ESG in the energy sector

26th November 2024

Sustainable and responsible decision-making

Team 1 – XXXX

Our team of experienced consultants provides you with comprehensive support

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The oil industry is under immense pressure to change in the future to become climate resilient and to safe their own business model

Executive summary

Aspect	Analysis
Current Situation	The oil and gas sector, as a major emitter of greenhouse gases, faces significant challenges in reducing emissions. However, this presents opportunities for efficiency and diversification. A key hurdle is the low acceptance of renewable energy near settlements, which can be addressed by highlighting benefits, involving local residents, and using greenhouses. Additionally, the sector lacks clear regulations on sustainable practices, but engaging directly with investors could provide an advantage in reporting efforts.
Challenges in the future	The carbon capture and storage method offers significant future opportunities for companies but requires further research. Tackling climate change demands extensive mitigation efforts, where the oil sector plays a pivotal role. However, this transition presents challenges for workers adapting to renewable energy. Additionally, while AI has the potential to boost efficiency in the sector, it also intensifies labor market issues. To address these challenges, a comprehensive climate governance framework must be established to support sustainable progress.
Scenario planning and exit strategies	By 2050, unchecked technological progress and rising energy demands will push the planet to a critical tipping point. AI-based energy systems and smart cities strain infrastructure, while the Paris Agreement fails due to lack of support. Cyber wars intensify calls for AI regulation. Oil companies must transform their business models to avoid collapse, as the looming climate catastrophe threatens the sector's survival. This would disrupt the business model of the companies. Because of their good knowledge in data analytics, they can further push into this sector or trying to transform into logistic companies.

1. **+35 %** Rise of global oil demand till 2050
2. **50 %** Share of oil industry of global GHG emissions
3. **>85 %** Job increase in renewable energy*
4. **~15-20 %** Of global electricity systems use AI
5. **~5-10 MW** Energy demand for quuantum computing*

Overall, the sector is currently also facing significant challenges, but these can be overcome through investments. In the future, technologies must be used intelligently for the benefit of the planet.

AIT Asian Institute of Technology

*till 2050

Agenda

01 Industry Overview

02 Recent News

03 ESG issues

04 Future Trends

05 Scenario planning

06 Impact Assessment

The energy industry consists of 4 sectors, we focus on the oil and gas industry which is expected to grow further in the coming years

Introduction

Industry Profile

> The energy sector is the backbone of the economy; it encompasses the production, distribution and sale of energy, including the extraction and conversion of all energy sources into usable forms and their distribution to consumers.

The industry (energy production) consists of different sectors:

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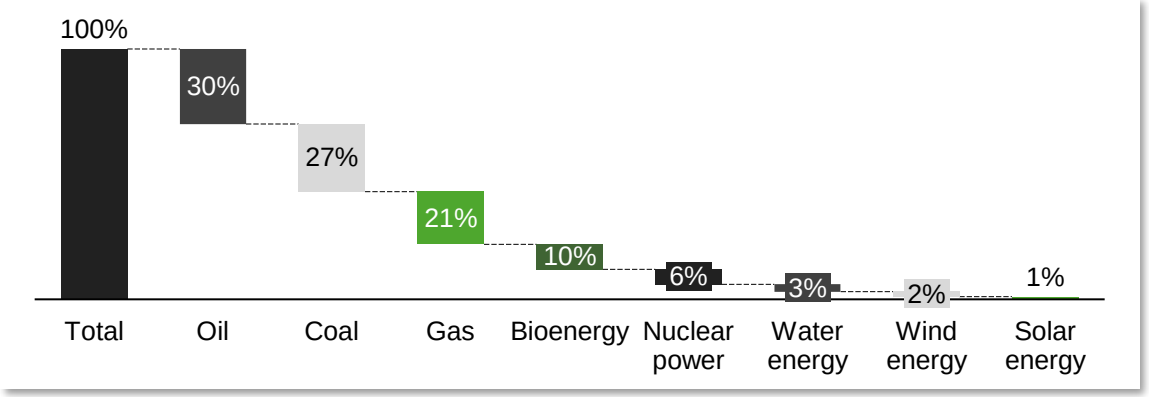
- **Operators of coal-fired power plants**
- **Operators of nuclear power plants**
- **Oil and gas companies**
- **Operators of wind and solar parks**

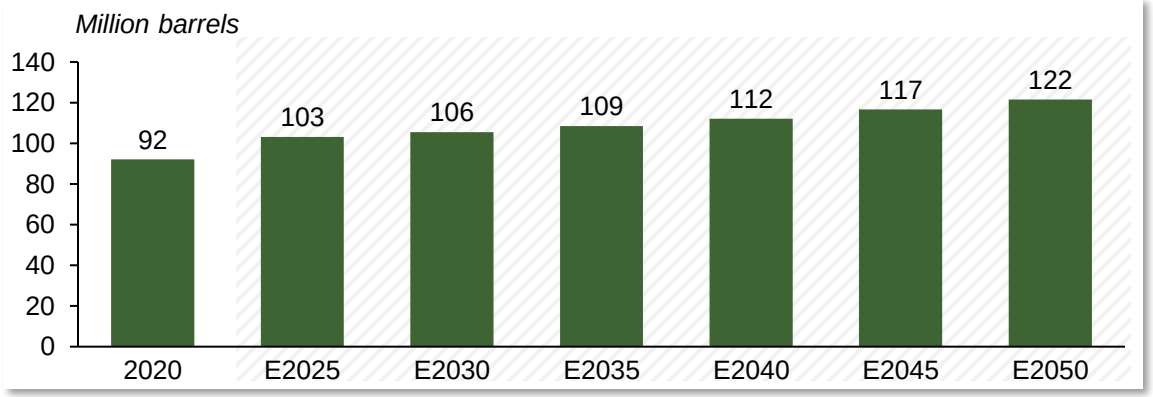
Industry challenges

- **Increasing energy efficiency** to boost competitiveness
- **Digitization of energy management** for control and monitoring
- **Expansion of electrification** (e.g. transportation systems)
- **Geopolitical tensions** around the globe in major production areas and Nationalization trend especially in Africa

Energymix worldwide [2023]



Industry development (daily oil demand)



Weltweiter Energiemix nach Energieträger 2023 | Statista, Täglicher Ölverbrauch weltweit bis 2050 | Statista, Herausforderungen und Chancen: Die Ölbranche im Jahr 2024

The standard business model focuses primarily on the use of available natural resources and their distribution

Standard business model

What are the companies in the industry build on?

Key Partners

- **Government and Regulators**: Acting as the primary funder for project development
- **Technology Providers** : Develop partnerships with other companies to develop smart grids
- **Industrial clients** : An energy-intensive industry and plays an important role in developing renewable energy.
- **Renewable Energy Developers** : Collaborations for new renewable capacity installations globally.

Key Activities

- **Energy Generation**: Operate power plants, fossil fuels, nuclear
- **Energy Distribution**: Maintain and expand grid infrastructure
- **Grid Maintenance**
- **Customer Billing and Support**

Key resources

- **Oil & Natural gas Reserves**
- **Refineries & chem. Plants**
- **Fuel Supply Contracts**
- **Skilled Workforce**
- **Retail Network**
- **Power Plants**

Value Proposition

- **Reliable Energy Supply:** Provide consistent, reliable energy to residential, commercial, and industrial customers.
- **Affordable Pricing:** Offer competitive energy rates to attract a broad customer base.
- **Convenience and Accessibility** : Ensure easy access to electricity for urban and rural areas through established grid systems.
- **Flexibility for Large Clients**: Tailored energy packages for corporate and industrial users to meet their operational demands.

Customer relationships

- **Long-term Contracts** : Most organizations (60%) sign long-term contracts to reduce price volatility.
- **Self-Service Platforms**
- **Customer Support**
- **Consultative Relationships**

Channels

- **Direct Utility Services**
- **Digital Platforms**
- **Partnerships :** Partnerships with renewable energy developers
- **Physical Infrastructure**

Customer segments

- **Individual Customers** : 40-50% in Global electricity.
- **Corporate & Industrial Clients** : 42% of Global electricity with relying heavily on fossil fuels.
- **Government and Public sectors** : play an important role in supporting and taking care of Renewable Energy Project.
- **Emerging Markets** : Energy demand exceeds available resources

Cost structure

- **Infrastructure Costs** : $2 trillion is spent each year to build and maintain power plants and grids around the world.
- **Fuel Costs** : It accounts for 25% of the operating budget of traditional energy providers.
- **Technology Costs :** It costs utilities $200 billion a year.
- **Regulatory Costs** : It is an average of 5-10% of the total budget.
- **R&D Investments :** Costs to reach $75 billion by 2022 focus on renewable energy.

Revenue streams

- **Energy Sales:** Revenue from selling electricity to residential, commercial, and industrial clients.
- **Grid Access Fees:** Charges for maintaining and accessing the grid infrastructure.
- **Government Subsidies:** Support for rural electrification projects or limited renewable energy investments.
- **Service Fees:** Additional charges for new connections, maintenance, or metering services provided to customers.

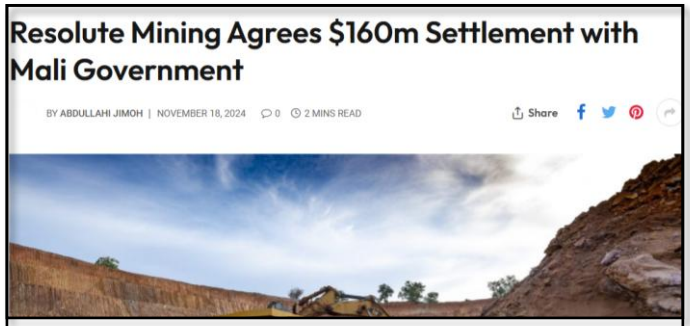
Exxon Mobil Annual Report 2023, Shell Co. Ltd. Annual Report 2023, Where energy is opportunity | Aramco, Chevron Annual Report 2023, BP Annual Report 2023, Gazprom Annual Report 2023, Total Energies Annual Report, Petro China Annual Report

Recent News

Despite climate change, global oil reserves are an opportunity for economic advancement, especially in poor African countries

Recent news (1/2)

What is going on in the industry?



What?

The Resolute mining executives, were detained earlier this month in Bamako after travelling for what they believed were routine negotiations with Mali's ruling junta.

Why?

This is due to the Malian military government's demand for a larger share of the gold mining companies operating in Mali.

Impact on sector

What?

Nambibia plans to further expand the country's existing oil reserves and continue to extract oil as efficiently as possible.

Why?

Namibia has enormous reserves of natural resources but has not yet been able to use them to its own advantage.

Impact on sector

What?

Transformation from agriculturally-based economies to potential oil powerhouses, influenced by major investments from foreign companies.

Why?

This shift is strengthening the global profile of both nations and promising substantial economic benefits.

Impact on sector

A large portion of the world's natural reserves are located in developing countries. These countries are making efforts to regain ownership of these **reserves**, hoping to **achieve strong economic growth and ending poverty**.

The geopolitical crises are making it increasingly important for companies to diversify their business model and actively manage their data

Recent news (2/2)

What is going on in the industry?

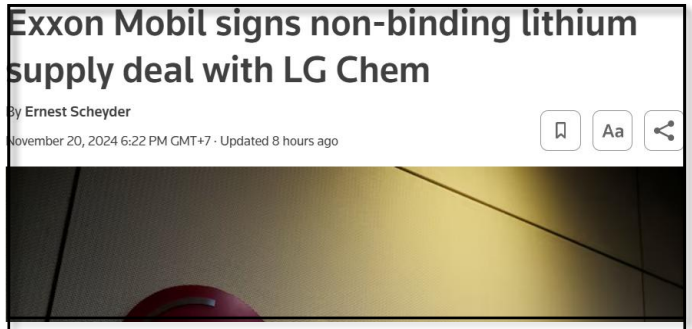
What?

The geopolitical situation in eastern Europe leads to increased oil prices due to concerns about supply disruptions.

Why?

Due to concerns about supply disruptions and decreasing output levels or heightened demand for energy security.

Impact on sector



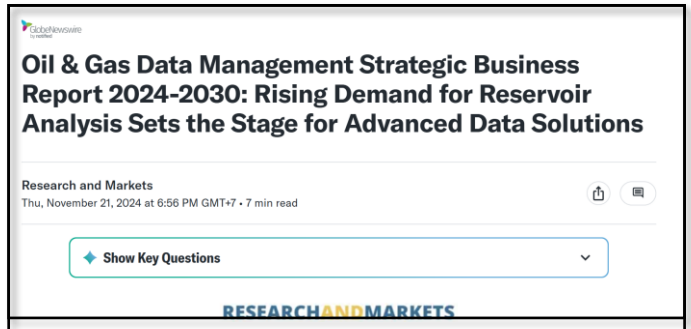
What?

Exxon signed a non-binding lithium supply agreement with LG chem. to further extract lithium from the Smackover shale.

Why?

Exxon has increasingly invested into lithium due to the company predicts that lithium demand will increase significantly.

Impact on sector



What?

Managing data effectively can enhance operational efficiencies, improve safety standards, and ensure compliance with regulations in the industry.

Why?

Data management is crucial in the industries due to the amounts of data generated from exploration, production, and distribution activities.

Impact on sector

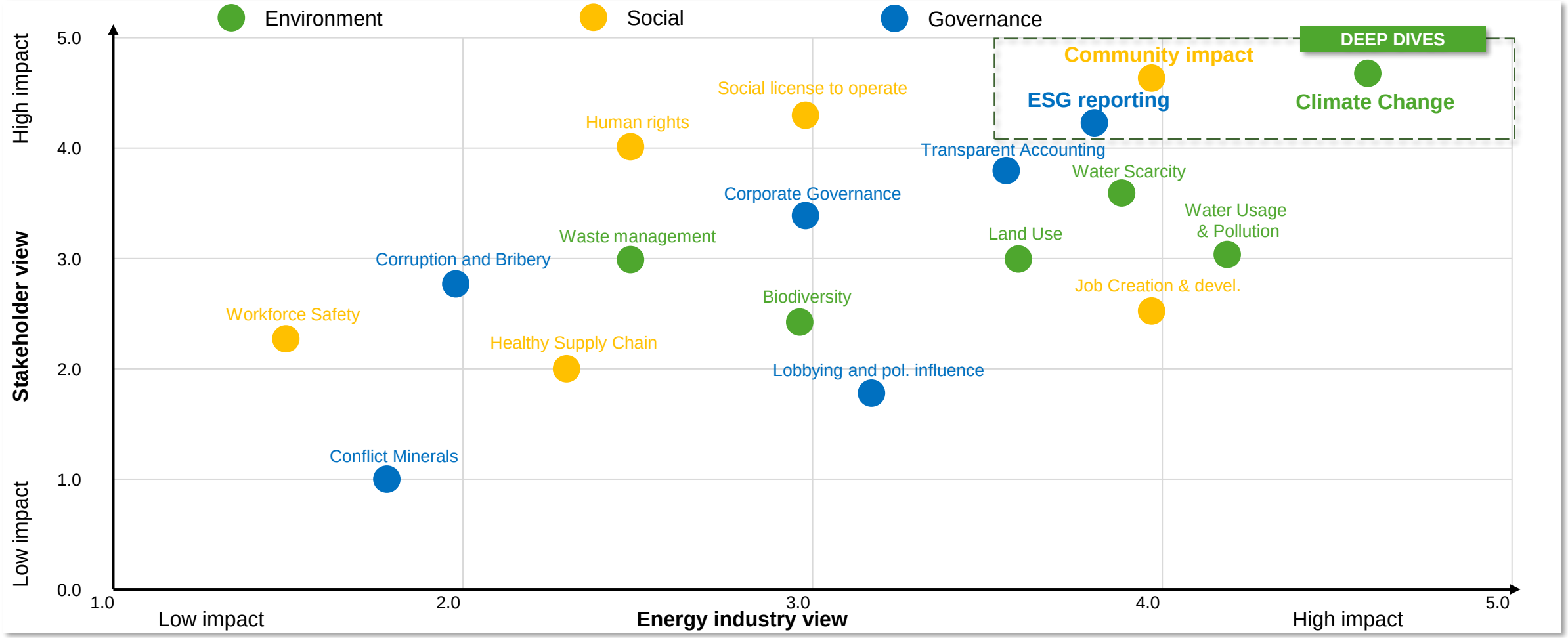
The global geopolitical crises are leading to high volatility in the industry, which companies are trying to minimize through new lines of business. The increased amount of data also leads to an increase in complexity.

ESG issues

The current trends in the sector relate primarily to the interaction of ESG with the company's own business practices

Materiality map

What are current ESG-trends in the sector?



The oil sector is the largest emitter of GHGs in the world and this creates enormous pressure to fundamentally change the business model

Deep Dive 1: Environment

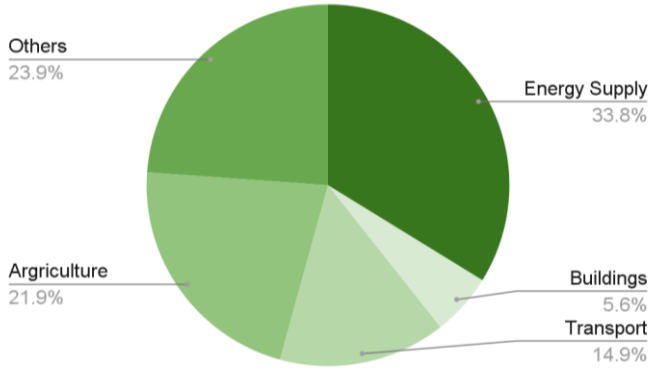
What is the issue and impact?

The energy sector's reliance on fossil fuels contributes significantly to global warming and environmental degradation

Failure to reduce emissions threatens the ability to meet the Paris Agreement targets, leading to severe climate impacts such as extreme weather, rising sea levels, and resource scarcity

Climate change is forcing oil and gas companies to adapt their business models and completely change their corporate strategy

Global Greenhouse Gas Emissions by sector



Key Takeaway

The energy supply sector is by far the biggest GHG contributor and with that under extreme pressure to change drastically their business model in the future.

Facts

34 % **of human-caused GHG emissions** originate from the energy sector

6 **Years of global GHG emissions** to make sure we stay under the 1.5-degree goal (240 billion tons)

50 % **Minimum reduction of global CO2 emissions** by 2030 to still meet the goals of the Paris Climate Agreement.

How to overcome this challenges

	Impact
Increase of energy efficiency and minimize energy losses through e.g. new heat recovery systems	
Diversification of the energy portfolios to become less dependent on fossil fuels	
The development and use of biofuels as an alternative or supplement to conventional fossil fuels	

As a major emitter of green house gas emissions, the oil and gas sector faces the enormous challenge of reducing these emissions in the future. However, this also offers potential for increasing efficiency and diversification for the sector.

https://www.un.org/en/climatechange/what-is-climate-change, https://www.unep.org/topics/energy, https://energyindustryreview.com/environment/sustainable-energy-and-climate-trends-and-projections/, https://ourworldindata.org/how-much-co2-can-the-world-emit-while-keeping-warming-below-15c-and-2c

The resulting change with a focus on renewable energies is causing uncertainty and, in some cases, rejection among the population

Deep Dive 2: Social

What is the issue and impact?

The energy transition to renewable sources is critical for limiting global warming to 1.5°C and reducing greenhouse gas emissions

While renewable energy can create millions of jobs, the growth of clean energy projects faces resistance from local communities, fueled by fears, including NIMBY (Not In My Backyard) attitudes

This resistance can delay or cancel projects, impacting or even stopping the transition of the oil industry's new energy sources

Communities must be empowered

Key Takeaway

The successful energy transition relies heavily on community support and involvement, to integrating renewable energy projects into local environments and achieve acceptance.

Facts

11 — **Minimum required production volume** for clean energy (in thousand GW) by 2030. Which means 3 times the current output

86 % — **Of the worldwide population belief in climate change** and thinks it's a problem caused by us humans

228 — **Number of local restrictions** declared in the USA by community representatives to prevent the construction of renewable energies near homes

How to overcome this challenges

	Impact
Active involvement of local communities in planning and decision-making processes to address concerns	●
Educational programs on the advantages of renewable energies and the long-term disadvantages of fossil fuels	◑
Raising awareness of career opportunities and job security in the renewable energy sector	◔

A major challenge in the transformation of the sector is the low acceptance of renewable energy in the vicinity of settlements. The sector needs to clearly emphasize the benefits of renewable energy through the use of greenhouses and the involvement of local residents in the planning process.

https://www.weforum.org/stories/2024/01/communities-must-be-empowered-to-drive-energy-transition/, https://ourworldindata.org/climate-change-support , https://climate.law.columbia.edu/content/opposition-renewable-energy-facilities-united-states-may-2023-edition

Added to this are the uncertainties for companies caused by the lack of a clearly defined regulatory framework

Deep Dive 3: Governance

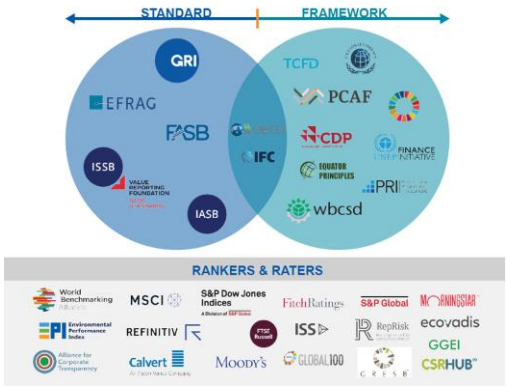
What is the issue and impact?

The oil and gas industry is under increasing pressure to improve transparency in their ESG performance

Failing to address ESG concerns could result in reputational damage, increased regulatory scrutiny, and loss of investor confidence, as climate change becomes a central issue for stakeholders

Greenwashing (misleading or inaccurate reports) undermines the credibility of the entire industry

Difficulty to chose the right framework



Key Takeaway

Companies need to understand a variety of frameworks and ratings in order to produce transparent reports that meet all stakeholder requirements and regulatorics.

Facts

40 % **of investment funds' ESG products** are labeled as “potentially misleading” in terms of their environmental benefits

27 % **of ESG factors in the oil sector** are very difficult or almost impossible to quantify with current technologies

30 % **Increase in serious cases of greenwashing** in the last 12 months, especially in regions without strict regulation

How to overcome this challenges

	Impact
Regular dialog with investors and regulatory authorities to address concerns and build trust	◔
Implementation of stricter internal control systems and regular audits	◔
Use of standardized reporting frameworks such as GRI (Global Reporting Initiative) or SASB (Sustainability Accounting Standards Board)	◑

The regulatory framework for how companies measure their sustainable business practices continues to offer too much leeway and is not clearly defined. However, oil companies could gain an advantage in reporting through direct dialog with investors.

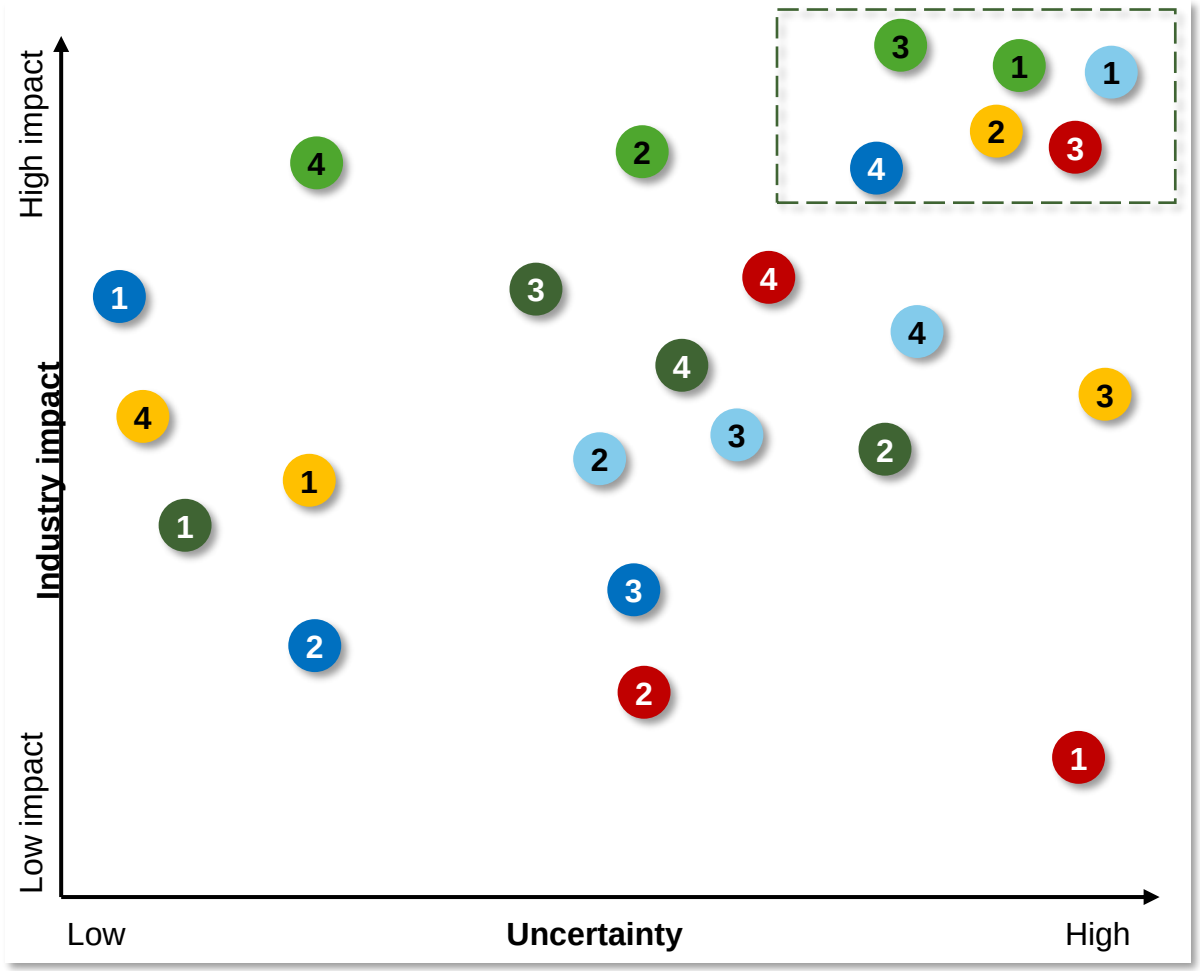
https://www.weforum.org/stories/2022/09/how-national-oil-companies-overcome-challenge-esg-reporting/, https://sustainability-news.net/net-zero/esg-reporting-frameworks-in-2024-everything-you-need-to-know/, https://aquila.is/knowledge-hub-article/navigating-esg-reporting-standards-a-comprehensive-mapping-guide/ , Daato | Berichterstattung für Öl- und Gasindustrie


Future Trends

Future trends in the sector will focus primarily on the interplay between the environment and technology

Future trends

How impactful are the future trends



Environmental

1. Carbon Capture and Storage
2. Waste Management
3. Environm. crisis Mitigation
4. Rising sea levels

Social

1. Global Energy Access
2. Workforce shift from Fossils
3. Digital Comm. & Metaverse
4. Aging Population

Governance

1. Regulatory Frameworks
2. Transparent reporting
3. Data & Digital regulatory
4. Climate Governance

Economic

1. Urbanization
2. Public Debt
3. Circular economy
4. Economic Interconnected.

Political

1. Rising Populism
2. Democratic Backsliding
3. Geopolitical Instability
4. Political Division

Technology

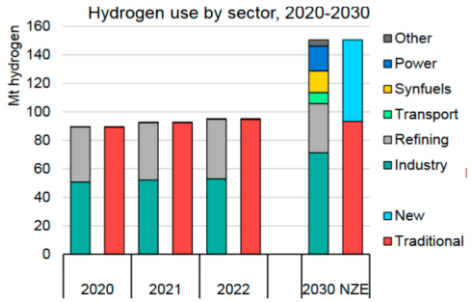
1. AI and quantum computing
2. Zero Latency Connectivity
3. Industry 5.0
4. Post-Silicon Technologies

Climate change can only be tackled through far-reaching climate change mitigation, and the oil sector has a key role to play here

Deep Dive into Climate Change Mitigation

What and how does it work?

By 2050, the energy business will undergo transformative changes driven by climate change mitigation trends. The sector will adapt to evolving technologies, policies, and consumer behaviors to align with global net-zero goals.



Decarbonization of Energy production

Renewable Energy Dominance

Solar, wind, and other renewables will become the primary sources of energy. Advances in technology, storage solutions, and grid infrastructure will enable their widespread adoption.

Phase out of Fossil Fuels

Coal and oil will see diminished roles, with natural gas serving as a transitional energy source. Companies heavily invested in fossil fuels will face stranded assets and will likely pivot to renewable projects or energy storage.

Carbon Capture and Storage

CCUS will be integral for mitigating emissions from remaining fossil fuel plants and hard-to-abate sectors, allowing energy companies to continue operations while reducing their carbon footprint.

Expansion of Green Hydrogen

- Green hydrogen (produced using renewable energy) will play a crucial role in the sector.
- Hydrogen will be a medium for long-term energy storage and cross-border energy trade, transforming energy companies into global exporters of clean energy.

Electrification of End-Use Sectors

Transportation

A shift to electric vehicles (EVs) will drive demand for clean electricity. Energy companies may expand into EV charging networks or battery supply chains.

Buildings

Insulating homes, using energy-efficient appliances, and switching to LED lighting reduce energy consumption.

Industry

Optimizing production processes, using waste heat recovery, and adopting energy-efficient equipment lower industrial emissions.

Transitioning to circular economy

- Using low-carbon materials, such as recycled steel or bioplastics, reduces emissions during manufacturing.
- Minimizing waste and reusing resources reduce emissions associated with production and disposal.

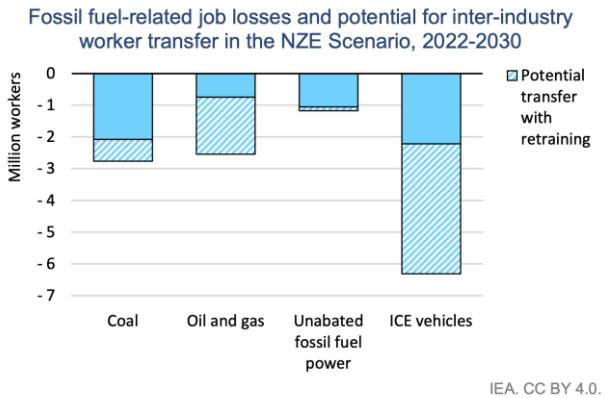
https://blog.verde.ag/en/carbon-capture-and-storage-ccs/, https://link.springer.com/referenceworkentry/10.1007/978-1-4419-7991-9_37, https://www.etira.org/wp-content/uploads/2020/07/shutterstock_1207936660-resized-circular-economy-square-e1596218480832.jpg

This in turn creates difficulties for the workers who have to master the transition to renewable energies

Deep Dive Workshift shift from fossil fuels

What ?

The shift to renewable energy with smart grids, IoT in energy management, and digital transformation in renewable energy sectors is creating demand for: Data scientists and analysts. Cybersecurity for energy infrastructure, AI specialists for predictive maintenance and energy optimization



Fields with job losses:

- Drilling personnel & technicians
- Employees in refineries and distribution

Current issues and obstacles to overcome

- Many fossil fuels workers lack the specific skills required for renewable energy or other green sector (more data driven)
- Jobs in renewables are not be located in the same regions as traditional fossil fuels jobs and this is currently one of the biggest barriers
- Another problem is that the energy sector is less interesting for young people, so there must be political incentive systems here
- Entire communities are currently dependent on fossil fuels (especially communities in Texas or California) without adequate support and transition programs, such regions can experience significant economic and social problems

Outlook on the future

- The Renewables Energy Agency estimates that renewables energy jobs could grow from 12.7 million in 2022 to over 38 million by 2030
- Currently, the proportion of employees in the renewable energy sector is 52% compared to fossil fuels, and is expected to exceed the 85% mark by 2050
- The management complexity of energy storage and smart grids in particular opens up a wide range of applications for technician and engineers in the field of electricity and connectivity

Impact and opportunities

- The skills gap and lack of interest of young people in the sector can lead to a significant labor shortage, affecting productivity and innovation in the oil industry
- Regional dependencies on the oil industry can lead to economic losses in the event of an energy transition without adequate support, which could exacerbate political and social tensions and further worsen the acceptance of the oil sector

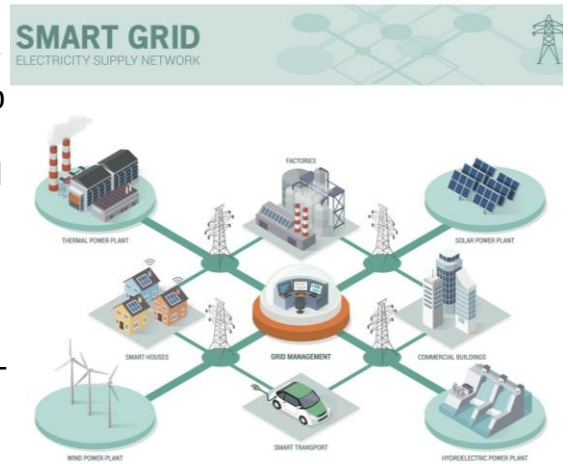
https://www.csis.org/analysis/global-workforce-ready-energy-transition, https://www.nature.com/articles/s41467-023-41133-9, How the clean energy transition affects workers and communities | EDF

The AI trend is exacerbating the problems of the labor market, while it represents an opportunity for the sector to increase efficiency

Deep Dive 1/2 AI Quantum Computing

What?

Power systems are becoming vastly more complex as demand for electricity grows and decarbonisation efforts ramp up. AI is uniquely placed to support the simultaneous growth of smart grids and the massive quantities of data they generate.



Application examples:

- Environmental monitoring through AI-controlled sensors
- Improve predictions of supply and demand
- Managing and controlling grids

Trends in the future

- AI is already performing more than 50 functions (with more then 400 billion data points) in the energy system today
- AI will be handling the complexities of modern power systems, which require support for multi-directional electricity flows and involve numerous interconnected devices in the future and contribute to more efficient system
- The use of AI will be particularly pertinent in managing renewable energy sources, where it can help balance variable supply with demand, enhancing the financial and operational efficiency

Current issues and obstacles to overcome

AI systems require large amounts of high-quality data. In the oil industry, this can be a problem, especially in geographically remote or politically unstable regions (regions with oil reserves)

AI systems that control critical infrastructure can be the target of cyberattacks and the risk of data leaks is increasing

Implementation of AI technologies is very cost-intensive, primarily due to the necessary investments in hardware, software and specialists

The integration of AI into existing systems is extremely complex and time-consuming, as it often requires a comprehensive restructuring of the current systems

Impact and opportunities

- More transparent business processes and greater compliance with regulations through automated systems
- Improved monitoring and control lead to more efficient operations and lower emissions
- Accident risks are minimized through predictive maintenance and hazard detection
- The volatility of electricity prices can be balanced out and companies can better manage their purchase and demand volumes

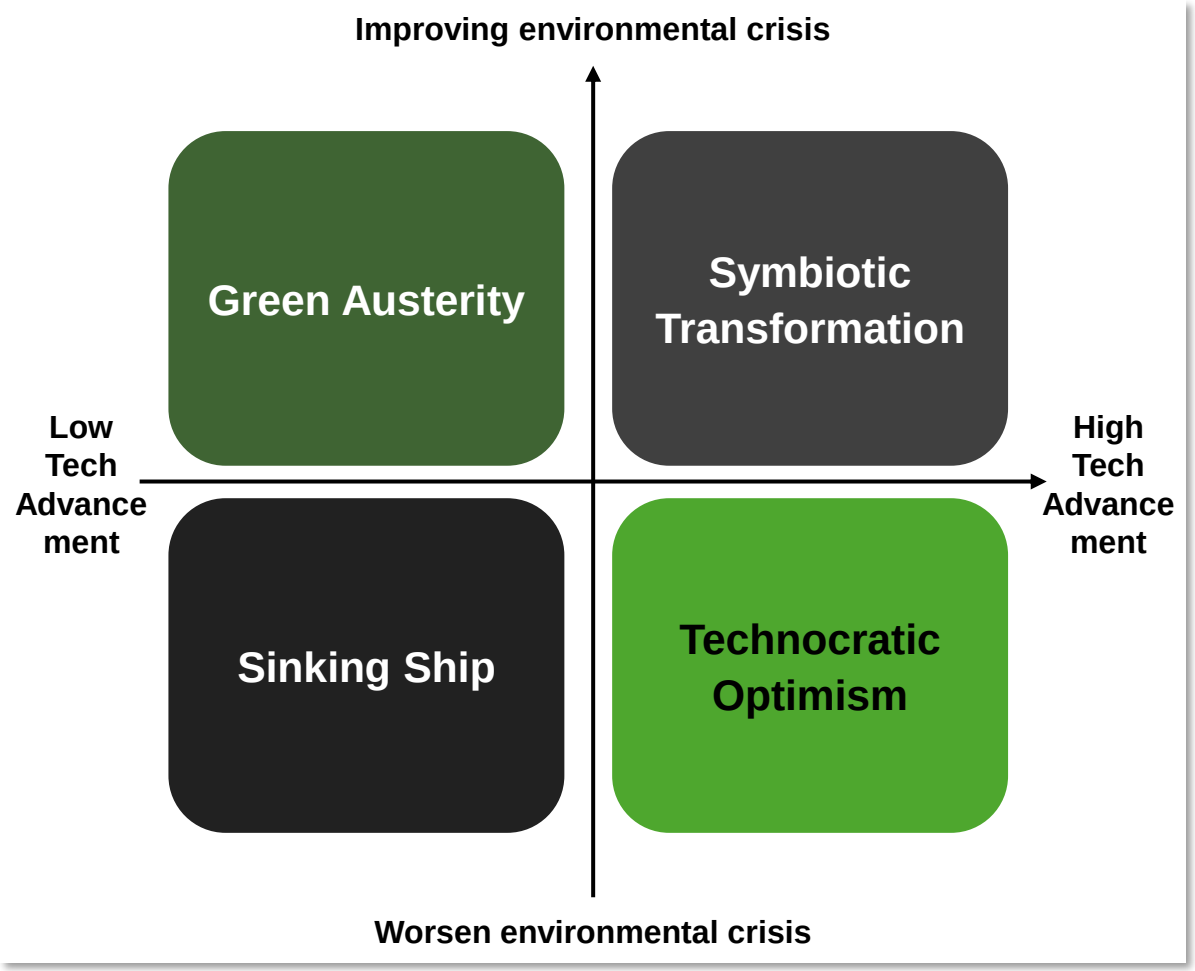
Why AI and energy are the new power couple – Analysis – IEA, Generative AI in energy and materials | McKinsey, Top 10 applications of AI in the energy sector | FDM Group UK

Scenario planning

The trends result in four main scenarios with a focus on technology adaptation and compliance with climate guidelines

2x2 scenario planning

Scenario Planning matrix



Green Austerity

Governments impose strict regulations on carbon emissions and resource use, and prioritize climate action through Investment in Green Technologies and robust Regulatory Frameworks and Standards, but struggle to integrate new technologies effectively. While effective in reducing environmental impact, this could lead to economic hardship and social pushback if not implemented with care.

Symbiotic Transformation

Rapid technological innovation and robust climate regulatory work in synergy to mitigate environmental impact. This leads to a transition to a green economy and sustainable practices across all sectors. The Hydrogen Economy and Carbon Capture and Storage (CCS) play crucial roles in decarbonization. Integrated Climate Technologies are developed and deployed through strategic investments and global collaboration.

Sinking Ship

Environmental degradation intensifies, resources dwindle and societies struggle to adapt with limited technological innovation, causing widespread, devastating environmental consequences, social conflict and economic instability. The states around the globe fail to create an applicable framework for the economy.

FOCUS

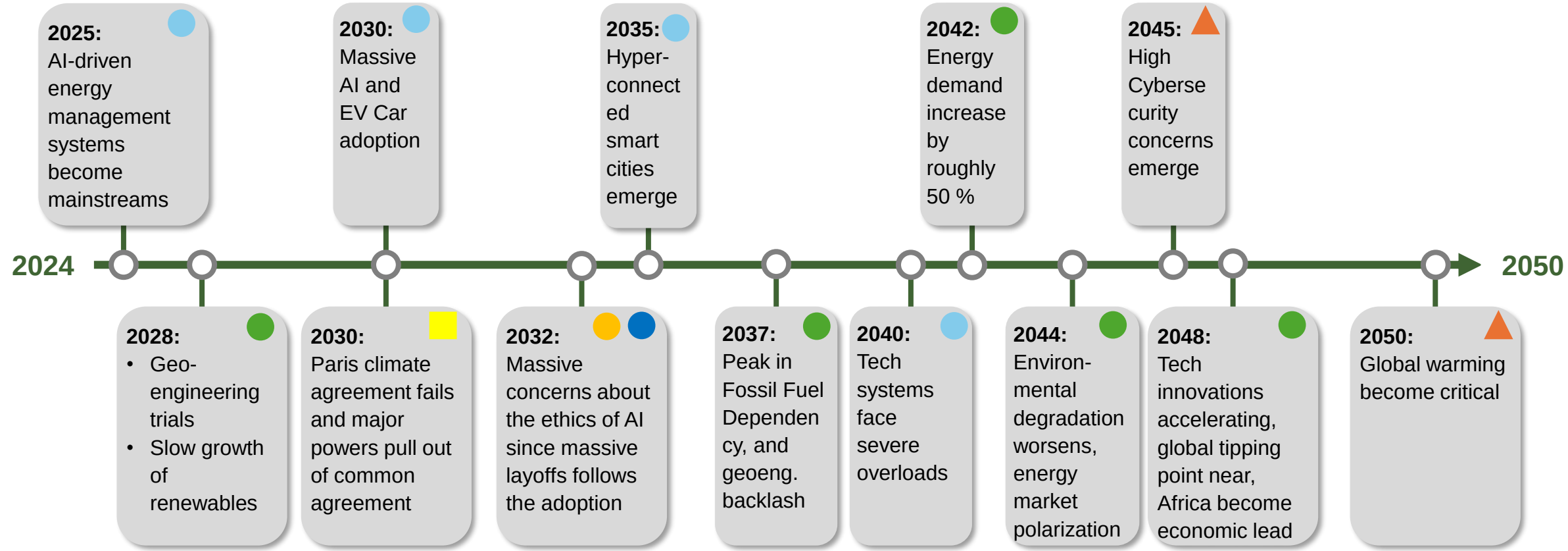
Technocratic Optimism

Large-scale tech investments drive innovation, like AI and quantum computing, smart cities but without a focus on sustainability due to a lack of framework. People become reliant on technology to manage consumption. A reliance of unproven solutions can create unintended consequences and new vulnerabilities like massive energy consumption and further environmental degradation.

The situation for the planet comes to a head in the middle of the century in the Technocratic Optimism scenario

Stroyline: Technocratic Optimism

What could possibly go wrong?



Environmental | Social | Technology | Governance | Political | Economics | Tipping Point | Weak Signal

Impact Assesment

Before the threat of catastrophe in 2050 means that the business model of oil companies will have to change again in order to remain successful

The changes in the business model

Our current basis

Value Proposition:
- Reliable and affordable energy solutions
- Provide a critical supply of energy that powers industries, transportation and homes
- Global access to fuels

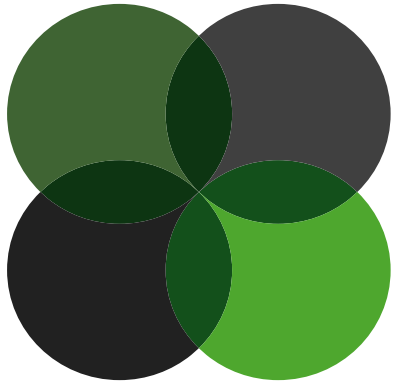
Key Resources:
- Oil & Natural gas Reserves
- Refineries & chem. Plants
- Research & Development
- Skilled Workforce
- Retail Network

Key Activities:
- Exploration and Production
- Refining and Marketing
- Chemical Manufacturing
- Retail Ops and Logistics
- R&D

Revenue Streams:
- Sales of crude oil and gas
- Refined Petroleum products
- Petrochemical products
- Marketing and distribution
- Power generation

Changes in 2050:

Value Proposition:
- Adaptive energy systems designed for climate resilience
- Real- time, crisis-ready energy solutions minimizing disruptions during extreme conditions



Key Resources:
- Decentralized microgrids and adaptive energy storage
- AI systems for climate adaption
- Partnerships with hybrid green-energy providers

Key Activities:
- Deployment of emergency energy solutions
- Retrofitting systems for regulatory compliance
- Collaboration on resilient, green-energy initiatives

Revenue Streams:
- Pay-as-you-go energy access
- Crisis-resilient system subscriptions
- Revenue from disaster response energy services and carbon offset programs

However, in 2050 due to the scenario the business model of the oil companies need to change totally and adapt to new circumstances

BMC – Deep Dive

Business Model deep dive 2050

Value Proposition	Key resources
• **Adaptive Energy Systems:** Provide reliable and resilient energy solutions capable of functioning during extreme weather events and system disruptions. • **Crisis-Ready Solutions:** Offer real-time, crisis-ready systems minimizing downtime and ensuring energy stability for customers in disaster-prone areas. • **Integrated Cybersecurity:** Ensure secure energy systems through advanced cybersecurity protocols to protect critical infrastructure and IoT networks. • **Hybrid Green Energy:** Combine renewable energy integration with fossil fuel systems for sustainable yet reliable energy offerings. • **Customer-Centric Services:** Tailored energy solutions	• **Decentralized Microgrids:** Flexible, scalable microgrid systems to provide localized, reliable energy during grid disruptions. • **AI Systems and Analytics:** Advanced AI tools for predictive energy management, fault detection, and real-time optimization. • **Cybersecurity Expertise:** Skilled teams and state-of-the-art cybersecurity tools for proactive defense against evolving cyber threats. • **Hybrid Infrastructure:** Renewable energy assets (solar, wind, and storage) combined with fossil fuel backups for uninterrupted energy supply.
Key Activities	**Revenue streams**
• **Emergency System Deployment:** Implement portable microgrids, adaptive storage, and temporary energy systems for disaster management • **Cybersecurity Development:** Design and maintain AI-driven, advanced cybersecurity measures to safeguard energy grids and IoT networks • **Infrastructure Retrofitting:** Upgrade and retrofit existing systems to meet evolving climate regulations and ensure compatibility with green energy. • **AI-Driven Optimization:** Leverage predictive analytics to optimize energy consumption, load balancing, and grid efficiency in real-time. • **Collaborative Initiatives:** Partner with governments, green energy firms, and municipalities to build scalable, resilient energy projects.	• **Pay-as-You-Go Systems:** Subscription-based access to adaptive and crisis-ready energy services for residential and corporate clients. • **Cybersecurity Services:** Premium charges for safeguarding energy systems and IoT networks, particularly for corporate and government sectors. • **Renewable Add-Ons:** Revenue from carbon offset programs, hybrid renewable solutions, and ESG-compliant energy plans • **Crisis Response Solutions:** On-demand energy packages for governments, municipalities, and corporations during natural disasters or system outages. • **Data Monetization:** Selling anonymized energy usage data and analytics to urban planners, industries, and smart city developers for optimization

The aggressive strategies for the general issues are all focusing on capitalizing on market opportunities and expanding the business to dominate

Contingency plan: agressive strategies for general issues

How can the industry answer to the general issues?

Strategy	Contingency Plan	Risk level	Time frame
Expand High-Tech Energy Solutions + Monetization	Scale up investment in AI-driven energy optimization systems for corporate, residential, and city-level applications. Offer customized energy solutions for hyperconnected smart cities, such as advanced IoT integration and grid optimization and collect and anonymize data from AI and IoT systems, then sell insights to city planners, technology firms, and policymakers. Develop subscription-based data analytics platforms	Medium	Long-term
EV Infrastructure Leadership	Build and dominate EV charging networks, leveraging AI to optimize charging schedules and minimize grid disruptions. Partner with EV manufacturers to provide integrated charging solutions, creating an exclusive ecosystem	Low	Short-term
Cybersecurity as a Differentiator	Offer premium cybersecurity solutions to corporate clients and smart cities, positioning the company as a leader in energy system protection. Monetize cybersecurity expertise through consulting and subscription-based services.	High	Long-term
Global Market Expansion	Target emerging markets with increasing energy demand and fewer sustainability restrictions, offering cost-effective, high-tech solutions. Expand into regions with developing EV and IoT infrastructure, capitalizing on untapped opportunities.	Medium	Mid-term

However, in an aggressive strategy, individual companies could still try to be the first to establish themselves in the market for hybrid services and AI services

Contingency plan: agressive strategies for weak signals

How can the industry answer to the general issues?

Strategy	Contingency Plan	Risk level	Time frame
Dynamic Grid Development and EV Charging Dominance	Invest in smart, AI-powered grids that dynamically allocate energy to avoid overloads and maximize efficiency. Additionally build AI-integrated EV charging networks with automated load management and surge pricing to capitalize on EV adoption	**Medium**	**Mid-term**
Hybrid Energy Solutions and Green Services:	Partner with renewable energy providers to introduce hybrid energy systems, appealing to ESG-conscious markets. Offer optional green energy subscriptions or carbon-neutral EV charging plans to generate additional revenue streams	**Medium**	**Mid-term**
Advanced Cybersecurity Services:	Develop proprietary AI-driven threat detection systems that can predict and neutralize cyberattacks in real time. Partner with government and private sector entities to create industry-wide cybersecurity solutions. - Cybersecurity Monetization: Offer premium cybersecurity packages tailored to high-risk clients like governments, smart cities, and industrial corporations	**High**	**Long-term**
Green and Hybrid Services:	Monetize cybersecurity expertise through consulting, licensing AI-driven security systems, and offering advanced incident response services. Generate revenue from hybrid energy solutions, such as carbon-neutral EV charging networks and ESG-driven consulting.	**Mediun**	**Long-term**

However, if the catastrophe were to occur in 2050, this would mean the almost immediate end of the sector and companies need to search for new opportunities

Exit strategy

How can the companies exit the sector?

1 Focus on Cybersecurity

Key Focus:
Specialize in securing energy systems and IoT networks

Description:
Repositioning the company as cybersecurity leader focused on protecting critical energy infrastructure, IoT networks, and AI systems. Develop advanced threat detection and response solutions for smart grids, data centers and hyperconnected cities.

Supporting Stats (by 2050):
- The global cybersecurity market will reach $500 billion, with energy systems among the top three most targeted sectors
- Cyberattacks on critical infrastructure are expected to rise by 30 % annually, costing $100 billion per year in damages

2 Data Monetization and Consulting

Key Focus:
Transition into data-driven strategies for urban planning and energy management

Description:
Focus on providing consulting and predictive analytics services for urban planners, governments and corporations. Use anonymized energy consumption and grid performance data to optimize city planning, industrial processes and resource allocations.

Supporting Stats (by 2050):
- The smart cities market is expected to reach $1.5 trillion, driven by AI and IoT-based systems
- The global data monetization market is expected to exceed $800 billion annually, with energy systems contributing 15 % of the total market

3 Logistic services

Key Focus:
Develop and lease energy efficient logistics platforms for smart cities and fleets

Description:
Build logistics solutions that integrate AI-driven fleet management, route optimization, and renewable powered distribution hubs. This leverages the companies energy expertise to create efficient, scalable solutions for growing urban and global logistics market and they can use parts of there already existing fleet.

Supporting Stats (by 2050):
- The worldwide logistic market is expected to reach $15 trillion with 60 % of operations integrating AI for route and energy optimization
- Renewable powered logistic hubs could cut energy costs by 25 %, and AI base fleet management reduces inefficiencies by 30 %.

McKinsey (2021), Statista (2024), Deloitte (2023), Roland Berger (2024)

Conclusion

The presentation is intended to illustrate how important a view of climate change is for the oil sector, otherwise the preservation of the business model is at risk

Conclusion

Key Takeaways

- ESG considerations are becoming more important than ever in the energy industry because they directly involve global environmental impact, including climate change mitigation, resource management, and pollution prevention.
- All energy companies must incorporate ESG as a core part into every aspect of their business strategy and operations. By proactively addressing the potential risks and leveraging technology responsibly, the companies can harness its power to drive positive change. This requires a commitment to transparency, ethical AI development, and a focus on long-term sustainability, ensuring that technological advancements contribute to a more sustainable future. So, zero-carbon emissions may be possible in 2050.
- While technological advancement in the energy industry is desirable and offer lucrative opportunities, it's crucial to recognize the potential pitfalls and do due diligence. Without a strong commitment to ESG principles, we risk creating new vulnerabilities, and ultimately failing to address the root causes of our environmental crisis. We must ensure that technology serves humanity and the planet.
- Energy companies that prioritize ESG considerations, particularly those addressing the potential downsides of technology, are likely to be more resilient and sustainable in the long run. Investing in such companies not only generates financial returns but also contributes to a more responsible future.

Call to action

- The 'Technocratic Optimism' scenario is not predetermined. We have the power to shape the future by demanding responsible technology, supporting sustainable innovation, and holding corporations accountable for their environmental impact. Let's ensure that technology serves as a tool for positive change, creating a world where both progress and sustainability thrive.
- Investors should consider energy companies' ESG performance when making investment decisions.
- Mitigating environmental crisis is everyone's responsibility, not just the energy companies'.
- The world is optimistic about a clean economy in 2050, but it will never happen if we all are not committed to ESG in unison now.

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