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The “Crown Joules” of the energy industry

Winning in the energy transition calls for a new and dynamic approach to capital allocation – We call it the Accenture Energy System Model

As the multi-decade energy transition finally gains traction, there are still plenty of unknowns. We don't know, for example, when it will fully take off, nor where it will move the fastest. We don't know whether governments, activist boards or consumer behaviors will represent the main drivers of change. We don't know what combination of governments, activist boards or consumer behaviors will drive the needed change or even if all of them will be important in one way or the other.

But there's plenty we actually do know. We know that humans consume 14,000 million tons of energy (mtoe) each year[1] —and produce 54 billion tons of CO_2 doing so.[2] And that demand for energy will likely continue to grow at approximately 0.8% per year.[3] And that energy emissions must drop to net zero if we are to avoid a climate crisis.

Perhaps most importantly, we know that in order to respond to investor/customer demands and fast-moving disruption, companies need to change the way they evaluate investments and allocate capital to create the energy future.

Rather than wringing their hands over what they don't know, industry leaders focus on what they do know (or can surmise from the trends they are seeing). Based on those insights, they make no-regret decisions today that will better position them for the transition and beyond.

From one to many

Historically, our energy system has been relatively homogenous. That is to say, the world needed energy and most of that was supplied by hydrocarbons. Moving forward, as the world accelerates its push to decarbonization (Figure 1), we will shift to a more heterogeneous approach that takes different energy sources and the energy demand of different regions into consideration.

Nigeria, Africa's largest economy, has a per capita energy consumption of 0.8 mtoe/person. China clocks in at 2.4 mtoe/person. And the United States has a consumption rate of 6.8 mtoe/person.[4] Yesterday's homogenous energy system is no longer geared to effectively meet these disparate energy consumption levels while also addressing the decarbonization imperative. What's emerging is a multipolar energy system. In that system, hydrocarbons will still play a significant role, but one that is regionally driven rather than globally dominant.

Country regulations, technological advancements and investor pressure are just some of the factors that will drive even greater heterogeneity in the energy market over the next decade. Arguably, consumer demand and changing preferences will have the biggest impact and create a unique demand-driven transition that isn't purely impacted by cost of supply, but also by consumer choice and a willingness to pay for low-carbon energy services products like electric vehicles (EVs) (Figure 2). Unlike in the past, the liquidity of a global energy market cannot be relied upon to efficiently manage the changes that a truly multi-polar energy system forces on participants.

Figure 1. Drivers of decarbonization

Global decarbonization is accelerating, driven by:

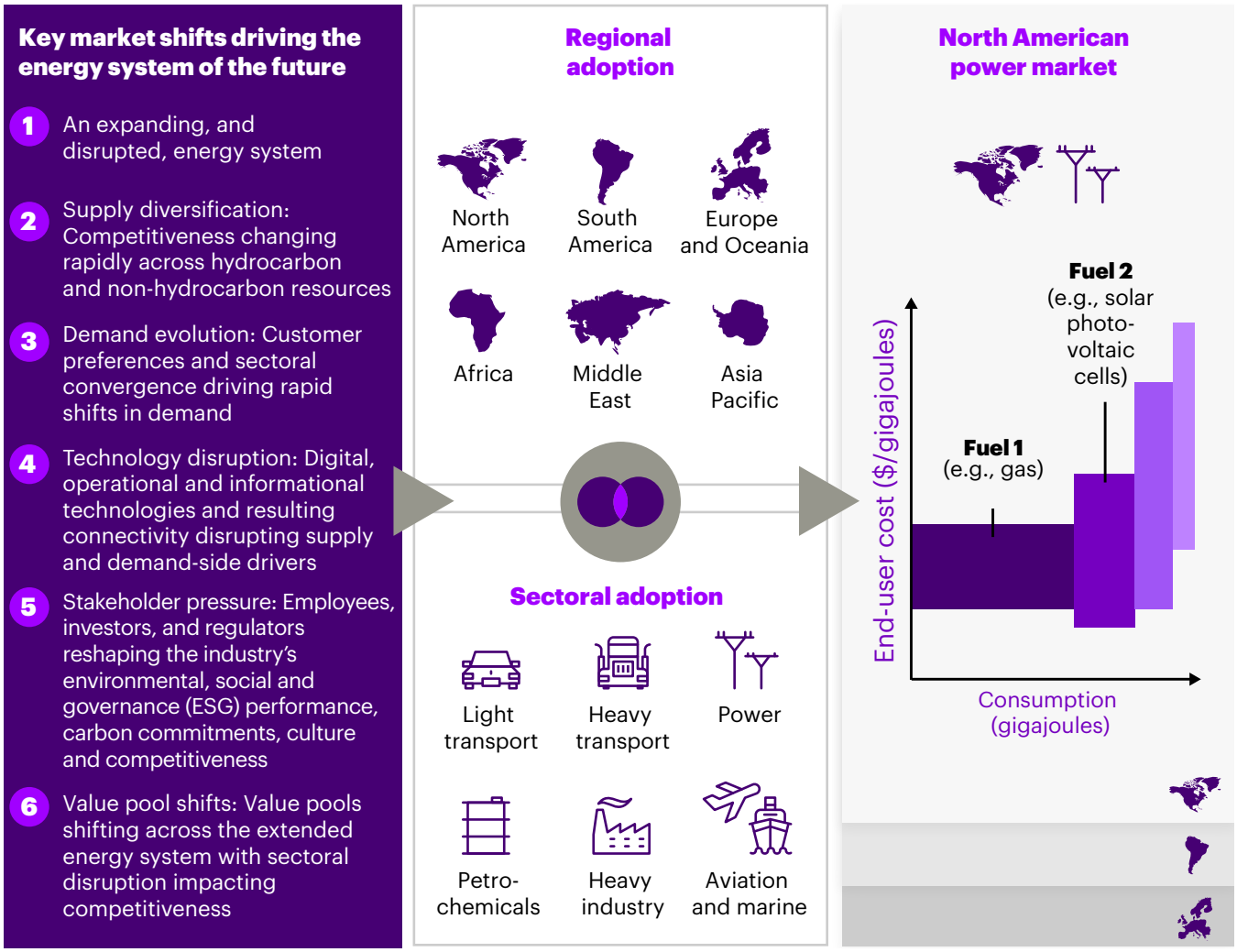
Environmental regulations and incentives

Investor/ environmental activism

Availability of lower carbon energy sources

Consumer demand for cleaner energy

Figure 2. Energy companies across the value chain need to better understand demand dynamics by market across competing sources of energy



To compete in the energy future, companies will need to understand market-by-market demand dynamics. Only then can they effectively adjust their asset portfolios to the most economical plays, while also offering the supply sources that tomorrow's energy consumers seek.

Gaining the necessary insights requires a new approach. Tools that once supported traditional long-range planning, capital allocations and exploration strategies for the energy industry are no longer fit for purpose. Today, there are multiple sources of energy (solar, wind, geothermal, oil, gas and others) that have fundamentally different economic and environmental characteristics, all of which must be taken into consideration. New tools and approaches are needed to help guide companies' decision making.

Technologies that help energy companies process huge volumes of data and understand consumer demand are needed to enable companies to serve up the right source of energy at the right moment. Equally important are comparable metrics that will allow companies to dynamically reposition their portfolios.

The primacy of capital allocations

CEOs and boards looking to reinvent their businesses and meet shareholder demands must address multiple imperatives simultaneously—sustainability, digitization and resilience, to name a few. Arguably, the most important issue they need to tackle is the return on their capital allocations across multiple dimensions.

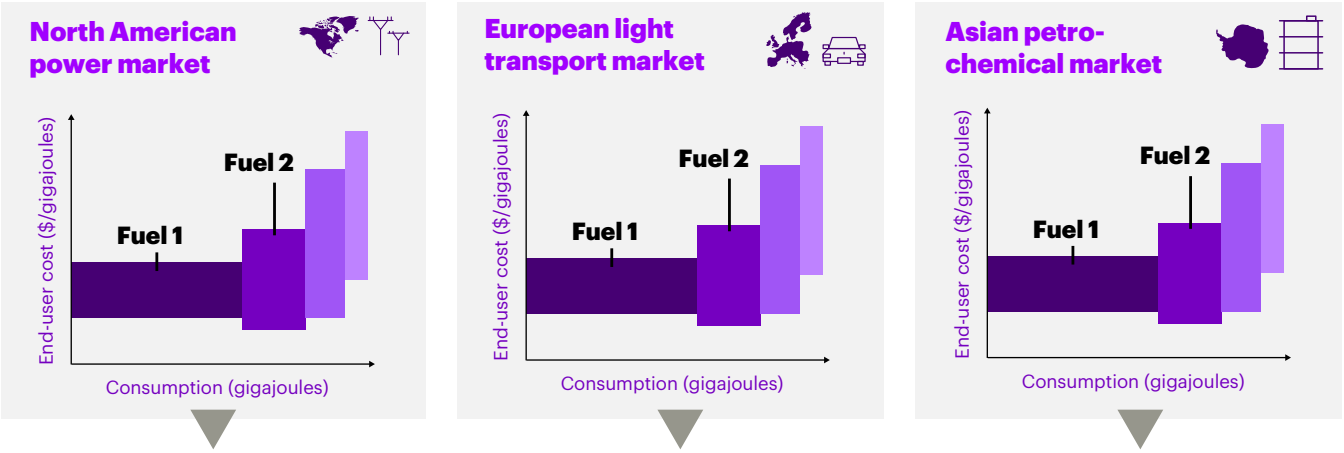
This is new territory for many players. While the industry has accepted that carbon abatement programs or digital transformation affect the entire enterprise—from back-office operations to corporate culture—it hasn't paid the same attention to capital allocations and portfolio rebalancing. Tools have been introduced to accelerate calculations, but few changes to the capital-allocation approach have been made. In a heterogeneous energy system, old methods of allocating capital won't work. Companies must look at the entire energy system, not just a limited set of variables. And they need to assess the profitability (vs. the cost-effectiveness) of asset classes (vs. assets only). To do that, they must be able to compare different segregated asset classes on common metrics: Joules (J) and dollars (USD).

The Accenture Energy System Model

This radical shift in thinking gives rise to the Accenture Energy System Model (patent pending), a portfolio-evaluation methodology that is analytics-based and scenario-driven. The model looks at two metrics—profitability per joule (USD/J) and invested capital turnover or joule delivered per unit of capital (J/USD) to weigh asset investments on their absolute value creation (Figure 3). These metrics are particularly valuable because they encompass all of the variables that the converging energy system of the future introduces.

Looking at profitability per joule (instead of cost per barrel) allows energy companies to incorporate a variety of other measures into their capital-allocation calculations, including:	Looking at capital turnover per joule allows energy companies to incorporate a variety of other measures into their capital allocation calculations, including:
• Customer preferences and related energy source pricing differences (e.g., 1 kilowatt hour (kWh) of electricity generated from wind may command a higher price than 1 kWh of energy generated from gas) • Cost of extraction • Cost of processing and converting into end-use fuels • "Cleanliness"of energy source represented through carbon taxes or fees • Regional dynamics represented through government taxes and subsidies	• Capital spending efficiency/ development costs • Capacity factor of energy source • Cost of capital • Special incentives for cleaner energy represented through lower cost of capital

Figure 3. Market-specific demand dynamics will drive the profitability of each asset class

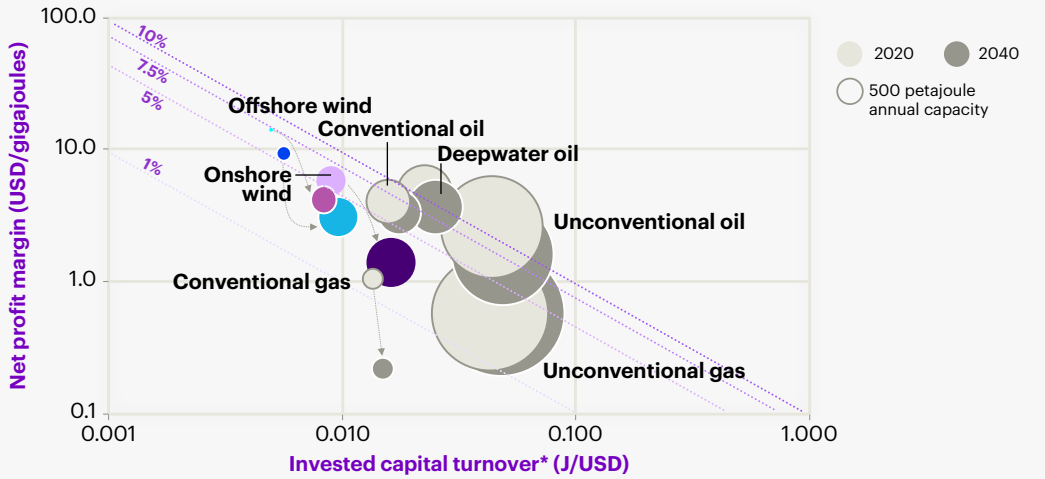


Illustrative and not exhaustive

Translating demand dynamics into supply constraints

1. How will demand dynamics impact the price of each energy source?
2. What is the net margin that can be generated from each energy source?
3. What is the impact of carbon and environmental, social and governance (ESG) performance on each market and sector?
4. How are regulations likely to impact energy source swaps?

What is the most profitable asset mix to respond to the dynamics in each market and sector?



*Invested capital turnover refers to joule delivered per unit of capital.
Assumptions: Carbon tax = $100/tCO$_2$e. Emissions efficiency = 20%.
Hydrocarbon cost efficiency = 15%. 2020 price = $50/barrel (bbl). 2040 price = $40/bbl.
Source: Accenture analysis and assumptions.

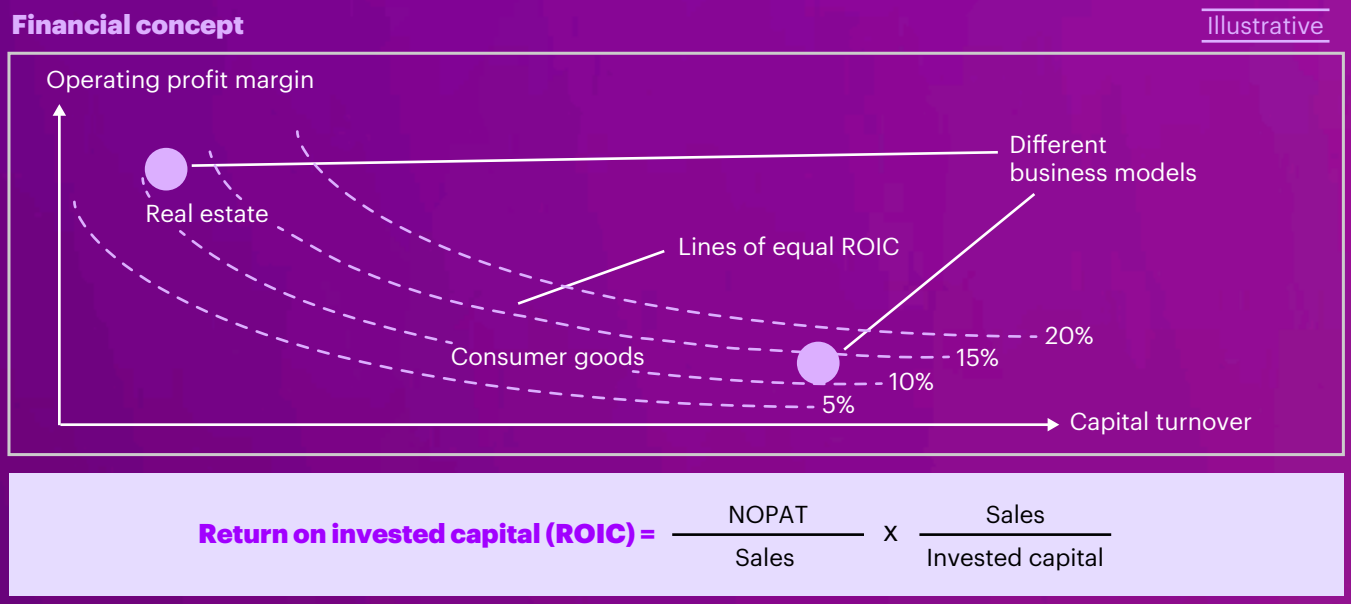
The additional benefit of choosing these two metrics is that, when multiplied together, they provide the return on invested capital (ROIC) of that particular asset class (Figure 4). While it has been common to compare different business models using this method, we believe it should take center stage in modeling energy portfolios going forward. There are three reasons:

1. It enables a like-for-like comparison of different asset classes and energy sources, thereby providing insights into the options that are possible.

2. It ensures a focus on capital returns, which is top of mind for investors.

3. It enables companies to incorporate fluctuating variables such as subsidies, taxes and product premiums into their value assessments.

Figure 4. Comparing different business models based on a total value creation (ROIC) analysis



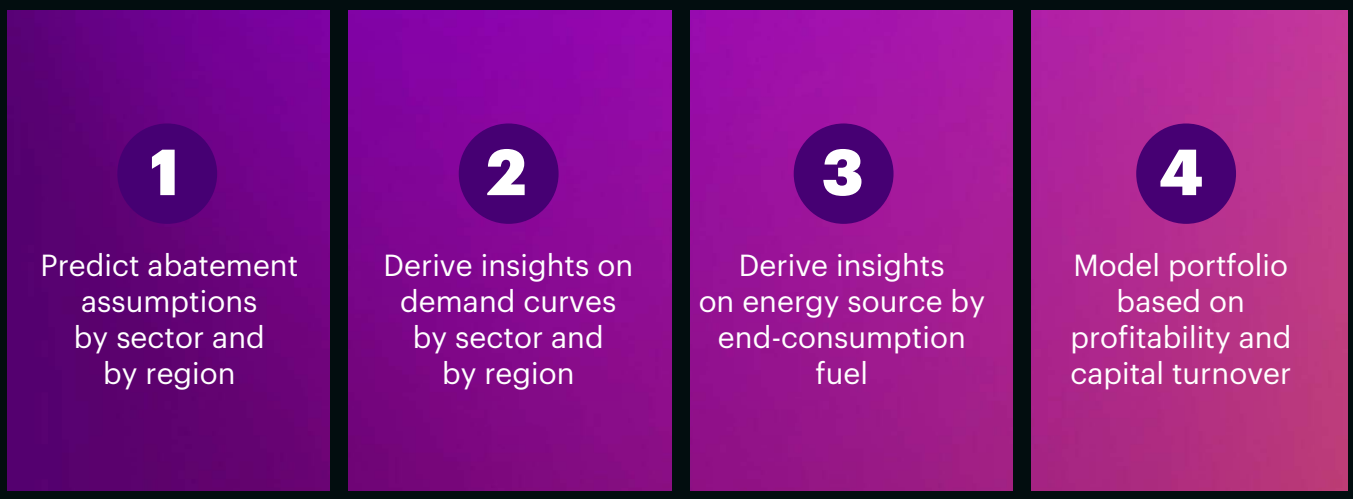
Return on invested capital (ROIC) = $\frac{\text{NOPAT}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Invested capital}}$

In practical terms, the Energy System Model can be used by oil and gas companies to identify the most profitable long-term portfolio mix. Importantly, it can also be used to optimize current portfolios by shedding light on the actions that can be taken on each existing asset to maximize the profitability of the overall portfolio.

The Energy System Model in action

Companies using our methodology to model demand scenarios for either long-term or short-term asset plays follow the same steps (Figure 5). They start by predicting abatement assumptions by sector and by region. From these assumptions, they can model the demand curves of each end-use energy product. Finally, based on their assumptions and potential implications of their choices, companies can model their current or future portfolios to optimize profitability and capital turnover.

Figure 5. Our key steps to correlate sectoral and regional demand dynamics to a profitable capital-allocation strategy



For illustrative purposes, this approach might be applied in the light transport sector as follows. Companies would start by creating multiple scenarios for light transport decarbonization by region. Then these scenarios—which may include different carbon taxes, fuel efficiency standards, government incentives, EV technology advancement rates and other factors—would give rise to specific demand curves by region. They may, for example, find that 80% of the demand in North America would still be served by gasoline and diesel, while 40% of the demand in Europe would be served by electricity.

The main goals for energy companies today are identifying sustainable energy sources that can be produced at volume and creating new value for an industry that has had a traditionally high cost of capital.

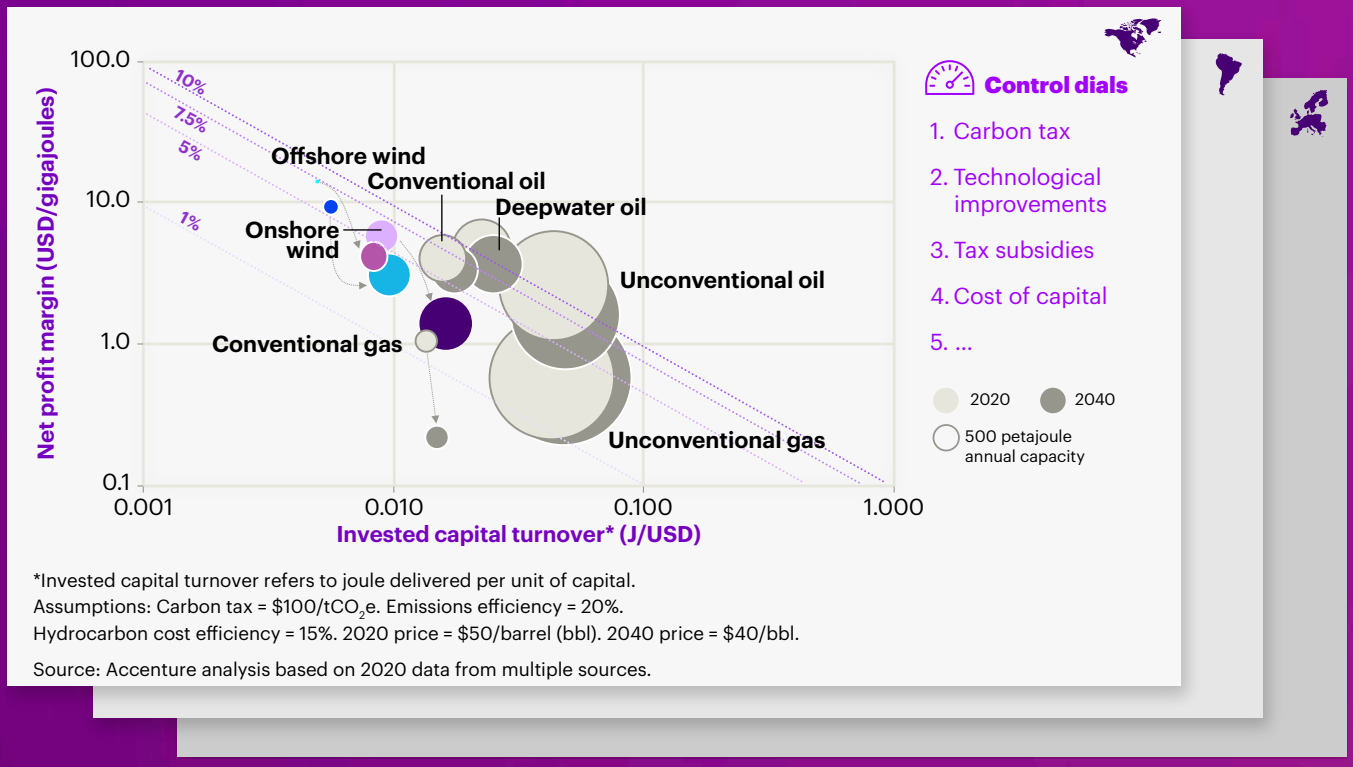
These demand curves, coupled with absolute demand growth, could then be translated into energy source allocations. For example, the 80% of North American consumption that is driven by gasoline and diesel could be sourced partly from conventional oil assets, partly from unconventional oil assets and so on. Finally, with the capacity of energy sources determined, companies could then model multiple scenarios by adjusting their assumptions (or "control dials") on carbon tax, technology improvements, tax subsidies and other influencing factors (Figure 6).

The result is a robust, dynamic model that energy companies can use to allocate capital to assets or asset classes in a way that best meets energy demand and generates the most value over short-term or long-term horizons.

Long-term vs. short-term planning

In the case of long-term planning, asset classes can be weighed against each other on a "per-joule" basis. This distinguishes the most value-creating asset classes from the rest.

Figure 6. To optimize value, companies need to weigh their investments on a price- and profit-driven "per-joule" basis



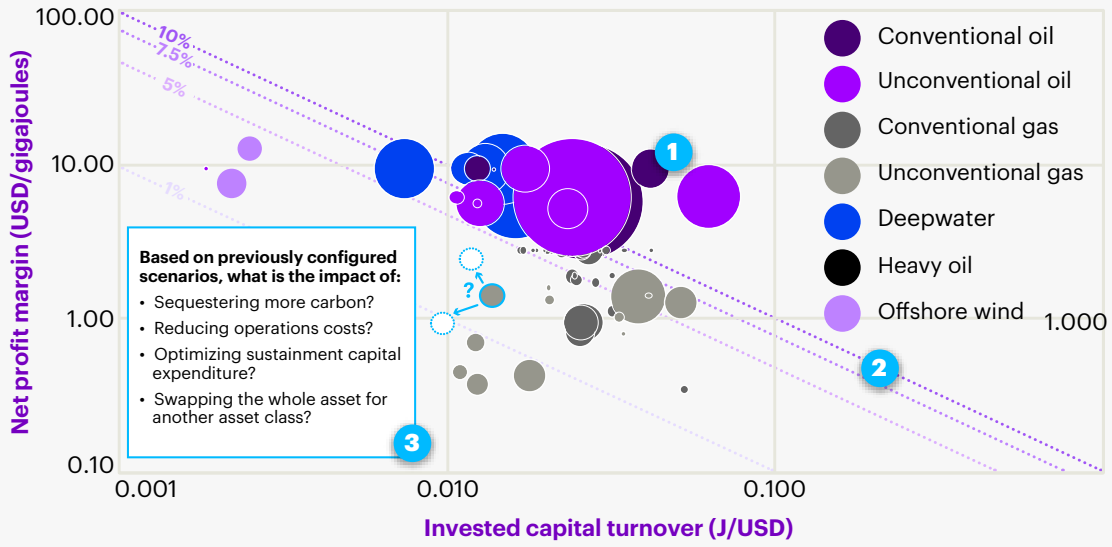
*Invested capital turnover refers to joule delivered per unit of capital.
Assumptions: Carbon tax = $100/tCO$_2$e. Emissions efficiency = 20%.
Hydrocarbon cost efficiency = 15%. 2020 price = $50/barrel (bbl). 2040 price = $40/bbl.

Source: Accenture analysis based on 2020 data from multiple sources.

For short-term planning purposes, the model can present asset-by-asset optionality for portfolio rebalancing. In this scenario, companies are required to have granular visibility over each asset's performance in terms of profitability, capital turnover and carbon/emissions performance (Figure 7).

Figure 7. Continuously rebalance the portfolio and ensure the most advantageous assets across both margin and carbon

1. Obtain **granular visibility over each asset's performance** in terms of profitability, capital turnover and emissions
2. Understand the **absolute value creation of each asset** relative to its cost of capital
3. **Simulate multiple scenarios** with carbon, regional regulations and prices and **decide on most profitable capital allocation**



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Source: Accenture analysis based on 2020 data from multiple sources.

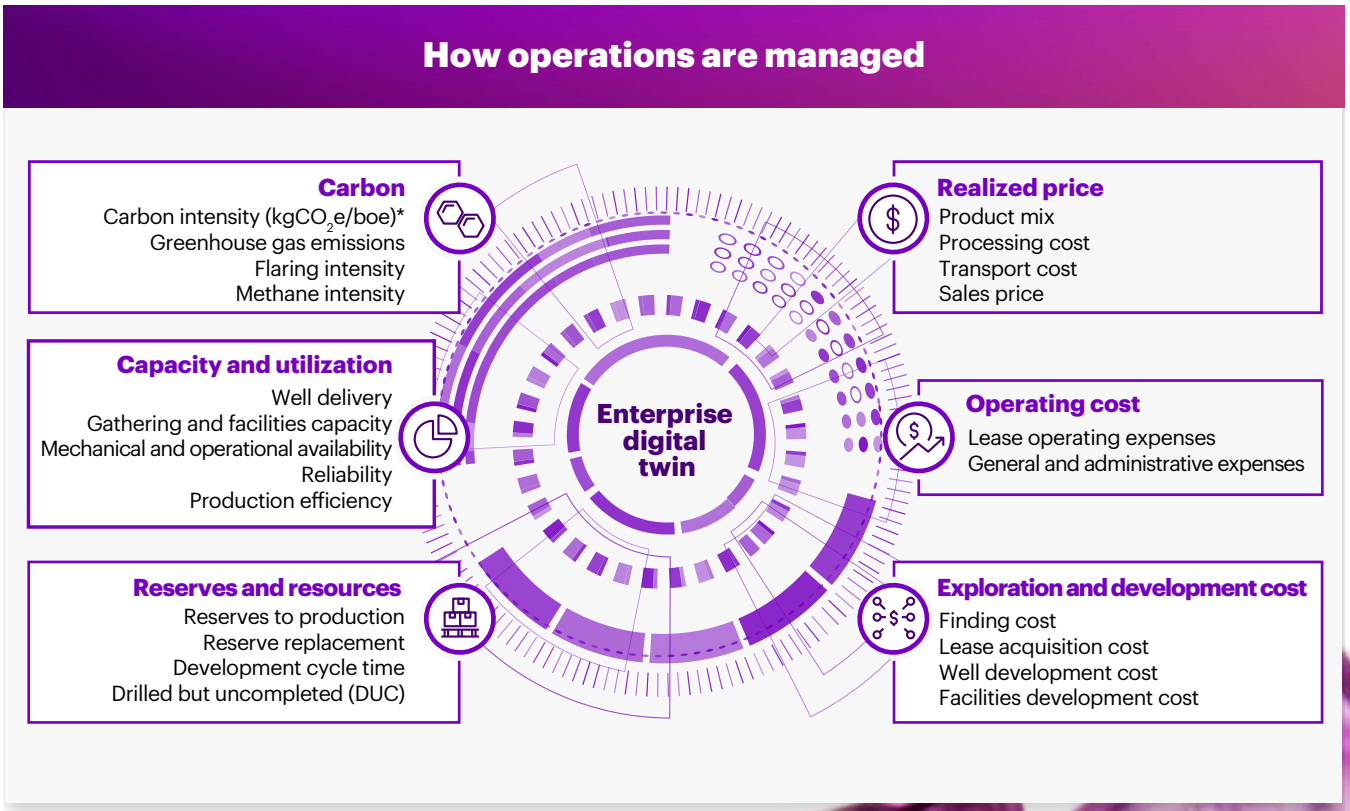
Capital expenditure optimization is only the beginning

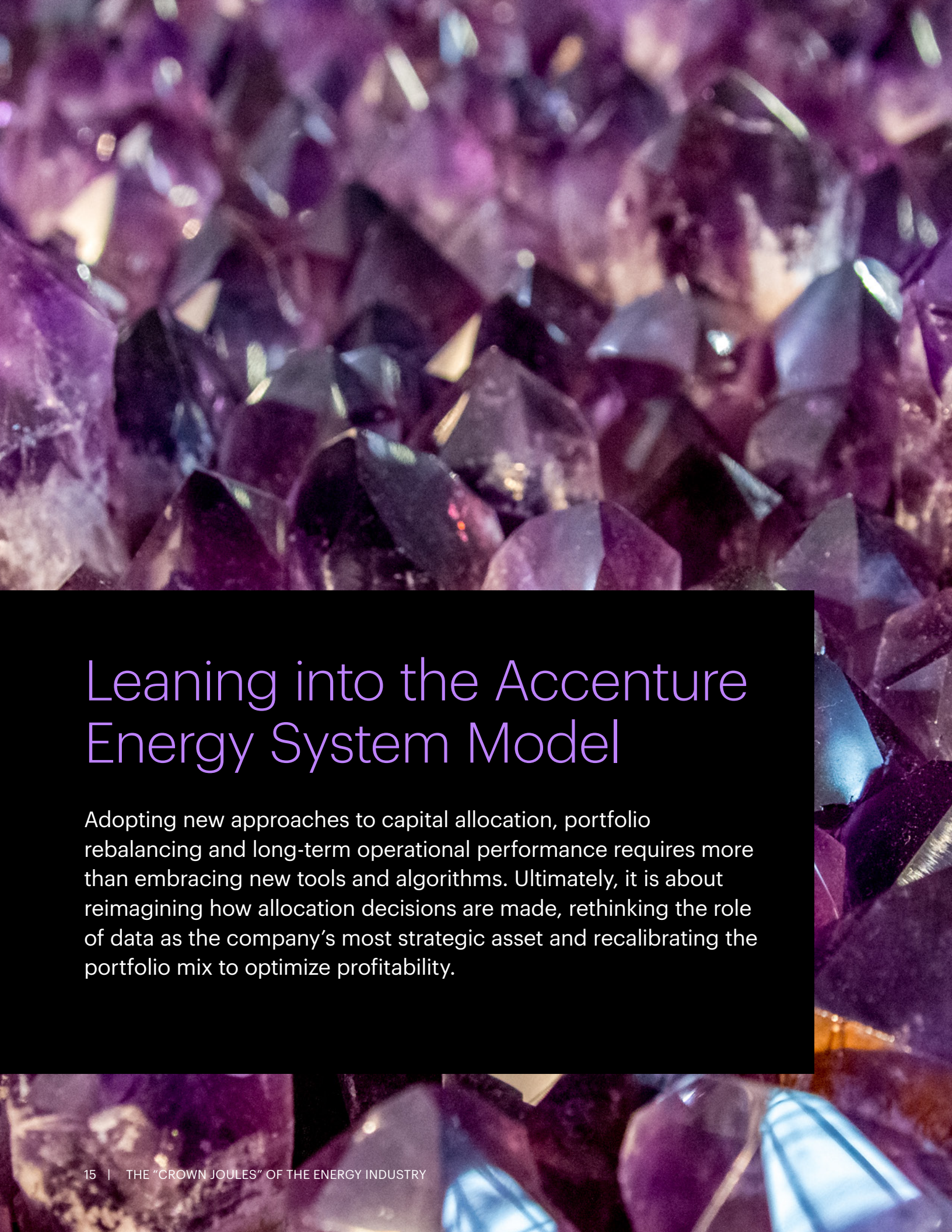
Leading in the energy transition requires not only optimizing capital allocations and portfolios, but also infusing performance excellence throughout the company's day-to-day operations. To manage operational complexity and operational expenditures, companies must equip their key decision makers with a modern and powerful decision platform—one that allows the correlation of these variables in real-time and the discovery of new trade-offs to optimize margins.

Why? Because allocating capital to the right assets is just one part of the equation. Equally important is ensuring that those allocations generate high returns over time and value across different variables (Figure 8). For example, in an energy system that rewards carbon performance, companies must weigh operational decisions in terms of their impact on emission intensity just as much as cost. Increasing production at the same cost may not always be the best action because it could increase emissions, which, in turn, increases carbon taxes or fees and impacts profitability. Alternatively, increasing production at a constant emission intensity may increase maintenance costs and equipment breakdowns, which can ultimately offset any growth in revenue.

Only by combining both capital allocation and operational decision platforms can energy companies navigate the transition with confidence and emerge stronger in the energy system of the future.

Figure 8. To ensure maximum results from dynamic capital allocation, companies must be able to balance operations at speed across multiple levers, with carbon at the heart of decision making





Leaning into the Accenture Energy System Model

Adopting new approaches to capital allocation, portfolio rebalancing and long-term operational performance requires more than embracing new tools and algorithms. Ultimately, it is about reimagining how allocation decisions are made, rethinking the role of data as the company's most strategic asset and recalibrating the portfolio mix to optimize profitability.

About Accenture

Accenture is a global professional services company with leading capabilities in digital, cloud and security. Combining unmatched experience and specialized skills across more than 40 industries, we offer Strategy and Consulting, Interactive, Technology and Operations services—all powered by the world's largest network of Advanced Technology and Intelligent Operations centers. Our 537,000 people deliver on the promise of technology and human ingenuity every day, serving clients in more than 120 countries. We embrace the power of change to create value and shared success for our clients, people, shareholders, partners and communities.

Visit us at www.accenture.com

1. IEA, World Energy Outlook 2020
2. The World Bank. Available at https://data.worldbank.org/indicator/EN.ATM.GHGT.KT.CE
3. IEA, World Energy Outlook 2020
4. Accenture analysis based on IEA, World Energy Outlook 2020

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