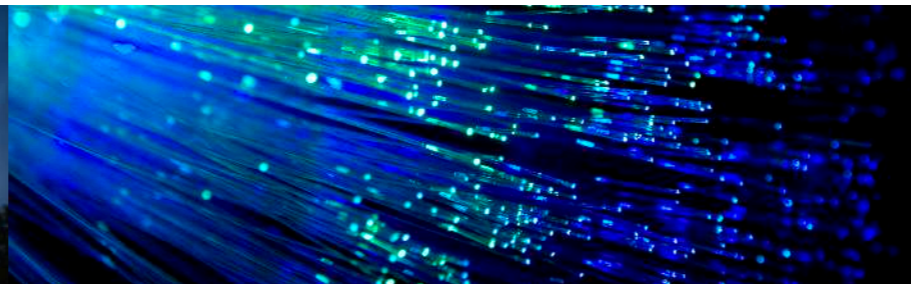




# THE ENERGY CONVERGENCE

Gaining clarity. Taking action.



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# INTRODUCTION



This is a very exciting time to be in the energy business. In fact, I don't believe there has ever been a period of history where the sheer level of change, and the pace of change, has been this momentous in a market this dynamic. As just one example, the speed at which renewables can scale today is extraordinary. Unlike in the old days (5 to 10 years ago), where we had to wait a long time for the impact in the market from energy decisions, we are now seeing change in the market the moment that people decide to do something, such as adding wind and solar capacity. And this, of course, means that the time frame within which the market must react has been dramatically reduced.

But the real challenge for executives today is that everything in our increasingly digitized energy world is interconnected. Renewables are just one piece of a much larger puzzle, with multiple business sectors now coming together, overlapping, competing and partnering to win over newly empowered and tech-savvy customers. This new environment, which DNV GL defines as the energy Convergence, represents an extraordinary opportunity for companies to redefine themselves, embrace change, and build new business models for long-term success.

With 2,500 experts in wind, solar, grids and energy management, we provide the connected intelligence to help our customers find their path through this complexity. By offering a platform to existing and new players in the energy industry, DNV GL will stimulate discussion and together we'll find ways to manage the challenges and opportunities of the energy Convergence. While no organization can predict the future with total certainty, one thing is clear. Going forward there's going to be a very big business in seat belts, because all of us will be moving very fast.

Best,

Ditlev Engel,  
CEO, DNV GL - Energy

## CONVERGENCE IS HERE, AND ACCELERATING

Voice-controlled smart homes. Defections from the grid. Blockchain. Self-driving cars. Self-driving electric cars. Cyberattacks. Sudden policy shifts. To say that we're in an era of accelerating change is an understatement—with major impacts on the energy sector that seem to occur on a daily basis. No single company or sector has all the insights they need or even fundamental ways to interpret what all of these dynamics mean and what you should do to adapt and thrive. At DNV GL, we believe the first step toward evolving is to see this era of change through a framework we define as Convergence.

Convergence is a merging of players, policy, financing and solutions, where old business models are being re-examined and new strategies are being explored among four key sectors: Internet of Things (IoT) companies, utilities, retail energy providers, and distributed energy providers. In this fast-evolving energy ecosystem, traditional players are competing with (or partnering with) new entrants in a race to develop breakthrough technologies and services that put consumer relationships at the center of the equation.



We're in a reality with so many products that customers get to be picky, they get to choose exactly what they want. This "share-of-choice" requires companies to be better. To be more unique. And to give customers a reason to pick them.

Kristie Deiuliis,  
VP, Energy Markets, DNV GL

What's driving this change? Customers. They're connected. Curious. And always looking for the newest and best. They believe that easier, cheaper, and more personal isn't the exception for product and service providers — it's the rule. To them, energy itself is not a commodity—it's a lifestyle choice and a service enabler. Homeowners are increasingly demanding the same level of smart innovation they take for granted in other parts of their lives. For commercial and industrial customers, finding new and better strategies for their energy consumption (and conservation) is often part of a larger corporate sustainability imperative.

This booklet is designed to provide you with an overview of some of the dynamic forces that we see occurring today in Convergence. We explore consumer demand, review recent trends shaping attitudes and choice, provide business models for success, and share DNV GL's vision of what will be required for companies to embrace rapid change instead of fearing it. Through informed strategy development, a reliance on facts, and seeing the broad view of the energy landscape, we believe it's possible for companies to seize upon extraordinary opportunities in this new environment and position themselves for success.



### The Consequences of Technology Change

The rapid pace of change is not new, it's standard, expected. What's noteworthy is that change is occurring faster than anyone in the energy sector anticipated, and in many cases, planned for.

Take the cost of solar, as just one example. The price of solar PV was expected to continue falling at a rate in line with Swanson's Law, a learning curve style drop of approximately 20 percent for every doubling of capacity. But in 2016 alone, global solar capacity increased by 34 percent and PV module costs dropped by an estimated 40 percent\*. Solar capacity installations in 2016 in the USA were up 97 percent over 2015 and solar was the largest new generation source (39 percent solar, 29 percent natural gas, 26 percent wind). DNV GL believes the implications of this rapid change have not yet been fully assessed—challenging business models that continue to rely heavily on centralized energy production, long-range transmission and the volume of energy delivered.

\* Source IHS Markit

Given the rapid pace of change and innovation there's a very real possibility we'll see the emergence of a "Super-Competitor" to dominate the market.

Soner Kanlier,  
VP, Energy Strategy, DNV GL

Annual U.S. Solar PV Installations, 2000–2016

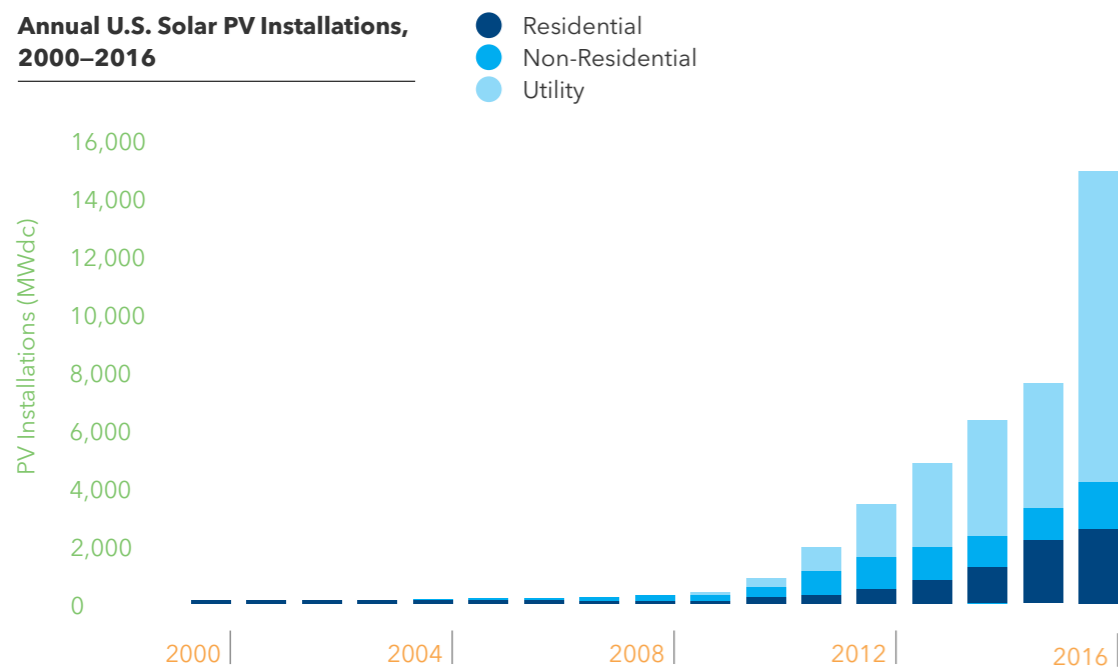
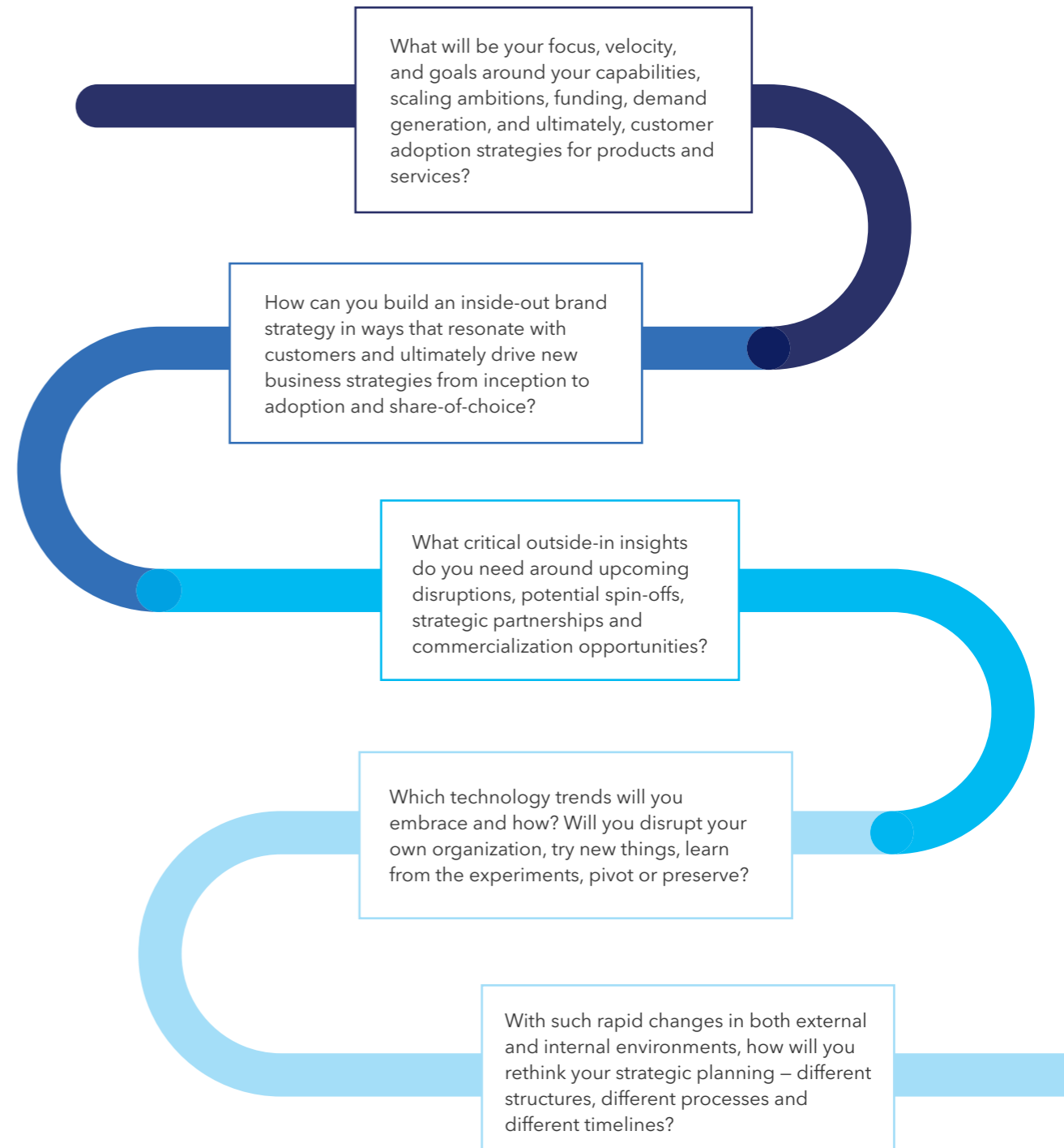


Chart Source: SEIA

The converging trends of dramatically lower solar costs paired with new energy storage systems could lead to a tipping point where more customers choose a higher level of energy independence, or even total independence from the grid. The path towards consumer defection in other industry sectors is well worn, as evidenced by cable TV "cord-cutters" choosing streaming services over traditional cable. Consumers abandoning traditional cabs in favor of Uber and Lyft. Or flocking to Airbnb instead of hotels.

The flipside of this risk is greater opportunities for utilities, distributed energy companies, battery storage providers, and other innovators to capitalize on emerging business models. There are already communities of customers sharing their stored solar energy, neighbor to neighbor. Corporations such as Walmart are experimenting with stored clean energy as a way to lower costs and increase sustainability. As new technologies and services continue to launch, combining and overlapping in surprising ways, the complexity of this landscape will only increase.

### Key questions:



# CONVERGENCE SPOTLIGHT

The energy customer is educated and empowered like never before, creating opportunities for innovation. Companies know this, but some are first movers, challenging old assumptions and finding new ways to establish and build relationships. Here are just a few examples:



### Energy Ogre eats electric bills.

Energy Ogre is using advanced algorithms to make cutting energy bills simple for consumers and gaining new customers in the process. They serve as a kind of energy agent for consumers, continuously and automatically taking advantage of the best deals on the market to help customers slash their energy bills (often in half).



### Griddy cuts out the middleman.

Griddy connects consumers directly to energy providers, at lower cost. Special price alerts let customers know when prices are high and low, with the lower costs associated with abundant wind and solar energy at certain times of day.



### Welcome to Walmart (and our Hybrid Electric Building)!

In partnership with Advanced Microgrid Solutions (AMS), this retail giant is installing behind the meter batteries at 27 Southern California locations. The systems will save the company money by shaving expensive peaks, and smooth out imbalances in on-site generation and consumption. Walmart believes its on-site energy storage will allow them to meet their ambitious goal of powering half of all operations with renewable energy by 2025.



### Energy independence? It takes a village.

The "Sonnen Community" enables homeowners with Sonnen batteries to share power with each other as needed, creating what the company describes as the first Airbnb of energy. Customers within the community enhance their energy independence from the grid while saving money.



### Zen and the art of energy storage.

Zen Ecosystems partners with Swell Energy to package their smart thermostats with batteries to build customer savings. For example, the Zen thermostat can receive a signal from the utility that a demand response event will soon occur. The integrated system lets the battery know to load up before a demand response (DR) event so it has enough power to even out the home's energy use during the event, allowing customers to save money without compromising comfort. The system will also enable customers to optimize their energy usage if they have a time-differentiated tariff.



### Amazon's Echo learns energy management.

Amazon's popular Echo voice-activated speaker can run with a growing number of apps (Amazon calls them "skills") related to energy usage. The "My Utility" function allows consumers to ask questions such as, "How much electricity has been generated by my solar panels today?" Or, "When is the next demand response event going to be?"

### Key questions:

Which market sectors are best positioned to engage customers with new technologies and services?

What new capabilities do we need to navigate in this new landscape?

How do we engage policymakers and regulators to remove barriers and roadblocks to market adoption?

What planning strategies can companies implement to be ready for many possible Convergence scenarios?

What partner, make or buy strategies should companies consider to capitalize on innovation and speed market entry?

# CONVERGENCE CONSIDERATIONS BY SECTOR

While some companies may get by with their current business plans, others are taking a fresh look at the energy sector to identify sources of unmet customer value.

Here's DNV GL's perspective on the implications of Convergence for different market sectors.

## Utilities

Regulated utilities are tasked with rebuilding the plane while it's in the air. Hungry startups are inventing their way into the world of energy, often challenging traditional business models and seeking a direct route to consumer wallets. Distributed energy is threatening to drain resources at the very time new spending may be required to upgrade systems to accommodate electric vehicles, introduce smart meters, or fend off competitive threats. Energy customers are now seeing alternative, more interactive ways to engage with energy. At the same time, energy executives may feel that the urgent call to change has been heard before, and the sky did not, in fact, fall.

### Considerations include:

Balancing new customer solutions with the need to buy and sell more renewable energy.

Better understanding which aspects of their business are most important to focus on right now, versus those that can accommodate a longer time horizon such as transmission and distribution upgrades.

Gaining more knowledge of the mindsets and habits of customers who are accustomed to new technologies and services—especially millennials.

Identifying opportunities for partnerships versus competition (resistance to new entrants could backfire).

Formulating a planning strategy for the future that enables greater business resiliency in the face of change.

## Distributed energy

While the push toward producing clean energy at home (or close to home) shows no signs of abating, clouds continue blocking the sun: high-profile bankruptcies have demonstrated that the ideal model for home solar has yet to be fully realized. Utilities in many markets are pushing back against rooftop solar, slowing or in some areas, completely derailing broader adoption. A new administration in Washington is presenting an uncertain generation vision for the future. Against this backdrop, however, is the reality that consumers continue to demand cleaner power and greater energy independence.

### Considerations include:

The opportunity to find common ground with forward-thinking utilities and technology innovators to invent new consumer-centric business models.

Navigating long-term contracts with consumers that are reliant on regulations and tax incentives that could suddenly change based on policy shifts at the national and local level.

## Internet of Things

The Internet of Things, a revolutionary concept a decade ago, is now common as virtually everything is connected to everything else in some manner.

Today, IoT is colliding with early 20<sup>th</sup> century grid infrastructure and entrenched relationships between utilities and their customers. If the experience of Nest and GE is any guide, innovation usually finds a way to solve customer problems in delightful ways, and this creative force, backed by deep-pocketed investors, is coming to the world of energy. Will your business thrive, or retreat, as a result? Or, as more customers may soon be asking, "Hey Alexa, how can I lower my energy bill?"

### Considerations include:

Which business models can best leverage the power of IoT to gain acceptance by tech-savvy consumers?

What kinds of devices can solve consumer pain points?

How can we resolve cyber security issues in an interconnected digital energy landscape?

## Retail energy

As competitive retailers continue to compete for the same customers and limited new market opportunities, retail energy providers need to set their company apart. They need to be relentlessly customer focused while constantly delivering and reassessing their value to the customer. Are your electrons better or are they just cheaper? If cost is the factor customers care most about (or is it?) how can you compete successfully and still

make a profit? How does convenience, access and ease of use add value and differentiate? In light of these kinds of questions, it's not surprising that 67 percent of retail-focused respondents in a DNV GL survey cited "new technologies and applications" as key to their business strategy and growth. Convergence provides opportunities to rise above being seen as a commodity, and to make fresh connections with customers.

### Considerations include:

Finding new ways for customers to engage with energy that are as simple as a light switch.

Identifying the values to customers while adapting products and services.

Exploring mergers, partnerships, and acquisition approaches.

Exploring ways to increase access to customer data and leverage it for business advantage.

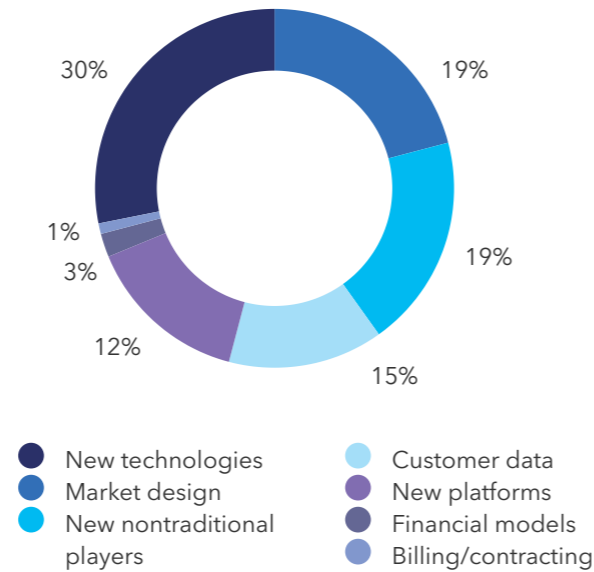
# HOW EXECUTIVES CHARACTERIZE CUSTOMERS' EXPERIENCE

DNV GL's 2016 Market Pulse Survey asked a wide range of executives within energy and IoT: What word best characterizes your customers' experience in evolving energy markets?

**A whopping 43 percent in aggregate described their customers' experience as confused, frustrated or stressed. Perhaps they are all three?**

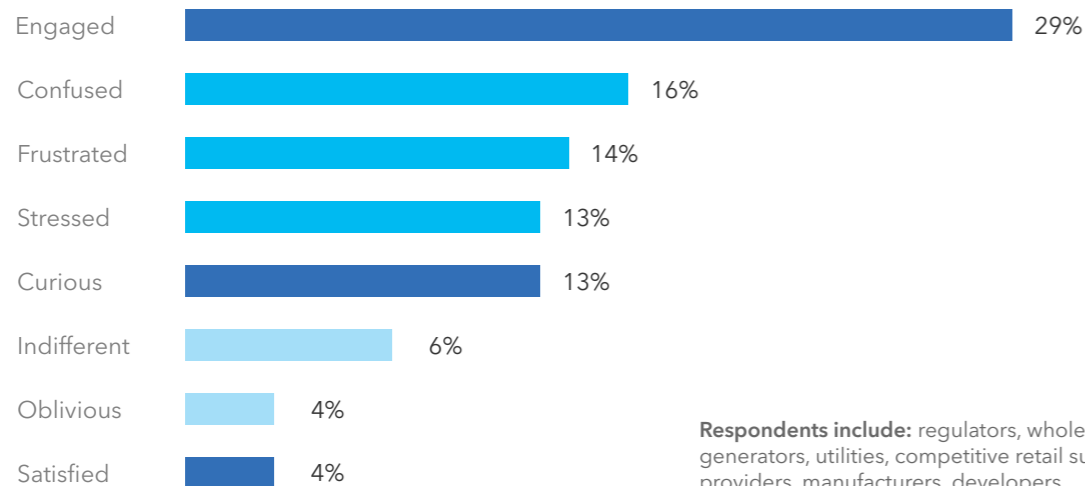
These customers' reactions underscore the demand for new business models.

## Where is innovation most likely to occur in energy markets in the next two – five years?

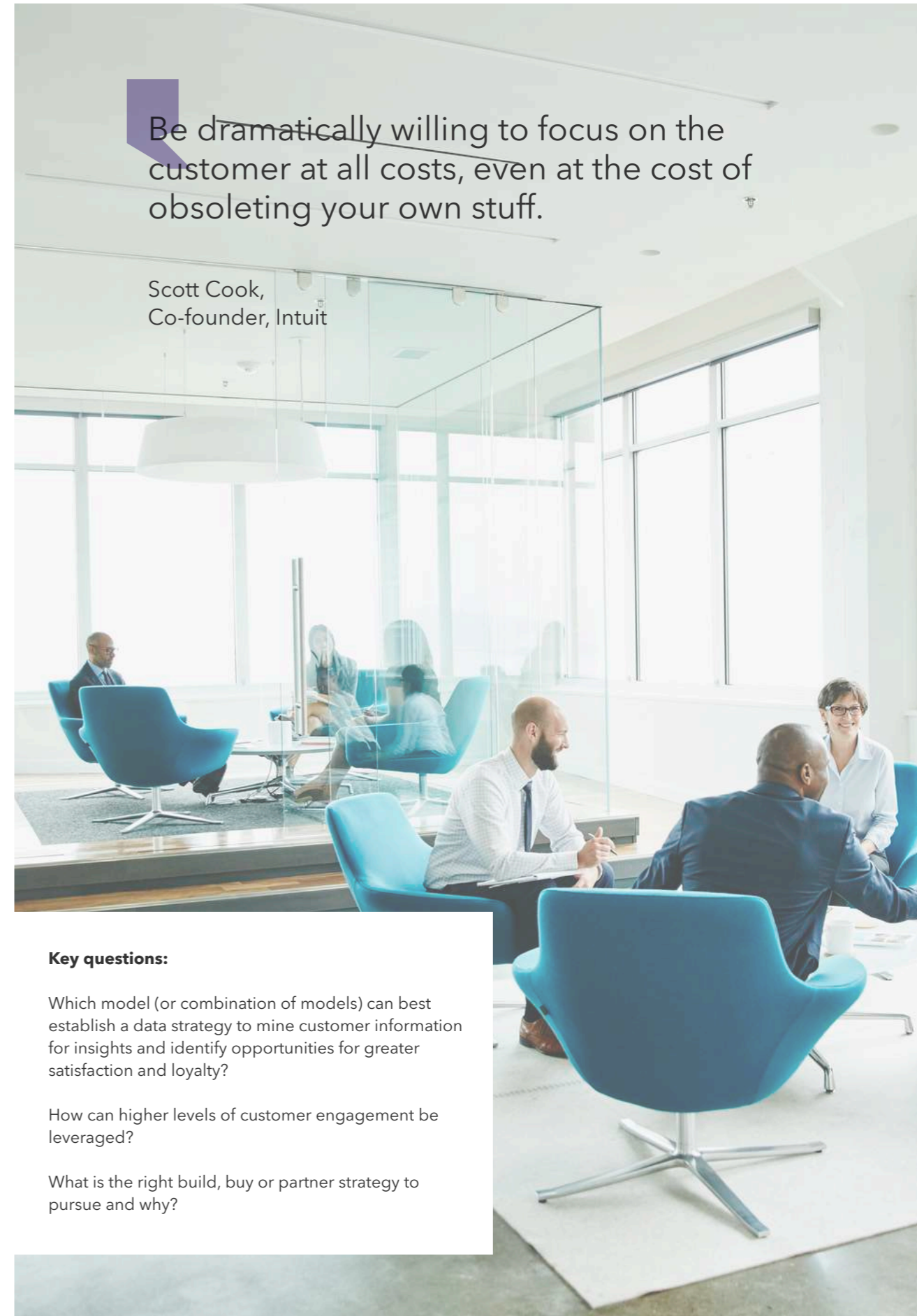


Source: DNV GL 2016 Market Pulse Survey

## How executives characterize customers' experience.



**Respondents include:** regulators, wholesale operators, generators, utilities, competitive retail suppliers, DER providers, manufacturers, developers



Be dramatically willing to focus on the customer at all costs, even at the cost of obsoleting your own stuff.

Scott Cook,  
Co-founder, Intuit

### Key questions:

Which model (or combination of models) can best establish a data strategy to mine customer information for insights and identify opportunities for greater satisfaction and loyalty?

How can higher levels of customer engagement be leveraged?

What is the right build, buy or partner strategy to pursue and why?



# THE CONVERGENCE OF BUSINESS MODELS FOCUSED ON CUSTOMERS

DNV GL has identified six successful business models to consider when developing a strategy for the new energy ecosystem. Just as different business sectors—from utilities to distributed energy to retail and IoT—are intersecting and partnering in Convergence, the business models themselves are also intertwining and continuously evolving. The common element of every model, however, is the relentless focus on meeting customer needs and making new things possible.

**Competing as an Ecosystem**

**Shared Economy**

**Platform Businesses**

**Outcomes-Based Models**

**Expansion into New Industries and Markets**

**Digitization of Products and Services**



Organizations that offer goods or services with tangible delivery objectives, quality metrics, or specific customer experiences. Examples include cable companies, pharma manufacturers or consumer product goods companies.

Organizations that see diversification of customers and applications as key to long-term success. They seek to apply underlying technologies and Intellectual Property to new, sometimes unclaimed, frontiers. These are often identified by firms that see areas of previously unidentified customer value, or opportunities to innovatively combine existing technologies to create new products and services. Examples include Apple and GE.

Organizations that are seeing the significant benefits of automation and data collection to improve margins and enhance offerings. Often services are segmented into free and premium components ("freemium") to build large networks of users. Examples include Google, LinkedIn and Pandora.

Organizations that see the opportunity to partner, instead of building or buying, as the strongest path to engaging new customers and staying top of mind in new scenarios. Examples include the NEST and Direct Energy partnership.

Organizations that seek to utilize excess capacity or unused assets. Often, value is added by being a middleman linking this capacity to prospective customers (i.e., a multisided platform). Examples include Uber and Airbnb.

Organizations that have built substantial, broadly applicable infrastructures and customer relationships, and can leverage their core expertise to catalyze the growth of other businesses. Examples include Amazon, Google and Alibaba.

# STAKEHOLDER STRATEGY AND ACTION: WHAT'S NEEDED TO MOVE FORWARD?

DNV GL sees three main pillars required to build a solid strategic and actionable foundation for successfully navigating Convergence.

## 1. Radical Common Sense

## 2. Impartial Advocacy

## 3. Practical Vision



### Let's discuss.

There's a great deal of talk in the industry about disruption, but devoid of context it's just noise. To make sense of this environment, where change is occurring so fast, what's needed is translation of the language of energy. Not simply what is being said, but who's saying it, why they're saying it, and what it means.

This requires an open dialogue among a community of disparate players with their own dialects, and the ability to gather data from all these sources to assimilate unique viewpoints and perspectives. This cannot be a one-way conversation. It must be multifaceted, with trusted interpretation, leading to distilled insights that provide exactly what's required to take action with confidence.

DNV GL invites companies to bring us their new models and technologies; we'll evaluate risks, and translate the complexity of energy into actionable insight.

### Try this.

The rallying cry of change is being shouted from every angle. Today's world is becoming more digital by the moment. And yet executives have businesses to run. Risk is the evil twin of action—and operating with a business-as-usual approach may be the riskiest path of all. How can companies move into the future, without breaking what's working today?

What's needed is deep energy domain knowledge paired with digitalization capabilities that bring companies into the future—not with a giant leap into the unknown, but with experimentation. All based on rock solid data, smart analytics, technical expertise and the right balance of caution and bravery.

DNV GL's data-driven approach helps executives base their decisions on facts, helping them move confidently into the future step by step, safely.

### Come with me.

Common sense is authentic but rare. Too often recommendations—the ones that may seem solid and smart—have strings attached, hidden agendas that cloud judgment and prevent action. Only a combination of total neutrality paired with deep expertise delivers crystal clear vision.

When strategic insights are grounded in the world of testing and validation, executives can rely on them to move into the future of energy by exploring and testing new business models. Finding possibilities that can only be seen when the entire picture is analyzed. And taking action with confidence, knowing the insight comes from understanding. The best ideas may seem radical. But in reality, they're just common sense.

DNV GL combines complete impartiality with the ability to connect the dots, so you can see a clearer view of your path forward.

## OUR VISION: THE POWER OF SYNCHRONICITY

Sometimes things occur that surprise us—even startle us—with their amazing clarity, their simplicity, their total brilliance. We often can't quite put our finger on how they came about. A seemingly unplanned connection between two or more ideas or objects that match up, randomly, as if they were made to be connected. Synchronicity.

At DNV GL, we see synchronicity not as chance but the direct result of a process that arises when the right building blocks are in place. An environment, an ecosystem, engineered to produce new ideas that have the power to transform business in unexpected ways.

Synchronicity is built on the strategic foundations required to navigate Convergence. The radical common sense that comes from deep energy domain expertise. The skills of a trusted advocate and interpreter of the often complex language of energy. The guide with practical vision to help executives transition to a digital future. A foundation in analysis, modeling, certification and innovation—grounded in facts, trusted across the globe. Each capability is intertwined, with data from one area informing insight in another. And experts who are constantly listening to customers, asking questions and sparking conversations. Testing not only products, but also assumptions.

Today, DNV GL provides the connected energy intelligence that gives executives a broader view of the whole energy ecosystem—making it easier to spot both the risks and opportunities inherent in Convergence. As the industry continues to evolve, DNV GL will evolve to harness the full power of synchronicity, providing customers with agility and the fact-based insights required to transition with confidence to the future of energy.

**Contact DNV GL for insights, technical expertise, and guidance on your path through Convergence. [dnvgl.com/convergence](http://dnvgl.com/convergence)**

