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SOLUTIONS

Q&A

Oilfield Electrification Strategies and Trends

August 2024

Power: clean, dispatchable, and reliable.

INTRODUCTION

When a diverse group of experts sit down to discuss the hot topic of oilfield electrification, it's sure to provoke an interesting discussion and insights. In this roundtable discussion, Doug Baltzer (CEO), John Alday (VP Engineering), and Mark Lindley (SVP Sales and Marketing), all with FlexEnergy Solutions, talk about oilfield electrification strategies and the trends driving them.

THE PANEL

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Why are Oil and Gas operators pushing to electrify their field operations?

DB: The shale revolution that began around 2010 changed the entire complexion of the North American industry, especially in the United States. Horizontal drilling and hydraulic fracture completion technology allowed operators to re-develop existing fields, and importantly, unlock the value of shale source rock. Unconventional wells, however, deplete very quickly and operators increasingly venture into remote, off-grid regions to sustain their development efforts and replace production.

JA: Right, and it takes time and money to build out electricity distribution infrastructure.

DB: Time and cost are the first considerations for an operator evaluating a field power solution. In our discussions with operators, we found that the first option they consider is sourcing power from the local utility, but the initial hurdles typically revolve around the expense and timeline of extending power distribution lines. In some cases, it might require the utility years to build a line out to a remote oilfield location.

ML: A lot can change over the time it takes to build that line. In a cyclical business like Oil and Gas, it's anyone's guess as to what commodity prices will be by the time the distribution line is installed.

DB: That's right. As project timelines grow and costs add up, operators begin looking for alternatives.

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What are some of the alternatives to utility power, or what we commonly call "the grid?"

DB: Initially, operators usually explore self-generated power solutions. With advancements offering faster deployment, comparable or even enhanced reliability to the grid, and cleaner operations, self-generation stands out as an attractive option. Today, with the array of available technologies, there has never been a better time to give self-generation serious consideration.

ML: Another factor driving interest in self-generation is the prolonged period of low natural gas prices in remote areas, this led many operators to look at associated gas almost as a waste commodity. They flare it off. There is a growing trend among operators to phase out routine flaring for several reasons. Eliminating flaring by using waste gas to generate electric power can be an attractive option, even if grid power is available.

JA: Minimizing emissions has become a leading priority for operators, no matter what power solution they choose, but the driving factor pushing many to evaluate self-generation is the sense of urgency on the operator's part – how quickly can they execute their asset development plan? If they can't get the power they need to operate their field, then that's a big problem.

How has government regulation impacted electrification choices?

DB: The U.S. Environmental Protection Agency recently introduced new regulations designed to decrease emissions at well sites, and state regulators are increasingly enforcing restrictions on flaring gas. In regions with rigorous gas capture mandates and stricter regulatory frameworks, operators are actively exploring alternative methods to use associated gas produced at well sites for beneficial purposes.

ML: For example, North Dakota enforces stringent gas capture regulations. Even if operators can secure utility power on their project timeline, compliance with flaring regulations remains mandatory. In North Dakota, operators must capture a very high percentage of the associated gas they generate onsite, significantly limiting flaring.

DB: We anticipate that other states will follow the path set by North Dakota, New Mexico, and Colorado with increasingly stringent regulations, rather than relaxing them. The risk of failing to comply could result in production curtailment, a potentially devastating consequence for many operators.

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Has the enforcement posture of regulators changed?

JA: We believe it has, particularly in New Mexico where regulators have sharpened their focus on enforcement. For example, in 2023, the New Mexico Environment Department imposed a $40 million civil fine on an operator for exceeding permitted limits on flaring associated gas. Although the state and the operator eventually agreed to a $24.5 million settlement, that really caught the attention of the industry.

What are the strategies operators are using for oilfield electrification?

DB: The primary option tends to be working with the local utility. If the utility says "yes," but it's going to take five years to build the line, then the operator turns to self-generation. From there, they have several options. If the wait time for utility power is only a year or two, then they usually put smaller generators on individual well sites. In the case of production pads in proximity to each other, they might concentrate power generation capacity on one designated pad and then tie the others together with a distribution network.

ML: Doug is spot-on with the progression of operator decisions and the options they consider. Another important variable is acreage position. Producers with large, contiguous acreage positions have more options than those having widely dispersed individual facilities.

DB: Thanks for mentioning that. Yes, operators with a large contiguous acreage block can look at building their own microgrid and distribution infrastructure to serve all their production pads from a centralized facility. This can be a very efficient way of powering your field. If you don't have contiguous acreage, then the cost of building distribution lines over relatively long distances may be cost prohibitive, if you could even secure the required rights of way.

JA: That's true, however, with the ongoing consolidation we've seen in regions like the Permian Basin, the potential for microgrid options is becoming more feasible and attractive.

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Do you see differences in electrification strategies among operators?

ML: We do. Smaller operators usually don't have enough contiguous acreage to make a microgrid economically viable, so they rely on the utility or small generators on individual well sites. On the other hand, larger operators are more likely to self-generate, although they might start small with individual generators on single well pads, they tend to move towards distributed power delivery from central facilities as they gain experience with the benefits and reliability of this approach.

DB: Right, but the primary strategic considerations include the acreage position—specifically, its contiguity—the timing of the development plan, and the regulatory landscape governing gas capture and flaring.

JA: In addition to what Doug pointed out, it goes without saying that cost is always a central issue. In some situations, and even in the case of contiguous acreage, it might simply be less expensive to use many individual generators instead of a microgrid, which requires additional equipment and infrastructure for field power distribution. On a per-Megawatt basis, many units may be more cost-effective than one central power generation facility. It is a complex decision-making process, and one size definitely does not fit all situations.

ML: The good news is that we can support producers with either an individual generator or a microgrid solution!

How did Winter Storm Uri impact the decision-making process?

DB: Good question. Uri hit the Permian Basin hard in February 2021, causing widespread power outages that impacted residential utility customers and businesses alike. Oil and gas production was nearly brought to a standstill. It was a very big deal, but it was just one event in a string of many developments.

Let me give you an example. Since Uri, power demand in the utility grid serving the Permian Basin has continued to rise, but utilities have not kept pace with sufficient increases in generation capacity. As a result, overall utility reliability has declined into the low 90-percent range, dropping even lower at the grid's outer edges. The assumption of uninterrupted 24/7 utility service is no longer valid.

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FlexEnergy Solutions' natural gas turbine generators have low emissions, but what is the practical impact on operations?

DB: Not only are our turbines cleaner than reciprocating engines, both diesel and natural gas powered, but in many cases, they are cleaner than the local utility grid itself because many utilities serving oil and gas regions generate a significant percentage of their power using dirtier fuels, like coal.

For an operator employing a self-generation solution using natural gas-powered turbines from FlexEnergy Solutions, that operator can put more power on a single site with our equipment than any alternative and stay below stringent air permitting thresholds.

How is that possible, to put more power on one site?

ML: Emissions can be a limiting factor because there are strong incentives for operators to avoid a well site or facility being classified as a major source of emissions. Because our turbine power solutions are so clean, an operator can simply put more of our turbines on a single site. For example, one of our customers explained that they can put 8.0 Megawatts on a single site using FlexEnergy Solutions as compared to only 4.0 Megawatts with a competing alternative. **You can put more power on a single site with FlexEnergy Solutions and avoid that site being classified as a major source of emissions.** This helps operators avoid the onerous compliance requirements of regulations like Title V.

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What is your response to critics who say that gas turbine generators deliver low emissions only when operating at full capacity, and if they aren't under full load, that their emissions increase?

JA: I would say they are correct, but in all fairness that criticism is valid for every power generation option. Everyone wants to run at full load, but at every load factor the Flex Turbine will always deliver the lowest emissions performance of any alternative.

DB: John is right. We've been doing this for a long time and found that under any load, our solutions consistently deliver emissions performance significantly lower than reciprocating engines.

JA: One of the reasons for that is we designed our turbines to have an extremely lean combustion process that operates a temperature high enough to minimize CO while low enough to produce minimal NOx. Our technology uses a lean pre-mixed swirl-stabilized combustion process that results in a very efficient burn, meaning our turbines produce the lowest emissions for the amount of fuel we burn.

We also have wide fuel tolerance. For example, we can run on Landfill Gas with a methane content of only 40%, all the way up to propane. Lower BTU fuels run a little cooler and produce more CO with less NOx, and with propane we will typically run a bit hotter with the opposite emissions profile. Either way, the Flex Turbine is going to generate extremely low emissions.

What are the relative risks of the various strategies?

JA: The biggest risk is if you don't have the power, then you can't develop your assets!

DB: That's true, and the availability and reliability benefits of FlexEnergy Solutions are hard to ignore.

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How has the role of small gas turbines in oilfield electrification changed?

DB: Self-generation using small gas turbines has emerged as the preferred alternative to relying on utility power. Historically, operators viewed small turbines as temporary solutions until utility connections were established. They might deploy individual turbines for 12 to 24 months while waiting on utility line construction. However, when they consider the combined costs of short-term turbine use and the time it takes to access the grid — which may not occur until the wells are farther down the decline curve —many operators find it more economical to continue with self-generation.

ML: Not to mention all the other benefits that come from converting a waste stream into field power – flaring mitigation, emissions reduction, and permitting efficiency. Currently, several operators we work with are disconnecting from the grid for the sole purpose of mitigating the risk of production curtailments due to flaring. By efficiently converting associated gas that would have been flared into electricity, they can power various operations on site and produce more oil.

DB: The reliability and low emissions performance of our solutions is why a lot of organizations outside of oil and gas look at our solutions, too. Commercial and industrial power consumers have many of the same needs as Oil and Gas operators.

Okay, that all sounds good, but we all know oil and gas wells decline over time. What happens when production falls off, or if an operator drills more wells than originally anticipated?

JA: Great question. Our solutions can scale from 250 kilowatts up to 10.0 Megawatts on a single location.

DB: We can meet power demand over the life of that production in a cost-effective way. We might put a small 250-kilowatt generator on a single well site, and then add larger and/or more generators as a pad is built out. When an operator looks at utility power, they typically are going to request only what they need at a minimum. Ideally, they want to pay for only what they know they are going to produce. If they ramp-up production in an area, then we can scale up with them very efficiently and scale down in response to natural production declines.

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Why should an operator consider FlexEnergy Solutions?

JA: We've talked a lot about emissions and availability, but what keeps reliability high is the service capability. All technologies are going to have a problem at some point, and being able to see issues and respond quickly from a local presence is critical. We have a local service presence in every market we operate in.

For example, we won a job ten years ago in Pennsylvania. The operator switched to us from a competitor after they experienced a 40-hour outage due to slow service response. they called us out of the blue. Since we put our turbines on site and maintained them, we have never let them down. That customer now uses us exclusively across five of their sites.

DB: All our equipment is remotely monitored around the clock and backed by 24/7 local support. We usually know about an issue before the operator does, allowing us to respond immediately.

ML: As the OEM, we maintain a direct line of communication between our field technicians and the engineers who design and build our turbines. Our units are built right here in America. This cohesive approach ensures faster problem resolution and seamless support from our team. Our customers appreciate the difference this close-knit team makes.

How can people get more information about FlexEnergy Solutions?

DB: You can visit our website at flexenergy.com where you can get more information, submit an information request, or call us at +1 (720) 826-0708.

Contact us today at +1 (720) 826-0708 to see how FlexEnergy Solutions can contribute to your oilfield electrification strategies.

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About FlexEnergy Solutions

FlexEnergy Solutions is a dedicated organization of engineering, technology, and data-driven professionals who provide clean, flexible power solutions to industrial and commercial institutions that require consistent, reliable power ranging from 250 kW to 10 MW.

We lease and service the most resilient, clean gas turbines available for off-grid or grid parallel applications. Whether located in remote, extreme climates or in the heart of Manhattan, our customers rely on our ability to deliver the highest quality engineering, power, and support 24/7, 365 days per year.

Power: clean, dispatchable, and reliable.