A pumpjack extracts waxy crude from a plateau north of Duchesne, UT, on July 13, 2023.
Photo Credit: John Schaefer.

The Uinta Basin, Petroleum Country:
Part 1

by Deborah Burney-Sigman

This article is the first in a two-part series focusing on the oil and gas industry in Utah's Uinta Basin. Look for Part 2 to be published in the December 2023 issue of *EM*.

The Uinta Basin in Northeastern Utah is a unique place. The Uinta Mountain range is a geological oddity, aligning crosswise, east to west, creating an unusually large high-elevation depression that was once a saline Eocene lake.[1] The Uinta Basin is now an arid high desert atop layer upon ancient layer of deposits under the surface, including oil and gas formed over millions of years from the organisms the lake held. Although the land's surface provided what it could to humans until the mid-20th Century, in the last 90 or so years, people have come to depend on the formations beneath the surface. The economic base is unlikely to pivot: the high desert climate limits agriculture, transportation constraints limit manufacturing, and electrical transmission infrastructure limits prospects for renewables. The Uinta Basin is possibly the most complex for doing business in the United States. The Ute Indian Tribe of the Uintah and Ouray Reservation governs a vestige of what were once vast seasonal hunting grounds that stretched from the Rockies to the Great Salt Lake. Federal lands are managed by the U.S. Forest Service and Bureau of Land Management; some lands are owned directly by the State of Utah, and tracts including homesteads distributed under the 1896 Dawes Act are privately owned. History is still in play, with property disputes including—but not limited to—whether treaties with the Ute Tribe have been sufficiently honored.

That said, the Basin—as it's often called in Utah—is in many ways a typical rural oil-and-gas-producing region. As an economy based on globally-traded commodities, times of plenty are fragile, and the people here have ridden boom and bust cycles. That fragility gives rise to wariness of environmental regulations and environmentalism in general, including suspicion that everything could crumble in the face of climate change-related economic and political pressures, the way it did for coal counties just to the south. In reality, forecasters predict that global markets for oil and gas will hold for several decades. This means that the local petroleum industry will continue to be a mainstay of the economy, for the Ute Tribe as much as for later arrivals. The challenge is to forge a path in which this reality is aligned instead of opposed to air quality and climate concerns. In this arid and geographically isolated patchwork of jurisdictions where "Keep it in the ground" is fightin' words, can health be protected, global warming mitigated, and livelihoods maintained?

Many actively hope so. The challenge is great. Natural gas is responsible for reducing greenhouse gas emissions significantly in the electricity sector as generation has been transitioned away from coal. Released directly into the atmosphere, however (and this is a big however), methane, the primary component of natural gas, is a potent greenhouse gas. Perfectly efficient collection and transport of natural gas would make it vastly superior to coal for climate intensity. Real-world loss to the atmosphere is a drag on its advantage over coal, and models estimate that 3% loss is the break-even point, the level at which the climate impact of natural gas is at parity with coal,[2] and one percent loss is a worthy but ambitious (or even aspirational) goal.[3] Soberingly, a recent study estimates that loss of methane

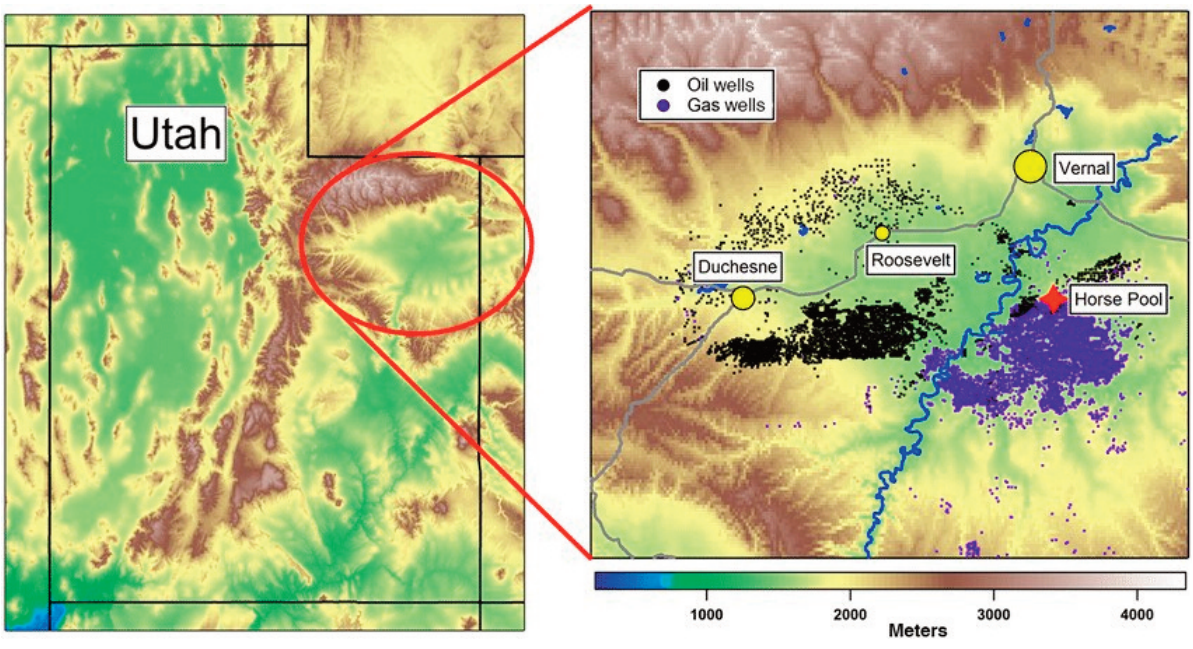

Figure 1. The Uinta Basin, showing active oil and gas wells, and major towns. The background is colored by elevation as shown by the color bar.
Source: Wild, R.; Edwards, P.; Bates, T.; Cohen, R.; de Gouw, J.; Dubé, W.; Gilman, J.; Holloway, J.; Kercher, J.; Koss, A.; An, L.; Lerner, B.; McLaren, R.; Quinn, P.; Roberts, J.; Stutz, J.; Thornton, J.; Veres, P.; Warneke, C.; Brown, S. Reactive nitrogen partitioning and its relationship to winter ozone events in Utah; *Atmospheric Chemistry and Physics* 2016, *16*. 10.5194/acp-16-573-2016.

to the atmosphere is around 7% across all Uinta Basin facilities.[4] Oil and natural gas development and production also emit volatile organic compounds (VOCs), which are precursors to ozone under certain weather conditions. Because of several winters with elevated ozone measurements, the Basin has been designated as being in "nonattainment" for ozone, meaning the air exceeds U.S. Environmental Protection Agency (EPA) health standards, which will be discussed further in the December issue. Natural gas is a by-product of oil extraction primarily in the northwestern part of the Basin, as well as the primary product of the formations in the southeastern portion (see Figure 1).

Six different agencies from three governments oversee mineral rights, drilling permits, royalties, and air emissions. Twenty years ago, the Division of Oil Gas and Mining DOGM) in Utah's Department of Natural Resources built a collaborative forum to address the sense of suspicion between operators, state government, county government, and local citizens of all backgrounds. There's an unconfirmed rumor that at the first meeting the words "you can vote with your feet" was uttered. Nowadays, a quarterly, three-hour meeting is held in Duchesne County Fairgrounds, a location that can be reached in under two hours from the populous Wasatch Front or anywhere in the Basin. Part of the Collaborative Meeting's savvy is its famous breakfast spread offering everything from avocado toast to donuts. There's a sponsored Dutch-oven lunch too, so attendees arrive early and stay until the end, striking up conversations at every chance. Experts have been invited over the years to talk on wide ranging topics like drilling technologies, sage grouse, gas pipeline capacity, and air quality constraints.

John Rogers is the Environmental Manager at DOGM who has organized and moderated the meeting for a dozen years. He actively invites participants from a wide range of local and state entities including the Ute Tribe and the local health department. Participation by industry, regulators, and elected officials remains strong, as well as surface and royalty owners from the community, and the occasional environmentalist. Rogers admits that one segment consistently underrepresented is small operators, referred to around here as "mom and pop". Regulars with different interests have become personally acquainted, making room to think better of one another's motives. Rogers is optimistic about creative and collaborative problem solving moving forward. "I can't speak for the rest of the country, of course, but I think people from other areas come in and find a supportive environment here to do the right thing."

One project launched from this meeting is an aerial survey co-op. The Fall 2022 meeting included a presentation by three oil and gas producers about their work to reduce methane emissions from their facilities, including aerial surveys to find and repair leaks. The presenters were larger companies that operate in several states, and also have boards

of directors that support investing in the "social license to operate". For them, the fiscal return on investment fluctuates with market prices, but repairs do recover marketable amounts of product. The collective results stirred a lot of interest from meeting attendees, including Dusty Monks and Alyssa Kay of the Utah Office of Energy Development (OED), a state agency that plans and implements Utah's energy policies. The OED was inspired to develop a co-op Aerial Leak Detection and Repair (ALDR) program to make aerial surveys accessible to Basin producers who aren't already doing their own.

The nonprofit Utah Clean Air Partnership (UCAIR) is providing a seed grant, OED is putting up leverage, and five producers (as of writing) have committed to participating. Monks pointed out, "Prohibitive economics means the UB was often not on the leading edge of rollouts of new techniques." A 50% rebate for participation will be paid upon repair of leaks. The co-op program will make aerial detection accessible to smaller companies. Since fewer, large-emitting sources are responsible for a large proportion of emitted gas,[5] finding and repairing these basin-wide is an exciting prospect, chipping away at the loss rate. An interesting twist on large-scale leak detection will come from the 2024 launch of MethaneSAT, a methane-observing satellite sponsored by the nonprofit Environmental Defense Fund. The data from its orbits will report signals on the several-hundred meter scale, published in the public domain.[6] With public access to worldwide methane signatures, the value of the social license may climb just as the cost of identifying leaks drops.

The remainder of emitted gas is from thousands of small sources. Much of existing infrastructure—wells, pumps, tanks, gathering lines, etc.—is several decades old, like 1980 pickup trucks instead of new cars. One producer expressed confidentially that a recently identified (and fixed) leak was a kilometer from the nearest valve, and even farther from the nearest meter. Shutting the pipe down and blowing it out to allow repair was no small feat. Newer oil and gas facilities account for very little of total emissions,[7] and many are set to take advantage of expanding electric transmission to upgrade some emitting equipment to no-bleed electric. For these reasons, every older facility replaced by new represents progress. Regulations continue to evolve that are expected to chip at the current natural gas loss rate (the Uintah and Ouray Federal Implementation Plan was just implemented this winter, and New Source Performance Standards (NSPS) OOOOb and OOOOc are in comment period).

Perhaps as importantly, with prices of gas and oil both settled higher since pandemic swings, both are attracting fresh investment. Monks wryly observed, "Things have a better prospect of success in prosperity than not." Research, innovation, collaboration, investment in social license come into play for the Uinta Basin as it continues to face seasonal high ozone, and the 2022–2023 winter was a humdinger. The Basin anxiously awaits a final timeline decision from EPA to decide its nonattainment level. The December ozone issue of this publication will feature the groups mentioned here—and many others—who have been preparing for a decade for what's to come. **em**

Deborah Burney-Sigman, Ph.D. is a consultant based in Salt Lake City, UT, with a background in environmental advocacy, political organizing, mediation, and research science. Email: **debbie@dlbsigma.com**.

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