

Global Fire Intelligence System

FIRMS + OpenStreetMap + Cloud Cover • One-Page Project Brief for Management
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Executive Summary

We propose a low-cost, high-speed global system that fuses NASA FIRMS satellite hotspot data with OpenStreetMap (OSM) ground features and seasonal cloud-cover statistics. The system estimates what is burning, filters persistent industrial false positives, builds pattern-of-life baselines for thermal and industrial plants, and quantifies weather-driven detection gaps. All primary data sources are free and publicly available, enabling rapid delivery of operational value.

Value Proposition

- **Speed to value** — First usable alerts and maps within 2–3 weeks using existing open data APIs; no new sensors or commercial imagery licenses required for core function.
- **Minimal cost** — Leverages free NASA FIRMS, OpenStreetMap, and open meteorological reanalysis (ERA5 / NOAA). Cloud compute and storage are the primary expenses.
- **Actionable intelligence** — Alerts include packaged analyst PDFs (imagery + context + links) so teams spend time deciding, not chasing data.

Core Capabilities

- **Hotspot-to-feature correlation** — Spatially join FIRMS detections with OSM buildings, land-use, power plants, and industrial tags to estimate what is on fire.
- **Pattern-of-life for plants** — Track recurring thermal signatures at known industrial and power-generation sites. Sudden sustained drops can flag possible outages. *Caveat: Heat signature is an imperfect proxy for utilization; efficiency, load, and weather affect the signal.*
- **Unmapped industrial discovery** — Persistent hotspots with no OSM match generate review alerts for possible undocumented facilities or data gaps.
- **Seasonal detection likelihood** — Global maps of expected cloud cover (tropical rainforests often ≥80–98%) inverted into probability of optical detection. Highlights regions where fires are systematically under-observed.
- **Ocean / false-positive handling** — All ocean-detected hotspots (gas flares, ships, etc.) are automatically flagged for analyst review.

Data Sources (All Open / Extant)

NASA FIRMS (MODIS/VIIRS active fires) • OpenStreetMap (buildings, industrial, power) • ECMWF ERA5 / NOAA cloud & weather reanalysis • Global Power Plant Database (supplemental industrial filter) • Sentinel-2 / Landsat / Planet (optional visual context for analyst packages).

Key Deliverables & 1-Month Timeline

- Filtered alert stream + analyst PDF packages (hotspot, OSM context, cloud status, recent/historic imagery links, time-series).
- Global seasonal cloud / detection-likelihood maps.
- Pattern-of-life baselines for selected thermal/industrial plants with outage-alert logic.
- Lightweight dashboard (Streamlit/Dash) + scheduled pipeline. Development broken into 1–2 hour sprints over ~4 weeks (~30 focused hours).

Current Status & Immediate Next Steps

Concept and high-level architecture defined. Ready to begin Week 1 (environment + FIRMS/OSM ingestion scripts). Recommend a short pilot on a high-cloud region or known industrial cluster to validate pattern-of-life and false-positive filtering before full global scale.