# The Sun Will Come Out Tomorrow

*Managing Orphan Well Risk through Business Cycles*

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# Taking the Long-Range View on Upstream Asset Retirement

Even before the unprecedented decline in energy demand and the dramatic drop in oil price caused by the COVID-19 pandemic, oil industry policy watchers were concerned whether the industry was sufficiently providing for infrastructure abandonment. Now, under a low-for-longer oil price scenario, the US could see an increasing number of orphan wells, those shut in but not plugged and abandoned, and the operator defunct due to the downturn. This will likely amplify the calls to increase financial assurance requirements for the industry. How should resource-development landowners react to the situation without making a long-term economic mistake? As authorities consider changes to existing regimes, the entire cycle of oil and gas development should be considered.

While many would like to point to the stereotype of irresponsible oil and gas companies that exploit the environment and care not for the mess they leave behind, the reality is more complex. The upstream oil and gas industry is an inherently uncertain economic sector, frequently without much public sympathy or support when it hits the low points. Some participants are well capitalized and can be depended on to deliver on their obligations, while hundreds are not diversified enough to weather a hundred-year storm. The smaller companies may still have value as nimble operators, but they are also more likely to walk away from uneconomic assets. In propagating abandonment rules that require upfront cash, each landowner can influence development pace and weigh the selection of the participants.

The matter of who pays for abandonment of an oil and gas asset ultimately is not that different from any other landlord and tenant relationship, but it is made more complex by the cyclical nature of the tenant's income. Government landowners require a deposit prior to the tenant moving in and must be satisfied with the tenant's credit history. While it is the tenant's responsibility to leave the place the way they found it, ultimately it is the landlord's burden to take care of the place if someone skips out without cleaning. If the standard deposit is set so high that only the highest-quality tenant can afford it, the landlord risks going without revenue. Successful landlords understand that there is a balance between ongoing income and taking no risk on cleaning up after a bad or unfortunate actor.

This paper proposes policy principles that we feel would lead to the best environmental and economic outcomes. The principles are based on the underlying economic landlord-tenant relationship of state or federal landowners and their oil and gas lessees. As the industry goes through another low point and prepares for what comes next, policymakers will be considering how to strike the right balance between protection of taxpayers and opportunity for future development. Applying these principles to policy can help prepare the landowners for the next several business cycle swings:

1. Delegate frequently overlapping regulatory and landlord (revenue-generating) goals to the agency with appropriate role and authority
2. Use actual and reasonable abandonment cost estimates and standards
3. Balance the risk to the landowner and/or taxpayers against benefits of development
4. Minimize impact on the value of cash flows from oil and gas developments over their life cycle
5. Select appropriate and consistent assurance instruments

# The Obligatory Acronyms

The Financial Accounting Standards Board (FASB) defines asset retirement obligations (ARO) as "legal obligations associated with the retirement of long-lived assets that result from acquisition, construction, development and(or) the normal operation of a long-lived asset."[1] At the end of field life exploration and production (E&P), companies are required to safely plug and abandon the wells and remove surface facilities. The actual activity is typically referred to as dismantlement, removal, and restoration (DR&R). ARO is a liability to perform DR&R in the future. Performance of DR&R is typically required by the lease and/or regulations.

1 FASB, "Accounting for Asset Retirement Obligations," Summary of Statement No. 143 (06 2001), available at https://www.fasb.org/summary/stsum143.shtml

# Requirements of Federal Landowners

The Bureau of Land Management (BLM) and Bureau of Ocean Energy Management (BOEM) are the federal agencies in charge of responsibly managing federal onshore and offshore oil and gas leasing and development activities. BLM's statutory mission is to support multiple uses on federally owned lands, including responsible energy development, timber harvesting, grazing, and recreation, including hunting and fishing. BLM land ownership is more prevalent in western states, with two-thirds of its active 96,000 oil and gas wells in just two states: New Mexico and Wyoming. BOEM manages federal Outer Continental Shelf lease sales, reviews exploration and development plans, and promulgates regulations including those that affect ARO.

Together, the revenues from oil and gas activities on federal lands or in federal waters derive income from lease sales, fees, and royalties that fluctuated between $3.3 billion and $8.6 billion from 2014 to 2018.[2]

Both agencies have been criticized by observers inside and outside of government for mismanaging reclamation and abandonment obligations.[3]. The US Government Accountability Office (GAO) issued a report in September 2019 calling for changes to law in regulations associated with insufficient coverage of potential reclamation costs by well bonding.[4]

## *BLM – Minimum Bonding Requirements and No Power to Collect*

BLM's regulations set minimum bond values at $10,000 for all of an operator's wells on an individual lease, $25,000 for all of an operator's wells in a state, and $150,000 for all of an operator's wells nationwide. The bond mount is kept by the BLM if the site is not reclaimed to the agency's satisfaction. These are some of the lowest bonding requirements among government landowners, and as GAO argues, have fallen behind inflation. The average bonding amount held by BLM per well managed is $2,122, far below the average reclamation cost. Of course, the obligation to abandon and reclaim the well sites rests with the lessee, so that means that the lessee is required to pay out of pocket prior to the return of the bond. However, in a situation where an operator does not properly reclaim the abandoned site, BLM does not have statutory authority to seek additional funding from the lessee to perform the reclamation.

GAO reports 296 orphaned wells that were identified by BLM as of early 2019, with 84 of those wells being new since 2017. BLM estimates a potential liability of $46 million to reclaim orphan wells that had been identified through 2018.5

The potential liability, if identified correctly, does not appear outsized compared to the cash flow to the landowner. The lease owner is required by the lease terms to conduct the reclamation, with the bonding providing an insurance mechanism. With identified orphaned wells at 0.3 percent of total number and reclamation costs estimates of $46 million compared to the $1.7 billion of BLM oil and gas permit fees and rents (excluding royalties) generated just in 2018, the costs should be manageable without burdening each lessee with 100 percent of the potential reclamations costs upfront through bonding for the full amount. However, the liabilities tend to come in waves with business cycles and require advance preparation. Without the ability for BLM to pursue cost compensation from bad-acting lessees or a dedicated revenue stream allocated to this risk-driven part of land management, this problem appears to be one of mechanism rather than magnitude.

## *BOEM Bonding and ARO Practices Favor Stronger Operators*

The offshore leases and wells regulated by BOEM tend to be more expensive, with water-borne spills having a potentially higher impact to the environment. Currently, BOEM requires producers to provide an areawide bond of $300,000,[6] or a lease-specific bond of $50,000. The bond can be posted by the operator to cover other working interest owners, notwithstanding that under federal regulations all working interest owners are jointly and severally liable for DR&R.[7] BOEM also requires additional bonds,[8] such as the $200,000 bond prior to lease exploration activities and $500,000 bond before development on each lease. However, such additional bonds are not required if the lessee maintains a sufficiently large areawide bond ($1 million to cover lease exploration bond(s) and $3 million to cover development bond(s)). Instead of surety bonds, BOEM will accept US Treasuries and possibly other comparable security instruments.

In addition to the abovementioned bonds, the "Regional Director may determine that additional security is necessary to ensure compliance with the obligations under your lease… The Regional Director's determination will be based on his/her evaluation of your ability to carry out present and future obligations." Financial assurances to cover ARO fall under Additional Bonds regulations.[9] Requirements for such Additional Bonds have been evolving over time,[10] primarily by increasing the complexity of financial risk metrics and establishing thresholds related to leverage and lessee's size.

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2 Derived from Office of Natural Resources Revenue data, available at https://revenuedata.doi.gov/

3 ECONorthwest, *Reclaiming Oil and Gas Wells on Federal Lands: Estimate of Costs, prepared for Center for Western Priorities* (February 2018), available at: https://westernpriorities.org/wp-content/uploads/2018/02/Bonding-Report.pdf

4 GAO, *Bureau of Land Management Should Address Risks From Insufficient Bonds to Reclaim Wells*, GAO-19-615, report to Congressional Requesters (September 2019), available at https://www.gao.gov/products/GAO-19-615

5 Ibid.

6 30 CFR § 556.900, "Bond requirements for an oil and gas or sulfur lease."

7 30 CFR § 556.604, "What are my rights and obligations as a record title owner?"

8 30 CFR § 556.901, "Additional Bonds."

9 Ibid.

10 Celata, Mike, "Bonding or Other Financial Assurance," Leadership Presentations under "Federal Offshore O&G Leasing Course," BOEM (April 10, 2018), available at https://www.boem.gov/newsroom/leadership-presentations

Under current regulations, additional bonds can be waived based on the following:

- Sufficient financial capacity, with quantitative definitions of that determination
- Projected financial strength
- Business stability
- Reliability in meeting obligations
- Record of compliance with laws, regulations, and lease terms

If one or more co-lessees or co-owners has "sufficient financial strength and reliability," it is "not necessary to provide additional security."[11] A guarantee from a sufficiently stronger affiliate could also be considered to satisfy such requirements.

In 2016 BOEM attempted to update financial assurance requirements.[12] The new notice attempted to move away from the binary approach that either requires assurances for the full amount of DR&R or waives such assurance requirements completely. Major notable differences were explained in the summary paper that was issued around the same time[13] and included:

- Assurance amounts that can vary based on a set of financial ratios and other measures.
- Lower limit on the amount of DR&R that can be covered by the lessee without resorting to third-party assurances. Self-insurance limited to 10 percent of Net Tangible Worth, a decrease from 50 percent.
- Addition of up to 25 percent of value of lessee's proven reserves to Net Worth, thus reducing the amount of additional bonding.
- Expanded consideration of liabilities, including decommissioning beyond lessee's working interest share likely because of joint and several liability.
- Increased number of financial ratios with focus on both short- and long-term financial strength.

NTL 2016-N01 was subsequently rescinded; however, it is likely that BOEM's research will inform agencies' future decisions.

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11 BOEM, "Notice to Lessees and Operators of Federal Oil and Gas, and Sulfur Leases, and Holders of Pipeline Right-of-Way and Right-of-Use and Easement Grants in the Outer Continental Shelf," NTL No. 2016-N01, rescinded, page 1, paragraph 2 (September 12, 2016), available at https://www.boem.gov/sites/default/files/documents/renewable-energy/BOEM-NTL-2016-N01_0.pdf

12 Ibid.

13 BOEM, *Evaluation of a Lessee's Ability to Carry out Present and Future Obligations* (December 21, 2016), available at https://www.boem.gov/sites/default/files/documents//Evaluation%20of%20a%20Lessee%27s%20Ability%20to%20Carry%20out%20Present%20and%20Future%20Obligations.pdf

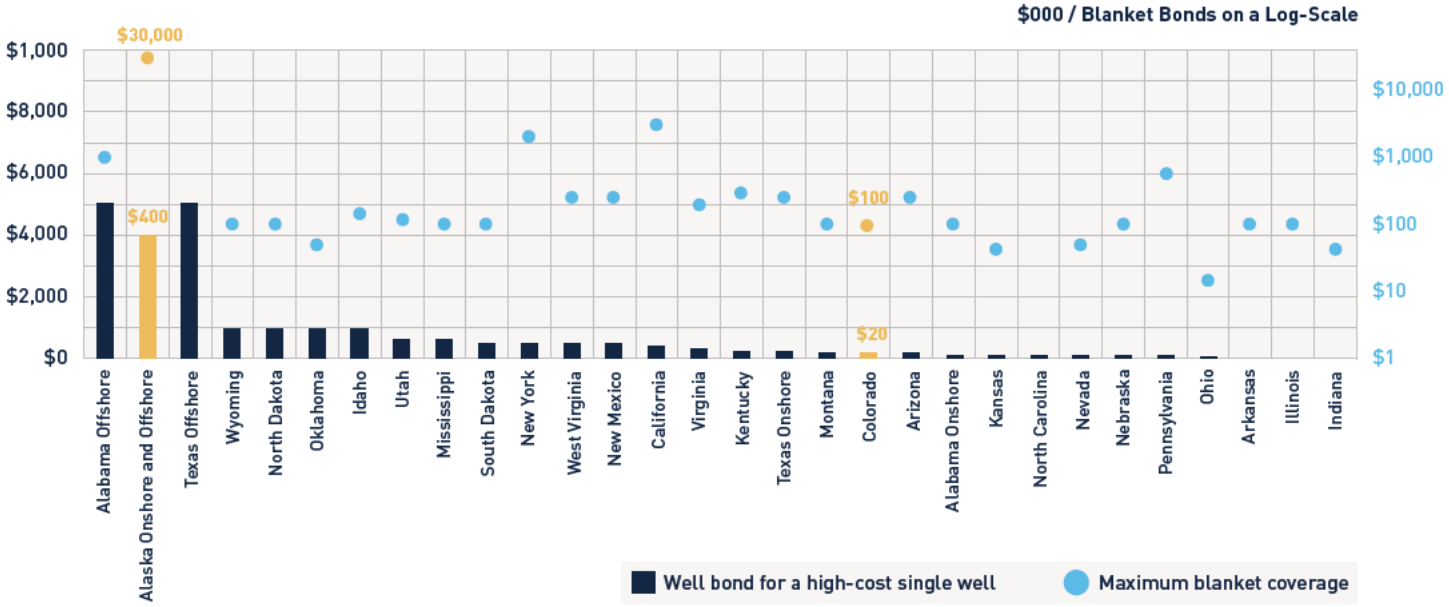
# State Oil and Gas Regulators

Every hydrocarbon-producing state in the US is obligated by the 1935 Interstate Oil and Gas Compact Commission (IOGCC) Charter to propagate laws and regulations to "conserve oil and gas by the prevention of physical waste thereof from any cause."[14] IOGCC has served as a representative organization to guide legislation and policy for management of idle and orphan wells and reclamation on state lands. Its latest report documents 56,859 oil and gas wells across US states that are identified as orphan wells as of 2018.[15] Many states report wells on federal and Indian leases as well, so there is a certain amount of overlap with federal statistics. A much higher number of wells are approved by the state authorities as idle (194,403, or 12% of all drilled and not plugged wells)[16] for various reasons, and therefore could be at risk of becoming orphan in a severe economic downturn.

All hydrocarbon-producing states have financial assurance-related statutes, regulations, and policies for carrying out the mission stated above. Landowners and regulators deploy a varied package of instruments, including upfront cash deposits and bonds, as well as dedicated taxes and fees to provide for state-controlled remediation funds. Some require creditworthiness assessments to determine if additional assurance is necessary. Relevant regulations address bonding requirements per well, frequently with a "blanket" maximum coverage requirement per operator or lessee.

The chart below represents a comparison between states' regulatory requirements for bonding.[17] Blanket bonds vary materially across different states, and as such are plotted on a logarithmic scale. Some of the difference may be dictated by varying conditions across states, such as average number of wells per operator, cost of drilling and DR&R, land ownership, or reservoir conditions leading to different risk profiles. The two preferred financial instruments across US jurisdictions are surety bonds and letters of credit.

## FIGURE 1. US STATES' HIGH-COST WELL BONDS AND BLANKET BONDS




### *Alaska's Custom Approach to ARO*

The Alaska Onshore and Offshore bar on the chart above represents well-bonding requirements administered by the Alaska Oil and Gas Conservation Commission (AOGCC), which regulates both onshore and offshore wells. AOGCC is a regulatory and quasi-judiciary agency with a mission "to prevent waste, protect correlative rights, improve ultimate recovery and protect underground freshwater"[18] on all hydrocarbon leases within the state of Alaska outside of BOEM's authority. The Alaska Department of Natural Resources (ADNR), one of the largest landowners in the state, has authority over decommissioning of surface oil and gas infrastructure on state-owned lands and waters. ADNR's stated mission is to "develop, conserve and maximize the use of Alaska's natural resources consistent with the public interest."[19] Specifically, for oil and gas, ADNR as landowner is focused on maximum benefit for the people of state of Alaska from the use of its resources, including revenue generations through royalties.

14 IOGCC, "Interstate Oil and Gas Commission Charter" (amended September 25, 1970) available at http://iogcc.ok.gov/charter

15 IOGCC, *Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies* (December 2019, updated May 2020), available at http://iogcc.ok.gov/idle-and-orphan-wells

16 Ibid.

17 IOGCC, *State Financial Assurance Requirements* (2016), available at http://iogcc.ok.gov/Websites/iogcc/images/Financial_Assurances_FINAL_web.pdf; and updated by BRG based on published status and regulations in respective jurisdictions.

18 Alaska Oil and Gas Conservation Commission, "About Us," available at: https://www.commerce.alaska.gov/web/aogcc/AboutUs.aspx

19 State of Alaska Department of Natural Resources, "About DNR," Commissioner's Office, available at: http://dnr.alaska.gov/commis/pic/about.htm

## AOGCC Quadruples Minimum Well Bonding in 2019

In 2019 AOGCC changed their bonding regulations by increasing "the minimum bonding amount to more accurately reflect the cost of abandoning wells by establishing a multi-tiered bonding schedule based on the number of wells an operator has."[20] Under the updated regulations, an operator must post a bond or provide a letter of credit or issue a callable certificate of deposit for the benefit of AOGCC prior to drilling a well. The minimum regulatory bond requirement is $400,000 per well and is tired up to a $30 million cap for 1000+ wells. The regulations provide for some discretion for AOGCC to increase or decrease bond amounts based on "evidence that engineering, geotechnical, environmental, and location conditions warrant an adjustment of those amounts," which they have done for at least one small existing operator.

## ADNR Signs Off on Lease Assignments through Negotiation of Requirements

ADNR employs a combination of bonds and Financial Assurance Agreements (FAAs) to protect the state as a landlord against lessees' possible failure to perform DR&R. Bonds include a general statewide bond in the amount of $500,000 to cover "the bond requirements to which an oil or gas lease is subject."[21] Statewide bonds are typically posted by individual lessees to cover their operations in the state. ADNR can require additional bonds to support the issuance of easements and rights of way; however, this article is focused primarily on upstream AROs. In the end, a third-party bond, a surety, or another instrument such as a parental guarantee could be required to support ADNR's decision.

In addition to the bonding requirements stated explicitly in the statutes and regulations, ADNR has negotiated FAAs with new entrants as part of lease assignment process. Most agreements have not been public, and as such it is difficult to determine the exact level of protection for the landowner, or the cumulative obligation for the lessee that they create. It is clear from public data that ADNR has aimed to employ some of the principles reviewed below, but has approached each lease transfer as a negotiation with individual circumstances. The FAA is reconsidered periodically, taking into account projections for DR&R costs and requirements, as well as the current financial health of the lease holder.[22] The ultimate responsibility for all costs of surface infrastructure removal still rest with the leaseholder regardless of earlier estimates, and the standard of removal is left to the determination of the ADNR commissioner.

Alaska has a relatively low number of lessees and operators compared to other states, so this custom approach has been functional in conducting lease assignments. As the province ages, the growing issue is the fact that every future operator potentially has a larger proportionate liability for DR&R compared to revenue potential. So far, Alaska has solved this by involving past lessees as secondary or even primary liability holders as a condition of transfer. Having a fallback pooled remediation fund that provides for DR&R of orphan sites such as Colorado (below), along with the majority of hydrocarbon-producing states,[23] could be beneficial in the environment where the state is trying to compete for capital in later stages of basin development.

### *Colorado's Inter-Agency Coordination Approach*

Colorado statutes designate Colorado Oil and Gas Conservation Commission (COGCC) to be the primary agency responsible for oil and gas resource conservation, and to regulate "the drilling, producing, and plugging of wells and all other operations for the production of oil or gas."[24] The second largest landowner in Colorado is the State Land Board, with 2.8 million acres in trust management for the benefit of educational institutions and other beneficiaries. Both agencies are housed within Colorado's Department of Natural Resources (CDNR), although they have separate powers and duties.

## COGCC Maintains Standards and Handles Orphans

COGCC's authority is broader than that of AOGCC and includes ARO oversight. For example, COGCC is responsible for surface facilities that are not subject to agreements with surface landowners, as well as flowline integrity management including abandonment. COGCC also sets standards for DR&R for all oil and gas infrastructure. COGCC coordinates its actions with Colorado's Department of Natural Resources. CDNR's commissioner is a non-voting member on COGCC's board and has the authority to appoint COGCC's director.

In the chart above, Colorado sits closer to the middle of the pack on a per-well and blanket bonding requirement. Instead of increasing well bond requirements for individual lessees, Colorado has chosen to protect against the risk of lessees' default by establishing a pooled fund (Financial Assurance and Oil and Gas Conservation and Environmental Response Fund), and charging a fee for every barrel produced toward it. Every operator is still fully accountable for plugging and abandoning inactive wells and maintaining financial assurance instruments; however, in the case of lessees' default, COGCC can deploy the fund to perform necessary reclamation.

20 State of Alaska Administrative Code, 20 AAC 25.025, available at http://www.legis.state.ak.us/basis/aac.asp#2.05.240

21 Id., 11 AAC 83.160.

22 Summarized from oral testimony of ADNR Commissioner to the Joint Resources Committee of the Alaska Legislature, (February 21, 2020).

23 IOGCC (2019).

24 Colorado Revised Statutes 34-60-106(2)(a), "Additional powers of commission - rules - definition – repeal," available at https://advance.lexis.com/documentpage/?pdmfid=1000516&crid=030c855e-bc04-443c-9e8a-f82ec2926acf&nodeid=ABJAAEAABAAI&nodepath=%2FROOT%2FABJ%2FABJAAE%2FABJAAEAAB%2FABJAAEAABAAI&level=4&haschildren=&populated=false&title=34-60-106.+Additional+powers+of+commission+-+rules+-+definition+-+repeal&config=014FJAAyNGJkY2Y4Zi1mNjgyLTRkN2YtYmE4OS03NTYzNzYzOTg0OGEKAFBvZENhdGFsb2d592qv2Kywlf8caKqYROP5&pddocfullpath=%2Fshared%2Fdocument%2Fstatutes-legislation%2Furn%3AcontentItem%3A5YWF-4WG1-FH4C-X2HJ-00008-00&ecomp=f38_9kk&prid=bb824e19-4733-4975-b531-22dc6abd73b4

## State Land Board Manages the Land and Revenue

State Land Board is composed of five public members appointed by the governor and represents the interests of trust beneficiaries. The board hires a director to oversee the activities of the agency with the governor's consent. As the surface landowner, State Land Board has separate bonding requirements for at $25,000 minimum performance bond for oil and gas leases, with an option for a $100,000 blanket bond for each lessee. The surface use agreements published on the board's website, along with all other rules and regulations for leasing state land for oil and gas development, require DR&R to be performed to the technical standards that are outlined in regulation by COGCC. This allows each lessee and the surface landowner to assess potential costs of DR&R and better estimate the sufficiency of financial assurance instruments.

# Key Principles to Drive Landowner Economics and Environmental Protection

The following section reviews suggested best practices for parties assessing existing or new regulations, negotiating FAAs, or otherwise resolving issues associated with multiple government agencies and landowners involved in creation and oversight of ARO and DR&R activity. The ultimate goal of any regulatory framework is the responsible development of resources without excessive cumulative risk to the landowner at the end of development, and without an inefficient financial burden on the project developer or cash flows to either party.

## Financial assurance framework should:

1. Be administered by the agency(s) with appropriate statutory role and authority
2. Use actual and reasonable DR&R cost estimates
3. Balance the risk to the landowner and/or taxpayers against benefits of development
4. Minimize impact on the value of cash flows from oil and gas developments over their life cycle
5. Select appropriate and consistent assurance instruments

## Principle 1 - Administration by the agency(s) with the appropriate statutory mission and authority

Agency missions can be strictly regulatory focused, such as preventing pollution and waste, or economically focused, preventing undue burden on future taxpayers while maximizing economic benefits. They can also be separated physically, such as surface and subsurface. While most regulations aim to balance economic benefits against potential harm, agencies that act as landowners and revenue generators carry a higher responsibility for creating an environment conducive to development. In selecting the most appropriate agency to administer the financial assurance packages, state governments must ensure that this function is aligned with legislative intent for that agency. Further, that entity must have the necessary authority to administer such framework or part thereof.

## Principle 2 – Not exceed actual and reasonable cost estimates

*Key Elements*

a. Base requirements on actual and reasonable costs. Here we refer to the overall financial assurance requirement rather than the bonding amount, which tends to the focus in broad reporting. Financial assurances must rely on the best estimate of the expected actual and reasonable cost that will be incurred to satisfy ARO for the specific asset or assets. Such estimates should be reviewed periodically. In the absence of the asset-specific cost estimates, assurances should be based on actual analogs.

b. Eliminate excessive assurances. Excessive assurances are either untimely or redundant. Untimely assurances secure the full amount of DR&R when no infrastructure has yet been installed, or do not account for the time value of DR&R. Redundant assurances typically stem from lack of coordination or inability to access protections under various agreements. Lessees, landowners, and regulatory agencies need to cooperate to avoid imposing excessive assurances that may require more than 100 percent of the expected value of the loss at any given time. The state of Colorado appears to have achieved a good balance of separation of powers and cooperative behavior among landowner and regulatory agencies.

## Principle 3 - Balance the risk to the landowner and/or taxpayers against benefits of development

*Key Elements*

a. Establish clear and transparent standards. Establish clear and consistent standards for what constitutes acceptable land quality upon return of such land back to the owner. These standards should be applied consistently to reduce the uncertainty about the cost of reclamation activities, and should account for likely reuse or repurpose of some of the infrastructure with alternative residual value.

b. Assess risk to the landowner adequately. Consider the set of circumstances that lead to the loss and what drives the likelihood and the amount. The likelihood of such a loss is typically driven by both the chance of producer's default and the quality of the underlying asset. The unmitigated loss amount can be the cost of DR&R, but not necessarily. At some stages of development, the expected amount of loss to the landowner is the cost to operate or maintain such an asset until market conditions improve and a buyer is found. An illustrative oil or gas cash flow profile is shown in Figure 2 below.

c. Avoid one-size-fits-all approach. The upfront and ongoing cash expenditures imposed by the combination of well bonding requirements and FAAs are more impactful on the balance sheets of smaller producers. In times of economic hardship, such requirements can reduce liquidity, thus increasing the chance of default. FAA financial strength tests must be balanced to create adequate protection against default while leaving sufficient liquidity for the operator to endure through the downturn if the underlying asset is viable.

d. Consider barriers to entry. If it can be demonstrated that the regulatory requirements act as unintended barriers to entry, landowners should consider updating those regulations. If there is some discretion to lower the barriers within the existing regulations, landowners should weigh the benefits of such development against both the regulatory precedent of easing the requirement and the benefit of the development itself.

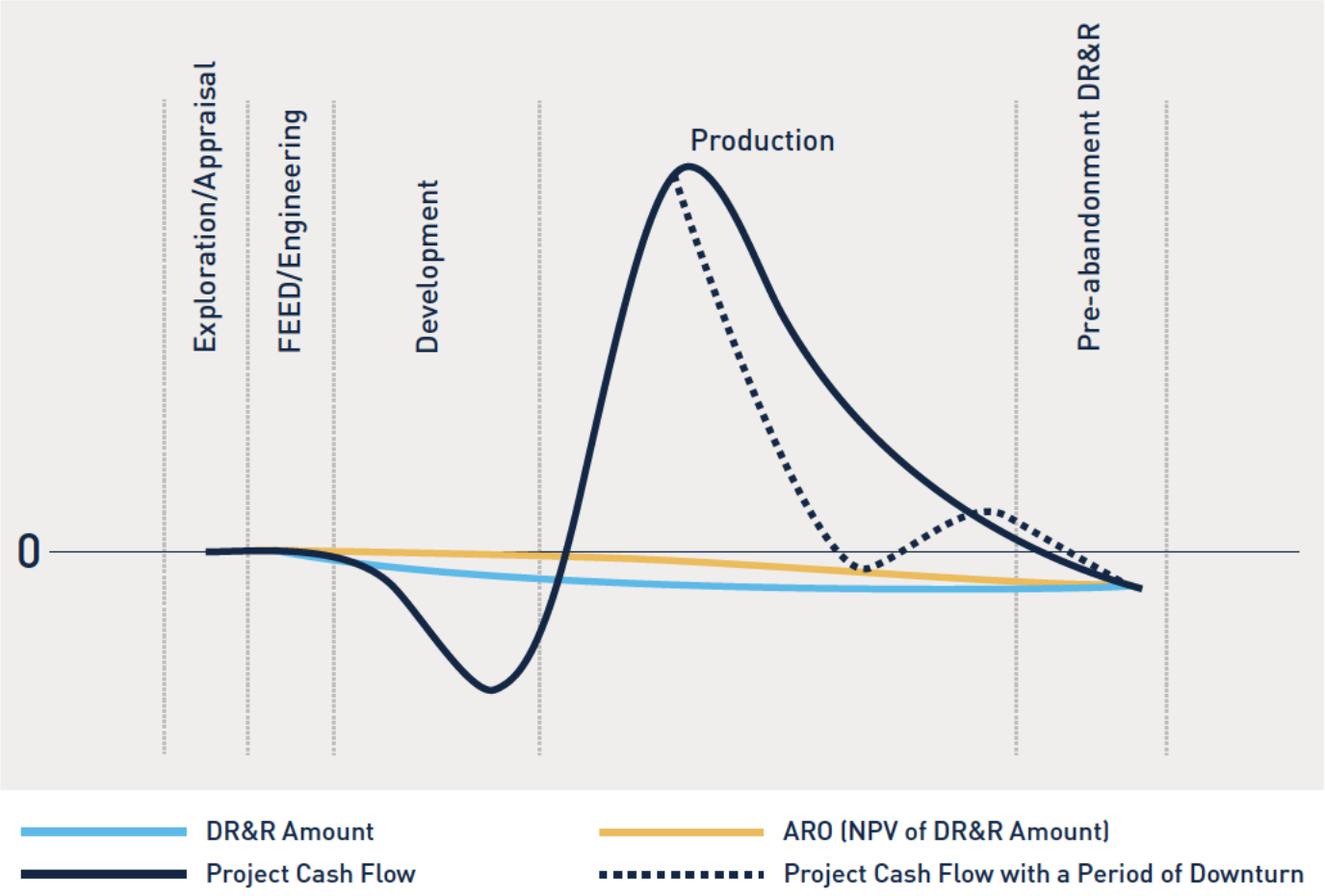
e. Consider project life cycle transition. Changing operators at certain points of a project life cycle can revitalize the development, as large, upfront, and risky investments made by large companies are replaced by more efficient well-work programs and investments in operating efficiencies by smaller players. Lack of transparency or a high level of certainty in ARO obligations can prevent or delay such transitions, potentially forgoing the incremental benefits to the landowner.

## Principle 4 – Minimize impact on the value of cash flows from oil and gas developments

*Key Elements*

a. Assess project life cycle regularly. Changes in project abandonment dates and trapped capital have impact on project cash flows. All parties involved should periodically identify and weigh the possible tradeoffs between protection and benefits derived from the project. Ignoring project benefits from both producers' and landowner's perspectives and looking solely at the risk can impact revenues adversely at the wrong time in project life cycle, thus effectively making financial assurance protections costlier.

### FIGURE 2. ILLUSTRATIVE UPSTREAM EXPECTED VALUE DIAGRAM



Up until development, there is risk that the project will not progress and some of the infrastructure will be left behind. However, for most of that period, liability is limited largely to exploration and appraisal wells. Development starts after the Final Investment Decision (FID) has been made. At this point, the project should have financial backing and likely has been tested under a range of development scenarios and market conditions. Probability of project success in this phase is driven by the resilience of project economics and the operator's ability to deliver the project on time and within the budget.

As infrastructure is being built, the DR&R amount grows. However, under the most likely case, the amount of ARO remains small, because project value also increases as every construction dollar spent improves forward-looking economics. The project is most valuable when it starts to produce. This is also the time when collection of DR&R cash provisions would be least burdensome on the economics. In the production phase, the project will likely experience periods of price decline or operational challenges that sometimes can lead to negative cash flows and bankruptcies. It is important to assess under what assumptions such a project can again become viable in order to estimate likelihood of restart.

Over time, as production declines, the amount of ARO begins to grow as the project starts to approach pre-abandonment. The project becomes more sensitive to changes in market conditions and operational challenges. By this point, the landowner must have certainty that the current lessee or another secured source (such as a preestablished designated fund, a pooled resource collected during high-income periods, or a previous lessee) will be able to pay for abandonment.

b. Avoid distorting incentives. Assurance packages should be crafted to consider the impact on potential developments and be checked against multiple possible outcomes. Particular attention should be paid to uneven step-ups in bonding requirements and their impact on incremental investment.

## Principle 5 – Use appropriate and industry-standard financial instruments

*Key Elements*

a. Fit-for-purpose instruments. The instruments selected must be necessary and sufficient to provide adequate protection and aim to follow an industry standard as to be easily implemented. The most efficient equivalent instrument should be chosen in each case. If a sufficiently strong affiliate can provide an adequate guarantee at lower internal cost than a bond or a surety, the preference should be given to the lower cost instrument.

b. Consider different options. Select the most appropriate instrument from a variety of options. Instruments can be broadly classified into third party and internal, as well as sole risk and shared risk. For example, a surety bond is a third-party sole-risk instrument. A pooled fund where each lessee contributes some amount but funds are drawn when one of the members fails is an external shared-risk instrument.

# Beyond the ARO

To ensure sustainability of this mutually beneficial relationship, it is imperative for financial assurance regulations and agreements to be both adequate and equitable so as to prevent economic waste and preserve the value of the underlying assets. More orderly dismantlement should reduce environmental risks associated with such infrastructure. Infrastructure reuse and flexible abandonment planning to ensure economies of scale lead to more efficient capital allocation. Ultimately, considering the risk of paying for DR&R of orphaned assets should be part of the overall landowner risk assessment that is compensated with development revenue. Government landowners can prepare for those costs just like the lessees must: allocating revenue at the right stage of development (when it's plentiful) from each lessee or its own receipts to prepare for the next business cycle.

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