Functional Requirements Document

Indirect Tax Reporting for Oil Products – Release 1

**Disclaimer: This FRD was prepared for a fictional company and using information from AI (Copilot and/or ChatGPT) acting as the stakeholders.*

Version 1.3

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Date last updated: 26-Sep-2025

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1. Document History

1.1 Revision History

Version	Date	Author	Revision Description
1.0	22-Sep-2025	S.F.	Initial draft
1.1	24-Sep-2025	S.F.	Added detailed requirements, reporting list and acceptance criteria.
1.2	25-Sep-2025	S.F.	Separated the requirements into smaller tables by categories. Added Use Case Descriptions, Use Case Diagram, Process Flow, Context Model, and High-Level Solution Diagram. Added Tool Selection section.
1.3	26-Sep-2025	S.F.	Updated Data Requirements and Reporting List. Added Tax Rules Overview.

1.2 Document Approval

Name	Role	Approve or Review	Date
First Last	Indirect Tax Team Manager	Approve	28-Sep-2025
First Last	Project Sponsor	Approve	28-Sep-2025
First Last	IT / ETRM System Owner	Approve	28-Sep-2025

1.3 Distribution

Name	Role	Date
First Last	Project Sponsor	27-Sep-2025
First Last	Indirect Tax Team Manager	27-Sep-2025
First Last	Tax Analyst SME	27-Sep-2025
First Last	Trade Operations SME	27-Sep-2025
First Last	Logistics Team SME	27-Sep-2025
First Last	Regulatory Affairs	27-Sep-2025
First Last	Tax Process Architect	27-Sep-2025
First Last	IT / ETRM System Owner	27-Sep-2025
First Last	Solution Designer	27-Sep-2025
First Last	Developer	27-Sep-2025
First Last	QA Team	27-Sep-2025

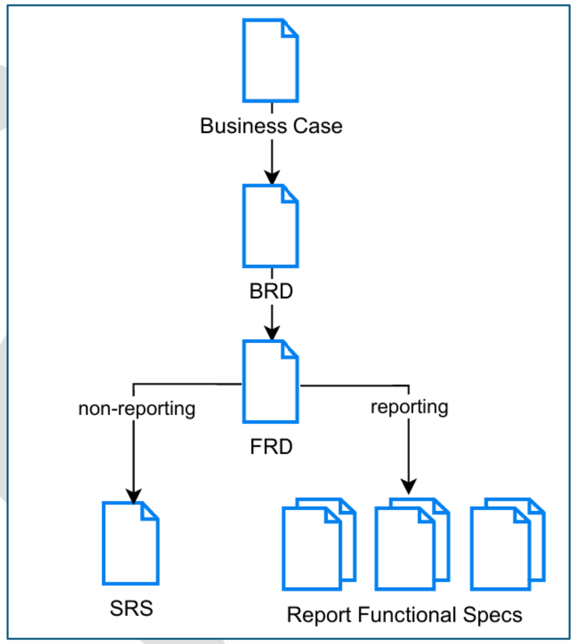
2. Introduction

2.1 Purpose of the Document

This document outlines the functionality and features a solution must have to fulfill the business requirements. It focuses on what the system should do, not how it will be implemented.

2.2 FRD Scope

It covers both reporting and non-reporting needs identified in the Business Case and BRD. Specifically, it provides an overview of the core reports required for tax reporting, along with the non-reporting capabilities such as the tax rules engine, real-time validation, auditability, and data integration. These requirements ensure alignment with the business objectives and serve as the foundation for subsequent detailed specifications.



Detailed report designs, layouts, and mockups will be documented separately in individual **Report Functional Specifications,** while non-reporting system-level technical requirements will be expanded in the **System Requirements Specification (SRS).**

Out of scope for this FRD are low-level design details, database structures, testing procedures, deployment activities, and training materials.

2.3 Intended Audience

- Business Stakeholders
- Analysts & Designers
- Development Teams
- Testers and QA Analysts

3. Project Summary and Scope

3.1 Background

The core business problem is that tax analysts rely heavily on spreadsheets and manual reconciliation across multiple ETRM modules (trade capture, logistics, invoicing). This approach is error-prone, resource-intensive, and unsustainable as the business scales or regulations evolve.

To address this, the project aims to implement an **external, low-code tax rules engine** integrated with the ETRM system. The solution will enable real-time validation of transactions, automate monthly reporting, improve audit readiness, and empower tax analysts to maintain tax rules without IT support.

The overarching goals are to **increase automation (90%+ of reporting), reduce errors by 50%, ensure 100% traceability, and lower compliance risk**, all while providing a scalable platform for future growth.

3.2 In Scope

The following items are in scope of Release 1:

- **Tax Rule Engine:** Configurable rule engine; exemption handling; volume/value thresholds.
- **Monthly Tax Reports:** Automated jurisdiction-specific tax report generation.
- **Real-Time Validation:** Real-time checks across trade, movement, invoicing data.
- **Audit-Ready Logging:** Role-based audit trails and override logging.
- **Master Data Mapping:** Validation of core tax master data inputs.

3.3 Out of Scope

The following items are NOT in scope of Release 1:

- **Direct Filing or Submission to Tax Authorities:** This project focuses on internal tax report generation, not on electronic filing or integration with government portals.
- **Full Global Rollout to All Jurisdictions:** <u>Release 1 will focus on one jurisdiction (the US) for a controlled pilot.</u> Global expansion may be scoped in future phases.
- **Changes to Core Trade, Logistics, or Invoicing Workflows:** We will read and validate data from these modules but not redesign or alter their business processes.
- **Migration of Historical Tax Data:** Only current and future transactions will be handled. Historical data cleanup or migration is deferred.
- **Exception Handling Workflow:** Approval routing for overrides or flagged records.
- **Rule Simulation Tools:** Strategic forecasting or tax modeling capabilities.

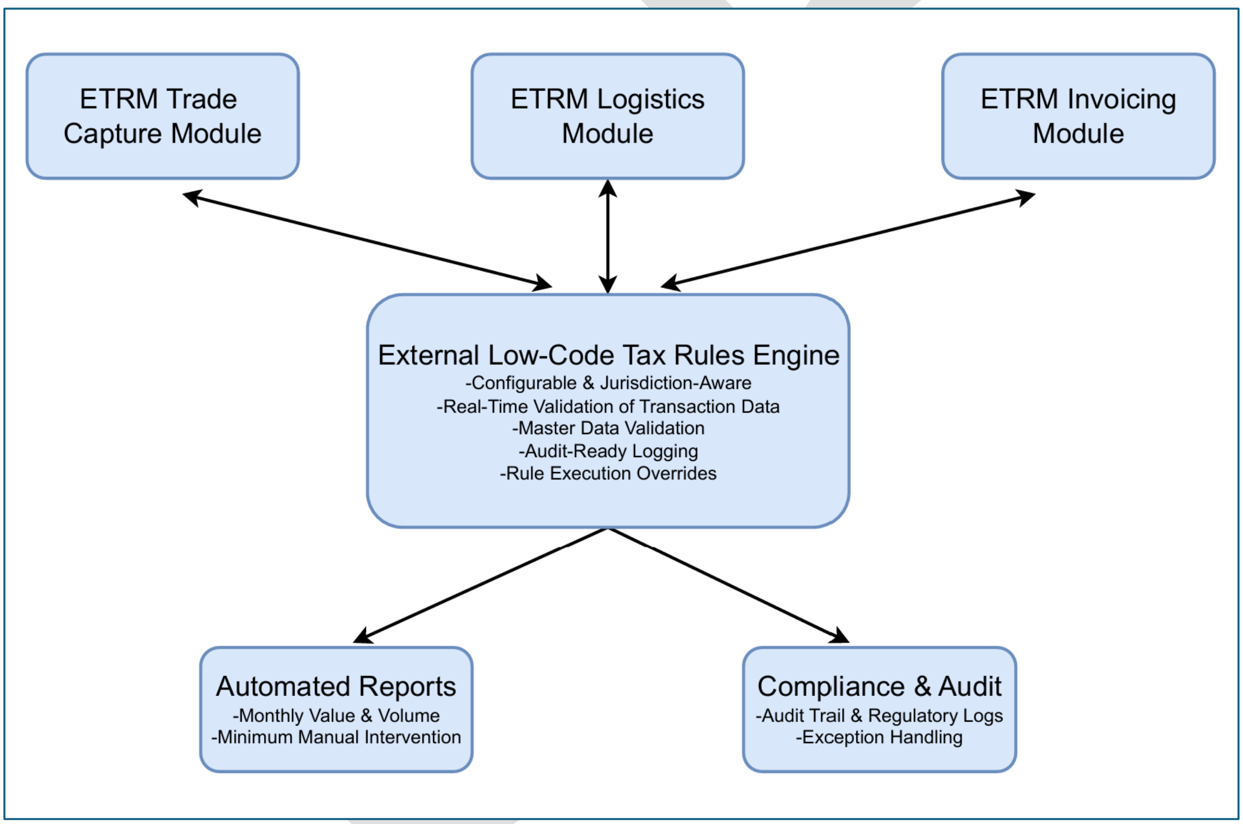
4. System Overview

4.1 High-Level Solution Summary

The proposed solution is the implementation of an external, configurable tax rules engine that integrates seamlessly with the existing ETRM system. The rules engine will apply jurisdiction-specific indirect tax logic, validate transaction data in real time, and automate the calculation of tax obligations across trade, logistics, and invoicing modules.

This engine provides flexibility by allowing tax analysts to manage and update tax rules without IT intervention, ensuring timely adaptation to frequent regulatory changes. It also standardizes master data elements to improve reporting consistency, while generating compliance-ready reports and audit trails with full traceability.

Through bi-directional integration with the ETRM system, the solution enhances data quality, reduces manual effort, and increases scalability, positioning the organization for more efficient and transparent tax reporting as it expands into new markets.



4.2 Actors & Users

The proposed solution will be used and supported by multiple business and technical stakeholders. The primary users are **Tax Analysts**, who will interact directly with the tax rules engine to review reports, validate results, and update rules as regulations evolve. They will rely on automated reporting and dashboards for compliance and audit readiness.

Other key actors include:

- **Trade and Logistics Users** – enter transaction data (trade deals, shipments, invoices) that will be validated in real time by the tax engine.
- **IT/System Administrators** – oversee integration between the ETRM system and the tax engine, manage technical configurations, and ensure system availability.
- **Tax SMEs/Process Owners** – provide oversight on jurisdiction-specific tax logic, approve rule updates, and ensure alignment with regulatory requirements.
- **Audit & Compliance Teams** – access audit trails and reports to validate compliance, review override actions, and prepare for regulatory audits.
- **Business Leaders/Executives** – consume high-level reporting outputs and KPIs to assess compliance risk, operational efficiency, and financial impact.

Together, these actors ensure the solution operates effectively: business users manage day-to-day tax compliance, while technical teams maintain stability and scalability of the system.

5. Functional Requirements

5.1 Tax Rule Management

Req#	BRD Req	Requirement (Short Name)	Requirement Description	Priority
FR-01.01.01	FR-01.01 Configurable Engine	Centralized Rule Library	Users need ability to see a single view of all rules grouped by jurisdiction, product type, or transaction type.	H
FR-01.01.02	FR-01.01 Configurable Engine	Rule Conflict Check	System must validate and flag conflicts between rules before they are activated.	H
FR-01.01.03	FR-01.01 Configurable Engine	Rule Search	Users should be able to search, filter, and navigate through rules quickly.	M
FR-01.02.01	FR-01.02 Analyst Rule Updates	No-Code Rule Updates	Tax Analysts must be able to add, update, or deactivate rules via a no-code interface.	H
FR-01.02.02	FR-01.02 Analyst Rule Updates	Rule Simulation	Analysts must be able to simulate/test rule changes in a sandbox environment before deploying them.	H
FR-01.02.03	FR-01.02 Analyst Rule Updates	Version Control	System must provide version control so users can roll back to earlier rule sets if needed.	H

5.2 Automated Tax Calculation

Req#	BRD Req	Requirement (Short Name)	Requirement Description	Priority
FR-02.01.01	FR-02.01 Auto Tax Calc	Automated Calculation	System must auto-calculate indirect taxes on trade, logistics, and invoicing data using jurisdiction-specific rules.	H
FR-02.01.02	FR-02.01 Auto Tax Calc	Override with Justification	Users must be able to override system-calculated tax values but must provide a justification.	H

5.3 Real-Time Data Validation

Req#	BRD Req	Requirement (Short Name)	Requirement Description	Priority
FR-03.01.01	FR-03.01 Real-Time Validation	Immediate Validation	As users enter transaction data, the system must immediately validate required tax fields (e.g., jurisdiction, tax code, product mapping).	H
FR-03.01.02	FR-03.01 Real-Time Validation	Validation Alerts	Invalid or missing fields must trigger real-time error messages with corrective guidance.	H
FR-03.02.01	FR-03.02 Compliance Checks	Transaction Blocking	Transactions must be blocked from progressing if they fail compliance checks.	H
FR-03.02.02	FR-03.02 Compliance Checks	Non-Compliant Messages	The system should provide error messages that explain why the data is non-compliant.	H
FR-03.02.03	FR-03.02 Compliance Checks	Exception Escalation	Users need the ability to escalate exceptions for review by a Tax SME.	M

5.4 Reporting Automation & Insights

Req#	BRD Req	Requirement Name	Requirement Description	Priority
FR-04.01.01	FR-04.01 Auto Tax Reports	Scheduled Reports	Monthly jurisdiction-specific tax reports should be auto-generated without user intervention.	H
FR-04.01.02	FR-04.01 Auto Tax Reports	Ad Hoc Reports	Users must be able to generate ad hoc reports on demand.	M
FR-04.01.03	FR-04.01 Auto Tax Reports	Report Export	Reports must be exportable in PDF, Excel, and CSV formats.	M
FR-04.02.01	FR-04.02 Compliance Dashboard	KPI Dashboard	Dashboards must provide at-a-glance KPIs (e.g., compliance %, error rate, audit readiness).	H
FR-04.02.02	FR-04.02 Compliance Dashboard	Drill-Down Capability	Dashboard users must be able to drill down into transaction-level details.	M
FR-04.02.03	FR-04.02 Compliance Dashboard	Role-Based Views	System should allow role-based views; Analysts see detailed transactions; executives see summaries.	M

5.5 Auditability & Compliance

Req#	BRD Req	Requirement Name	Requirement Description	Priority
FR-05.01.01	FR-05.01 Audit Log	Action Logging	System must log every calculation, rule change, and override with timestamp and user ID so that tax analysts can review history.	H
FR-05.01.02	FR-05.01 Audit Log	Log Integrity	Logs must not be editable by end users.	H
FR-05.02.01	FR-05.02 Log Review Access	Log Filtering	Tax Analysts must be able to query and filter logs by date, user, or transaction ID.	M
FR-05.02.02	FR-05.02 Log Review Access	Audit Reports	System must provide pre-built audit reports available for download.	M
FR-05.02.03	FR-05.02 Log Review Access	Log Export	Logs must be exportable in CSV and PDF formats for regulators and auditors.	M

5.6 Data Integration & Quality

Req#	BRD Req	Requirement Name	Requirement Description	Priority
FR-06.01.01	FR-06.01 ETRM Integration	ETRM Data Sync	System must pull tax-relevant data from ETRM trade, logistics, and invoicing modules so that tax analysts don't have to re-enter it.	H
FR-06.01.02	FR-06.01 ETRM Integration	Integration Failure Alerts	Failed integrations must trigger alerts to IT and Tax Analysts.	H
FR-06.02.01	FR-06.02 Master Data Check	Master Data Validation	System must validate master data at entry so that invalid codes/regions are caught early.	H
FR-06.02.02	FR-06.02 Master Data Check	Governance Reports	A quarterly report on master data issues should be available for governance review.	M

6. Non-Functional Requirements

6.1 Performance & Reliability

Req#	BRD Req	Requirement Name	Requirement Description	Priority
NFR-01.01.01	NFR-01.01 Real-Time Validation	Real-Time Validation Speed	System must validate transactions and display results within 3 seconds for 95%+ of cases.	H
NFR-01.01.02	NFR-01.01 Real-Time Validation	Validation Messaging	System must display clear, human-readable error/confirmation messages during validation.	H
NFR-01.02.01	NFR-01.02 High Availability	High Availability	System must maintain 99.9% uptime during peak trading and reporting periods.	H
NFR-01.02.02	NFR-01.02 High Availability	Planned Maintenance Windows	Maintenance must occur outside peak hours, with >95% of updates scheduled off-hours.	M
NFR-01.03.01	NFR-01.03 Fast Report Process	Monthly Report Processing	System must generate monthly tax reports (90% coverage) within 2 hours.	H
NFR-01.03.02	NFR-01.03 Fast Report Process	Ad Hoc Report Performance	System must generate ad hoc reports (100k records) within 2 minutes for 95%+ of cases.	M

6.2 Scalability

Req#	BRD Req	Requirement Name	Requirement Description	Priority
NFR-02.01.01	NFR-02.01 Scalable Growth	Jurisdiction Scalability	System must allow adding new jurisdictions without redesign and in <1 day configuration effort.	H
NFR-02.01.02	NFR-02.01 Scalable Growth	Product Scalability	System must support additional product types without degrading validation or reporting performance.	M

6.3 Usability

Req#	BRD Req	Requirement Name	Requirement Description	Priority
NFR-03.01.01	NFR-03.01 User-Friendly Rules	No-Code Rule UI	Business users must configure new tax rules via dropdowns, checkboxes, and simple UI elements.	H
NFR-03.01.02	NFR-03.01 User-Friendly Rules	User-Friendly Errors	Error messages must use plain language understandable without SME support.	M
NFR-03.01.03	NFR-03.01 User-Friendly Rules	Analyst Training Efficiency	Analysts must be able to learn and configure tax rules after ≤2 hours of guided training.	M

6.4 Compliance & Security

Req#	BRD Req	Requirement Name	Requirement Description	Priority
NFR-04.01.01	NFR-04.01 Role-Based Access	Role-Based Access Control	Only authorized roles may create, override, or export tax rules and reports.	H
NFR-04.01.02	NFR-04.01 Role-Based Access	Access Request Workflow	Users must follow a request/approval workflow before elevated role access is granted.	M
NFR-04.02.01	NFR-04.02 Audit Log Retention	Audit Log Retention	Audit logs must be stored and retrievable for at least 7 years.	H
NFR-04.02.02	NFR-04.02 Audit Log Retention	Log Query & Filters	Analysts must filter logs by date, user, or transaction ID in <1 minute.	H

6.5 Maintainability & Support

Req#	BRD Req	Requirement Name	Requirement Description	Priority
NFR-05.01.01	NFR-05.01 Low IT Dependency	Analyst Rule Updates	Analysts must handle 80% of tax rule updates without IT involvement.	H
NFR-05.01.02	NFR-05.01 Low IT Dependency	Fast Updates	Common updates (rates, exemptions) must take <10 minutes to complete.	M
NFR-05.02.01	NFR-05.02 Vendor Support	Vendor SLA Response	Vendor must resolve or mitigate high-priority issues within 4 business hours.	H
NFR-05.02.02	NFR-05.02 Vendor Support	Patch & Upgrade Cycles	Vendor must deliver quarterly patches/upgrades with ≤2 hours downtime per release.	M

7. Acceptance Criteria

Acceptance criteria for requirements stated as checklists.

7.1 Functional Requirements

Req#	Requirement Name	Acceptance Criteria
FR-01.01.01	Centralized Rule Library	- User views all rules on single screen - Rules grouped by jurisdiction, product, or transaction - Rules searchable/filterable by jurisdiction, product, effective date
FR-01.01.02	Rule Conflict Check	- System blocks saving if conflict exists - Conflict flagged with error - Error identifies conflicting rule IDs
FR-01.01.03	Rule Search	- Users search rules by jurisdiction, product, effective date - Results load within 2 seconds - Navigation between results seamless
FR-01.02.01	No-Code Rule Updates	- Analyst adds, updates, deactivates rules via UI - Changes applied in <1 min - No coding/IT required
FR-01.02.02	Rule Simulation	- Analysts simulate/test rule changes in sandbox - Sandbox shows pass/fail results - Analyst views impact before deployment
FR-01.02.03	Version Control	- User rolls back to any version - Version history includes date, user, changes - Rollback successful without data loss
FR-02.01.01	Automated Calculation	- Tax auto-calculated at transaction save - Jurisdiction rules applied - 100% calculations in <2 sec latency
FR-02.01.02	Override with Justification	- Override only allowed if justification entered - Override reason, user ID, timestamp stored - Overrides logged for audit
FR-03.01.01	Immediate Validation	- System validates jurisdiction, tax code, mapping at entry - Invalid data rejected immediately - Results displayed instantly
FR-03.01.02	Validation Alerts	- Missing/invalid fields trigger real-time error - Error displayed with corrective guidance - User sees issue at entry
FR-03.02.01	Transaction Blocking	- Transactions blocked if compliance check fails - User notified with error - Cannot proceed until resolved
FR-03.02.02	Non-Compliant Messages	- Error clearly states reason - Error suggests required fix - Message human-readable (not codes)
FR-03.02.03	Exception Escalation	- User escalates exception to SME - SME notified within 5 minutes - Escalation tracked in workflow
FR-04.01.01	Scheduled Reports	- Monthly reports auto-generated - Reports delivered by deadline - No user intervention needed
FR-04.01.02	Ad Hoc Reports	- User generates on-demand report in <2 min - Filters applied successfully - Report data accurate

Req#	Requirement Name	Acceptance Criteria
FR-04.01.03	Report Export	- Reports exportable in PDF, Excel, CSV - Exported data matches on-screen - No data loss
FR-04.02.01	KPI Dashboard	- Dashboard shows compliance %, error rate, audit readiness - Updated daily - Data visible at login
FR-04.02.02	Drill-Down Capability	- Users drill from KPI to transaction detail - Drill-down loads in <2 sec - Data matches source transactions
FR-04.02.03	Role-Based Views	- Analysts see detailed transactions - Executives see summaries - Views enforced by role test
FR-05.01.01	Action Logging	- Every calc, rule change, override logged - Log includes user ID + timestamp - Logs stored for review
FR-05.01.02	Log Integrity	- Logs read-only - Any edit attempt blocked - Log tampering alert sent
FR-05.02.01	Log Filtering	- User filters by date, user, transaction - Filter results in <1 min - Results accurate
FR-05.02.02	Audit Reports	- Pre-built reports downloadable in <1 min - Data accurate - Reports formatted for audit
FR-05.02.03	Log Export	- Logs exportable in CSV/PDF - No data loss - Exports open correctly
FR-06.01.01	ETRM Data Sync	- Trade, logistics, invoice data pulled automatically - No duplicate entry - Data matches source system
FR-06.01.02	Integration Failure Alerts	- Failed integration triggers alert - Alert sent in <5 minutes - Alert received by IT + Analyst
FR-06.02.01	Master Data Validation	- Codes, counterparties, regions validated - Invalid data rejected - Error message shown
FR-06.02.02	Governance Reports	- Quarterly report generated - Report lists all master data issues - Available for governance review

7.2 Non-Functional Requirements

Req#	Requirement (Short Name)	Acceptance Criteria
NFR-01.01.01	Real-Time Validation Speed	- Validation results within 3 sec for 95%+ cases - Tested in UAT - Errors/confirmations display immediately
NFR-01.01.02	Validation Messaging	- Errors human-readable - Messages tested with users - ≥90% users confirm clarity
NFR-01.02.01	High Availability	- Uptime ≥99.9% during UAT stress test - Critical functions uninterrupted - Any outage recovers ≤2 min
NFR-01.02.02	Planned Maintenance Windows	- Maintenance runs off-hours - ≥95% updates outside peak - Advance notice ≥24h to users
NFR-01.03.01	Monthly Report Processing	- Month-end reports (90% coverage) generated in <2 hours - Verified in simulated run - Results accurate
NFR-01.03.02	Ad Hoc Report Performance	- Ad hoc (100k records) report in <2 min (95% cases) - Stress tested dataset - Response times logged

Req#	Requirement (Short Name)	Acceptance Criteria
NFR-02.01.01	Jurisdiction Scalability	- New jurisdiction added in <1 day config - No redesign needed - Rules applied correctly
NFR-02.01.02	Product Scalability	- Add 20% more product types - Validation remains <3 sec - Reports accurate
NFR-03.01.01	No-Code Rule UI	- Analyst configures new rule via UI - No IT help - Completed in <15 min
NFR-03.01.02	User-Friendly Errors	- Errors in plain language - 90%+ users understand w/o SME - Tested in training
NFR-03.01.03	Analyst Training Efficiency	- Analysts trained in ≤2h
NFR-04.01.01	Role-Based Access Control	- Unauthorized users blocked from restricted actions - Access control tested - Role enforcement confirmed
NFR-04.01.02	Access Request Workflow	- Access changes require request/approval - Approval logged - Tested in UAT workflow
NFR-04.02.01	Audit Log Retention	- Logs retrievable ≥7 years - Retention tested with old data - Logs accessible
NFR-04.02.02	Log Query & Filters	- Analyst retrieves logs by filter in <1 min - Filters tested for accuracy - Results complete
NFR-05.01.01	Analyst Rule Updates	- Analysts handle 8/10 sample updates w/o IT - Tested in UAT - Results correct
NFR-05.01.02	Fast Updates	- Common updates completed in <10 min - Measured in testing - 95% success rate
NFR-05.02.01	Vendor SLA Response	- ≥95% P1 issues resolved/mitigated in 4h - SLA report verified - Issues tracked
NFR-05.02.02	Patch & Upgrade Cycles	- Vendor delivers quarterly patches - Downtime ≤2h/release - Logs confirm completion

8. Reporting Overview

Below is a list of required reports. Separate report specs will be created to describe reports in detail.

ID	Report Name	Purpose	Req #
1	**Federal Excise Tax Monthly Accrual Report (Volume-Based)**	Tracks monthly federal excise tax accruals for quarterly Form 720 filing preparation, providing detailed volume and tax calculations by product category.	FR-04.01.01 Scheduled Reports
2	**State Motor Fuel Tax Monthly Return**	Generates monthly state motor fuel tax returns for all jurisdictions where the company is licensed, supporting direct filing with state revenue departments.	FR-04.01.01 Scheduled Reports
3	**Import Duty and Customs Tax Monthly Summary (Value-Based)**	Summarizes monthly import duties, customs taxes, and related fees for imported petroleum products to support customs reconciliation and duty optimization analysis.	FR-04.01.01 Scheduled Reports
4	**Local Sales Tax Summary Report (Value-Based)**	Calculates monthly local sales and use tax obligations on petroleum product sales, supporting local jurisdiction tax returns.	FR-04.01.01 Scheduled Reports
5	**KPI Dashboard**	Provides at-a-glance KPIs (e.g., compliance %, error rate, audit readiness).	FR-04.02.01 KPI Dashboard
6	**Audit Trail Report**	Provides detailed log of tax calculations, rule changes, overrides, and user actions with timestamps. Used for internal and external audits.	FR-05.02.02 Audit Reports
7	**Master Data Validation Report**	Provides detailed log of tax calculations, rule changes, overrides, and user actions with timestamps. Used for internal and external audits.	FR-06.02.02 Governance Reports

9. Use Cases & Diagrams

9.1 Use Cases by Actors

1. Tax Analyst

- Maintain Tax Rules
    - Add new tax rules
    - Update existing rules
    - Deactivate obsolete rules
- Simulate Rule Changes
- Roll Back to Previous Rule Version
- Review and Approve Overrides
- Generate Monthly Tax Reports
- Run Ad Hoc Tax Reports
- Export Reports (PDF/Excel/CSV)
- Review Audit Logs
- Filter & Query Logs (by user, date, transaction)
- Escalate Exceptions to SME

2. Tax SME (Senior/Compliance Role)

- Approve Complex Rule Updates
- Review Escalated Exceptions
- Review Governance Reports (quarterly master data issues)
- Approve Audit Reports for Regulators
- Validate Compliance KPIs

3. Trade/Logistics/Invoice User (Business User in ETRM)

- Enter Trade Transactions
- Enter Logistics Details
- Generate Invoices
- Correct Data After Validation Error
- Submit Transactions for Compliance Check

4. System (ETRM + Tax Engine)

- Perform Real-Time Validation on Entry
- Auto-Calculate Taxes (trade, logistics, invoice)
- Block Non-Compliant Transactions
- Trigger Alerts for Integration Failures
- Log All Actions (calculations, overrides, rule changes)
- Synchronize Master Data Across Modules
- Generate Scheduled Reports Automatically

5. IT / System Admin

- Configure System Integrations (ETRM ↔ Tax Engine)
- Monitor System Uptime & Maintenance
- Handle Integration Failure Alerts
- Manage Role-Based Access Control
- Maintain System Performance (scalability, patches, upgrades)

9.2 Use Case 1

ID & Name	**UC-01.02 / Maintain Tax Rules**
Requirement ID	FR-01.02 The solution must allow tax analysts (not IT) to update tax rules without code changes.
Actor	Tax Analyst (Primary), ETRM System integrated with tax engine (System)
Pre-condition	• Tax Analyst is authenticated and has appropriate role-based access. • The Tax Rules Engine is online and available. • Relevant master data (jurisdictions, product codes, tax regions) is available and validated.
Trigger	Tax Analyst needs to create, update, or deactivate a tax rule due to a new regulation, updated threshold, or correction of an error.
Post-condition	• The rule is stored in the centralized rule library with proper version control. • The updated/added rule is available for simulation/testing before deployment. • The system logs the change with timestamp, user ID, and justification (if required).

Main Success Path (Primary Flow)	User Maintains Tax Rules
Actor Actions	System Response
1. Tax Analyst navigates to the Tax Rule Management UI. 2. Analyst selects “Add New Rule” or “Edit Existing Rule.” If the user has permission, go to next step. Else, if user does not have permission, go to Exception Flow 1 (EF1).	3. System displays form fields (jurisdiction, product type, transaction type, rate, exemption criteria, effective dates, etc.).
4. Analyst enters or modifies rule details.	5. System validates inputs (mandatory fields, no duplicates, consistency checks). If valid, go to next step, Else, if invalid, go to Alternate Flow 1 (AF1).
6. Analyst submits the rule for simulation/test run.	7. System runs simulation against sample data and displays results. If successful, go to next step. Else, if simulation fails, go to Alternate Flow 2 (AF2).
8. Analyst reviews results and confirms deployment.	9. System activates the rule, updates the rule library, and logs the change. If successfully logged, go to next step. Else, if logging failed, go to Exception Flow 2 (EF2). 10. Confirmation message is displayed to Analyst.

Alternate Flow 1 (AF1)	Rule Conflict Detected
Actor Actions	System Response
	1. System flags the conflict with error message (e.g., “Rule overlaps with Jurisdiction X, Product Y”) and prompts the user to correct them before proceeding.
2. Go to Step 4 of PF.	

Alternate Flow 2 (AF2)	Simulation Fails
Actor Actions	System Response
	1. Simulation shows incorrect or unexpected results.
2. Go to Step 4 of PF.	

Exception Flow 1 (EF1)	Insufficient Permissions
Actor Actions	System Response
	1. System blocks action with message: “Access denied. Request elevated permissions.”

Exception Flow 2 (EF2)	Audit Logging Failure
Actor Actions	System Response
	1. User notified: “Rule update failed. Audit log not available. Contact IT Support.”

9.3 Use Case 2

ID & Name	**UC-04.01 / Generate Monthly Tax Report**
Requirement ID	FR-04.01 The solution must automate generation of monthly indirect tax reports.
Actor	Tax Analyst (Primary), ETRM System integrated with tax engine (System)
Pre-condition	• User has valid system access with reporting role/permissions. • Transactional and tax data are validated and available. • Reporting templates are preconfigured in the system.
Trigger	System's automated scheduler runs, or Tax Analyst manually initiates the monthly report.
Post-condition	• Monthly report is generated and stored in system repository. • Report is available for download/export in multiple formats. • Audit log updated with report generation details (user, timestamp, type).

Main Success Path (Primary Flow)	User Generates Monthly Tax Report
Actor Actions	System Response
If user wants to wait for scheduled reports, go to Step 1 Else, if user wants to initiate a manual report run, go to Alternate Flow 1 (AF1).	1. System scheduler initiates monthly reporting run. 2. System retrieves all validated transactional and tax data for the reporting period. If data retrieval is successful, proceed to Step 3. Else, if data retrieval failed, go to Exception Flow 1 (EF1) 3. System applies jurisdiction-specific tax rules and consolidates data. 4. System generates monthly tax reports (jurisdiction-specific format). 5. Report is saved in the reporting repository. If report has complete data, then go to Step 6. Else, if report is missing data, go to Alternate Flow 2 (AF2). 6. System notifies the Tax Analyst that the report is available.
7. Tax Analyst views, downloads, or exports the report in the desired format (PDF, Excel, CSV).	8. System updates audit log with report generation details. If successfully logged, end. Else, if logging failed, go to Exception Flow 2 (EF2).

Alternate Flow 1 (AF1)	Manual Run Instead of Scheduled Run
Actor Actions	System Response
1. Analyst initiates "Generate Report" manually before the scheduled job.	2. Go to Step 2 of PF.

Alternate Flow 2 (AF2)	Partial Data Availability
Actor Actions	System Response
	1. System marks report as "Incomplete" and notifies Tax Analyst.
2. If incomplete data is ok, Go to Step 7 of PF. Else, if incomplete data is not ok, wait a day and go to Alternate Flow 1 (AF1).	

Exception Flow 1 (EF1)	Data Retrieval Failure
Actor Actions	System Response
	1. Report generation aborted. 2. User notified: "Data unavailable. Report generation failed. Contact IT Support."

Exception Flow 2 (EF2)	Audit Log Failure
Actor Actions	System Response
	1. System blocks report from final release until logging issue resolved. 2. User notified: "Audit log cannot be updated. Contact IT Support."

9.4 Use Case 3

ID & Name	**UC-03.01 / Perform Real-Time Validation on Entry**
Requirement ID	FR-03.01 The solution must validate trade, logistics, and invoicing data in real time.
Actor	Trade & Logistics Users (Primary), ETRM System integrated with tax engine (System)
Pre-condition	• User has valid access to create or update transactions. • Master data (products, tax codes, jurisdictions) is available and current. • Validation rules are configured and active in the system.
Trigger	User enters a new trade, logistics, or invoicing transaction into the system.
Post-condition	• Transaction is validated against jurisdictional and tax rules. • If valid, the transaction proceeds to the next step (saved/approved). • If invalid, user is notified with corrective guidance. • Audit log captures validation outcome.

Main Success Path (Primary Flow)	Perform Real-Time Validation on Entry
Actor Actions	System Response
1. User enters a new transaction into the system (trade, logistics, or invoice).	2. System immediately runs validation checks on required fields (jurisdiction, tax code, product mapping). If validation responds within threshold, go to Step 3. Else, if validation does not respond within threshold, go to Exception Flow 1 (EF1). 3. System checks compliance with jurisdiction-specific rules. If no data missing, proceed to Step 3. Else, if missing non-critical data, go to Alternate Flow 1 (AF1). Else, if missing critical data, go to Alternate Flow 2 (AF2). 4. If all validations pass, system confirms entry with a success message. 5. Transaction is saved and available for downstream processes. 6. System updates audit log with validation result, timestamp, and user ID.

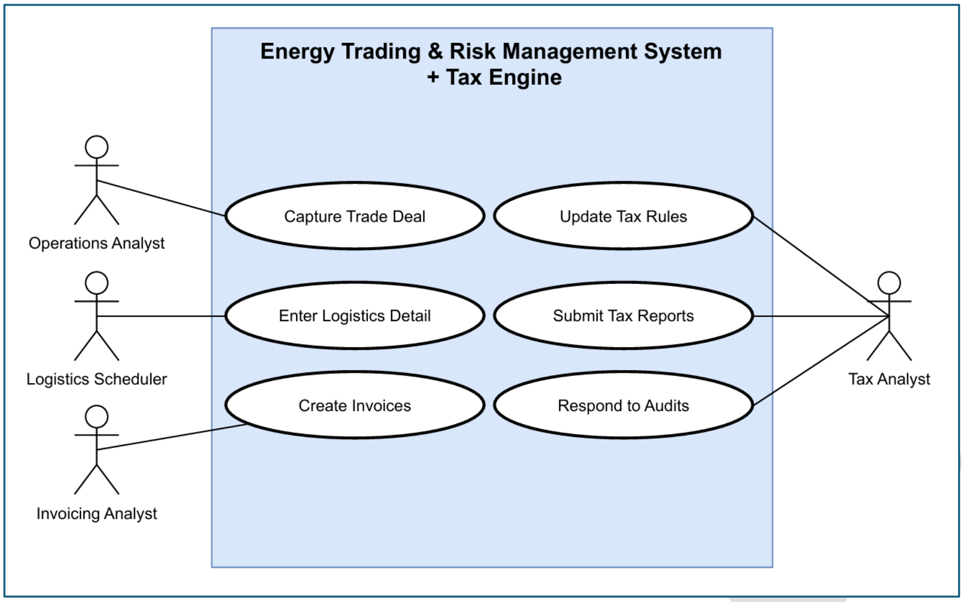
Alternate Flow 1 (AF1)	Missing Non-Critical Data
Actor Actions	System Response
	1. System allows transaction to proceed but issues a warning message.
2. Go to Step 4 in PF.	

Alternate Flow 2 (AF2)	Missing Critical Data
Actor Actions	System Response
	1. System blocks transaction from proceeding. 2. System prompts user with corrective guidance.
3. User corrects error	4. Go to Step 2 in PF.

Exception Flow 1 (EF1)	System Timeout
Actor Actions	System Response
	1. System cancels validation, logs timeout, and prevents transaction save. 2. System notifies user to retry later or contact IT.

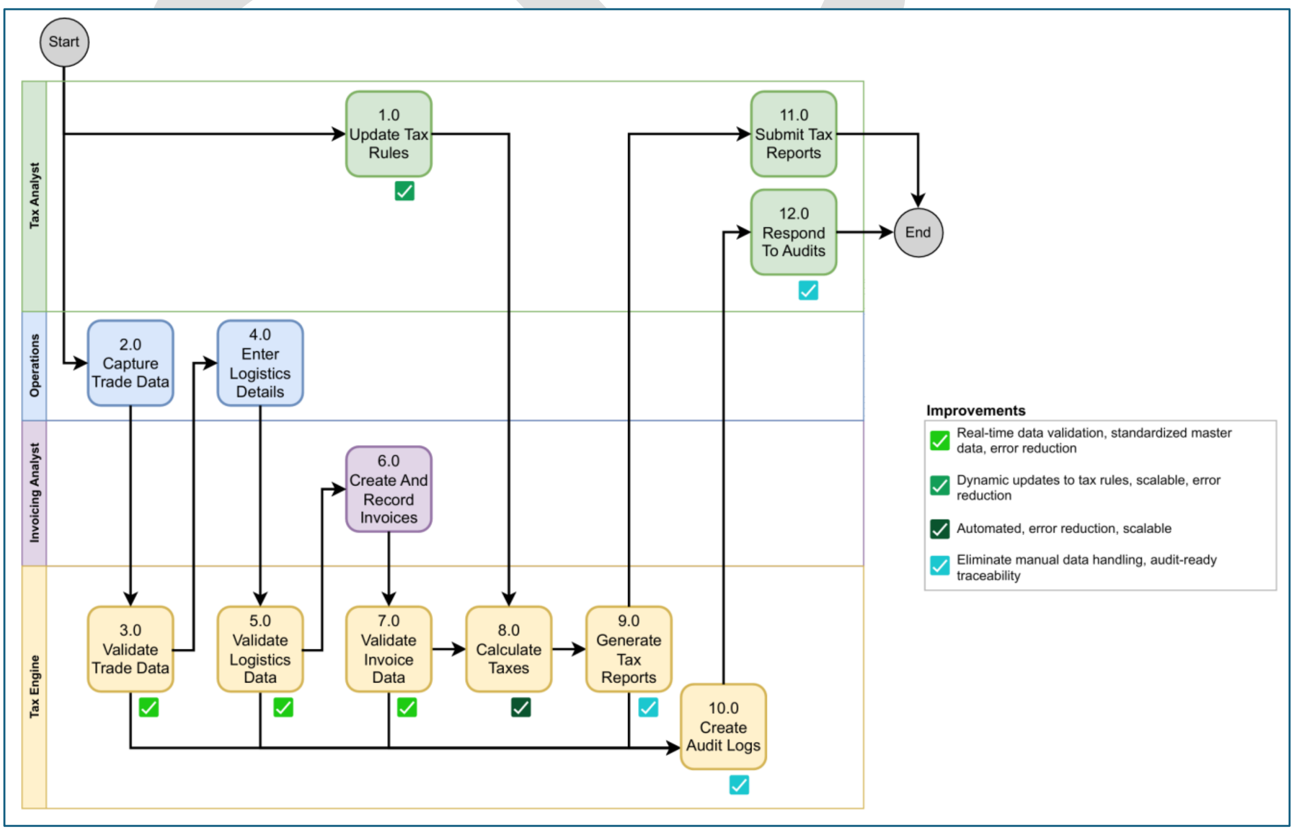
9.5 Use Case Diagram

This high-level Use Case Diagram shows the big picture of how actors interact with the system.



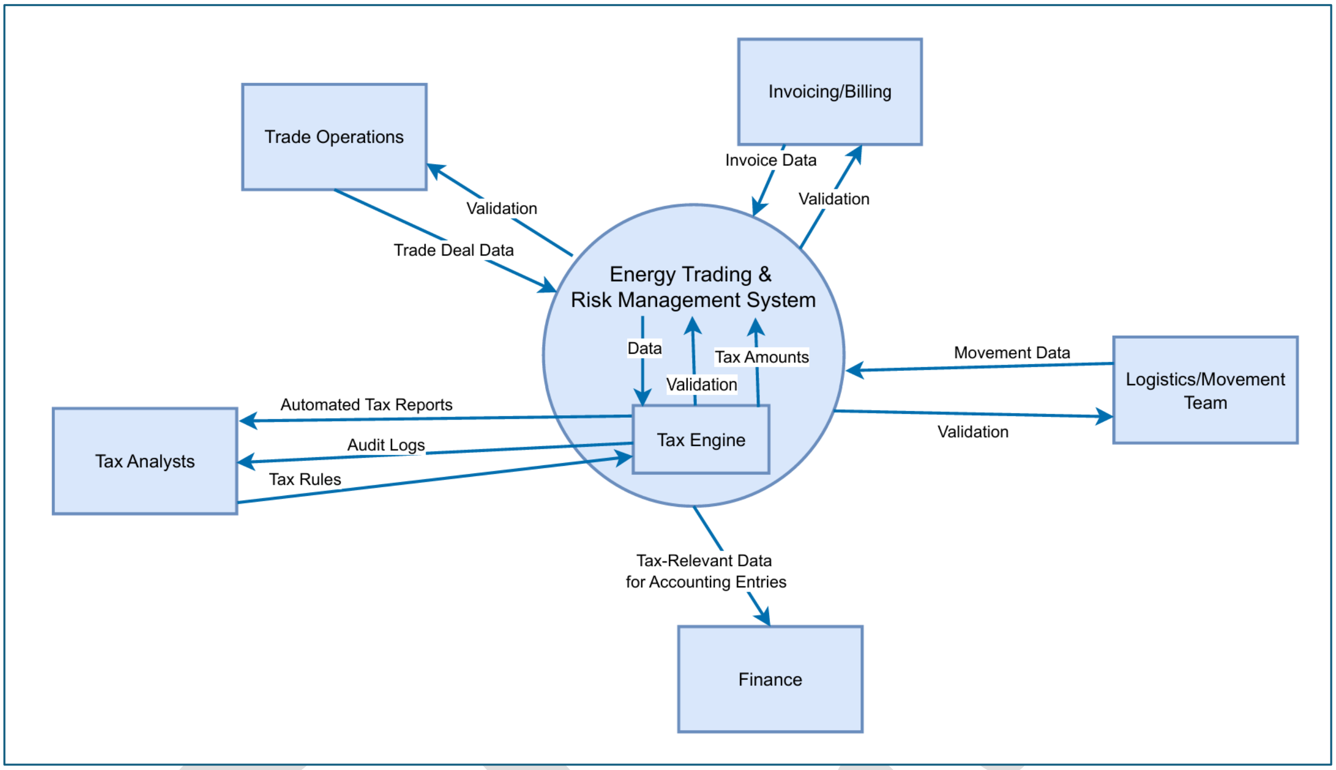
9.6 Process Flow

The future state process flow shows the centralized Tax Engine that validates trade, logistics, and invoice data in real time, reducing errors and rework. Parallel rule maintenance allows tax analysts to update and deploy rules without IT, ensuring rapid response to regulatory changes. Automated audit logs, standardized master data, and report generation improve efficiency, compliance, and traceability across the entire process.



9.7 Context Model

The future state context model shows how the ETRM system with Tax Engine automates tax calculations and updates data automatically. Tax SMEs now focus on review and manually sending compliance reports. Processing is faster, more accurate, and less error-prone than before.



10. Tool Selection (Tax Rule Engine)

10.1 Recommendation

Vertex O Series is the recommended choice for our ETRM project's tax rules engine needs. Vertex is widely used by large enterprises and built for complex, multi-jurisdiction VAT/GST/indirect tax scenarios and ERP integrations. It supports centralized determination, reporting, and audit/exemption management suitable for high-volume transactional environments.

Here's how it meets our main requirements:

- **Configurable rule engine / exemptions / value & volume thresholds:** Centralized tax rules and exemption/certificate manager (Vertex Certificate Center/ECM).
- **Monthly tax reports:** Built-in returns & reporting modules for indirect tax returns.
- **Real-time validation:** Real-time determination at point of transaction (edge or cloud).
- **Audit-ready logging / overrides:** Data extracts and audit trails to support reconciliations and audits.
- **Master data mapping:** Integrations & connectors for ERP systems (SAP, Oracle, NetSuite) and master data standardization.

10.2 Reasons

Vertex O Series was selected, based on the following reasons:

1. **Best Match to Complexity**
   - As a large oil & gas trading company operating across many jurisdictions, our tax logic will involve complex exemption rules, value/volume thresholds, master data mapping, etc. Vertex handles complex enterprise tax scenarios more robustly than many others.

2. **Out-of-Box Capabilities Reducing Build Risk & Effort**
   - Vertex provides strong features for returns/reporting, audit trail, override management, and master data synchronization. Choosing it means less custom work to build supporting features like audit logs and certificate handling.

3. **Scalability & Integration**
   - Vertex has good reputation for integrating with large ERPs / high transaction volume systems. That matters for our ETRM system which will generate many trades, movements, invoices. Real-time performance will be essential.

4. **Support & Maintenance Trade-off Favorable**
   - Yes, cost is higher, but when balanced against the cost of internal development (UI, reporting, audits, error handling, rule deployment) and risk of incorrect compliance (which can lead to penalties), the total cost of ownership may be lower or safer with Vertex.

5. **User Acceptance**
   - Vertex scores well with enterprise users, especially where compliance / multiple jurisdiction issues are in play. It seems that for other engines (e.g., Avalara), usability may be better for simpler use cases but may fall short in complex audit / threshold / exemption logic.

10.3 Option Comparison

The table below shows the top 4 options that were compared.

Key Requirement	Drools	Vertex O Series	Avalara (AvaTax + ECM)	ONESOURCE Determination
Configurable Rule Engine (exemptions, value/volume thresholds)	Very configurable for custom logic; requires technical work to build rule-UI, versioning, etc.	Strong built-in support; well suited for complex exemption and threshold logic across jurisdictions.	Good rule config; effective exemption/certificate management; simpler for standard scenarios.	Strong config + exemption tools; suited for enterprise workflows.
Monthly Jurisdictional Report Generation	Needs building/report template development, data extracts, format maintenance.	Offers built-in returns & reporting modules for many jurisdictions.	Has returns / compliance reporting features; may need customization for some jurisdictions.	Very capable reporting & returns automation; strong audit/compliance reporting.
Real-Time Validation (trade/ movement/ invoicing)	Possible but must build the routing, API, fallback logic, performance tuning.	Designed for real-time determination; good integration potential.	Excellent real-time APIs; widely used in transactional/invoicing contexts.	Also, strong real-time capabilities; includes override/validation functionality.
Audit-ready Logging & Override Tracking	Must build audit trail pages, override workflows, logging; more effort.	Built-in logging, change history, override management.	Has detailed logs & override control; especially in certificate/exemption management.	Enterprise grade audit trail features.
Master Data Mapping/ Validation	Custom mapping & validation needed; not out-of-the-box.	Robust integrations & connectors; good master data normalization.	Strong master data linkage via APIs; easier for consistent product/jurisdiction data.	Strong built-in MDM / connectors; solid normalization & validation.
Ease of Use for Tax Analysts / Non-Tech Users	Moderate to low; many tasks will need developer support unless extra UI built.	Higher for non-technical users; more polished UI & administration tools.	Designed with simplicity in mind; good UI & dashboard for exemption & rule maintenance.	Designed for tax professionals with good UI, but may have steeper learning for customization.
Total Cost / Maintenance Burden	Low licensing, but high development & maintenance cost over time.	High license cost but less custom build; faster to value.	Moderate to high (subscription + usage) but less internal dev required.	Likewise high cost, but many compliance and audit features provided out-of-box, reducing custom build.

11. Data Requirements

The proposed solution integrates the ETRM system with the Vertex O Series tax engine to streamline indirect tax calculation, validation, and reporting. Below are the main data entities that indirect tax reporting would utilize.

Category	Key Attributes	Business Rules	Source / Target
Transaction Data	Transaction ID, Trade Date, Quantity, Unit Price, Jurisdiction Code, Counterparty	All tax-relevant fields must be populated. Missing/invalid fields block submission (real-time).	Source: ETRM → Target: Vertex O Series
Tax Rules	Rule ID, Jurisdiction, Tax Rate, Exemption Type, Product Category, Effective Dates	Vertex is single source of truth for tax logic. No manual external adjustments.	Source: Vertex O Series
Master Data	Product Code, Counterparty ID, Tax Region, Mapping Status (valid/invalid)	Master data must be standardized across ETRM modules. Invalid mappings block transactions.	Source: Master Data System → Vertex/ETRM
Tax Results	Calculated Tax Amount, Jurisdiction Breakdown, Exemption Applied, Override Reason	System must calculate tax automatically. Overrides require justification and must be logged.	Source: Vertex O Series → ETRM
Audit Logs	User ID, Action Type, Timestamp, Rule Version, Before/After Values	Every calculation, rule change, and override logged with user traceability. Logs are read-only.	Source: Vertex O Series
Reports	Report ID, Period, Report Type, Format (PDF/Excel/CSV), KPI Metrics	Reports must reconcile to transaction data and be audit-ready. Generated automatically per schedule.	Source: Vertex O Series → Reporting Tool

11.1 Transaction & Movement Entities

Product Movements/Physical Transactions

- Inventory receipts and deliveries
- Inter-facility transfers
- Pipeline movements and transportation
- Storage tank movements (in/out)
- Blending operations and component usage
- Import/export physical flows
- Third-party storage movements

11.2 Commercial & Financial Entities

Billing/Invoicing (Sales Side)

- Customer invoices and credit memos
- Sales transaction details (volume, price, terms)
- Delivery tickets and bills of lading
- Intercompany sales between entities
- Third-party billing arrangements

Purchasing/Procurement (Buy Side)

- Vendor invoices and payment records
- Purchase receipts and accruals
- Import documentation and duty calculations
- Supplier statements and reconciliations
- Procurement card transactions
- Service and logistics invoicing

11.3 Tax-Specific Entities

Volume Tax Data

- Gallons/barrels moved by product type
- Tax jurisdiction of origin and destination
- Exemption certificates and supporting documentation
- Federal excise tax positions
- State motor fuel tax calculations
- Environmental tax volume tracking (LUST, CARB, etc.)

Value Tax Data

- Transaction values for sales and use tax
- Wholesale transaction amounts
- Import/export values for duty calculations
- Gross receipts tax calculations
- Ad valorem tax assessments
- Business license fee calculations based on revenue

11.4 Master Data Entities

Product Information

- Product codes and hierarchies
- Tax classifications (HTS codes, product categories)
- Biofuel content and renewable fuel designations
- Environmental classifications (CARB, reformulated, etc.)
- Federal and state tax rates by product

Location/Jurisdiction Data

- Facility locations and tax jurisdictions
- Customer ship-to addresses
- Supplier/vendor locations
- Transportation routes and cross-jurisdictional movements
- Tax authority registration numbers and licenses

Customer/Vendor Master

- Tax exemption certificates and status
- Jurisdiction of incorporation
- Customer type classifications (wholesale, retail, government)
- Tax registration numbers and permits

11.5 Accounting/Financial Postings

General Ledger Integration

- Tax accrual postings (federal, state, local)
- Tax payment entries and cash applications
- Variance postings and reconciliation entries
- Period-end adjustments and reclassifications
- Intercompany eliminations for tax consolidation

Accounts Payable/Receivable

- Tax liability balances by jurisdiction
- Prepaid tax positions
- Tax refund receivables
- Penalty and interest calculations
- Payment scheduling and cash flow projections

11.6 Regulatory & Compliance Entities

Filing & Compliance Data

- Tax return preparation data
- Regulatory filing schedules and deadlines
- Audit trail documentation
- Exception reports and resolution tracking
- Rate change notifications and effective dates

Environmental/Biofuel Compliance

- RIN (Renewable Identification Number) transactions
- EPA reporting data (EMTS submissions)
- Biofuel blending records
- Environmental program compliance tracking
- Carbon credit and offset transactions

12. Interface Requirements

At a high level, the system must support the following interface requirements:

- **ETRM → Tax Engine**: Transactional data (trade, logistics, invoicing) must be transmitted securely and in real time for validation and tax calculation.
- **Tax Engine → ETRM**: Validated and calculated tax amounts must flow back to ETRM modules to support operational accuracy.
- **Tax Engine → Reporting Layer**: Processed data, including tax results and audit logs, must be available for automated monthly reports, ad hoc queries, and dashboards.
- **Master Data Interfaces**: Product codes, jurisdiction mappings, and counterparty data must be synchronized between systems to ensure consistency in validation and reporting.
- **Audit & Monitoring Interfaces**: The solution must provide APIs or export capabilities to deliver audit logs and compliance evidence to auditors and internal stakeholders.

13. Tax Rules Overview

The tax rules engine is a core component of the solution, enabling automated calculation, validation, and reporting of indirect taxes. To ensure alignment with business requirements, this FRD outlines the **categories, parameters, and examples** of tax rules that must be supported.

13.1 Categories of Tax Rules

Excise & Motor Fuel Taxes

- Federal excise taxes (e.g., gasoline, diesel).
- State-specific motor fuel taxes.
- Environmental fees (e.g., LUST, CARB).

Sales & Use Taxes

- State and local sales tax rates.
- Wholesale vs. retail transactions.
- Exemption handling (e.g., resale certificates, government entities).

Import/Export Duties

- Customs duties on imports.
- Export tax reporting requirements.
- Cross-border jurisdiction rules.

Ad Valorem & Business License Taxes

- Taxes based on transaction value or gross receipts.
- Business license fees linked to revenues.

13.2 Key Parameters for Rule Definition

Each tax rule will be configurable in the engine based on:

- **Jurisdiction** (federal, state, local, cross-border).
- **Product Type** (e.g., gasoline, ethanol blend, wholesale product category).
- **Transaction Type** (purchase, sale, transfer, import/export).
- **Effective Date / Expiry Date** (validity period).
- **Exemption/Exception** (e.g., resale certificate, exempt entity).
- **Rate / Formula** (percentage, per gallon, fixed fee, etc.).

13.3 Example Rule

Rule Name: Texas Motor Fuel Tax – Gasoline Sales

- **Jurisdiction:** Texas (State)
- **Product Type:** Gasoline
- **Transaction Type:** Sale to Distributor
- **Rate:** $0.20 per gallon
- **Effective Date:** 01/01/2025
- **Exemptions:** Sales to government agencies with valid exemption certificate
- **Validation Condition:** If exemption certificate missing → transaction blocked

13.4 Rule Maintenance & Governance

- Tax Analysts (non-IT users) will create, update, and deactivate rules using a **no-code interface**.
- All rule changes must be **version controlled** and auditable (user ID, timestamp, change log).
- Rules will be reviewed quarterly for accuracy against federal, state, and local schedules.

14. Assumptions, Constraints, Dependencies

14.1 Assumptions

ID	Description
A1	ETRM modules contain complete trade and movement data for report generation
A2	Tax rules by jurisdiction are documented and agreed across Legal, Regulatory, and Tax
A3	Business users will be trained on new dashboard and validation logic
A4	Rule maintenance will be governed jointly by Tax Process Architect and IT

14.2 Constraints

ID	Description
C1	ETRM vendor limits may restrict customization of UI or dashboard widgets
C2	Rule logic complexity may require phased configuration updates
C3	Project resources are limited to core tax team and ETRM support staff
C4	Sandbox environment may not be available in time for final UA

14.3 Dependencies

Below is a list of factors that the project depends on.

ID	Dependency Description	Impact if Delayed	Management Strategy
D01	Approved jurisdictional tax rules and exemptions	Delay in configuring tax engine and finalizing logic	Early coordination with Legal/Regulatory teams and set sign-off milestones
D02	ETRM modules populated with trade, movement, and invoicing data	Incomplete tax calculations and reporting output	Data readiness checkpoints in project plan; assign ownership per module
D03	API/data pipeline capacity and ETRM integration readiness	Integration failures or rework; reporting gaps	Confirm integration design early; escalate gaps to IT/vendor; include build vs. buy analysis
D04	Master data governance (product codes, jurisdiction tags)	Inaccurate tax reporting and validation failures	Joint governance sessions with data owners; run integrity checks before go-live
D05	Stakeholder availability for rule mapping and UAT	Missed logic nuances and delayed user validation	Lock in stakeholder schedules early; use time-boxed workshops and async reviews
D06	Field mapping and extract capabilities across ETRM modules	System limitations in applying rules or generating reports	Field mapping exercise; involve ETRM support to validate extracts and custom logic
D07	Reporting framework compatibility with tax engine outputs and audit logs	Manual effort to visualize KPIs or audit trails	Confirm BI/reporting tools and integrations early; validate mockups during design phase
D08	Environment readiness (UAT sandbox, test data)	Blocked validation, testing, and training cycles	Schedule UAT prep milestones; define fallback test cycles with alternate data sets
D09	Tax Process Architect + IT Integration Lead assigned	Lack of ownership for rule logic and integration governance	Confirm roles/responsibilities in project charter; maintain joint decision log
D10	Training materials and delivery for analysts	Low adoption and incorrect usage of new validation features	Develop content in parallel; pilot sessions and feedback loops prior to go-live
D11	Audit protocol definition (logs, override handling)	Non-compliant audit trail and risk during reviews	Draft audit requirements early; align override justification and logging procedures
D12	Feedback loop setup for post-rollout refinement	No channel to fix validation or reporting gaps after launch	Create ongoing enhancement backlog; schedule post-deployment check-ins
D13	Vendor/platform support for external tax engine	Delays in configuration, defect resolution, or scaling tax logic	Establish vendor SLA, support contacts, and escalation paths before design phase

15. Appendices

15.1 References

Document	Link
Business Case	Click Here
Business Requirements Document	Click Here
Requirements Traceability Matrix	Click Here

15.2 Glossary

Term	Definition
Ad Hoc Report	On-demand, user-generated report tailored by filters or queries.
API (Application Programming Interface)	Technology interface that enables secure real-time data exchange between ETRM and the tax engine.
Audit Log	System-generated record of all actions (calculations, rule changes, overrides) including user ID, timestamp, and details.
Compliance Dashboard / KPI Dashboard	Reporting interface showing tax compliance rates, error rates, audit readiness, and other key metrics.
ETRM (Energy Trading and Risk Management System)	Core platform used to capture, manage, and report on trade, logistics, and invoicing transactions.
High Availability (HA)	System design ensuring uptime (99.9% or higher) during peak trading and reporting periods.
Indirect Tax	Taxes applied on goods and services (e.g., excise tax, sales/use tax, motor fuel tax) rather than on income or profits.
Jurisdiction	Geographic or legal authority (e.g., federal, state, local) that defines tax obligations and rules.
Master Data	Reference data used across systems (e.g., product codes, counterparties, tax regions) that must be consistent and validated.
Override	Manual adjustment of system-calculated tax values, requiring justification and audit logging.
Real-Time Validation	Automated system check of data fields and compliance rules at the time of entry.
Scheduled Report	Automatically generated report (e.g., monthly federal excise tax report) delivered without user intervention.
Tax Analyst	Primary business user responsible for configuring rules, validating tax calculations, and reviewing reports.
Tax Engine (Vertex O Series)	External system that calculates indirect taxes, validates data in real time, and generates reports.
Tax Rule	Configurable logic that defines how taxes are calculated based on jurisdiction, product type, thresholds, or exemptions.
Tax SME (Subject Matter Expert)	Senior role ensuring tax rules and compliance logic align with jurisdictional regulations.
Transaction Data	Trade, logistics, and invoicing records requiring validation and tax calculation.
UAT (User Acceptance Testing)	Testing phase where end users validate that requirements and acceptance criteria are met.