Fueling Innovation in Energy Exploration and Production with High Performance Computing (HPC) on AWS

Energize your industry
with innovative new capabilities

aws

> *With Spiral Suite running on AWS, a problem that once would have required about seven hours of calculation time completes in less than four minutes, which helps us adapt to market changes in almost real time.*

Troy Darcy
Refining Technology
and Engineering Manager, BP

Turbocharge Innovation with HPC on AWS

With HPC on AWS, you can start innovating the way you have always wanted. Whether it is finding oil (seismic processing), producing oil (reservoir simulation), or optimizing production (wellbore, pipeline and facilities simulation), you can stop worrying about the constraints of High Performance Computing (HPC) infrastructure cost and capacity.

Tap into the full potential of your workforce with individual access to the latest generation of HPC infrastructure on AWS. Leverage our global footprint and secure collaboration capabilities to reduce the risks in the exploration and appraisal stages of oil & gas field development and increase production during the development and operations phase.

On-prem HPC –
Costs, Delays and
Aging Technology

Enterprises that rely on on-premise HPC clusters incur significant up-front capital expenditure and take on the operational expenses associated with regular maintenance of these systems. In the energy industry that is always subject to fluctuating demands, this investment can quickly turn into a financial burden. And, with typical 3-5 year refresh cycles, you may find yourselves behind the technology curve, because the latest algorithms used in many HPC applications have computing requirements that often need newer infrastructure than is available on-premises.

On-premise infrastructure has limited capacity and fixed configurations—this means you are constantly adjusting your workloads to fit the parameters of the available hardware. Of course, the limited capacity also means you spend a lot of time waiting in queue. And, you never have the luxury of thinking big to drive innovation.

On-premise HPC equals:

- Costly and time-consuming procurement process and ongoing support

- Stifled innovation due to oversubscription, rationing of infrastructure usage, and long procurement and refresh cycles

- Lost opportunities and lost productivity due to long job queues and rigidity of hardware configurations

- Infrastructure that is often generations behind the latest technology

> *To deliver a new analytics algorithm when we first started out ...would take three to six months, and sometimes now we're seeing that turnaround happen in a matter of weeks, and sometimes for the right problem in a matter of days.*

Shelly Kalms
General Manager Science at Woodside

How the Cloud Powers HPC

With HPC in the cloud, there is no more waiting in the queue for limited, aging resources. There is no upfront investment in on-premise infrastructure. No more mid-cycle refreshes to keep up with technology. No paying for idle compute capacity, and no long-term contracts.

Seismic and Reservoir Simulations that once took days and months to run on an on-premise solution can potentially be done in hours or days with the virtually unlimited scale the cloud offers.

Why move to the cloud?

- Achieve optimal performance by tuning your infrastructure to match your HPC applications, not the other way around.

- Scale up as much as you want, when you want – and pay only for what you use.

- Never worry about technology refresh costs – you always have access to the latest generation infrastructure.

Get Results Faster and Drive Innovation

One of the biggest advantages of running HPC workloads on AWS is access to virtually unlimited infrastructure. With AWS, you get access to the latest generation of infrastructure earlier, and at much higher scale, than on-premise. This means you can accelerate the development lifecycle of your homegrown software applications with agile development methodologies and early prototyping.

You can reconfigure your HPC resources to optimize for either massively parallel or tightly coupled workloads. Your seismic processing and reservoir simulation workloads need hundreds of concurrent nodes and have unique networking, memory, and compute requirement. No matter what your workloads require, reconfiguring your hardware to match is easy and fast.
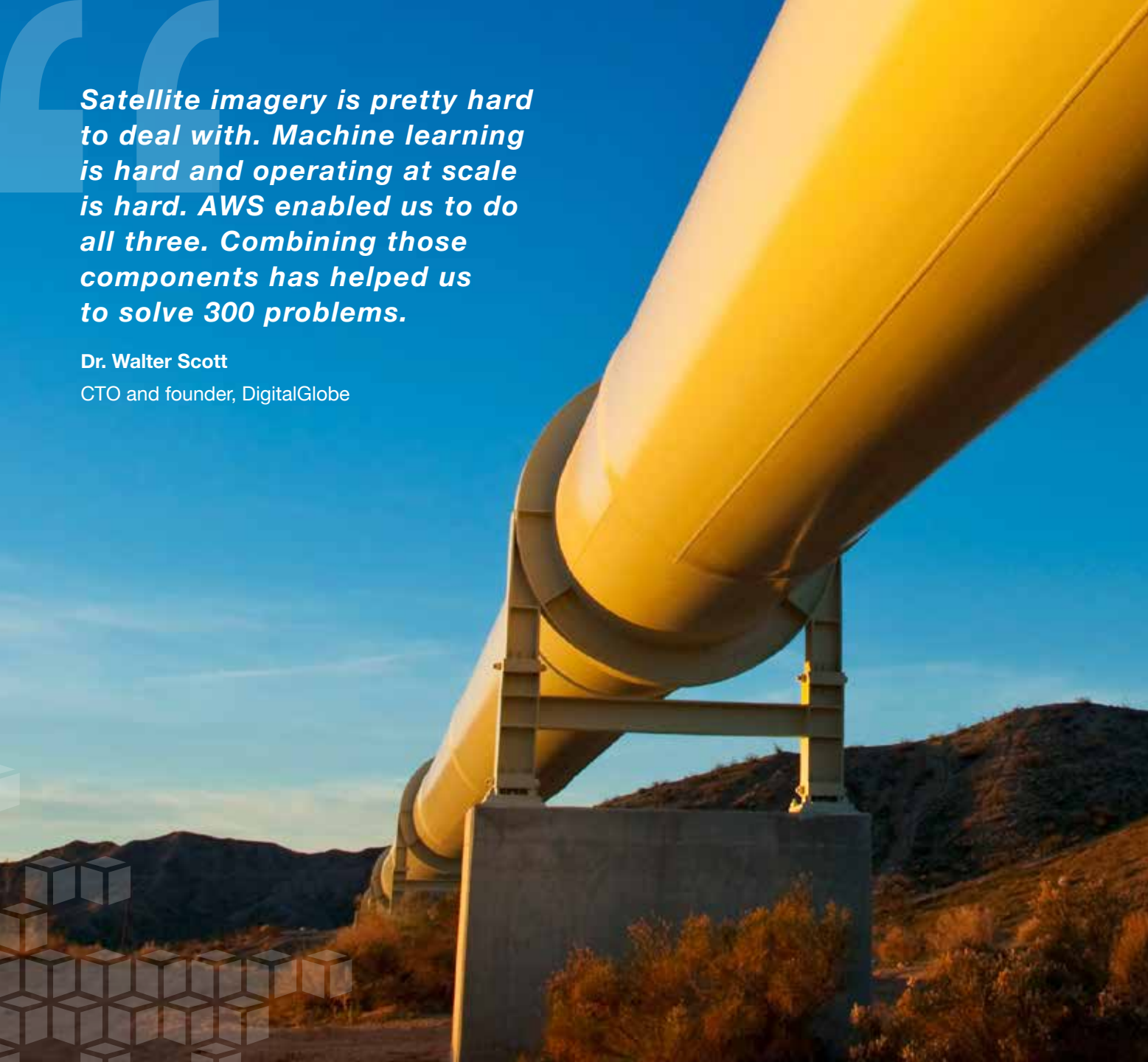
In addition, because these workflows either require iterative processing or are extremely spiky, accelerating the speed of processing is critical to enable geoscientists to fine tune these models faster, all at a lower cost, and without the need for large capital investments.
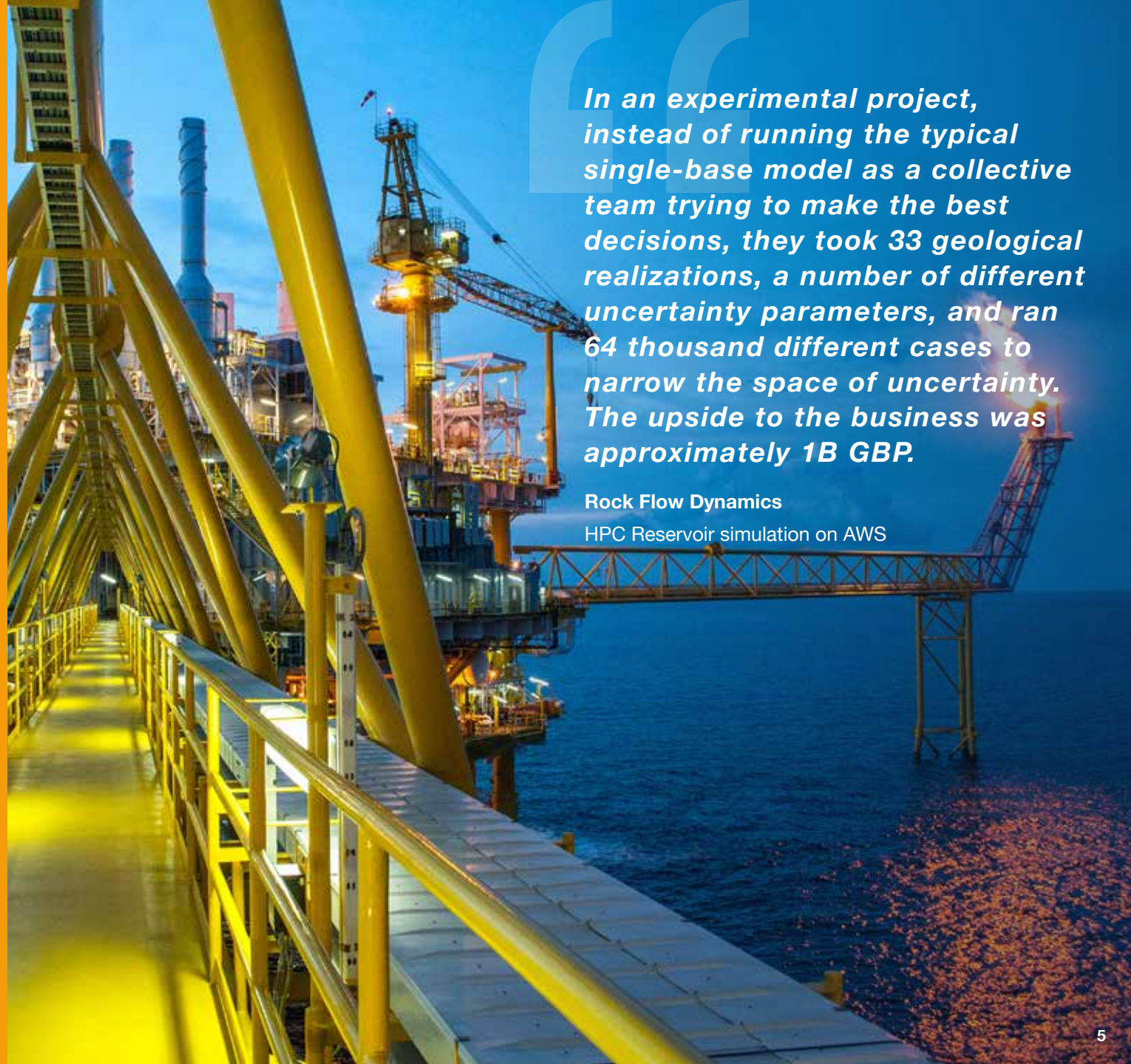
In an experimental project, instead of running the typical single-base model as a collective team trying to make the best decisions, they took 33 geological realizations, a number of different uncertainty parameters, and ran 64 thousand different cases to narrow the space of uncertainty. The upside to the business was approximately 1B GBP.

Rock Flow Dynamics
HPC Reservoir simulation on AWS

Satellite imagery is pretty hard to deal with. Machine learning is hard and operating at scale is hard. AWS enabled us to do all three. Combining those components has helped us to solve 300 problems.

Dr. Walter Scott
CTO and founder, DigitalGlobe

Do More with Your Data

Energy exploration generates exabytes of seismic data used for the discovery and extraction of oil. However, critical business insights are trapped in this dark data because it's not easily accessible and processed.

With AWS services, you can unlock value by using metadata to make volumes of surface and subsurface data searchable and actionable, enabling you to categorize and search data to find patterns between analogs.

You can use our Artificial Intelligence (AI) / Machine Learning (ML) services to build, train and deploy machine learning models, so you can improve the efficiency and speed of exploration (with assisted seismic interpretation using deep learning), drilling (to predict kicks using IoT and machine learning), and production.

Machine learning is an immensely powerful tool—but operating that powerful tool requires a significant investment in infrastructure. With HPC from AWS, you can tap into virtually unlimited processing power, so you can put your data to work faster and more efficiently. And you only pay for the compute power you need, when you need it.

Collaborate and Innovate – Securely, Anywhere

From developing solutions for subsurface modeling and simulation, to production and asset optimization, running your HPC workloads on AWS enables you to collaborate with team members across the globe and take advantage of their expertise, no matter where they reside.

AWS infrastructure is compliant with all relevant industry regulations, so you get full control of where your data is located and who has access to it. Share your work and collaborate with team members across the globe and accelerate your innovation—without compromising on security.

With our remote visualization, global collaboration, and machine learning solutions, we enable your geoscientists to improve the speed and resolution of subsurface imaging, thereby accelerating time to decision-making and significantly reducing time to discovery.

> *The exploration and production models are increasingly complex with very large datasets, 3D and dynamic algorithms, security, and global reach... Amazon EC2 G3 instances enable Landmark to deliver value to our clients in ways that were not possible before.*

Chandra Yeleshwarapu
Global Head of Services and Cloud Landmark, Halliburton
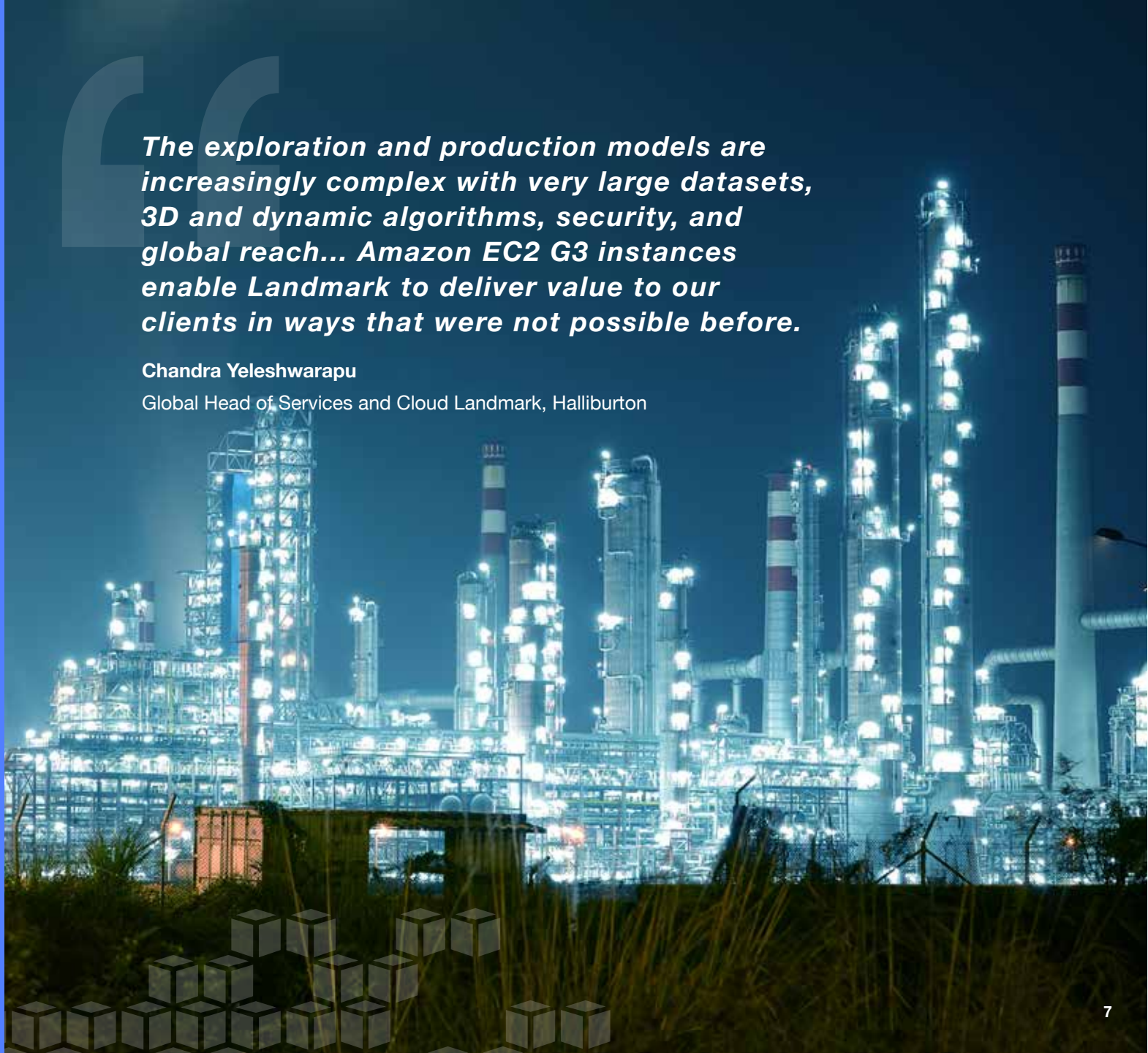
Optimize Cost with Flexible Resource Selection and Pay Per Use

Oil and Gas is an industry where supply and demand are highly influenced by geopolitical and economic events, so limiting your financial exposure is of utmost importance. With AWS, you do not have to worry about massive upfront capital expenses to run business critical applications. You can scale up your infrastructure to meet peak demands as they happen and scale down when it is no longer needed. You have the freedom to choose from a wide range of AWS services to augment your HPC capacity and performance, and you always pay for only what you use. In addition, with different pricing models including EC2 Spot Instances, you can get up to 90 percent lower prices than traditional cloud pricing.

How can the energy industry accelerate
and innovate through the transformative
benefits of cloud HPC?

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