Energy Intelligence

RESEARCH & ADVISORY
Briefing

Jogmec International Seminar

The Evolving Energy Transition Outlook and its Industry Implications

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CONTACT DETAILS

Alex Martinos
Director, Energy Transition Research
London
+44 (0)20 7518 2248 | amartinos@energyintel.com

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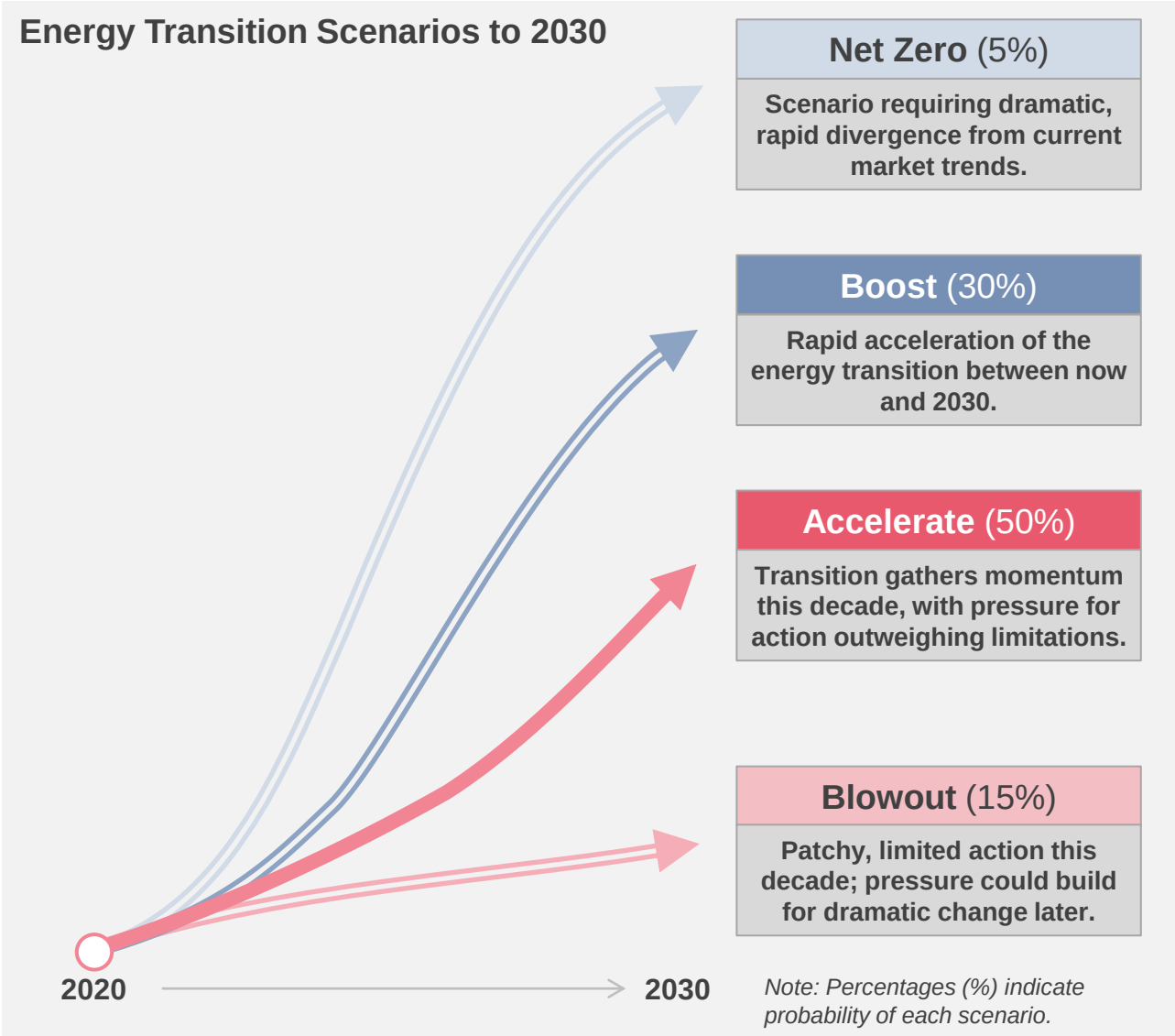
Agenda

- Energy Intelligence Transition Scenarios
- Russia-Ukraine Crisis: Emerging Impact
- Long-term Transition Scenario Outlook
- Implications for Corporate Strategy and Positioning

Energy Transition Trajectories to 2030: Overview

Our core Accelerate scenario sees the transition gathering pace through the 2020s

- **Recent trends bolster our view that the transition is accelerating, but falling short of net-zero goals.**
- **Accelerate**, our base case, sees the transition gather pace through the 2020s as policy pressures grow.
- **Boost** assumes an even more rapid, self-supporting cycle of robust policy support and technological progress.
- In the less likely **Blowout** case progress falters this decade – possibly storing up future pressures.
- A **Net-Zero** scenario remains unlikely to play out; however, hopes for such a trajectory are now at the heart of the energy transition discussion.



Source: Energy Intelligence, Energy Transition Research

Russia-Ukraine Conflict Reshaping Industry

Just weeks in, the crisis already has multiple lasting implications for the global energy industry

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Wider Headwinds May Impact Transition Trajectory

Beyond short-term impact, implications for transition are more balanced

	Slower Factors pushing the transition onto a slower trajectory	Faster Factors that support an even faster transition
Energy Security Focus	• **Emerging energy supply crises deflect momentum** from energy transition priorities • **Energy security concerns and high prices** support near-term oil and gas investment	• **Energy security concerns drive efforts to cut fossil fuel dependence** sooner with faster renewables rollout and other transition efforts over medium- and long-term
Geo-political Headwinds	• **Wider geopolitical tensions** may undercut cooperation needed for faster climate action	• none
Rising Clean Energy Input Costs	• **As global commodities prices soar**, key inputs for clean energy technologies are rising fast, including costs for steel (wind); polysilicon (solar) and nickel/lithium (EVs)	• none
Surging Oil & Gas Prices	• **High prices help company finances,** offering defense against ESG pressures • **Investors may see increased scope** for short-term oil and gas spending	• **Soaring prices may encourage demand destruction** as consumers seek alternatives • **Strong company finances** will support ongoing expansion of transition spending

We expect the crisis to have short-term impact on momentum around the energy transition; but over the medium and long-term, the implications are more balanced.

Energy Transition Dynamics: Transition Unlikely to Be Smooth

Crisis adds to risks of uneven, bumpy transition with rising tensions and volatility

- **The energy transition, requiring deep changes to the global energy system, already looked set to be an uneven, untidy process, varying by region.**
- The Russia-Ukraine crisis looks likely to add to reinforce these dynamics.

1 Stop-Start Change, Due to Policy, Markets

- **Investment decisions are subject to highly variable policy decisions and market signals, likely resulting in bumpy, stop-start action over shorter time frames.**
- Political shifts and reversals could see transition efforts gain and lose momentum.

2 Uneven Progress by Geography

- **Progress toward decarbonization is likely to remain uneven across countries and regions, reflecting multiple differing factors.**
- The energy industry faces an untidy patchwork of widely differing market dynamics, variations in regulation, and diverse social pressures

3 Mismatched Supply and Demand Shifts

- **Energy supply and demand are unlikely to shift in tandem through a multidecade transition.**
- Curtailing capital flows to constrain fossil fuel investment can see new supply cut back before shifts on the demand side.

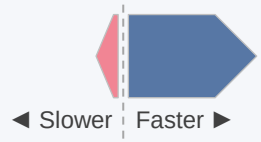
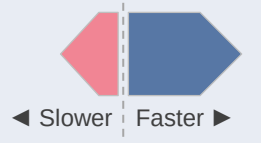
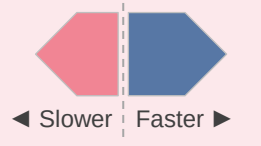
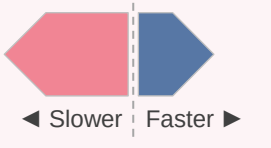
4 Rising Geopolitical Tensions

- **Despite hopes for global cooperation, the transition will likely be accompanied by rising geopolitical tensions.**
- Fault lines are already evident between advanced and developing economies over responsibility for emissions reduction.

Source: Energy Intelligence, Energy Transition Research

Energy Transition Trajectories to 2030: Key Conclusions

Key energy transition dynamics and implications across scenarios

Scenarios	Critical Dynamics	Drivers	Key Implications
Net Zero (5%)	• **Dramatic, acceleration in near term, driving sharp pre-2030 change** • **Forceful near-term policy action and corporate response**, despite negative effects like commodity price inflation	**Balance of Drivers** 	• **Temperature rises** within **1.5°C** • **Oil demand peak: early 2020s** • **Gas demand peak: before 2030**
Boost (30%)	• **Inflection point before 2025** led by clear policy support amid rising climate urgency. • Assumes **self-reinforcing cycle** of stronger policy incentives and corporate responses and faster technological gains	**Balance of Drivers** 	• **Temperature rises** within **2.0°C** • **Oil demand peak: by mid-2020s** • **Gas demand peak: early 2030s**
Accelerate (50%)	• Faster progress toward **inflection point in the mid-2020s** as low-carbon **technologies** become more competitive. • Rising **investor pressures** and **societal demands** also drive the acceleration.	**Balance of Drivers** 	• **Temperature rises** within **2.5°C** • **Oil demand peak: late 2020s** • **Gas demand peak: around 2040**
Blowout (15%)	• **No inflection point by 2030** as transition remains uneven and volatile. • Rising climate risks and direct impacts **may set stage for more disruptive responses** in the 2030s.	**Balance of Drivers** 	• **Temperature rises** of **2.5°C** or more • **Oil demand peak: mid-2030s** / later • **Gas demand peak: mid-2040s** / later

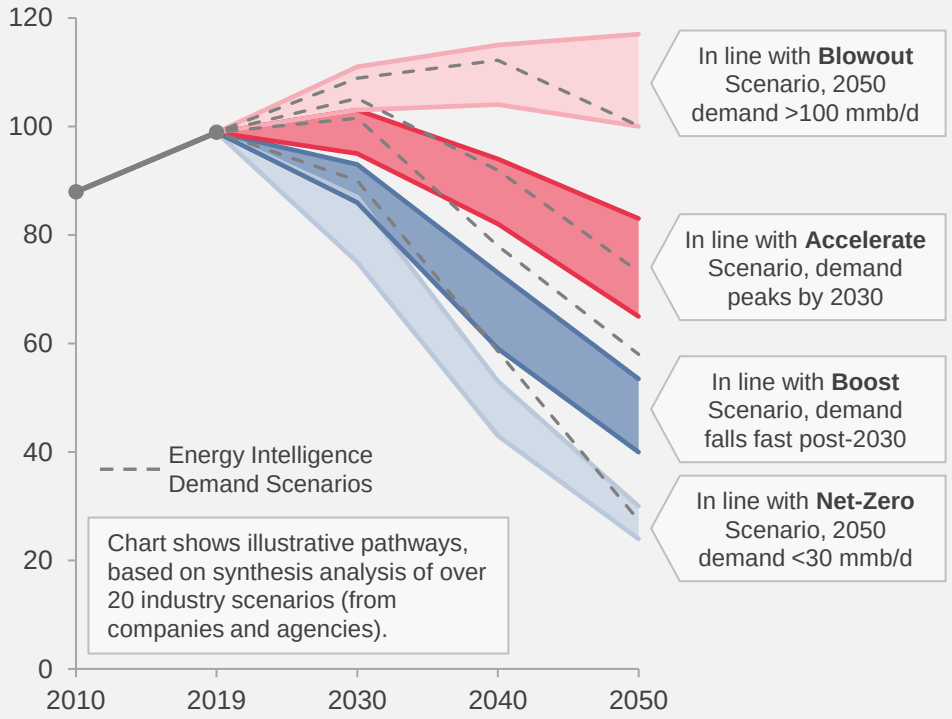
Source: Energy Intelligence, Energy Transition Research. Note: Percentages (%) indicate probability of each scenario.

Scenario Implications: Oil and Gas Demand Overview

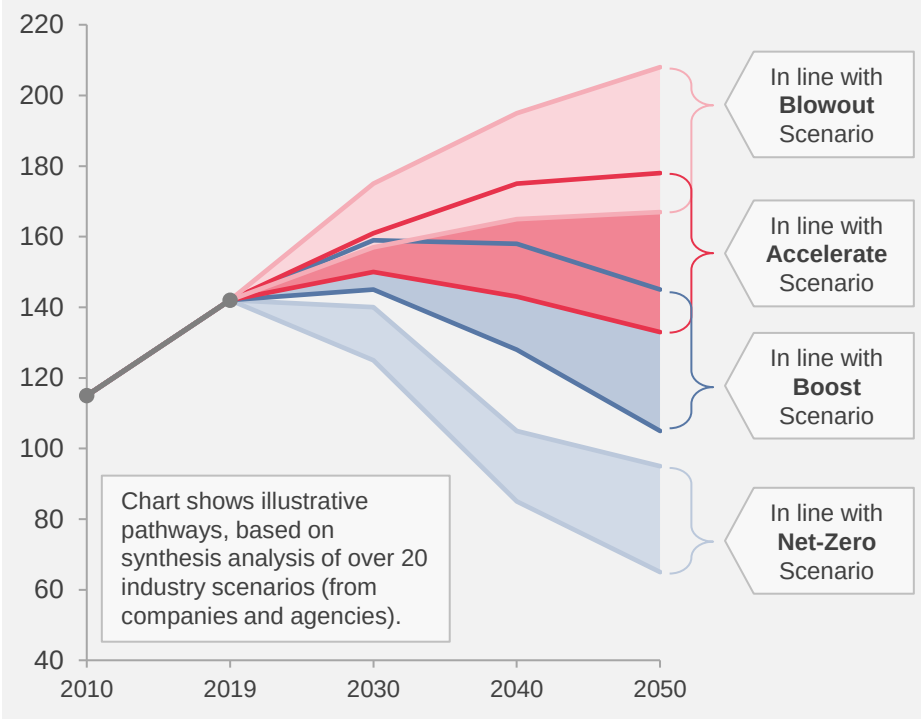
Illustrative analysis shows oil demand outlook sharply differentiated by scenario

- **Our synthesis of external scenarios, plus in-house analysis, illustrates the oil/gas demand outlook.**
- Oil demand trends differ sharply by scenario, ranging from continuing growth above 100 million b/d (in line with our Blowout scenario) to radical reductions to below 30 million b/d by 2050 (Net-Zero scenario).
- The correlation of gas demand outlooks to the transition scenarios is less clear-cut. In faster transition pathways, gas may benefit from a faster phaseout of coal, but be sidelined by renewables.

Energy Transition Scenarios, Illustrative Oil Demand
(million b/d)



Energy Transition Scenarios, Illustrative Gas Demand
(EJ)



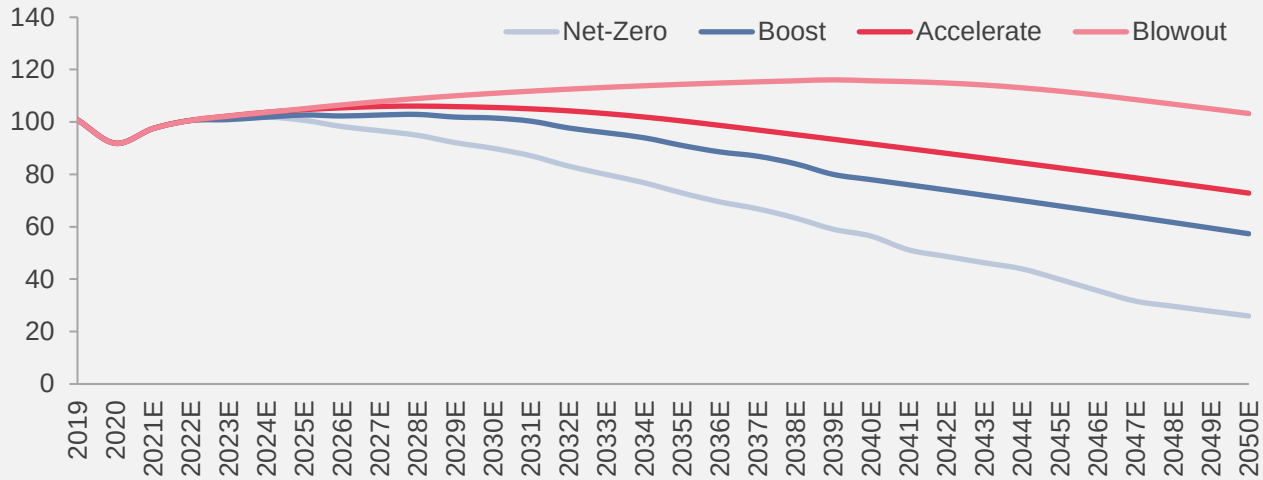
Source: Energy Intelligence, Energy Transition Research. Scenarios from IEA, EIA, IPCC, WEC, BP, Exxon, Total, DNV, Equinor.

Long-Term Outlook: Oil Supply

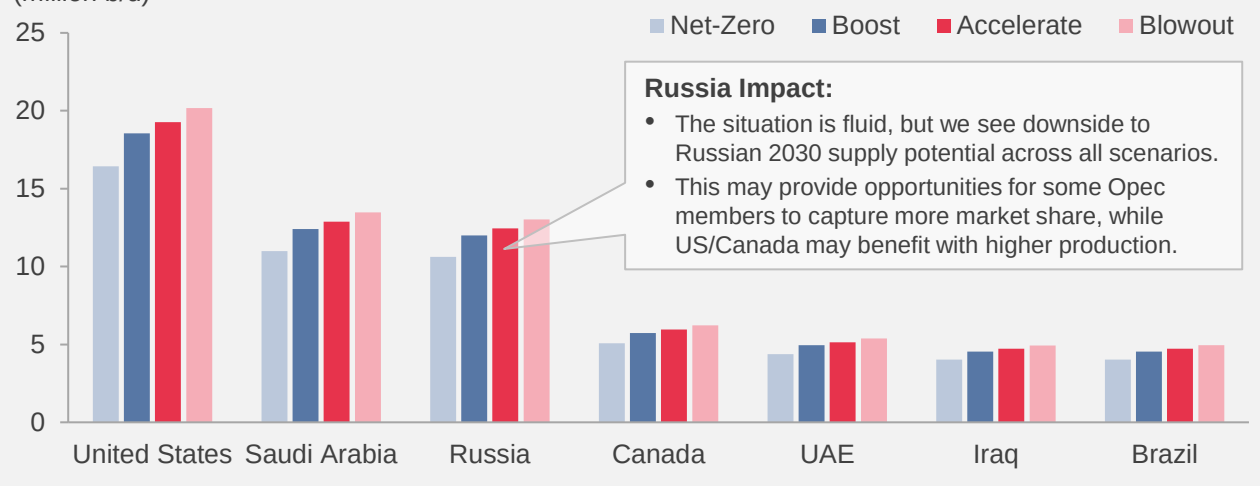
Base case Energy Intelligence scenario sees modest growth through 2030

- **Our near-term supply picture is stable across scenarios.**
  - Supply is seen flowing from a combination of producer states' spare capacity, projects in the pipeline, and a supply recovery following the Covid-19 downturn.
  - However, the Ukraine crisis is set to weigh on Russia's supply outlook, with wider repercussions.
- In our Accelerate scenario, supply rises gradually, just keeping up with demand growth, which shows resilience through the mid-2020s.
- **Over time, supply is set to decline along with demand in 2030 and beyond.**
  - This is set to be driven more by Western, public and energy transition-exposed companies.
  - Producer states and NOCs will likely be more resilient sources of supply for longer.

Oil Supply by Energy Intelligence Scenario (million b/d)



2030 Supply From Key Producers by Energy Intelligence Scenario
(million b/d)



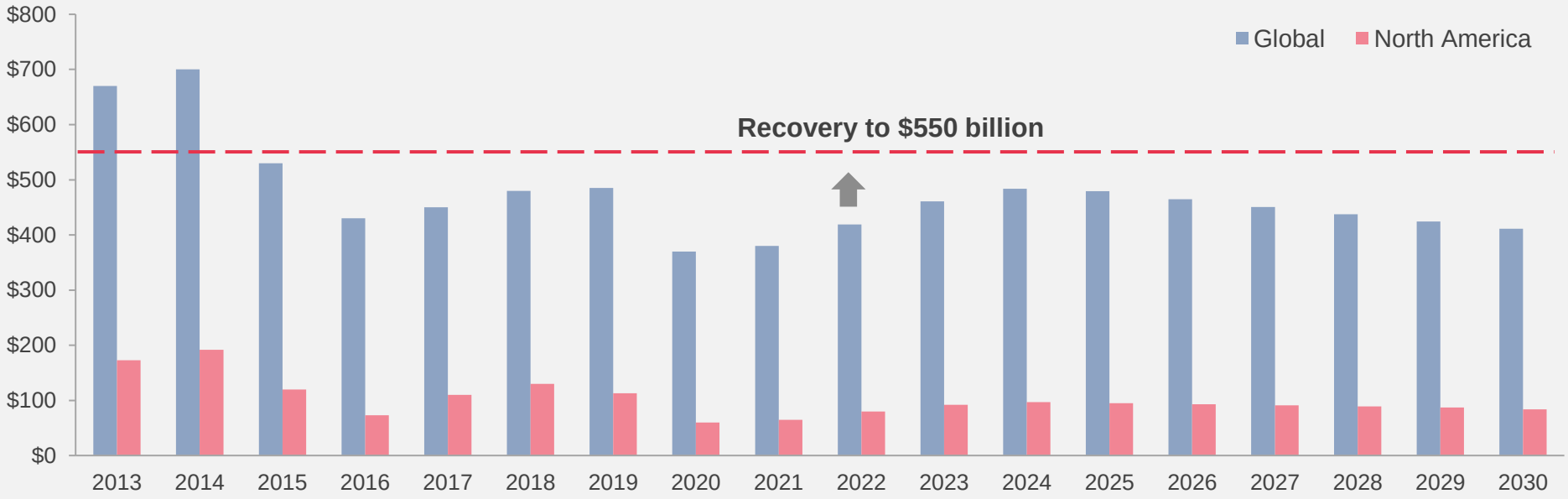
Source: Energy Intelligence

Long-Term Outlook: Capital Spending

Modestly increasing upstream capex is inadequate to address structural underinvestment

- **Global upstream spending in 2021 was only modestly up to ~$380 billion, 2022 should see a ~10% increase to $420 billion (but that is still down ~14% vs 2019).** While we see a rebound in the coming years, investments are set to remain a step leg lower through the 2020s as the energy transition becomes even more mainstream, affecting corporate strategies and capital flows.
- **Capex would need to increase 50% from 2021 levels to recover underinvestment,** given that demand for oil and gas has largely returned to pre-Covid-19 levels. This seems like a tall order given emissions pressures but, without it, years of price spikes and shortages may be inevitable.

Global and North America E&P Spending and Outlook ($ billion)



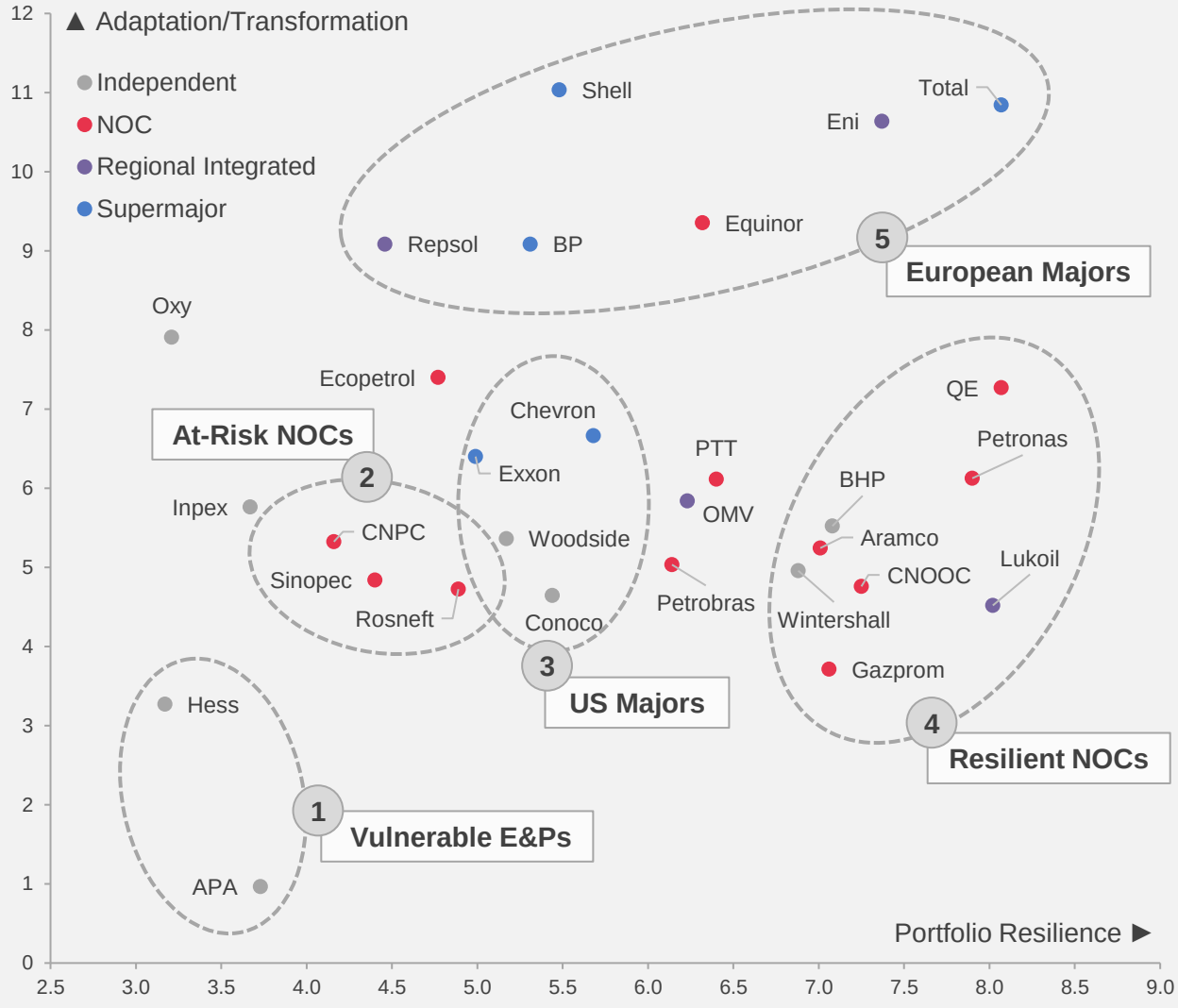
Source: Company reports, Energy Intelligence forecasts

Transition Strategy Index: Overall Positioning

Five core groups illustrate differentiated positioning and strategy

- **We identify five groups of firms by positioning – although there are certainly outliers.**
- **1. Vulnerable E&Ps** are most exposed on both axes, with weak underlying portfolio resilience and scant plans to adapt or transform.
- **2. At-risk NOCs** like Rosneft, CNPC and Sinopec arguably remain poorly prepared for the looming energy transition.
- **3. US Majors** rank closer to NOCs than to European peers, but are taking steps to expand their transition strategies.
- **4. Resilient NOCs**, including Aramco and gas-weighted firms like QE and Petronas, boast more resilient current portfolios.
- **5. European Majors** may be least vulnerable, with diversified portfolios and advanced transition plans, but still face challenges.

Transition Strategy Index: Portfolio Resilience vs. Adaptation & Transformation



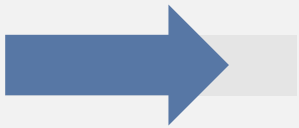
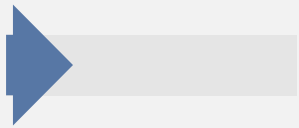
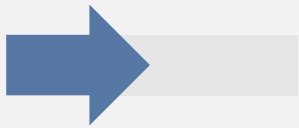
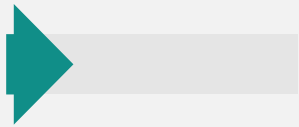
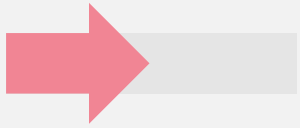
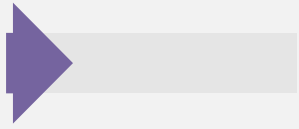
Source: Energy Intelligence, Energy Transition Research. Note: The maximum score for each axis is 12.

Peer Group Strategic Implications For The 2020s

Wide variations in implications for differing industry peer groups

- Europe's Majors would benefit from a faster transition, while US Majors and Resilient NOCs are betting on slower change. Some NOCs and Independents face greater risks across scenarios.

2020s Strategic Indicators

	European Majors	US Majors	Resilient NOCs	At-Risk NOCs	Independent E&Ps
Ability to increase oil and gas production?					
Financial resilience?					
Competitiveness of oil and gas resources?					
Scope to pivot to clean energy alternatives?					

Source: Energy Intelligence, Energy Transition Research.

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The Evolving Energy Transition Outlook and its Industry Implications

Key takeaways

1. **The Russia-Ukraine conflict is upending the global energy industry.** The crisis has already had lasting impacts both on oil and gas/LNG markets, and for competitor positioning in Russia's energy sector.

2. **Energy security and geopolitics have reemerged as priorities for policymakers and energy sector CEOs.** Governments must now address security of supply, while companies face a range of new geopolitical, reputation and stakeholder risks.

3. **The implications for the energy transition are less clear-cut.** In the short-term there is a definite loss of momentum around the transition; however, over the mid- and long-term we expect that the impact may be more balanced.

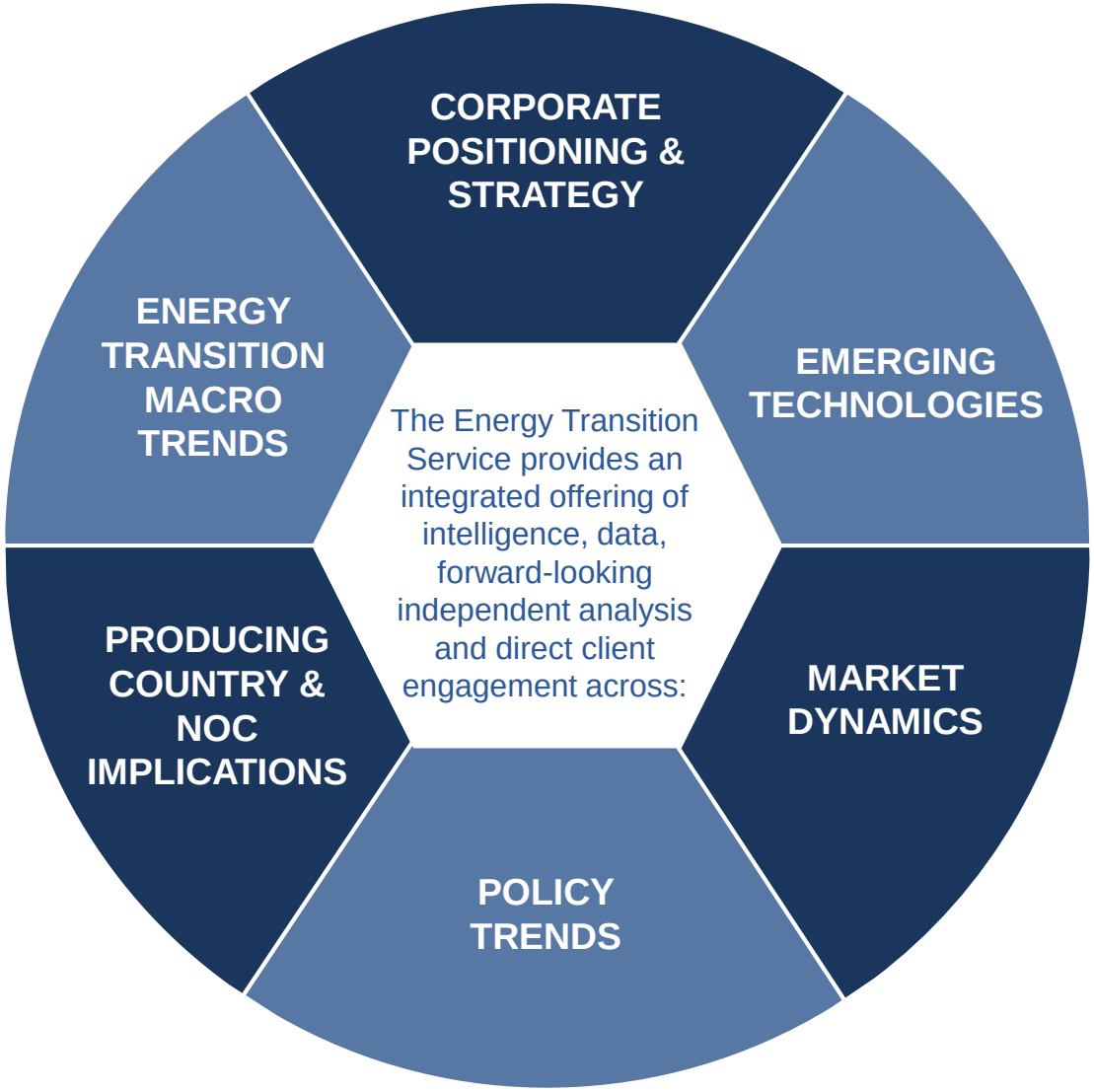
4. **Our long-term scenarios analysis and forecasts highlight a differentiated oil supply outlook by region.** This picture is set to be reshaped by downside risks for Russian supply, creating openings for others – but globally, upstream capex may remain constrained.

5. **Corporate implications vary widely.** Some firms – notably European majors – are better placed to benefit from a faster transition, others, such as US Majors and Resilient NOCs, are positioned for a more moderate or slower transition.

Energy Intelligence: Energy Transition Service

Guiding the energy industry through the low-carbon transition

- The **Energy Transition Service** offers an unparalleled combination of intelligence, data, independent analysis and direct client engagement.
- We focus on six thematic areas—from corporate strategy to market dynamics (see right).
- We seek to answer three core questions:
  - What is the pace and trajectory of the global energy transition, and how will it impact the oil and gas industry?
  - How are companies and countries positioning to adapt to the energy transition?
  - Which emerging low-carbon technology areas offer the most potential for the industry?



Appendix

Glossary of terms

Measurements:

- bbl: barrels
- b/d: barrels per day
- /bbl: per barrel
- boe: barrels of oil equivalent
- boe/d: barrels of oil equivalent per day
- Mcf: thousand cubic feet
- Mcf/d: thousand cubic feet per day
- MMcf: million cubic feet
- Mmcfe: million cubic feet equivalent
- MMcf/d: million cubic feet per day
- Bcf: billion cubic feet
- Bcf/d: billion cubic feet per day
- Bcm: billion cubic meters
- Bcm/yr: billion cubic meters per year
- Tcf: trillion cubic feet
- Tcfe: trillion cubic feet equivalent
- MMBtu: million Btu
- MMBtu/d: million Btu per day
- km: kilometer
- GW: gigawatt
- kW: kilowatt
- kWh: kilowatt hour
- MW: megawatt

Acronyms:

- CCGT: combined-cycle gas turbine
- CO2: carbon dioxide
- CO2e: carbon dioxide equivalent
- E&P: exploration and production
- Ebitda: earnings before interest, taxes, depreciation and amortization
- EIA: Energy Information Administration
- ESG: environment, social and governance
- EOR: enhanced oil recovery
- FERC: Federal Energy Regulatory Commission
- FPSO: floating production, storage and offloading vessel
- FSRU: floating storage and regasification unit
- EPC: engineering, procurement and construction
- Feed: front-end engineering and design
- FID: final investment decision
- f.o.b.: free-on-board
- GHG: greenhouse gas
- GTL: gas-to-liquids
- HOA: heads of agreement
- IEA: International Energy Agency
- IFRS: International Financial Reporting Standards
- IMF: International Monetary Fund
- IOC: international oil company
- IOC: international oil company
- IPO: initial public offering
- JCC: Japan Crude Cocktail
- JCPOA: Joint Comprehensive Plan of Action
- JKM: Japan Korea Marker
- M&A: mergers and acquisitions
- MOU: memorandum of understanding
- NGL: natural gas liquids
- NOC: national or state-owned oil companies
- PSA: production-sharing agreement
- PSC: production-sharing contract
- ROCE: return on capital employed
- S1, S2, S3: scopes 1, 2, 3 emissions
- USGOM: US Gulf of Mexico
- WI: working interest
- WTI: West Texas Intermediate

Company Abbreviations:

- Adnoc: Abu Dhabi National Oil Co.
- APA: APA Corp.
- Aramco: Saudi Aramco
- Conoco: ConocoPhillips
- EOG: EOG Resources
- Exxon: Exxon Mobil
- Oxy: Occidental Petroleum
- QE: QatarEnergy
- Total: TotalEnergies

Contact Us

Geoff Wright | New York
Global Head of Sales
+1 646 616 0836
gwright@energyintel.com

Sam Ghrairi | London
Director of Sales EMEA & APAC
+44 (0)20 7518 2244
sghrairi@energyintel.com

Ahmed Eissa | Dubai
Sales, Middle East & Africa
+971 (4) 364 2610
aeissa@energyintel.com

Anurag Joshi | Singapore
Sales, APAC
+65 6538 0363
ajoshi@energyintel.com

The Americas

270 Madison Avenue, Suite 302
New York, NY 10016
Tel: +1 212 532 1112

National Press Building, Suite 340
529 14th Street NW
Washington, DC 20045
Tel: +1 202 662 0700

808 Travis Street, Suite 1014
Houston, TX 77002
Tel: +1 713 222 9700

Europe

2nd Floor, Berkeley Square House
Berkeley Square
London W1J 6BD, UK
Tel: +44 (0)20 7518 2200

Daev pereulok 20, Office 509
107045 Moscow, Russia
Tel: +7 495 604 8279/78/77

Middle East & Asia-Pacific

15A Temple Street, #02-01
Singapore 058562
Tel: +65 6538 0363

Arjaan Office Tower 301
Dubai Media City
P.O. Box 502803
Dubai, UAE
Tel: +971 4 364 2607/2608

Berytech Innovation Park Mathaf
Museum District, Damascus Road
P.O. Box: 11-7503 Riad el Solh, 1107 2240
Beirut, Lebanon
Tel: +961 3 301278

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