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The Standard That Doesn’t Exist Yet

What the rules already require of a computational method in reported reserves, and what nobody has written down

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IN BRIEF

Reserves disclosure is governed by rules written decades before language models, and those rules already say more about AI than most operators realise. This paper reads the binding instruments and the voluntary standards directly, and reports what each one contains. The finding is a vacuum with a hard edge: the governing resources standard does not mention software or algorithms anywhere in fifty-seven pages, and no reserves-specific instrument in any jurisdiction mentions AI at all — while United States securities regulation already imposes a demanding, technology-agnostic test that AI-derived inputs must pass. We also report an original analysis of the 2025 annual filings, which shows where the disclosure record currently stands. It is not where the commentary assumes.

Contents

1. Executive summary

There is no rule about AI in reserves estimation. There is a rule about reliable technology, it was written in 2008, and it is harder to satisfy than a rule about AI would be.

Three findings from reading the instruments themselves:

- **The binding rule is technology-agnostic and demanding.** United States securities regulation defines reliable technology as a grouping of technologies — explicitly "including computational methods" — that "has been field tested and has been demonstrated to provide reasonably certain results with consistency and repeatability in the formation being evaluated or in an analogous formation." [1] No AI-specific carve-out exists, and none is needed: that sentence already applies.
- **The voluntary standards are silent.** The Petroleum Resources Management System, the governing resources standard, contains no occurrence of *software*, *algorithm*, *computational*, or *artificial intelligence* anywhere in its fifty-seven pages. [4] Canada's National Instrument 51-101 contains none either. [6] The published recommended evaluation practices do not address the subject. [7]
- **The disclosure record is emptier than the commentary suggests.** In our own analysis of the 2025 annual filings, the phrase *artificial intelligence* appears in thirty-one filings by crude petroleum and natural gas issuers — and in **none** of the third-party reserve reports or evaluator consents attached to them, although those exhibit types are demonstrably indexed and returnable by the same search.

The practical consequence for an operator is uncomfortable but clear. Nobody is going to tell you what qualifies. The obligation to establish that a computational method is reliable, for the formation in front of you, already sits with the registrant — and the regulator has reserved the right to ask you to prove it.

> **THE SENTENCE THAT DOES THE WORK**
>
> "Reliable technology is a grouping of one or more technologies (including computational methods) that has been field tested and has been demonstrated to provide reasonably certain results with consistency and repeatability in the formation being evaluated or in an analogous formation." — 17 CFR §210.4-10(a)(25) [1]

2. What the binding rules actually say

2.1 Reasonable certainty and reliable technology

The definitions that govern United States reserves reporting sit in Regulation S-X, Rule 4-10. Reasonable certainty is defined in two forms: for deterministic methods, "a high degree of confidence that the quantities will be recovered"; for probabilistic methods, "at least a 90% probability that the quantities actually recovered will equal or exceed the estimate." [1]

Reliable technology is the provision that reaches computational methods, and it is quoted in full above. Three of its requirements deserve attention because each one is independently difficult for a system

whose behaviour is not fixed: the technology must have been **field tested**; it must produce results with **consistency and repeatability**; and it must have done so **in the formation being evaluated or in an analogous formation** — not in general.

2.2 What the Commission deliberately declined to require

The adopting release that introduced these definitions is unusually informative, because it records two things the Commission considered and rejected. [3]

It had proposed that reliable technology also be "widely accepted." Commenters objected that this would exclude proprietary technologies developed internally, and the Commission agreed: "We concur with these commenters and have removed the 'widely accepted' requirement from the final rule." [3] A method does not have to be an industry standard to be relied upon.

It had also proposed a bright line — technology "proven empirically to lead to correct conclusions in 90% or more of its applications." That too was dropped: "We agree that a bright line test would be difficult to apply to a particular technology or mix of technologies to determine their reliability." [3]

The effect of both decisions is the same. The burden of establishing reliability was placed on the registrant, with no threshold to hide behind and no list of approved methods to point at.

> **AND THE STAFF KEPT A KEY**
>
> The same release records that the staff "may continue to request companies to provide supplemental data… which, under the new rules, may include information sufficient to support a company's conclusion that a technology or mix of technologies used to establish reserves meets the definition of 'reliable technology'." [3] The question is not whether you must be able to demonstrate this. It is whether you can, on request.

2.3 What must be disclosed — and what need not be

Regulation S-K, Item 1202 requires a registrant disclosing reserves for the first time or reporting material additions to provide "a general discussion of the technologies used to establish the appropriate level of certainty for reserves estimates." [2] It also requires disclosure of the internal controls used in the reserves estimation effort, and of the qualifications of the technical person primarily responsible for overseeing the preparation. [2]

Notably, the disclosure may stay general. The adopting release states that a company "would not be required to disclose proprietary technologies, or a proprietary mix of technologies, at a level of specificity that would cause competitive harm." [3] This matters for reading the filing record, and we return to it in section 5: silence in a filing is not evidence that a method was not used.

3. What the voluntary standards say — and do not

Below the binding rules sit the standards the profession maintains for itself. We searched each one directly for the vocabulary of computation.

Instrument	Binding?	Mentions AI?	What it constrains
SEC Regulation S-X, Rule 4-10 [1]	Yes	No	“Reliable technology… including computational methods” — field tested, consistent, repeatable, in this formation or an analogue
SEC Regulation S-K, Item 1200 [2]	Yes	No	General discussion of technologies used; internal controls; qualifications of the responsible technical person
SPE Petroleum Resources Management System, rev. 2018 [4]	No	No	Nothing — no occurrence of software, algorithm, or computational anywhere in 57 pages
SPE reserves estimating and auditing standards, rev. 2019 [5]	No (expressly)	No	The evaluator must understand internal calculation processes, and must confirm mathematically derived projections by judgement
Canada, National Instrument 51-101 [6]	Yes	No	Delegated entirely to evaluator competence and the COGE Handbook
SPEE recommended evaluation practices [7]	No	No	Nothing — no practice addresses software or algorithms
NCEES model law and model rules, Aug 2025 [9]	As adopted	No	Responsible charge, defined as direct control and personal supervision
NCEES position statement 6.10, 2025 [8]	No	**Yes**	Retain responsible charge; perform independent checks; document methods, data sources and assumptions
NSPE Board of Ethical Review, Case 24-2, 2024 [10]	No	**Yes**	AI-generated work requires at least the scrutiny of human work; sealing without responsible charge is unethical

Two observations follow from the table, and they point in opposite directions.

The first is the vacuum. **No reserves-specific instrument in any jurisdiction we examined mentions AI at all.** The two instruments that do squarely address an engineer using AI in certified work — the licensing council’s position statement and the professional society’s ethics opinion — are both non-binding, both dated 2024 or 2025, and neither is petroleum-specific. The licensing council’s own statement concedes the gap: member boards “should develop specific guidelines or rules addressing the responsible use of AI.” [8] As of this writing that position has not been carried into its model law or model rules, which contain no occurrence of the term. [9]

The second is that the vacuum is not permission.

4. The rule that already applies

The SPE standards for estimating and auditing reserves were approved in June 2019 and expressly bind no one — the Society "imposes no sanctions for the nonuse of these Standards." [5] They are nonetheless the most directly applicable text in the profession, because they address computational opacity head-on, three times, and each time as a caution rather than a permission.

On the competence required of a qualified reserves evaluator, the standard names an understanding of "the consequences of reliance on computer software without a full understanding of the internal calculation processes." [5]

On performance-based estimation — which is precisely where automated decline and rate forecasting sits — it is more specific still: "Particular attention should be given to the use of proprietary or commercial software programs that use various types of mathematical routines to assist in the projection of future production rates or pressure trends. Professional judgment and experience… should always be used in confirming mathematically derived projections." [5]

And on simulation: "the user is advised to exercise caution in accepting results produced through use of proprietary or commercial software without a full understanding of the internal mathematical algorithms and correlations." [5]

> **The objection to opaque computation is not a reaction to language models. It was written down in 2019, and it applies to them exactly as drafted.**

Read together with the regulation, the position is coherent even though nobody designed it for AI. The regulator requires that a computational method be demonstrated reliable in this formation. The profession requires that the evaluator understand the method well enough to confirm its output by judgement. A system that cannot support both of those is not blocked by a rule about AI. It is blocked by the rules that already exist.

5. What the filings actually show

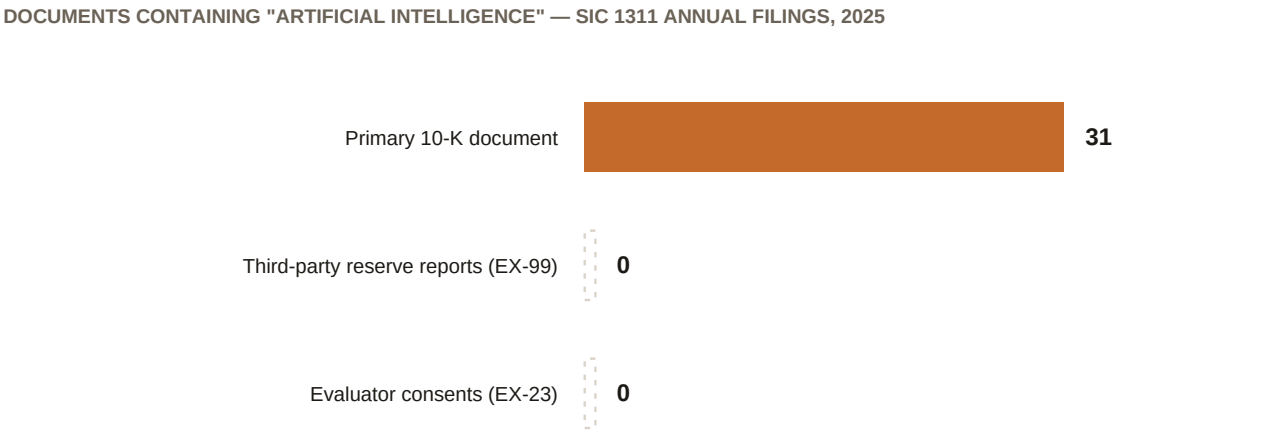
Commentary on this subject tends to assert that AI is already embedded in reserves workflows, or alternatively that regulators are about to act. We could find no evidence for either claim, so we measured the disclosure record directly.

5.1 Method

Using the Securities and Exchange Commission's full-text search of electronic filings, we counted phrase occurrences in annual filings by issuers under Standard Industrial Classification 1311 — crude petroleum and natural gas — for calendar year 2025. The search interface accepts no industry parameter, so classification filtering was applied after retrieval, on the classification returned with each result.

Because a full-text index can silently under-cover a population, we validated the denominator against a second, independent source: the quarterly filing indexes. Those give **97** issuers in this classification that filed an annual report in 2025. Full-text search independently returned **88** for the phrase *proved reserves* and **95** for *oil and gas* against that universe — agreement within a few percent, which is what makes the counts below usable rather than a guess.

5.2 The result



CONTROL — same engine, same population, phrase "proved reserves":

57 EX-99.1 · 17 EX-23.2 · 8 EX-99.2 · 3 EX-99 · 2 EX-23.1 — the exhibits are indexed and returnable.

Figure 1. Where the phrase appears in the 2025 annual filing record for this industry, and where it does not. The control line matters: the same search engine returns reserve report exhibits in quantity for a different phrase over the same population and period, so the zeros are an absence of the language, not an absence of coverage.

Thirty-one filings contain the phrase *artificial intelligence*. Every one of them is the primary annual report document. **None of the third-party reserve reports and none of the evaluator consents contain it** — nor does any contain *machine learning*.

Two further counts complete the picture. Of the 88 issuers whose primary annual report contains *proved reserves*, 28 also contain *artificial intelligence* somewhere in that same document, and only 4 contain *machine learning*. And across every staff comment letter indexed — 307 of which mention artificial intelligence, and 1,779 of which mention proved reserves — **zero** mention both.

WHAT THIS DOES NOT SHOW — STATED PLAINLY

The co-occurrence figure must not be read as “a third of operators use AI in reserves estimation.” It measures two phrases appearing in one long document. We opened three of the four filings that mention machine learning: in every case, every occurrence sits in the risk factors and concerns cybersecurity or generic adoption risk, with no connection to reserves methodology. [11] Keyword co-occurrence is not context, and here it demonstrably is not.

5.3 What the absence does and does not mean

The exhibit finding is the informative one, and it needs careful reading in both directions.

It establishes silence in the disclosure record. It does not establish absence in practice — and section 2.3 explains exactly why not, since the Commission affirmatively permits proprietary technology to go undescribed where specificity would cause competitive harm. [3] An evaluator may be using computational methods and be under no obligation to name them.

Equally, the comment-letter zero is weaker evidence than it looks. Staff review only a portion of filings, letters are published on a delay, and reviews are routinely limited in scope. Absence of a comment is not approval.

5.4 The one concrete instance we could find

Searching for a case where AI-derived inputs met the regulator, we found one. A 2023 registration statement disclosed, inside its reserves technology discussion, that its independent evaluator employs “machine learning models… to gather and examine large volumes of information and translate it into actionable insights,” asserting reliability on the ground that the technologies “use standard engineering methods that are generally accepted by the petroleum industry.” [12]

The staff comment letter that followed raised eight comments, none of which concerned reserves or technology. [12] That is a non-objection, not an endorsement: the same letter states that review was limited to the issues addressed, and that the company remains responsible for the adequacy of its disclosure regardless of any action or absence of action by the staff. It should not be characterised as the regulator accepting AI-derived reserves inputs, and we do not so characterise it.

6. Where the pressure will come from

If no reserves regulator has moved, it does not follow that nothing is moving.

The Commission’s investor advisory committee approved a recommendation on AI disclosure in December 2025 whose own framing is the clearest available primary evidence of the vacuum: issuers “have struggled with providing consistent disclosure to investors in the absence of comprehensive guidance from the Commission.” [13] Its recommendations concern definitions, board oversight, and material effects of AI deployment. None addresses reserves or technical estimation.

Separately, the Commission has brought settled enforcement actions against advisers for overstating their use of AI. The enforcement director's statement extended the posture beyond advisers: "public issuers making claims about their AI adoption must also remain vigilant about similar misstatements that may be material to individuals' investing decisions." [14] We note plainly that both respondents were investment advisers, not oil and gas issuers, and that a statement of enforcement posture in a press release carries no independent legal force.

The direction of travel is therefore towards disclosure accuracy about AI, not towards a methodology rule for reserves. An operator waiting for the second is waiting for something that is not currently being drafted.

7. What follows for an operator

Nothing in this paper argues that AI-derived inputs cannot be used in reported work. The regulation is technology-agnostic by design, and the Commission deliberately removed the requirement that would have excluded proprietary methods. What follows is narrower and more practical.

- **The demonstration burden is yours, and it is per-formation.** "Field tested… in the formation being evaluated or in an analogous formation" is not satisfied by a vendor's general accuracy claim. [1]
- **Repeatability is a stated criterion, not an aspiration.** A method whose output varies between runs is in direct tension with the words "consistency and repeatability." [1]
- **Your evaluator must be able to understand the method.** The profession already names reliance on software without understanding its internal calculation processes as a competence failure. [5] A system that cannot be explained to a qualified evaluator creates a problem for that evaluator, not only for you.
- **Responsible charge does not transfer to a tool.** Both instruments that address AI in certified work say the licensed professional retains it, and must perform independent checks with documented methods, data sources and assumptions. [8][10]
- **Absence of a rule is not a safe harbour.** The staff reserved the right to ask for support on request. [3] The question worth asking internally is whether you could answer that request today.

8. Limits of this analysis

The measurement in section 5 is ours, and its limitations are ours to state.

Full-text search of electronic filings covers 2001 onward only, so every absence reported here is bounded by that. Industry classification is self-reported by the filer and assigned at the company rather than the filing level; the classification we used excludes adjacent issuers coded to oilfield services or refining, and the one concrete instance discussed in section 5.4 falls outside the population for exactly that reason. The filter for annual reports also captures amendments and transition reports. Matching is by exact phrase, so an issuer writing "neural network" or "data-driven type curves" without the literal terms

would not be counted.

On the standards side, we could not obtain the current consolidated Canadian evaluation handbook, which is sold rather than published; we therefore report nothing about its contents. We also found no published instance of AI-derived inputs being formally rejected or adversely found against in any jurisdiction — which is an absence of evidence bounded by the fact that state licensing board actions are not centrally searchable.

Finally, one correction to material in circulation. Commentary asserting that AI-related concerns head the Commission's examination priorities for fiscal 2026 is not supported by that document, which mentions artificial intelligence once, in a discussion of malware. We read it. [15]

9. Conclusion

The standard does not exist, and waiting for it is the wrong strategy, because the rule that governs you was written in 2008 and is stricter than the one you are waiting for.

An operator who assumes that the absence of an AI rule means the question is open has misread the record. What the record shows is a technology-agnostic reliability test that any computational method must satisfy, a professional standard that already treats computational opacity as a competence failure, and a disclosure record in which the third-party reserve reports say nothing about AI at all.

The practical test is unchanged from the one the profession has always applied. Can you show that this method produces consistent, repeatable results in this formation? Can a qualified evaluator follow it well enough to confirm the output by judgement? Can you produce that support if asked?

Those questions are answerable. They are simply not answerable by a system that cannot say what it did.

How SolvxAI has already resolved this

The three questions at the end of section 9 are answerable on SolvxAI today, because the system was built against the 2008 test rather than against a rule that does not exist yet.

Consistency and repeatability are properties of the architecture, not aspirations: every number comes from a versioned, deterministic, SPE-cited engineering function, so identical inputs give an identical answer today, next quarter, and after the underlying model has been replaced. A qualified evaluator can follow the work because each figure arrives carrying its method, its inputs, its units and its source — the competence standard's demand that software be understood, satisfied by making the software explain itself. And the staff's supplemental request can be answered, because every analysis leaves an audit trail of what was computed, by which function, at which version, on what data.

ABOUT SOLVXAI

SolvxAI is the agentic operating system for upstream oil and gas. To see this working against your own asset, or to request the technical papers in this series, contact sd@nexaconsultinc.com.

References

Sources are listed with publication year; preliminary, self-reported, or vendor-authored work is flagged as such.

[1] **US Securities and Exchange Commission.** Regulation S-X, Rule 4-10, 17 CFR §210.4-10(a)(24) and (a)(25). Binding regulation; reserves definitions from the amendment published 74 FR 2190, 14 January 2009. https://www.ecfr.gov/current/title-17/chapter-II/part-210/section-210.4-10

[2] **US Securities and Exchange Commission.** Regulation S-K, Item 1200, 17 CFR §§229.1201–229.1202, in particular 1202(a)(6), (a)(7) and (a)(8)(iv). Binding regulation. https://www.ecfr.gov/current/title-17/chapter-II/part-229/subpart-229.1200

[3] **US Securities and Exchange Commission.** Release 33-8995, *Modernization of Oil and Gas Reporting*, adopted 31 December 2008 (74 FR 2158). Commission adopting release; interpretive weight. Quotations from pp. 35–37. https://www.sec.gov/rules/final/2008/33-8995.pdf

[4] **SPE / WPC / AAPG / SPEE / SEG.** *Petroleum Resources Management System*, revised June 2018. Voluntary multi-society standard. Cited here for the **absence** of any occurrence of software, algorithm, computational, or artificial intelligence across the document. https://www.spe.org/media/filer_public/0c/83/0c835db9-501f-4ce7-97f1-a1d6bb4e3331/prmgmtsystem_v103.pdf

[5] **Society of Petroleum Engineers.** *Standards Pertaining to the Estimating and Auditing of Oil and Gas Reserves Information*, revised June 2019, sections 3.1, 3.2, 5.3.2 and 5.3.3. Voluntary; the Society expressly imposes no sanction for non-use. https://www.spe.org/industry/docs/Reserves_Audit_Standards_June%202019_Final.pdf

[6] **Canadian Securities Administrators.** National Instrument 51-101, *Standards of Disclosure for Oil and Gas Activities*, Part 1 definitions. Binding securities rule; consulted as an unofficial consolidation current to 1 July 2015. Cited for the absence of any computational-method provision. https://www.osc.ca/sites/default/files/2020-09/rule_20150701_51-101_unofficial-consolidation.pdf

[7] **Society of Petroleum Evaluation Engineers.** Recommended Evaluation Practices, the published series of ten. Voluntary peer-approved guidance; SPEE states these “should not be confused with legal interpretations or regulatory approved guidelines.” Cited for the absence of any practice addressing software or algorithms. https://spee.org/recommended-evaluation-practices/

[8] **National Council of Examiners for Engineering and Surveying.** Position Statement 6.10, *Responsible Use of Artificial Intelligence in Engineering and Surveying*, adopted 2025, in the Policy Manual of August 2025, pp. 42–43. Model position statement; binding only as adopted by an individual licensing board. https://ncees.org/wp-content/uploads/2025/10/Policy-manual_August-2025_web.pdf

[9] **National Council of Examiners for Engineering and Surveying.** Model Law and Model Rules, August 2025. Cited for the **absence** of any AI provision, and for the definition of responsible charge as “direct control and personal supervision.” https://ncees.org/wp-content/uploads/2025/09/Model-Law_August-2025_web.pdf

[10] **National Society of Professional Engineers, Board of Ethical Review.** Case 24-2, *Use of Artificial Intelligence in Engineering Practice*, 18 July 2024. Advisory ethics opinion; non-binding. https://www.nspe.org/career-growth/ethics/board-ethical-review-cases/use-artificial-intelligence-engineering-practice

[11] **Primary filing data.** 2025 annual reports of three SIC-1311 issuers whose filings co-mention machine learning and proved reserves, read in full to establish context. In each, every occurrence sits in Item 1A risk factors and concerns

cybersecurity or generic AI-adoption risk. Filings retrieved from the Commission’s electronic archive.

[12] **Primary filing data.** Registration statement on Form F-1 filed 16 March 2023 (File No. 333-270624) disclosing an independent evaluator’s use of machine learning models within its reserves technology discussion, and the associated staff comment letter of 31 March 2023, which raised no comment on reserves or technology and stated that review was limited to the issues addressed.

[13] **US Securities and Exchange Commission, Investor Advisory Committee.** Recommendation on artificial intelligence disclosure, approved 4 December 2025. Advisory only; not a rule. https://www.sec.gov/files/approved-artificial-intelligence-disclosure-recommendation-120425.pdf

[14] **US Securities and Exchange Commission.** Press release 2024-36, 18 March 2024, announcing settled charges against two investment advisers for misleading statements about artificial intelligence. Settled enforcement orders under the Investment Advisers Act; the quoted extension to issuers is a statement of enforcement posture, not a rule. https://www.sec.gov/newsroom/press-releases/2024-36

[15] **US Securities and Exchange Commission, Division of Examinations.** Examination Priorities, fiscal year 2026. Staff statement; expressly “not a rule, regulation, or statement of the… Commission.” Cited here to correct circulating commentary: the document mentions artificial intelligence once, in a malware context. https://www.sec.gov/files/2026-exam-priorities.pdf