israeli parliamentary member Ayoub Kara, who cited conversations with "senior officials" in the region, said in an interview in Jerusalem. Eilat, the Israeli city which banks the Gulf of Aqaba and is about 40 kilometers (24.9 miles) from the border, was chosen for its proximity to Saudi Arabia.

An energy project of this magnitude would require formal diplomatic relations between Israel and Saudi Arabia and is likely to elicit political pushback. Israel remains largely unpopular in the Arab world for its treatment of Palestinians, who live under occupation in the West Bank and under siege in Gaza. Israel and Saudi Arabia have united behind closed doors in their antagonism toward Iran but formalizing an alliance may still be hard to achieve.

Kara has been one of Netanyahu's closest advisers on relations with Arab countries and was among a handful of Israeli ministers to appear publicly in a Gulf state in the past year. "This is about mutual interest," he said.

Representatives for the energy ministries in Israel and Saudi Arabia didn't respond to requests for comment. The Saudi Information Ministry's Center for International Communication also didn't respond to a request for comment.

In Saudi Arabia, Israel would find an eager partner for its emerging natural gas industry. Companies found massive quantities of gas in Israeli waters about 10 years ago but have struggled to realize the fuel's potential. The partners developing Israel's biggest reservoir, have inked \$25 billion in contracts but still have more than 80% of the reservoir untied to any buyers.

Saudi Arabia plans to invest more than six times that amount in gas over the next decade, in part to meet rising demand for cheaper electricity.

## **Regional Opposition**

Mass demonstrations broke out in Amman in 2016 after the companies developing Israel's biggest offshore gas fields signed a \$10 billion contract with Jordan, home to millions of people of Palestinian origin.

While some Saudis argue that normalizing relations with Israel is a natural merging of interests, many others vehemently oppose the idea. Public resistance to establishing relations with Israel is so strong that a group of more than 2,000 citizens from different Gulf countries circulated an online petition last year "to stop all forms of normalization with the Zionist entity." They signed their full names – a rare step in a region where freedom of expression is limited.

While leaders of the Arab world used to be united behind the



Palestinians, that support began to wane with the rise of the Iranian threat to Sunni Gulf countries, Kara said. Saudi Arabia and its regional allies now pay “lip service” to the Palestinian cause, and are seeking upgraded military and economic ties with Israel to counter Iran, he said.

Gulf states are “not interested in the Palestinian issue,” Kara said. “All they care about is the security and future of their countries.”

Part of the discussions between officials center on a new energy corridor that would connect Saudi Arabia to the Eilat-Ashkelon Pipeline in Israel. This would allow the Arab kingdom to export its oil to Europe and markets further west while skirting a sea route where the U.S. has accused Iran of carrying out several attacks against commercial ships, Kara said.

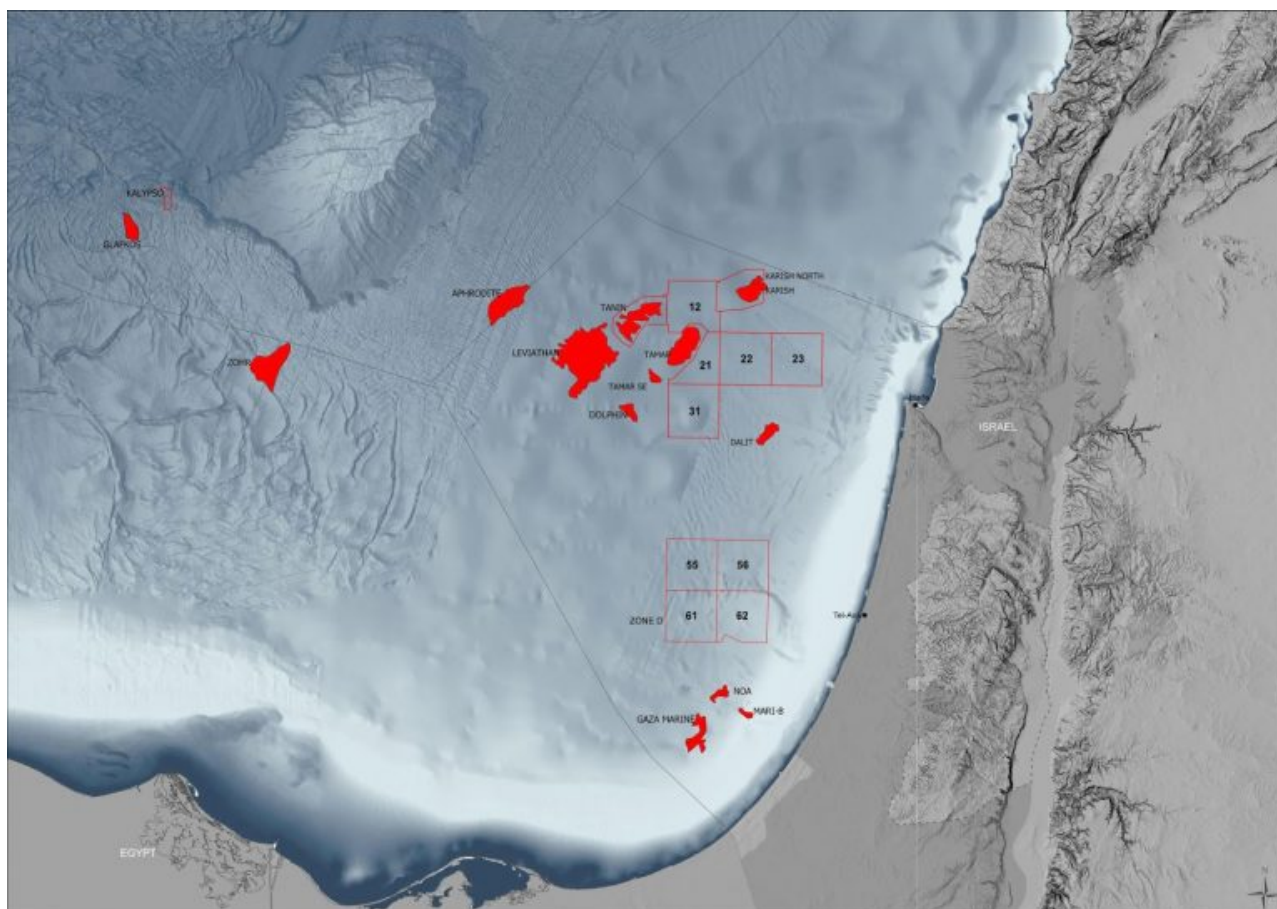
Set up in 1968, Eilat-Ashkelon Pipeline Co. was then jointly-owned by Iran and Israel and facilitated oil exports from Iran to Europe. That relationship ended after Ayatollah Ruhollah Khomeini rose to power in Tehran in 1979 and he marked Israel as an enemy to the Islamic Republic.

– *With assistance by Donna Abu-Nasr, and Vivian Nereim*

---

**Four Further Licences Awarded  
to Energean for Oil and Gas  
Exploration in Israel's**

# Exclusive Economic Zone (“EEZ”) – ENERGEAN OIL & GAS



Energean Oil and Gas plc (LSE: ENOG, TASE: אנוג) is pleased to announce that Israel's Petroleum Council has awarded the Company four new licences for oil and gas exploration in the Israeli EEZ. Energean submitted its proposal in partnership with Israeli Opportunity (20%). The awarded Licences were granted for Block D, located 45 km off the Israeli coast – and include Licences 55,56,61,62 (“Zone D”), offered in the recent Bid Round published by the Israeli Ministry of Energy. Energean has identified a prospect within Zone D analogous to the prolific Tamar Sand fields (Karish, Tamar, Leviathan etc) offshore Israel. The prospect is believed to extend towards the SW of the license contingent to further seismic processing. A relatively shallow Mesozoic prospect was also identified (four way closure).

Mathios Rigas, CEO of Energean, stated: "Energean has proven its ability and commitment to explore and develop resources in a timely and cost efficient manner in the East Med. The addition of the 4 new licenses contained in Zone D adds further upside potential to our portfolio".