

# Comparative Analysis: 3D Seismic vs. RSS-NMR Technology

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The comparative assessment of costs and timelines between a conventional **3D Seismic** campaign followed by drilling versus the utilization of **RSS-NMR (Remote Sensing Systems - Nuclear Magnetic Resonance)** technology highlights profound structural differences. 3D seismic relies heavily on extensive physical infrastructure on the ground, whereas RSS-NMR is a passive, non-invasive method, radically transforming the financial and administrative footprint of the project.

Below is a detailed and comparative analysis of costs, infrastructure requirements, and permitting timelines.

## 1. Global Cost Comparison

### 3D Seismic (Exploration + Drilling)

Exploration using 3D seismic involves a massive deployment of personnel, heavy vehicles (vibrator trucks) or explosives, and the installation of thousands of ground sensors (geophones).

- **Data Acquisition & Mobilization:** Very high. Requires mobilizing specialized service contractors (e.g., CGG, Schlumberger), transporting fleets of vibrator trucks or helicopters, and clearing survey lines (layons) through vegetation.
- **Environmental Permitting & Licensing:** High cost due to extensive Environmental Impact Assessments (EIAs) required for deforestation, wildlife disruption, and the use of explosives.
- **Social Licensing:** Substantial financial compensation is often required for local communities, farmers, or landowners due to surface damages (crop destruction, noise pollution).
- **Estimated Total Cost (Standard):** Generally between **\$20,000 and \$50,000 per km<sup>2</sup>** for acquisition alone, quickly escalating to several million dollars for a standard block, excluding subsequent exploration drilling costs.

### RSS-NMR Technology

RSS-NMR captures nuclear magnetic resonance signals remotely (often via satellite imagery, airborne platforms, or passive surface stations) to directly detect the presence and characteristics of fluids (hydrocarbons, water).

- **Data Acquisition & Mobilization:** Low to moderate. The absence of heavy ground equipment drastically reduces logistical costs and the dependence on heavy oilfield service providers.
- **Environmental Permitting & Licensing:** Minimal. Because the method is passive and does not disturb the subsurface or surface, environmental compliance is heavily streamlined (no heavy EIA required).
- **Social Licensing:** Virtually zero or very limited, as there is no physical intrusion, land degradation, or disturbance to local populations.
- **Estimated Total Cost:** Drastic reduction (often **60% to 80% cheaper** than a conventional 3D campaign to cover the same surface area).

Cost Item	3D Seismic + Drilling	RSS-NMR Technology
<b>Service Provider Mobilization</b>	Very High (Heavy logistics, large field crews, equipment transport)	Very Low (Data processing, minimal field crew if any required on site)
<b>Environmental Licensing</b>	High (Mandatory impact studies, audits, mitigation measures)	Negligible (Passive technology with zero physical impact on the ecosystem)
<b>Social License</b>	High (Protracted negotiations, community compensation, risk of operational blockades)	Very Low (No intrusion or land degradation)
<b>On-Site Installation</b>	High (Base camps, access road construction, ground preparation)	Virtually Zero (No heavy infrastructure required prior to precise targeting)
<b>Associated Drilling Cost</b>	"Pay to see" (High risk of dry holes, inflating overall project costs)	"Sweet point" targeting (Optimized success rate, reduction of unnecessary wells)

## 2. Difference in Permitting Timelines (in Months)

The regulatory process is the primary bottleneck for 3D seismic. RSS-NMR allows operators to bypass the vast majority of environmental and social bureaucracy.

### Timelines for 3D Seismic

- Exploration Permit (Seismic):** 6 to 12 months. This timeframe includes drafting Environmental Impact Assessments (EIAs), public hearings, and negotiating social licenses (prior consultation with local communities).
- Drilling Permit (Well):** 12 to 24 months. Obtaining authorization to drill an exploration well after 3D interpretation requires a new cycle of engineering permits, spill/hazard management plans, and strict government approvals.

*Average Total Timeline: 18 to 36 months before spudding the first well.*

### Timelines for RSS-NMR

- Exploration Permit (Analysis):** 1 to 3 months. Since it is a remote acquisition or passive surface analysis technology, administrative clearances are often limited to simple survey or data access rights, bypassing heavy public consultation.
- Drilling Permit (Targeted):** 6 to 12 months. While drilling itself always requires rigorous permits, having immediate, precise magnetic resonance data on the "sweet points" (reducing subsurface uncertainty and potential footprint) accelerates approval from environmental authorities.

*Average Total Timeline: 7 to 15 months.*

### Timeline Synthesis (Time-to-Market)

3D Seismic : [--- Exploration (6-12 m) ---][----- Drilling / Permitting (12-24 m) -----] = 18-36 months  
 RSS-NMR : [- Exp (1-3 m) -][--- Drilling / Permitting (6-12 m)

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= 7-15 months

## In Summary: The Strategic Advantage

From a financial and administrative perspective, **3D Seismic** represents a heavy and high-risk capital commitment ("pay to see"), where a major portion of the budget is consumed by logistics, environmental bureaucracy, and social risk management before ever establishing commercial hydrocarbon presence.

Conversely, **RSS-NMR** acts as an upstream de-risking tool. By eliminating the physical ground footprint during the exploration phase, it delivers:

1. A direct **60% to 80% savings** on preparation and licensing costs.
2. A time savings of approximately **1 to 2 years** on the permitting schedule, dramatically accelerating the path to first production.