

Upstream O&G Sustainability Evaluation



Development of shale resources in the United States poses a number of challenging policy and technical issues related to the environment, including water demand, groundwater and surface water protection, air emissions, management of flowback water, traffic issues, and land use.

GSI employs a systematic process for evaluating the sustainability of a variety of O&G-related operations, allowing clients, site engineers, environmental specialists, regulators, and local stakeholders to readily assess how operations influence a series of **sustainability metrics** associated with key environmental, natural resource, safety, and socio-economic issues.

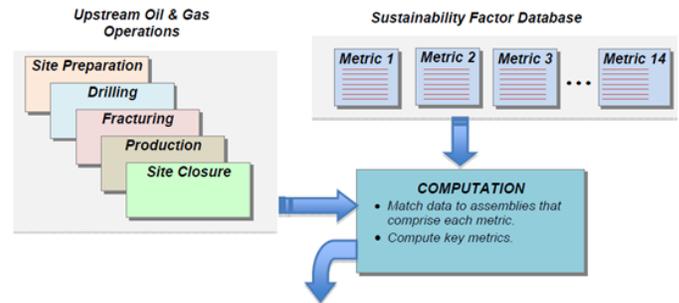
NATURE OF THE PROBLEM

- An emerging paradigm calls for environmental and energy-related activities to be conducted in a sustainable manner. The overarching concepts for sustainability include a wide range of environmental and human impacts considered over the short- and long term.
- Many responsible parties, including private sector companies and government agencies, analyze sustainability factors as part of their decision making processes.
- O&G operators need repeatable and defensible methodologies and tools to help measure, evaluate, and implement sustainable practices for entire range of O&G operations (i.e., site prep through closure).



provides an efficient way to compare overall impacts of various operating alternatives.

- Spreadsheet-based applications comprehensively compute metrics for all major nodes of work activity based on materials consumption, human health and safety, and environmental and social impacts.



Output for Sustainability Metrics – Option 1

Metric	Site Prep	Drilling	Fracturing	Production	Closure	TOTAL
1. Water Use	#	#	#	#	#	#
2. Carbon Footprint	#	#	#	#	#	#
3. Transportation Safety	#	#	#	#	#	#
(metrics 4-15 not shown)	#	#	#	#	#	#
14. Socioeconomic	#	#	#	#	#	#

KEY POINT:
Compare multiple options, and develop those with the most favorable sustainability metrics.

Sustainability Issue	Potential Metric *
1 Water Use	Consumptive Water Use
2 Wastewater Generated	Water Generated Requiring Treatment
3 Recycling	Water Recycled
4 Carbon Footprint	CO ₂ Emissions
5 Air Emissions	Air Emissions
6 Transportation	Distance Driven
7 Safety	Workplace and Driving Injuries
8 Chemical Toxicity	Chemical Waste Generated
9 Ecological Impacts	Resource Service
10 Groundwater Impacts	Incidents of Groundwater Impact
11 Land Disturbance	Roads, Pads, Storage Ponds Construction
12 Surface Water Impacts	Spilled Produced Water
13 Energy Use	Energy Used
14 Socioeconomic	Employment; Revenue; Property Tax Base

PROPOSED SOLUTION

- For the U.S. Air Force, GSI developed the Sustainable Remediation Tool (**SRT™**), a user-friendly software tool for comparing the relative sustainability of environmental remediation alternatives.
- Employ easy-to-use decision support tools to help O&G operators incorporate sustainability concepts into decision-making and optimize future operations.

HOW IT WORKS

- Systematic estimation of key sustainability metrics in terms of real-world quantifiable metrics, such as energy use, resource consumption, and air emissions,

BENEFITS

- Preclude outcomes that may correct one problem but cause or exacerbate another.
- When summarized by key metrics, both short- and long-term environmental outcomes can inform overall decision making and reduce overall costs.
- More environmentally efficient and cost-effective operations.

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