

A New Era for Energy Companies

Cloud computing changes the game



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Executive summary: How cloud computing changes the game in the energy industry

Over the next few years, it is inevitable that many major industries—energy included—will migrate to cloud computing. The important question is which companies will seek to take advantage of the benefits first, and which will find themselves playing catch-up.

As this trend gains momentum and scale, Accenture believes that cloud computing will combine with mobile technology and powerful analytics to change the game in the energy industry across five key dimensions.

1 Cloud and data



- Today, energy companies have to manage and make sense of an unprecedented and ever-expanding mass of "big data." For example, energy exploration is leveraging data-intensive imaging technology to find oil and gas at greater depths, in remote terrain, with increasingly complex extraction techniques.
- Cloud computing provides companies with access to transformational, new real-time data and analytical capabilities, underpinned by supercomputing power and massive storage capacity—enabling them to unleash the value locked up in financial and operations data across their organizations. It also allows them to undertake specific data-heavy activities such as detailed analysis of seismic information.
- In the coming years, we believe that energy companies will increasingly source their data centers in the cloud, and will turn more frequently to cloud services to augment their existing supercomputing capabilities. This change will offer them greater flexibility and reduced image analysis times. Also, energy companies that are leaders in analytics-heavy activities, such as geospatial and 4D seismic modeling, will start to sell their capabilities to peers and competitors on a pay-per-use basis.

2 Cloud and collaboration



- In major capital projects, energy companies need to manage ever-larger, more complex and more geographically diverse ecosystems of partners, suppliers, subcontractors and employees.
- With cloud computing, companies gain integrated global access to information—anytime, anywhere—bringing them the ability to share data and collaborate more effectively in real time across these complex project ecosystems.
- Given the consumption-based pricing models, speed-to-market and flexibility benefits of cloud-based collaboration and information sharing on multi-stakeholder capital projects, companies will increasingly expand their use of cloud services across their operations.

3 Cloud and production operations



- Intensifying global competition—combined with volatile and uncertain economic, regulatory and market conditions—means energy companies have to generate higher performance and greater operational agility with reductions in costs.
- Cloud-based, as-a-service infrastructure, applications, platforms and business processes enable companies to control costs more flexibly and transparently, while also providing greater scalability and agility via pay-per-use access to an emerging generation of market-leading capabilities.
- Over time, as an expanding array of specialized industry services (e.g., 4D modeling to energy trading to exploration and production [E&P] asset management) migrate into the cloud, cloud orchestrators will aggregate bundles of cloud services for energy companies on a managed service basis to create an industry-tailored cloud environment.

4 Cloud and customer engagement



- As competition for retail and business customers intensifies, energy companies are striving to build deeper customer relationships and brand value using advanced customer relationship management (CRM) and social media.
- Cloud brings companies the ability to implement new customer-facing capabilities rapidly, responsively and at lower cost than traditional systems, enabling them to compete more effectively for customers' loyalty and spending.
- Energy companies will make growing use of cloud-based CRM and social media, including building "green" branding and becoming more actively involved in the blogosphere to engage with activists.

5 Cloud and next-generation energy, environment and health



- Energy companies are navigating their transition to the next-generation energy mix. This mix will be characterized by a wider array of energy sources, including lower-carbon alternatives and renewables, and will be accompanied by a greater focus on protecting the environment.
- Energy companies will reduce their environmental impacts by controlling their operations more effectively, and removing redundant and underutilized IT capacity and assets.
- Cloud computing helps energy companies navigate this journey—including allowing them to track and manage their environmental impact, and monitor ever-more complex equipment remotely in real time.

The energy industry starts its cloud journey

As Accenture's *Technology Vision 2012*¹ for the energy industry highlights, most oil and gas companies are evaluating the risks and benefits of cloud computing, and have taken major steps toward virtualizing their internal infrastructures. But the majority have yet to implement the full-scale automation or self-service provisioning that can help to harness the full benefits of the cloud.

The impact of cloud computing adoption on energy companies will be multiplied, given the increasing pervasiveness of three technology trends: enterprise mobility, IT and operations technology convergence and increasingly sophisticated data analytics. This triumvirate of technologies is fundamentally changing the way companies do business, collaborate and compete, not just in the energy sector, but across many industries.

As part of these initial moves into cloud computing, energy companies have started exploring public clouds in non-critical areas, such as testing and development. They are also exploring support systems without sensitive information, and many have already moved e-mail and

personal-productivity applications to cloud-based platforms. However, some enterprises are reluctant to entrust certain applications that are core to their intellectual property—such as business applications, operations and maintenance plant systems—to public cloud services. As a result, most energy companies have plans for private clouds, and—even in the future—cloud providers will need to offer client-dedicated hardware.

In assessing the potential of cloud in the energy sector, it is important to distinguish between its internal and external uses. Internally, its impact mirrors that in other industries, by enabling advances such as integrated, internal collaboration, greater flexibility and reduced costs through virtualization. In contrast, external usage of cloud computing has far greater industry-specific implications, by challenging and changing existing business models. For example, as we will discuss later, it opens the way for third parties to act as cloud "orchestrators," aggregating and providing a wide array of industry-tailored, cloud-based services.

How cloud can change the game for energy companies

As Figure 1 illustrates, the inherent characteristics of cloud computing that directly address the five factors are driving forces for industry change—thus providing energy companies with an effective platform to support future high performance and growth. These factors are why we believe cloud will fundamentally change the game for the energy industry in the next few years. Within each of the five defining factors shown in Figure 1, there are specific near-term opportunities to be seized in energy companies' migration to cloud. We will highlight these opportunities alongside our analysis of cloud's longer term impacts.

Figure 1. How cloud's fundamental characteristics address the five defining factors of the current industry context

	Defining Factors	Cloud Characteristics	
1. Cloud and data	Data intensive and geographically dispersed	On demand, scalable, super computing anywhere	<ul style="list-style-type: none"> • Available compute power for increasingly complex sub surface models
2. Cloud and collaboration	Multi-supplier enabled and connectivity challenged	Flexible, secure information sharing and collaboration	<ul style="list-style-type: none"> • Connected multi-supplier capital project team members in remote locations
3. Cloud and production operations	Increased production and reduced cost	SaaS-enabled oilfield	<ul style="list-style-type: none"> • Agile i-fields with flexibility to scale asset integration and monitoring
4. Cloud and customer engagement	Social consumers and real-time engagement	Responsive, low cost, new customer facing capabilities	<ul style="list-style-type: none"> • Involved consumers in retail brand development, corporate direction, and global energy issues
5. Cloud and EH&S and next-gen energy	Environmental forces and next-generation energy	Speed to market, pay per use, and ubiquitous connectivity	<ul style="list-style-type: none"> • Improved safety, air, and water quality • Rapid next generation technology acquisitions and start-up

1. Cloud and data

Cloud computing provides energy companies with access to new, real-time data and analytical capabilities. By leveraging advanced analytics powered by cloud-based supercomputing capabilities, they can uncover the financial and operational value locked up in "big data."



As demand for energy grows, and the reserves of "easy oil" diminish, energy companies have to expand their focus and move towards increasingly hard-to-access and unconventional sources of oil and gas. This is fueling the use of advanced data management capabilities in upstream operations, including for preventive maintenance processes and for 3D/4D modeling based on reservoir and seismic data. At the same time, global energy trading is becoming increasingly complex, demanding ever-more advanced data-driven modeling and forecasting capabilities.

These trends, amongst others, mean energy companies have to manage and make sense of an unprecedented and ever-expanding mass of "big data." As a result, it is increasingly important for them to develop a cloud strategy aligned with production operation imperatives to reduce business process cycle times. In addition, in areas ranging from energy trading to retail, cloud computing provides the cost-effective processing power and scalability to manage rising complexity and time pressures.

What companies are doing today

Across the industry, companies have started to leverage cloud-driven supercomputing power, capacity and analytics to increase oil field performance and production without heavy up-front investment in on-premise IT systems. Shell Oil is using cloud services² to help it manage and analyze the massive amounts of geological data produced by the super-sensitive seismic sensors that it installed recently under a collaborative agreement with Hewlett-Packard.³ The sensors enable the company to detect and extract oil from wells that were formerly believed to have run dry, or in locations where previous investigations suggested that no oil was present.

Today, Shell Oil's drilling engineers and geophysicists use the cloud for analytics, provisioning the computing capacity themselves and then running their analytical models on a pay-per-use basis.⁴ Shell has been piloting cloud-

based Hadoop for big data analytics and focusing on sophisticated authentication for data security. It also enables authorized third parties to access its Amazon Virtual Private Cloud-based platform.

Oil field service company Baker Hughes⁵ is also using the cloud, leveraging Microsoft's Azure cloud platform to compute fluid dynamics in its TubeFlow (a simulator of fluid flow) in real time and at the rig site. The company augments its high-performance computing clusters by tapping into supercomputing power in the cloud without adding costly on-premises infrastructure. Using the cloud has reduced processing time dramatically, meaning an estimated year of computation can be delivered within 30 days.

Future impacts

Going forward, we believe cloud's power and scalability will continue to transform the energy industry's ability to manage and drive value from "big data." Use of third-party IaaS will continue to grow, and industry-specific providers offering supercomputing in the cloud will provide fast and powerful cloud-based handling of complex data-intensive activities, such as geospatial and 4D seismic modeling. We believe that energy companies that are leaders in specialist, analytics-heavy activities will start to sell their capabilities to peers and competitors in the cloud on a pay-per-use basis, while other processing-intensive and time-critical activities such as trading and customer analytics will also be offered as SaaS solutions.



2. Cloud and collaboration

With cloud computing, energy companies worldwide gain integrated global access to information—anytime, anywhere—and to new tools that have expanded into the corporate environment from the consumer world, such as social networking and low-cost online video conferencing. These advances bring energy companies the ability to collaborate more effectively at all levels, from the enterprise to the individual employee.



The emergence of cloud computing in the energy industry is taking place at a time when energy companies are making growing use of joint ventures and collaboration to help them manage risks and reduce costs, especially in major capital projects involving many different parties. The enhanced capacity for collaboration brought by cloud computing will be increasingly valuable in a global environment where energy operations and projects involve ever-larger, more complex and more geographically diverse ecosystems of participants.

Energy companies that utilize cloud computing strategically can also deploy infrastructure and applications for joint ventures, mergers, and divestments far more quickly than with traditional technologies—thus shortening the time to first oil and boosting competitiveness and speed to value. Cloud also creates the ability to scale these assets up quickly and at low cost over time, to cope with growing business need. Furthermore, it enables upstream production optimization by enabling energy companies and subcontractors to share data and insights in real time.

What companies are doing today

Tullow Oil, one of Europe's largest independent oil and gas exploration companies, has deployed the cloud computing-based YouSendIt Corporate Suite across its business.⁶ The platform enables Tullow Oil employees to securely exchange very large files containing maps, oil-well data, CAD drawings, images, graphics and other crucial information without overloading the e-mail system traditionally used for this purpose.

A good example of collaboration via cloud across a project ecosystem is a recent Australian gas well project, in which the parties collaborated through a SaaS application that served 2,350 users across 89 participating companies.⁷ The number of e-mails sent during the project reached 531,600, and the platform managed a data mass totaling 368 gigabytes. The capabilities supported by the platform included simultaneous viewing and—in some cases—even simultaneous markup of documents.

State-controlled national oil companies (NOCs) are also taking steps into the cloud. The People's Republic of China's Sinopec announced in September 2011 that it was accelerating its development of a Contract Information Management System (CIMS) and incorporating cloud technology.⁸ The aim was to help make Sinopec's contract management more standardized, integrated and information-based, thus reducing administrative costs and improving efficiency.

Future impacts

We believe cloud-based collaboration across project ecosystems will become the norm, reflecting its cost, flexibility and speed. Having tested and experienced the benefits of cloud-based collaboration and information sharing on multi-stakeholder capital projects, energy companies will increasingly expand their use of cloud services across their operations. This change is already taking place with internal collaboration and communications such as e-mail, and we believe that other functions will follow. In time, energy companies will be able to plug in and out of collaborative cloud ecosystems at will, and this ability will become a prerequisite for participating in major industry programs.

Collaboration via the cloud will also help energy companies manage differing data security and privacy regulations in different parts of the world. Cloud providers have recognized stringent data compliance requirements and are working on or have implemented model clauses for stringent country data protection compliance. The commitment to compliance and security will rapidly increase cloud adoption and speed to market where today cloud solution architectures are frequently rejected or delayed by security, procurement and legal concerns.

Does cloud-based ERP negate prior ERP investment?

For large enterprises, the simple answer is “no.” A growing number of energy corporations are retaining their existing core enterprise resource planning (ERP) systems while simultaneously realizing the benefits of cloud services at a local and/or subsidiary level. They are doing this by adopting a “two-tier” ERP strategy—one where the company runs a traditional global ERP system at the group level, in combination with separate regional SaaS ERP solutions at the subsidiary level.

The consideration of a two-tier ERP approach is common among companies that struggle to push out the core ERP platform to smaller subsidiaries and joint ventures—especially in emerging markets. This is usually because they face one or more of three main difficulties:

- The core ERP solution is too complex for subsidiaries' needs.
- The core ERP solution is too expensive for the local operation, even with cost allocation schemes to remove some of the up-front expense.
- The subsidiaries cannot afford to wait for the next release or wave of core ERP rollout because their business is changing rapidly.

The result is typically a “hub-and-spoke” ERP model which many enterprises already have despite efforts by the central IT function to unify on one system.

By looking at the ERP ecosystem, the organization can identify subsidiaries due for an upgrade—or new subsidiaries with few common suppliers/customers, local competition and changing local regulation—as prime “spoke” targets.

Establishing SaaS ERP as one of the preferred two-tier ERP solutions for these targets enables the enterprise to gain experience in SaaS capabilities often without the need for an expensive software selection process.

Experience also shows that a two-tier ERP strategy can significantly shorten implementation times while reducing capital and operational costs, enabling greater agility and speeding up acceptance by end-users. Implementing all the “spokes” on the same two-tier system brings further cost and operational advantages because it is easier and cheaper to link, coordinate and govern the various local ERP instances.

Therefore, selecting SaaS as one of the two-tier options also brings benefits in governance and control terms—with the key benefit being greater visibility, since anyone with a browser and a login/password can see, in real-time what is happening in the subsidiary.

3. Cloud and production operations

Cloud-based as-a-service platforms enable energy companies to manage costs more effectively in functions and activities across the enterprise, while also increasing operations agility by opening up flexible and cost-effective access to an emerging generation of market-leading, industry-specific applications.



Energy companies are constantly seeking ways to improve production control, effectiveness and efficiency. Over the past decade, energy companies have embraced the digital oil field to integrate production and exploration information, saving hundreds of million dollars a year. The majority of E&P digital oil-field solutions leverage packaged software for monitoring, optimization and control, integrated with collaboration and visualization capabilities.

Today, many of the technologies that enable the digital oil field are emerging as cloud capabilities giving existing i-fields the flexibility and agility to scale asset integration and monitoring. On-demand compute power is available from pooled, cloud-based computing, bandwidths as low as 1 Mbps can operate complex 3D applications, and display performance is improving with thin clients that send screen images over the LAN/WAN while processing is conducted in the cloud.

Early adopters of cloud-based production operation monitoring are capitalizing on an opportunity to create cloud-enabled business services for others. New strategic energy asset developments will turn to the cloud for speed to market and on-demand skills, and speed will outweigh integration initially.

Cloud computing provides greater transparency and control of costs through pay-per-use pricing, enabling energy companies to tap into infrastructure, platforms, applications and business processes and dial them up or down flexibly on demand. To provide users with these benefits, more and more of the industry's established packaged software providers—notably those supporting upstream operations—are moving their packaged solution to the cloud. As a result, companies that are currently using legacy licensed versions of these packaged software products will likely need to migrate to the cloud-based variant of these products in the near future.

What companies are doing today

There are many examples of this migration to cloud technologies happening across the energy industry. The global, independent E&P company, Talisman Energy, recently implemented a Real-Time Operations Center (RTOC) using the cloud computing and remote hosting environment now offered by Landmark for its vSpace® well operations monitoring and management product.⁹ The companies say the cloud solution saved Talisman around US\$30-\$40 million in the first year alone, as well as yielding further benefits including improved collaboration between the geoscience and engineering domains, and the ability to predict drilling hazards ahead of the drilling bit.

In another example, Accenture is currently working with a global energy firm based in Europe to begin to virtualize this firm's infrastructure using a private cloud. This client has particular interest in cloud for testing and development environments, and has found that using cloud allows it to shave the time taken to create an environment from one month, to four hours. The virtual environment also is one-fifth of the cost of the client's previous traditional environment. Enhanced capabilities like these are especially important for engineers and researchers undertaking rapid development, where speed to market is critical. Reduced speed to market makes cloud solutions ideal for activities like agile engineering development for production operations, or using emerging technologies in R&D.

In our view, the trend for industry-specific applications and services to move into the cloud will accelerate in the years to come, with virtually all the major application providers in areas like geographical information systems (GIS), regulatory reporting, and research and development (R&D) likely to migrate to an as-a-service delivery model. For example, Digital Oilfield Online is a cloud-based version of iStore's PetroTrek software suite helping oil and gas companies remotely organize and visualize exploration and production (E&P) data in the cloud.

Analytics services are also increasingly cloud based, and industry investment in these offerings is continuing. In 2011, the global oil field services provider Schlumberger participated in a US\$22 million venture funding round for start-up Liquid Robotics, a cloud computing GIS provider offering direct access to real-time oceanographic information.¹⁰

Future impacts

The next few years will see continued expansion and advances in the range of cloud computing services available to energy companies. Companies that create an "evergreen" readily upgradable,

enterprise-wide shared SaaS platform will use it to streamline their back-office operations and achieve ongoing lower costs, providing a platform for more cost-effective management of common functions including human resources (HR), retail and business-to-business CRM, finance, trading, and so on.

With the use of IaaS and SaaS already established and widespread, PaaS will come to the fore. PaaS enables software vendors and corporate IT departments to focus on innovation instead of infrastructure, by leveraging the elasticity of cloud computing and providing tools to design, test, stage and deploy Web applications over the Internet or through a local corporate cloud. In Accenture's view, PaaS will bring waves of innovation to the digital oil field, enabling developers to focus less on IT constraints and more on the Exploration and Production business requirements, and to deploy highly customized solutions, rapidly and on a large scale to support global operations and distributed workforces.

For example, a company's cloud-based analytics platform can be shared so third parties can contribute to E&P or operation processes. Remote performance management and decision support by third-party specialists are also feasible

using cloud services, since operators can engage these specialists much more easily to actively manage and monitor production. In case of any event, they can trigger the workflow for action or investigation. Given such capabilities, we believe that energy companies that have not yet established a cloud computing strategy need to anticipate that PaaS offerings will become a strategic part of their technology portfolio soon.

In addition to having access to a growing range of cloud services, energy companies will also gain more options for how these services can be sourced, managed and integrated. This shift will be driven by the emergence of industry-focused cloud orchestrators, who will offer to aggregate and integrate tailored bundles of services from different cloud suppliers, and provide them to energy companies as a cloud environment tailored to specific industry needs. The services offered by these cloud brokerage service (CBS) providers will cover the full spectrum of cloud offerings, from IaaS to specialized SaaS applications including analytics, to PaaS environments for development and testing, and BPaaS offerings for activities such as energy trading.

Shell extends data center outsourcing into the cloud¹¹

In July 2012, Royal Dutch Shell agreed to a five-year extension to a contract under which its data centers will be managed using a cloud computing infrastructure, enabling it to access information and services remotely without having to maintain its own servers. The 1 billion-euro (US \$1.2 billion) contract is managed by Deutsche Telekom's T-Systems subsidiary.

4. Cloud and customer engagement

With both business and retail customers, cloud computing brings energy companies the ability to implement new, customer-facing capabilities rapidly, responsively and at lower cost than traditional technology, enabling them to compete more effectively for customers' loyalty and share of spend.



The battle to engage retail and business customers and retain share of their spending is intensifying, prompting efforts to build deeper customer relationships and brand value. To differentiate themselves in the eyes of consumers, companies are turning to cloud-based CRM and social media, forging deeper and more durable relationships with business customers, and joining consumers' conversations on social media sites to engage with them more closely.

What companies are doing today

Energy companies are increasingly well represented in social media, which is becoming an important tool for customer communication, feedback and relationship building. Examples include Accenture's use of cloud computing to create a social media platform for the Green Guardians team in the Shell Eco-marathon Challenge.¹² The Challenge, born of Shell's commitment to work against climate change and diminishing oil reserves, allows students around the world to design, build and test vehicles that travel farther using less energy.

A team from Accenture Technology Labs helped the Green Guardians team taking part in the Challenge to leverage cloud computing to simultaneously reduce costs and enhance functionality. Cloud sourcing provided scalability on-demand and pay-as-you-go costing, enabling the Green Guardians' site to handle the peak traffic over the three days of the race itself. The cloud service providers used included Watershed for live video streaming, Akismet for the filtering of blog content, and Widgetbox for widget creation and distribution.

Cloud-based CRM is also gaining ground in the industry. Williams Companies, Inc.—one of the largest providers of energy infrastructure in North America—implemented Salesforce's Sales Cloud for its midstream business segment, which

is one of the US' largest natural-gas gathering and processing businesses. The solution has improved customer satisfaction as knowledge-sharing collaboration grows across the enterprise, with Salesforce's Chatter, an enterprise-level social network, breaking down information silos. Improved transparency has led to better relationship management at all levels and increased sales effectiveness.¹³

Future impacts

Building on the successes to date, energy companies will continue to escalate their usage of cloud-based CRM and social media. Social networks will be especially valuable for building branding around "green" issues. Agile, sustainability-focused new market entrants will be highly adept at using these tools, forcing the established, major energy companies to continue to respond. The ability to leverage social networking as a branding tool will be especially important, since the blogosphere is traditionally the domain of the activist community. Entering the world of social networking will enable energy companies to tackle and engage with environmental and social activists more directly—enabling them both to listen and ensure their own voice is heard.

Cloud computing: a quick primer

Cloud computing is a model for providing and sourcing information technology services on a “pay-per-use” basis through Web-based tools and applications. Cloud services are elastic allowing them to be highly configurable, adaptable and scalable, and require less up-front investment and ongoing operating expenditure than traditional IT models.

Clouds generally take one of four deployment models: private, public, hybrid, and community. **Private clouds** are dedicated to a single company for private use and can either be built within a company’s premises (or located off-premise and owned and provided by an external third party), to deliver virtualized application, infrastructure and communications services for internal business users. **Public clouds** are accessible to the public over a network and are fully owned and provided by external third parties. **Hybrid clouds** blend the benefits of public and private clouds, by enabling a company to retain confidential information in a private cloud, while providing access to the wider choice of cloud computing services public clouds offer. **Community clouds** are collaborative resources shared between a limited number of selected organizations with common user interests—perhaps in the same industry or geographical region—across the users. Community clouds can be hosted internally or by external third parties as a managed service.

All four deployment models of cloud computing can provide computing “on demand” at one or more of four levels:

Infrastructure

Companies use infrastructure-as-a-service, or IaaS offerings, to source raw computing resources, processing power, network bandwidth and storage on an on-demand basis. IaaS is the most basic cloud service model.

Application

Generally known as software-as-a-service, or SaaS, a software application is delivered to the end user encompassing any application and associated data that are centrally hosted on the cloud and accessed via Web browsers, supporting device independence and anywhere access. In some business areas, such as customer relationship management, companies such as salesforce.com have achieved widespread take-up across many industries.

Platform

Platform-as-a-service, or PaaS, is a computing platform and solution stack environment that includes platform elements such as database, middleware, messaging, security, development tools and a presentation layer that are used to develop custom applications. It provides companies with an environment that supports rapid evolution of the software development life cycle where there is a need for continuous change.

Business process

Cloud computing-based solutions, known as BPaaS, offer a Web-enabled, externally provisioned service for managing business processes. These solutions differ from application clouds in that they provide end-to-end process support, covering not just software but also people processes such as contact centers.

5. Cloud and next-generation energy, environment and health

Cloud computing's blend of massive and scalable processing power, pay-per-use charging models and ubiquitous interconnectivity helps energy companies navigate their way to the next-generation energy mix—including tracking and managing their environmental impact and monitoring ever-more complex equipment remotely in real time.



A blend of political, environmental and regulatory pressures, combined with rising gasoline prices and consumers' increasingly strong opinions about energy sources, is driving analysis and investment around companies' environmental impacts and the transition to the next-generation energy mix.

What companies are doing today

Cloud-based collaboration can improve the energy industry's environmental impact. For example, Chevron uses Locus Technologies' Environmental Information Management (EIM™) solution under a SaaS model to organize and manage laboratory data for environmental remediation projects.¹⁴

Cloud's environmental benefits can also apply to processes such as hydrofracking, where companies need to maintain and demonstrate compliance with environmental regulations on factors such as the quality of drinking water supplies and air emissions (see "Managing hydrofracking data in the cloud"). And Continental Resources, a major oil producer in the US' Rocky Mountains, is using Enviance's cloud-based Environmental, Health and Safety (EHS) software to manage its regulatory compliance processes — including industry-specific health, safety, air, waste, water and greenhouse gas (GHG) compliance requirements.¹⁵

Industry players are also using cloud technologies to improve their speed and responsiveness in managing the control systems core to any engineering operation. This undertaking often involves using cloud in combination with mobile technologies to help increase the uptime of remote equipment in hostile environments, enabling more efficient management of assets and less wasted resources. One example is

the growing use of cloud computing to manage sophisticated rock-fracturing equipment —including rigs, perforating guns, blenders, additive units, gauges and meters— employed to release petroleum and natural gas from a wellbore drilled into reservoir rock formations under high pressure.

The heavy equipment and original machinery equipment manufacturer (OEM), M.G. Bryan is leveraging cloud computing for remote asset management of fracturing equipment,¹⁶ using a system designed and integrated with Rockwell Automation and based on Microsoft's Windows Azure platform. The system provides secure remote access to real-time information, automated maintenance alerts, and service and parts delivery requests, helping to extend equipment life cycles and optimize asset uptime and productivity.

Future impacts

As well as helping energy companies make the transition to a more environmentally aware world powered by a more diverse mix of existing and emerging next-generation energy sources, cloud computing will continue to contribute to energy companies' efforts to limit environmental impacts and energy consumption in their own operations. These efforts will include continuing to virtualize and consolidate infrastructure and provision more applications and processes as a service, thus cutting energy usage and costs and removing redundant capacity.

BP leveraging the cloud

Dana S Deasy, CIO & Group VP, IT & services at BP, comments:¹⁷ "Cloud computing is allowing us to take advantage of the incredible economies of scale, that you can never get internally on your own. We are starting to take some of our development environments, web hosting environments on Software as a Service (SaaS) platform. We are looking at taking advantage of other companies' data center scale, like Amazon, and extending it to our own data center . . . Over time some of the cloud computing

environments will be mature enough with the right security, safeguards to run important company assets. We are trying to understand how we take advantage of emerging cloud technologies over the next five years and couple them with our existing assets. This year we are now putting our Global Email Service—touching over 100,000 mailboxes—into the cloud, and therefore are moving beyond test and QA Systems only."

Cloud computing has also been an important tool for BP

in managing the aftermath of the Deepwater Horizon incident.¹⁸ In a report filed with the US drilling regulator—the Bureau of Ocean Energy Management, Regulation and Enforcement—BP said that using cloud computing had been vital in its efforts to rapidly scale collaboration tools. The cloud services that BP has been using include AeroMetric's geospatial cloud solution for natural resources damage assessment and restoration.

Managing hydrofracking data in the cloud¹⁹

"Cloud-based data management can completely replace existing stand-alone data systems and reporting tools to provide a comprehensive integrated solution to one of the hydrofracking industry's most vexing problems—the centralization and management of complex data pertaining to contaminated water, groundwater, soil, and air."

Toward the cloud future: Three steps to start the journey

As energy companies start to move more and more activities into the cloud, Accenture's experience shows that there are three steps that business and IT leaders should be taking now to start getting value from cloud today—and prepare for the ongoing major advances in capabilities tomorrow.

Step 1

Assess your cloud readiness and define your cloud strategy.

Assess your organization's readiness for cloud, and use that as a basis for establishing a clear and explicit cloud strategy, aligned with your company's wider business strategy.

To help energy companies map out their cloud readiness, Accenture has devised the cloud maturity model shown in Figure 2. This model divides energy companies' progression to cloud maturity into three main phases—starting with "commodity" IT activities such as e-mail and collaboration tools; then moving into more complex areas such as trading and multi-party collaboration; and finally, escalating to the most sophisticated activities, such as running analytics and production operations in the cloud.

Similarly, the value levers of the cloud journey often evolve from a primary focus on costs, to improving business operations with analytics and integrated information, to—at the most mature level—increasing exploration confidence and production.

Having established its current positioning against these maturity measures, your company can map the journey ahead by formulating a new cloud strategy. This process will impact many components of IT, requiring changes such as:

Designing and implementing a **new IT operating model** to provide integration and alignment of data, operations and standards across third-party cloud vendors, services and applications.

Developing a **strategic cloud sourcing strategy** to help confirm that third-party providers are used as effectively and efficiently as possible.

Modifying **supplier governance**, including establishing effective disaster recovery procedures, integrated service management, and processes for monitoring and enforcing third-party suppliers' compliance with standards.

Underpinning the new IT operating model with **clear and robust data governance**. Primary focus areas should include:

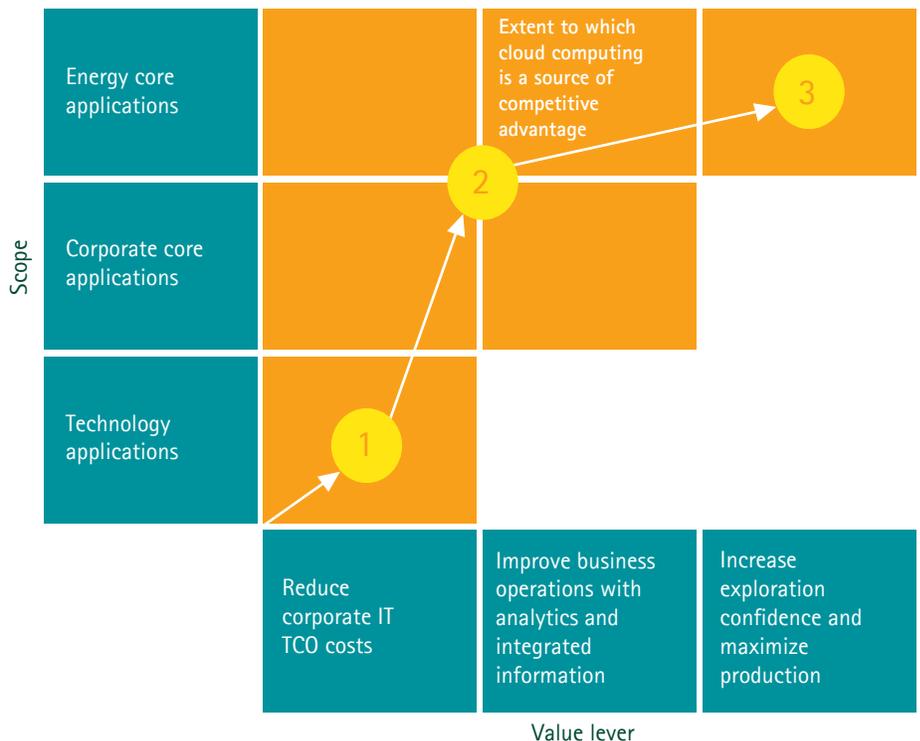
- Verifying and/or cleaning data that is to be stored in the cloud.
- Transforming incoming data for use in internal systems.
- Confirming that all integration points are secure.

Implementing a **segmented security architecture** for multi-tenant cloud operations and environments, together with risk-based security profiles for multi-partner capital projects.

Figure 2. A cloud maturity model for energy companies

Examples

- Supercomputing
- 4D seismic analysis & visualization
- Drilling & completions
- Production operations
- Trading
- Multi-party collaboration
- Asset management
- Supply chain
- Document management
- Collaboration tools
- Email
- Storage and compute



Step 2

Launch targeted pilots to prove the benefits of cloud.

The migration to cloud is a journey rather than a “big bang.” So, with the strategy in place, a good next step is to select discrete areas of the business that are decoupled from the constraints of legacy IT, and cloud-enable them to seize early quick wins and build experience and buy-in. These pilots may well include IaaS solutions, usage of PaaS for testing and development, and some SaaS offerings for smaller application areas.

In our experience, the energy companies that make the fastest and most successful progress up the cloud maturity curve are those that drive the momentum behind cloud adoption by the needs of the business, not by the IT function. Also, we believe that progress into cloud will tend to be led by upstream operations, where companies want to seize competitive advantage, as opposed to the downstream operations—where cost reduction tends to be more of a focus.

Step 3

Build toward the cloud world.

As your organization's cloud migration expands and accelerates, it will be important to put key building blocks in place to support future progress. These building blocks include:

Change security models to reflect the new IT service environment made up of diverse cloud suppliers and applications. By integrating and embedding security policies and processes into the way services are provisioned, the IT function can ensure that any time services are sourced from the cloud, the enterprise security requirements will be met. As a result, it will be harder to circumvent the rules than before, thereby improving overall security.

Start moving infrastructure to the cloud to gain major cost benefits and build a mindset based on pay-per-use rather than heavy up-front capital expenditures on in-house systems.

Consider the skills that the IT function will need in a cloud environment and redefine the IT organizational model to have these skills. IT will need people who can act as true business partners—which means being close enough to the business to fully understand the business issues—but who also know the technicalities of how and where data is stored and managed, and how cloud computing can help to meet enterprise needs quickly and cost-effectively. The IT function will also need to be run more like a business itself, with a clear service catalog and pricing, and the ability to collaborate with customers in the business to reach the right decisions around the technologies that will best meet their requirements.

No time to lose

Cloud computing presents major opportunities for energy companies. When combined with mobile technology and analytics, it stands to change the game in the energy industry.

However, to succeed in this technology-driven game, energy companies need to commit to an ongoing journey to cloud enablement. They should start that journey today—or run the risk of finding themselves struggling to catch up with their cloud-powered competitors in the years to come.

We began by stating our view that the energy industry's move to cloud computing is inevitable. With this in mind, we believe those companies that invest now in planning and preparation for the cloud will be able to establish an early lead over their competitors, and take advantage of the benefits of cloud computing as its adoption grows. By moving now, energy companies can put themselves at the forefront of the industry's migration to cloud—positioning that we believe all companies should seek to claim.



For more information

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Accenture is a global management consulting, technology services and outsourcing company, with 257,000 people serving clients in more than 120 countries. Combining unparalleled experience, comprehensive capabilities across all industries and business functions, and extensive research on the world's most successful companies, Accenture collaborates with clients to help them become high-performance businesses and governments. The company generated net revenues of US\$27.9 billion for the fiscal year ended Aug. 31, 2012. Its home page is www.accenture.com.

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