Overall overview of Distributed Renewable Energy Trading Platform

The **Distributed Renewable Energy Trading Platform** involves multiple stakeholders, each contributing to and benefiting from different aspects of the system. Compiled user stories and made use cases which i used to make my traceability matrix

Traceability Matrix

Requirem	Requirement Description	Class	Method(s)
R 01	The system shall allow prosumers to monitor their real-time energy production and consumption.	Prosumer	Prosumer.monitorEnergyUsage()
		EnergyProductionData	EnergyProductionData.getRealTimeProduction()
		EnergyConsumptionData	EnergyConsumptionData.getRealTimeConsumption()
R 02	The system shall provide AI-powered forecasting of energy production and consumption.	AIEngine	AIEngine.generateEnergyForecast()
		Prosumer	Prosumer.requestEnergyForecast()
		EnergyForecast	
R 03	The system shall automate energy storage management.	Prosumer	EnergyStorageDevice.storeEnergy()
		EnergyStorageDevice	EnergyStorageDevice.dischargeEnergy()
		AIEngine	AIEngine.optimizeEnergyUsage()
R 04	The system shall support peer-to-peer (P2P) energy trading using blockchain.	Prosumer	Prosumer.offerEnergyForSale()
		EnergyOffer	EnergyOffer.createOffer()
		SmartContract	SmartContract.executeContract()
		BlockchainTransaction	BlockchainTransaction.verifyTransaction()
R 05	The system shall determine real-time energy prices based on supply and demand.	EnergyMarket	EnergyMarket.getRealTimePrices()
		EnergyOffer	EnergyMarket.matchBuyersAndSellers()
		AIEngine	
R 06	The system shall automatically match energy producers and consumers.	EnergyMarket	EnergyMarket.matchBuyersAndSellers()
		EnergyOffer	EnergyOffer.acceptOffer()
		SmartContract	SmartContract.executeContract()
R 07	The system shall provide AI-driven grid load management.	AIEngine	AIEngine.analyzeGridStability()
		MicrogridController	MicrogridController.optimizeResources()
R 08	The system shall manage microgrids with islanding capabilities.	Microgrid	MicrogridController.switchToIslandMode()
		MicrogridController	MicrogridController.returnToGrid()

This is a simplified view of the traceability matrix.

Lexical Analysis

NOUNS	ATTRIBUTES	VERBS	DESCRIPTION
Prosumer	id, name, energyProduced, energyConsumed, energyStored,	offerEnergyForSale(), requestEnergyForecast(), monitorEnergyUsage(), storeOrDischargeEnergy()	Individual or entity that both produces and con
EnergyProductionData	currentProduction, historicalProduction	getRealTimeProduction(), getHistoricalProduction()	Captures data related to real-time and historic
EnergyConsumptionData	currentConsumption, historicalConsumption	getRealTimeConsumption(), getHistoricalConsumption()	Captures real-time and historical energy consu
EnergyStorageDevice	id, capacity, currentChargeLevel, deviceType	storeEnergy(), dischargeEnergy()	A device that stores or discharges energy, such
AIEngine	energyModels	generateEnergyForecast(), optimizeEnergyUsage(), analyzeGridStability()	AI component responsible for generating energ
EnergyForecast	predictedProduction, predictedConsumption	generateForecast()	A forecast object predicting future energy prod
EnergyOffer	offerId, prosumer, energyAmount, pricePerUnit	createOffer(), acceptOffer()	Represents an offer made by a prosumer to sel
EnergyMarket	currentPrices, availableOffers	getRealTimePrices(), matchBuyersAndSellers(), updateEnergyBalance()	Platform for real-time energy trading between p
SmartContract	contractId, buyer, seller, energyAmount, pricePerUnit	executeContract(), verifyContract()	A digital agreement recorded on the blockchai
BlockchainTransaction	transactionId, contractId, timestamp, status	recordTransaction(), verifyTransaction()	A secure, immutable record of energy transact
Microgrid	gridId, connectedProsumers, status	switchToIslandMode(), returnToGrid()	A small-scale electrical grid that can operate i
IoTSensor	sensorID, type (e.g., temperature, energy), status	monitorGridStatus(), sendSensorData(), detectTemperature()	Devices that monitor the status of energy equip
UtilityCompany	utilityId, location, gridStabilityData, energyRequests	monitorGridStability(), manageEnergyRequests()	Entity responsible for maintaining and stabilizi
RenewableEnergyCredit (REC)	creditId, prosumer, energyGenerated, verificationStatus	createREC(), verifyREC(), tradeREC()	Certificates generated for prosumers who prod
OwnershipToken	tokenId, prosumer, ownershipPercentage	issueToken(), verifyOwnership(), tradeToken()	Represents fractional ownership in community
CommunityProject	projectId, location, totalCapacity, currentEnergyGenerated	manageShares(), distributeEnergy(), expandProject()	A renewable energy project, such as a commu

A preview of the lexical analysis

Entities and actors

1. Prosumers (Energy Producers and Consumers)
2. Utility Companies and Grid Operators
3. Regulators and Policy Makers
4. Renewable Energy Equipment Manufacturers
5. Energy Traders and Market Analysts
6. Community Solar/Wind Project Managers
7. Electric Vehicle (EV) Owners
8. Building Owners and Energy Managers (Smart Buildings)
9. Investors in Renewable Energy Projects

The visual representation of the um diagram.