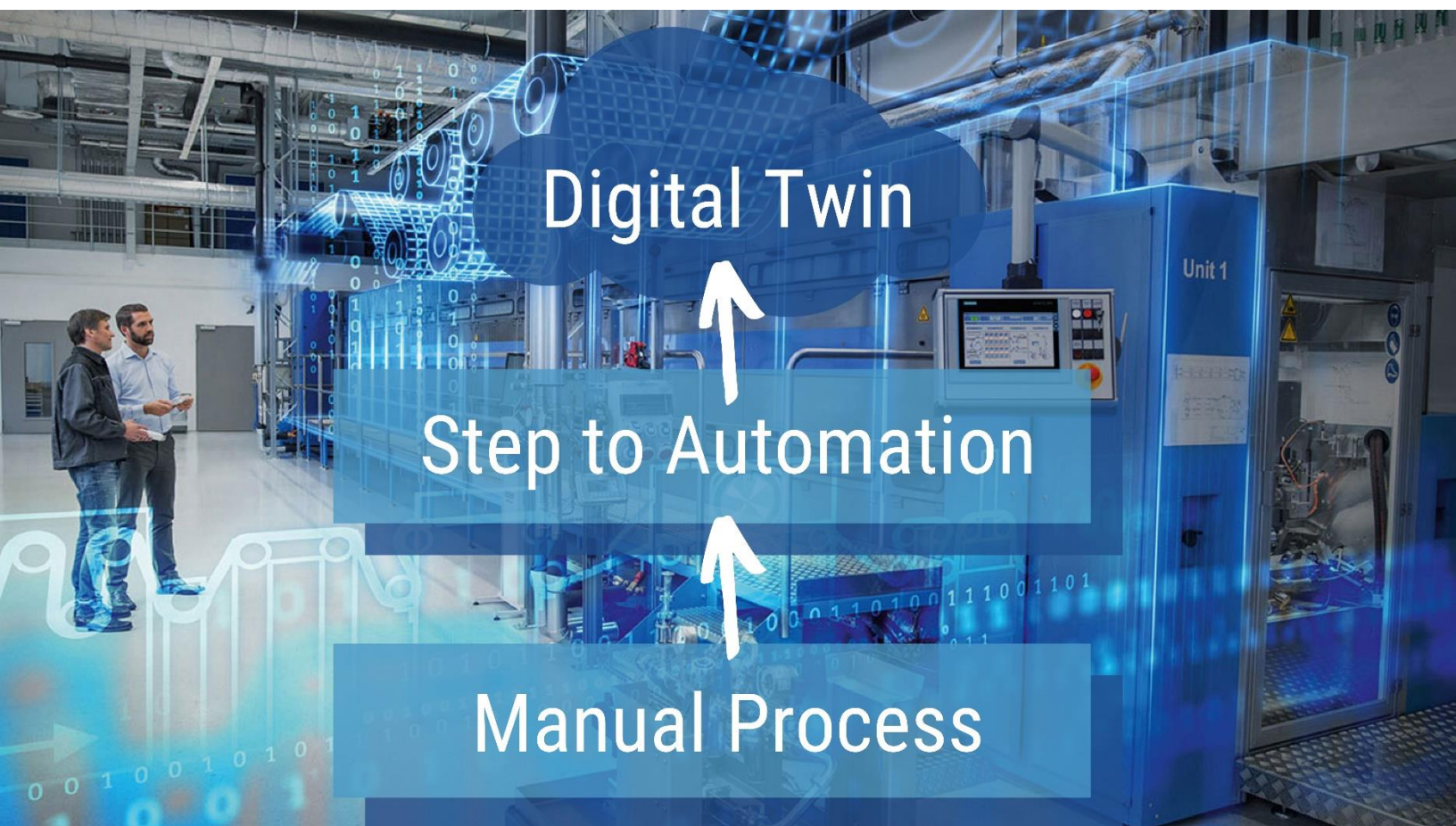


## APTIMIZED RESPONSE TO ASSISTANT SECRETARY FOR FOSSIL ENERGY STEVE WINBERG



# US OIL AND NATURAL GAS REPORT

Aptimized would like to thank the assistant secretary for the opportunity to attend his call and read the report on US oil and natural gas. Our opinion is that the assistant secretary is correct in the utilization of technology is a key factor in the advancement of the sector. The use of innovations and emerging technologies will drive more efficiencies and give the ability to be more proactive in maintaining and the management of current networks.

The report picked up on a number of innovative areas:

## **Automation**

The automation of manual processes both in the field and throughout the back-office processes

## **Internet of Things (IoT)**

Connection and management of the network through intelligent sensors

## **Digital twin**

The ability to create a virtual model of existing infrastructure based upon live data. This enables proactive assessment and modeling of scenarios which in turn create efficiencies and effective management processes.

# CONTEXT

The report has been prepared at a time of global uncertainty and instability. The Covid 19 pandemic and the significant challenge of reducing the pace of global warming have created a 'Perfect Storm' for the Oil and Gas industry. It is therefore critical that the Industry takes the next big step forward.

Assistant secretary Winberg should be commended on the report, especially as the suggestions for the progression of the industry in this time of uncertainty may be the roadmap to galvanize against catastrophic events such as a pandemic. The bold statement made in this report, is very thought provoking and offers guidance in how to potentially protect and also survive the future.

The report highlights the significant achievements of the Oil and Gas industry in the US. These scientific and engineering achievements ensure a plentiful future supply of both Oil and Gas for the entire American population.

The focus must now be on how to leverage the latest information technology to better manage the end to end processes. The report identifies examples of where technology is being used at a corporate level, the big breakthrough will only be achieved when technology is used to manage and control networks at a State and Federal level.

Other countries are developing innovative technology to manage both local networks and countrywide networks. In the UK National Grid is planning the development of a Digital Twin of both the High-Pressure Gas Network and the High Voltage Electricity Grid. The underpinnings of these Digital Twins will be consolidated and accessible data in the form of a Data Lakes. It is Data that is the heart of any successful deployment of modern technology such as Digital Twins, Artificial Intelligence (AI) and Robotic Process Automation (RPA).

## OUR OPINION

Optimized view of the report is that there are a number of fundamentals that need to be considered in moving from the traditional models that run at the moment to a more innovative model. The sector needs to consider both the cost and time to realize these potential benefits.

Much of what is discussed in the report is in practice in Europe and there have been many lessons learnt, some positive and some very costly. Embarking on such a journey requires a review of both the investment in the technologies as well as the human enterprise to run these innovative systems.

As we examine the words in the report, we see that the renewables sector sees most if not all the identified items as fundamental building blocks of their industry. But it is easy to design something on a blank canvas than alter a traditional and established institute.

The key to innovating with technology is that it does not have to be a big bang approach, it can be gradual and with a structured roadmap benefits can be quickly realized.

### Assessing Your Network

Our experience in the field has shown that pipeline organizations have varying degrees of asset management. This is not a statement that companies do not have control of their assets, but that over lengthened periods the additions into the networks and plant continue to grow. Experience in this sector has unearthed that the actual complete asset catalogue becomes more and more extensive and it can reside in multiple places, based upon operation, purchasing, maintenance, improvement regulatory change etc. Organizations need to be clear on what they are assessing for, and not confuse the goal with modernizing for little or no value.

An example of this situation is with a large Gas provider in Europe who continued to add to its network over forty years, when it undertook a modernization exercise, it found the amount of supplemental and

obsolete infrastructure was considerably higher than initially thought. In plain terms they did not know what was on their network, but it did not detract from it operating.

Replacing legacy networks with intelligent technology can be a large cost. In fact, a lot of organizations who have carried out the change are based on commercial life events such as a merger or acquisition.

Other organizations have waited for funding cycles or took a more pragmatic approach and identified through assessment how the modernization will manifest and be realized.

## Readying and Updating the Network

The key to modernizing the operations of oil and gas is data. In the report data is referred to numerous times, and it is on this premise that the efficiencies in all areas from exploration to throughput are realized. Once quality data is available in a consolidated repository, then the manipulation and modelling can be exponentially valuable.

All the identified innovations written about in the report either utilize or provide data. This premise is becoming more and more realistic in the field. From seismic data through to operational throughput of pipeline valves, being able to readily assess and act on this data, is making data a very valuable commodity to oil and gas companies.

In order to embrace some of the identified wins within the report, careful consideration to the age and operation of a network needs to be brought to the fore. Many organizations will have aging infrastructure with little or no telemetry.

## The Benefits of Innovative Technology in Oil and Gas

The use of innovative technologies is common in the renewable energy market. The use of Digital Twins, AI and RPA in Wind, Solar and Wave power generation have become integral in the optimal operation of the generators and networks. These industries are leveraging more modern infrastructure with up to date control systems and telemetry. These technologies mean they can monitor and operate their sites remotely. A Norwegian Wind farm is operated from over 1000 miles from the Windmills. By utilizing data provided from the assets they have developed a Digital Twin. They are able to manage both the ongoing operation of the site and run simulations enabling them to understand how to deal with all eventualities.

These technologies are available to the Oil and Gas Industry, the challenge will be to get the necessary data into form that can be used to create the Digital Twin.

The benefits of deploying this type of technology are significant, from reduced maintenance costs and down time to better management of pumps and compressors.

## Quality Data Management

“Data is the new oil” Clive Humby. It is very much a correct statement, and throughout the report the message of using data to advance is very clear. In exploration through to supplier demand metrics, both upstream and downstream, the presence of data can accelerate the sector into more innovative and considered approaches. The reliance and value of data within the sector is going to grow exponentially. But data like oil and gas has to originate from somewhere, has to be extracted and it has to be handled, processed, and manipulated. Bad data or missing data is just as harmful to a business as contamination.

As organizations move to more data driven models, ensuring that data sources are reliable and reporting in the correct cycles is going to be key.

In many situations data may be delivered automatically, either through telemetry or event-based reporting. However, there will always be human based interaction that needs to trigger or submit data. How those processes work and ensuring that the tools are available and reliable is something that will have to be addressed.

Where environmental factors come into play the transfer of data via different channels will have to be reviewed. New transmission approaches are on the brink such as Elon Musk's star link, a satellite-based internet that will deliver high speed connection, meaning remote fields can deliver data without the need for ground-based infrastructure.

## Utilizing the Internet of Things (IoT)

Although IoT is used predominantly in the domestic market a new emergence of intelligence is appearing. The new technology is called the industrial internet of things (IIoT). The premise is the ability to apply to smart networks. There is significant development going on at present with regards to this technology. As the demand grows within the energy sector the IIoT is developing a whole range of cost-effective appliances that can integrate more readily into the network.

The fixed and linear assets that make up the Oil and Gas Networks will be monitored by existing control systems. This operational technology can, in conjunction with additional IoT devices, become the basis for a 'Smart' network. This smart network becomes the IIoT.

The creation of the smart network is the foundation to something of real value. The value of an IIoT comes from how the data is utilized. This opens up access to technologies such as predictive maintenance applications, reducing unplanned maintenance, reducing costs, and increasing productivity. The data, once consolidated, can be used to build a digital image of the asset estate, this is known as a Digital Twin. This opens up opportunities for scenario planning enabling better management of the assets and the oil or gas flowing through the pipes.

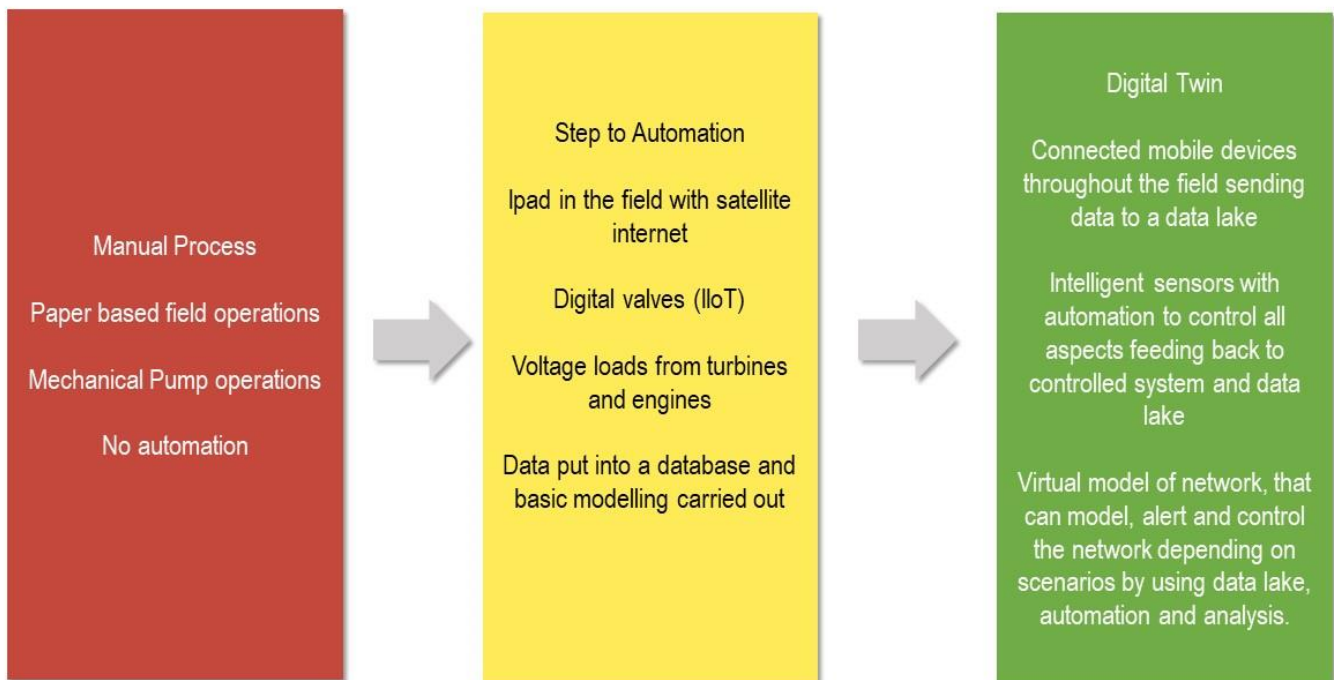
## Steps to Build A Digital Twin

Building a digital twin has huge benefits within the sector, from a high-level perspective it can extend both the capacity and create smart processes. In order to build a digital twin as stated previously certain fundamentals need to be in place, and a road mapped process for what an organization wants to obtain from that twin should be set out.

As we have already said the operational infrastructure needs to be assessed, the identified items above feed into the twin model. IIoT and automation along with data all are the precepts for the digital twin. The twin is now a critical part of the control center. Its utilization is monitoring, assessing, maintaining, and executing processes.

The forecasting and planning of the network on a digital twin means that effective cost analysis, production management and event reviews can be carried out to optimize a network. The twin can be built up over time or implemented as a single activity.

A word of warning is that commitment to building a digital twin is needed, ensuring the inhouse knowledge is available to whomever is carrying out the exercise is critical to success.



## Giving Back

The report approaches funding and giving back to other sectors by the use of by-products of oil and gas. It would be interesting to see if the sector moves toward sustainable models and injections into sustainable energy for all.

As advancements are made and renewables are both used to power the industry, there is a possibility that surplus energy may be created. Where solar or wind is utilized for pump powering, solar farms and wind farms may create a large surplus. At present the calculation of consumption need versus over-generation is a relatively new concept. In Europe there is a small trend that is delivering that oversupply to communities and deserving establishments.

As the growth of lesser utilized renewables such as thermal and biomass takes hold, the more compelling the approach to share the benefits.

## External Factors

With the political landscape taking on a polarized stage, the approach to more innovative production could quickly become a reality. The stance on fracking is so extreme in its opposites, that oil producers may need to think of alternatives to supplement as well diversify to. The utilization of multiple production processes makes a compelling argument for the digital twin model, more so on the increased production at facilities or adversely the reduction. The quantum of data will enable producers and suppliers to forecast the full impact of an imposed reduction, or the uplift to further reliance on new fracking sites.

There is a school of thought that uses the adage of “knowledge is key” and at present the full impacts to the environment from fracking are unknown and like many petrochemical organizations the roadmap to safer extraction needs time and development. This is where the twin comes into its own. By implementing a digital twin, producers that are fracking can prove and show that the network is managed, and potential leaks or events can be avoided.

## Conclusion

The decision to move down the innovation route is a daunting prospect, with financial challenges and added political pressure that could change the landscape for a large part of the industry, it could be argued that investing large amounts would be detrimental.

The golden prize is a fully functional four-dimensional digital twin, that can model, forecast, and inform. The twin can sit as the pinnacle of the roadmap, implementing change through a slow and steady approach could reap a number of benefits. Assessing existing data and utilizing information that is readily available is a step closer to the prize.

Assessing the network and planning incremental changes over time will drive benefits, ensuring the knowledge and experience of these exercises are readily available is invaluable. Deciding on the right team and partners will help make the change less painful.

As technology changes and advances, the ability to utilize more data and automate more tasks will become easier. Consideration needs to be given to the new skill sets that are being introduced to the business. Keeping up to date with these changes, training and management needs to be budgeted for, it isn't a one-off purchase.

## About Optimized

Optimized are a thought leadership company within many sectors. Its model is based upon ensuring that any industry sector is managed and advised by seasoned experts with real life experience in the field.

The Energy practice is proud to boost experts who have owned, ran, and procured oil and gas networks globally. With a combined experience of over 100 years in leadership roles, the knowledge of the sector and the cross border collaboration means the guidance and advice provided to the sector has enabled the realization of both efficiencies and modernization objectives a reality.

Optimized prides itself on becoming trusted advisors to all levels of the sector from regulator through to supplier.

Optimized Energy Key Consultants are Mike Simmons ([msimmons@optimized.com](mailto:msimmons@optimized.com)) and Emilee Larabee ([elarabee@optimized.com](mailto:elarabee@optimized.com)).