# IBM Energy Data Hub

Proof of Concept to rapidly provision and demonstrate the business value and technical feasibility of an Open-Source-based data orchestration platform that enables secure, real-time streaming data processing capabilities across the OT, IoT and IT estates.

Developing this new capability, at affordable cost, is crucial to handle the increased complexity and volatility of a Net Zero energy system.
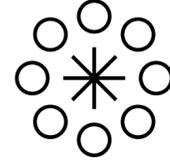
IBM Consulting

The 4D megatrends, driven by regulation and new technologies, fundamentally change the energy industry
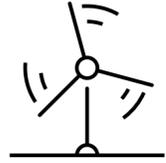
Decarbonization
New zero carbon energy sources, resources, and incentives drive massive electrification of society and industries
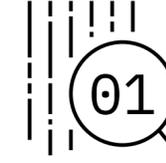
Decentralization
Uptake of distributed assets and IoT allow the field to inform control systems and enable digital operations

Democratization
Prosumers become active players in the system; transparency, trust, and control deliver real value

Digitization
Exponential technologies enable open, real-time, and automated systems operations

Key enabling technologies

- Growth of RES
- Power-to-X
- E-mobility
- Heat pumps
- CCS

- Growth of DER
- Energy efficiency
- Flexibility
- Microgrids
- ADMS/DERMS

- AMI 2.0
- Smart appliances/devices
- Beyond the meter optimization
- Energy tokenization
- Aggregation platforms
- Blockchain

- IoT and smart sensors
- Edge computing
- IT/OT integration
- Predictive insights/forecasting
- Business automation
- Open data ecosystems

Energy players need to develop new capabilities at affordable cost to handle the increased complexity and volatility in the Clean Energy era

New Capabilities
needed to address industry shifts

Secure, near real-time intelligent operations based on OT/IoT/IT data sets, combined with advanced predictive and prescriptive analytics.

- Efficiently **operate closer to real-time** and **increase the level of instrumentation** deployed on the asset base (e.g. LV grid monitoring, Hydrogen generation optimization) to deal with the increased complexity and volatility of a Clean Energy system.

- Improve and scale capabilities around **real-time data streaming** and closely **integrate OT, IoT and IT data sets**, combined with **advanced predictive and prescriptive analytics** on these data estates like digital twins, optimization engines, etc.

- These new capabilities must be deployed with an **increased level of security** to protect Critical National Infrastructure as OT and IT converge, and compliant with **evolving regulatory frameworks**.

Typical Challenges
to build out the new capabilities

Build data streaming and real-time processing capability on the back of common, integrated semantic models – at affordable costs.

- **High cost of scaling:** Traditional OT platforms (e.g. historian) are priced by the number of endpoints. As energy companies deploy 10–20 times the number of sensors, this results in exploding license costs and data-related Opex and Capex.

- **Data streaming and real-time processing:** New requirements require rethinking the data platform with real-time data streaming at the core, and not as an add-on (as it is typically the case today).

- **Common, integrated IT/IoT/OT semantic models:** Digital Twin Models require that data is put into context through associated engineering data and asset models. Currently these data sets are highly siloed and fragmented.
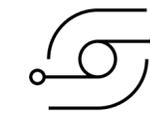
IBM Consulting Offering
for accelerated capability development

Energy Data Hub is a scalable, portable, cloud-deployable data platform tailored to utilities' needs built on license-free OS technology.

- **Data streaming** and **real-time processing platform** to collect, aggregate, validate, inter-/extrapolate and interpret operational data, and provide a foundation for advanced analytics and digital twins.

- **Low cost, highly scalable** Cloud-ready platform built on license-free Open-Source technology that supports high volume, high velocity sensor and control message processing.

- **Best of Breed –** combines the best elements of several custom-developed solutions for energy clients, such as a rules engine for data validation (data quality and completeness), multiple persistence technologies and adapters for easy integration into a client's existing environment.

The IBM Energy Data Hub enables secure, data-driven operations with integrated, predictive intelligence for bi-directional electric grids

Example: Power Networks

- **Augmented / new applications** for more efficient and effective planning and operations of the electric grid leveraging combined data from OT, IoT instrumentation and IT (Smart Grid applications).

- **Advanced Analytics & AI/ML** are applied to the data for leverage by augmented / new applications, e.g. to improve operational awareness or for predictive insight.

- **Convergence of OT/IoT/IT** data is orchestrated by the Energy Data Hub managing streaming data and near real-time processing of data, and providing data historians.

- **Increased level of security** is managed by the Secure Hybrid Cloud Platform to protect the CNI from vulnerabilities as OT and IT converge.
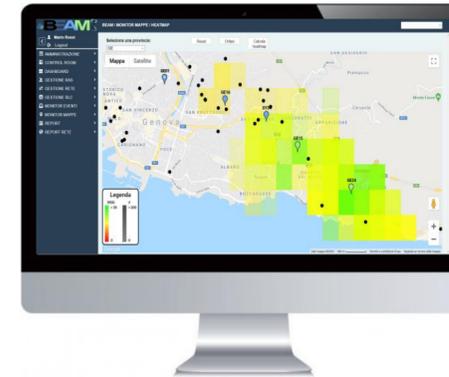
Control Room Operations
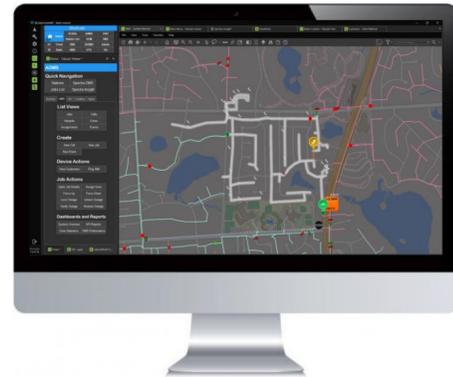
Field Operations

Smart Meter Operations

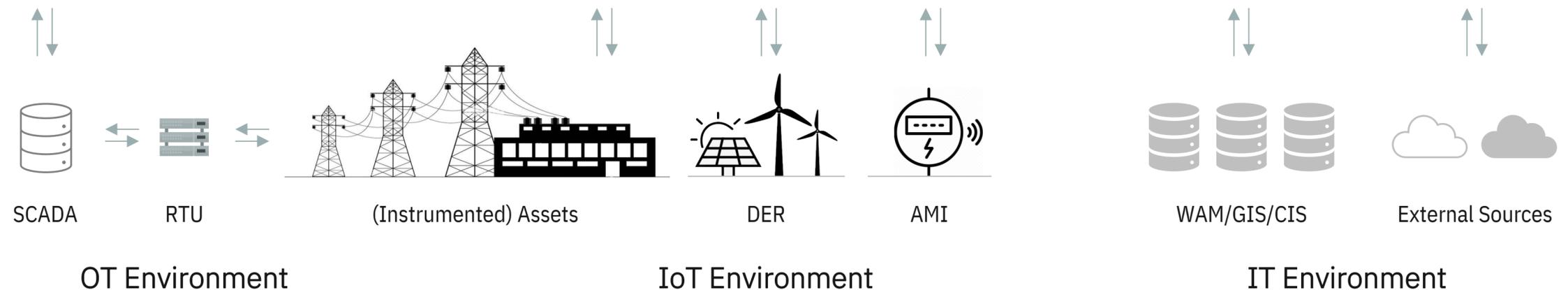**Network Planning**
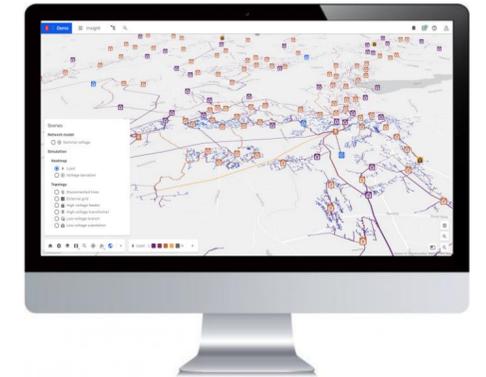
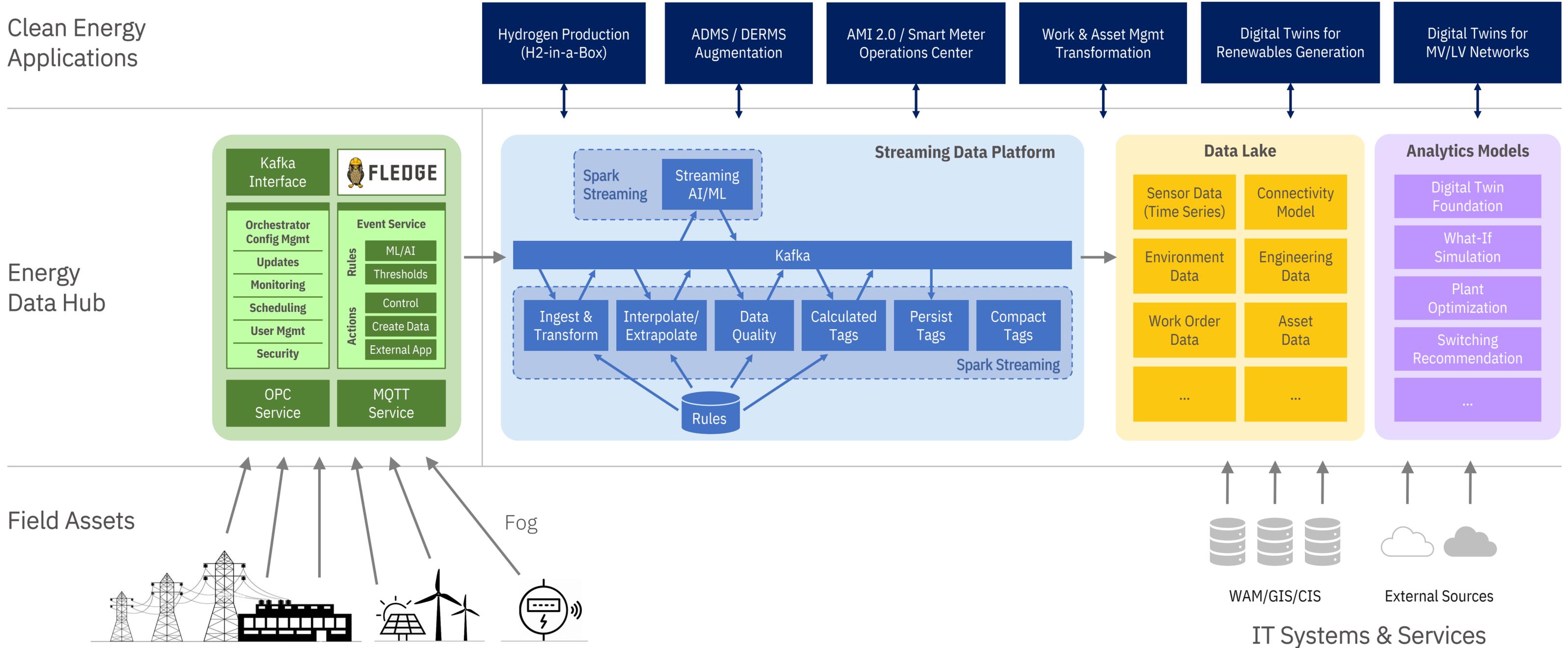**Intelligent Operations Platform for Clean Energy**

Operational Awareness | Operational Control | Predictive Insight | Intelligent Decision-making

Real-time Data Orchestration (**IBM Energy Data Hub**)

Secure Hybrid Cloud Platform

SCADA   RTU   (Instrumented) Assets   DER   AMI   WAM/GIS/CIS   External Sources

OT Environment   IoT Environment   IT Environment

Energy Data Hub high-level architectural overview

Clean Energy Applications

Hydrogen Production (H2-in-a-Box)	ADMS / DERMS Augmentation	AMI 2.0 / Smart Meter Operations Center	Work & Asset Mgmt Transformation	Digital Twins for Renewables Generation	Digital Twins for MV/LV Networks

Energy Data Hub

- Kafka Interface
- FLEDGE

Orchestrator Config Mgmt
- Updates
- Monitoring
- Scheduling
- User Mgmt
- Security

Event Service
- Rules
  - ML/AI
  - Thresholds
- Actions
  - Control
  - Create Data
  - External App

- OPC Service
- MQTT Service

Streaming Data Platform

Spark Streaming
- Streaming AI/ML

Kafka

Spark Streaming
- Ingest & Transform
- Interpolate/ Extrapolate
- Data Quality
- Calculated Tags
- Persist Tags
- Compact Tags

Rules

Data Lake
- Sensor Data (Time Series)
- Connectivity Model
- Environment Data
- Engineering Data
- Work Order Data
- Asset Data
- ...
- ...

Analytics Models
- Digital Twin Foundation
- What-If Simulation
- Plant Optimization
- Switching Recommendation
- ...

Field Assets

Fog

WAM/GIS/CIS

External Sources

IT Systems & Services

IBM

Key characteristics and benefits of the Energy Data Hub solution offered by IBM Consulting

1 **Scalable Architecture, Multi-Cloud Ready Platform**

Utility, Industrial, Chemicals and Petroleum companies are beginning to transition a lot of their analytical workloads and System of Engagement to the Cloud, while keeping their Systems of Records on premise. As a result, we offer a solution that can be deployed both on premise as well as in the cloud, which provides customers with flexibility.

2 **Open-Source Technology Stack**

Customers often seek Open-Source based solutions to avoid the high, end-point based licensing fees that traditional solutions in this space apply.

3 **Enterprise Systems Integration**

The Energy Data Hub platform is designed to support analytics platforms, as well as interfacing to real time control systems. The platform supports standards such as Kafka, SPARK, Kubernetes etc.

4 **Industry Standards Driven Integration**

The integrations are based on standards prevalent in the industry for interfacing with IoT devices and include ICCP, DNP3, MQTT, OPC as well as JSON and XML. Supports traditional comms such as serial and Modbus, as well as newer IP based protocols and 5G

5 **Linux Foundation Edge Platform (Fledge)**

Deployed in industrial use cases since early 2018, Fledge integrates IIoT, sensors, machines, ML/AI tools-processes-workloads, and cloud/s with the current industrial production systems and levels, as per ISA-95.

6 **Multiple Persistence Layers**

The platform offers many different persistence layers, as such it can support IBM Products such as DB2 and Informix, as well as partner technologies like Snowflake, AWS Aurora and Redshift.

7 **Enablement of Intelligent Workflows**

The Energy Data Hub platform integrates a **Rules Engine** to apply validation and estimation rules for improving data quality and completeness, and furthermore, it combines **Data, AI/ML services** to build Intelligent workflows with automation

We offer a Proof of Concept for the IBM Energy Data Hub using client data sets to demonstrate the platform capability on select use cases
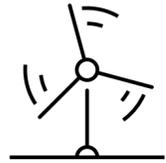
Offering Overview

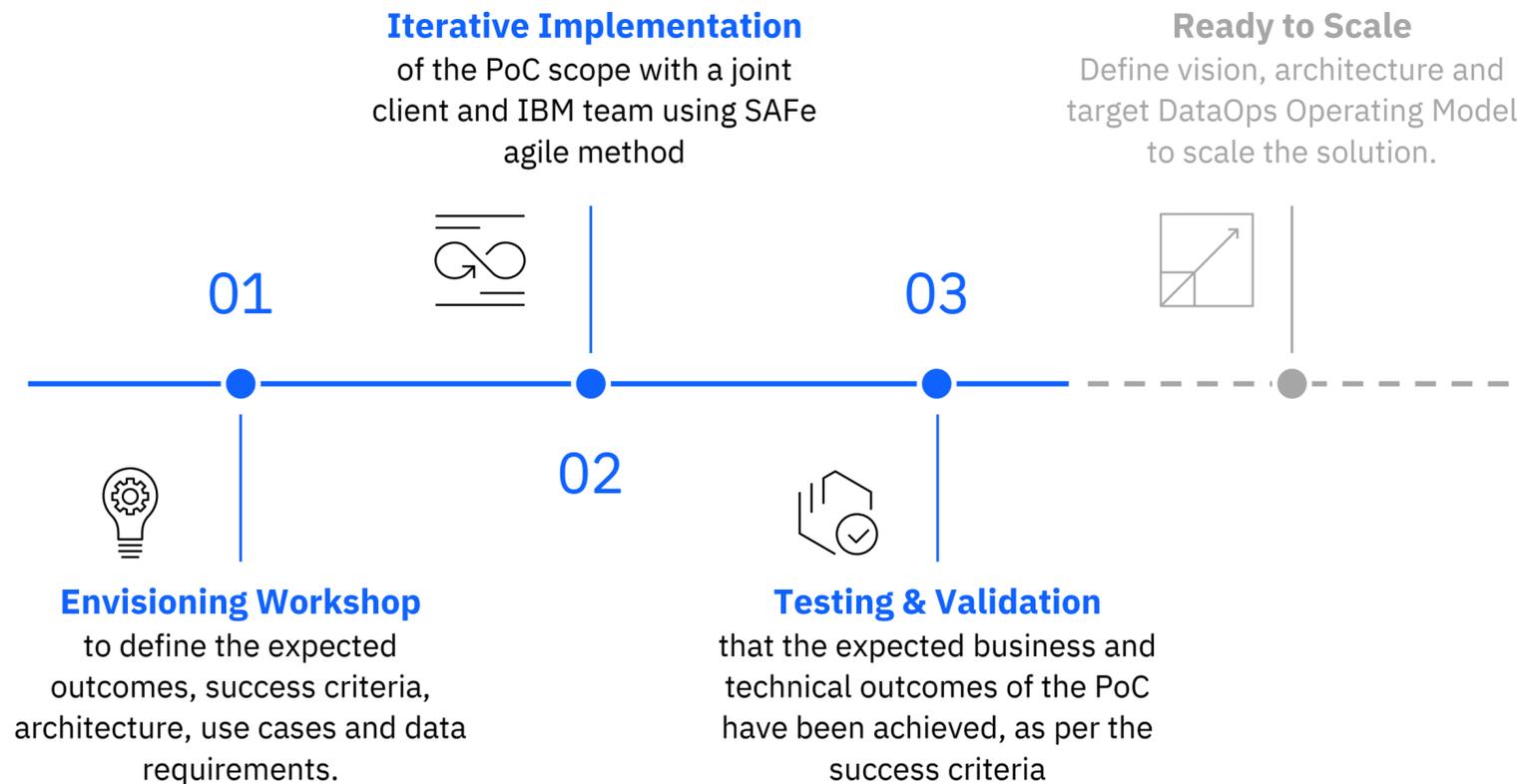Rapid deployment of a Proof of Concept of the Energy Data Hub

The Energy Data Hub Proof of Concept offering aims at rapid provisioning and demonstration of a data orchestration platform across OT, IoT and IT estates with real-time streaming data processing capabilities.

– **Scoping** the PoC in terms of use cases, data requirements, solution/integration architecture, expected outcomes etc.

– **Setup and Configuration** of the Energy Data Hub platform according to custom requirements and scope

– **Client Data** integrations with existing client environment – platform can adapt to multiple persistence technologies
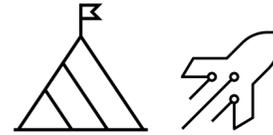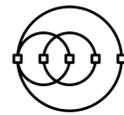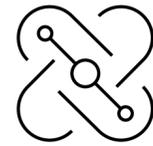
Proof of Concept Design & Execution

Scope and deliver the PoC in 12-16 weeks using the user-centric IBM Garage method for co-creating the solution, and by following a 3-phased approach

Iterative Implementation
of the PoC scope with a joint client and IBM team using SAFe agile method

Ready to Scale
Define vision, architecture and target DataOps Operating Model to scale the solution.

01

02

03

Envisioning Workshop
to define the expected outcomes, success criteria, architecture, use cases and data requirements.

Testing & Validation
that the expected business and technical outcomes of the PoC have been achieved, as per the success criteria

Proof of Concept Outcomes

Demonstrate the suitability and feasibility of the Energy Data Hub

– **Technical:** Prove data streaming and real-time processing capability in your specific environment as the foundation for a fully integrated, endurable solution

– **Best Practice:** Drive DataOps culture and skills, and user-centric digital transformation with IBM Garage

– **Financial Case:** Reduce data-related costs by up to 60% for platform build and operate, and for new use cases (license costs; automation; reuse data pipelines, etc.)

– **Business Risk:** Accelerate time-to-value and reduce implementation risk by using proven, secure industry assets

Why IBM

EE&U Industry Expertise – deep expertise and experience on industry-specific data-driven use cases and implementations, as well as assets/accelerators like the DMEU (Data Model for E&U)

IBM iX – a globally leading consultancy with 60+ design studios for differentiated user experiences and data-driven visualizations using Enterprise Design Thinking and IBM Garage methodologies

Data & AA/AI – leader in Data & Analytics Services with 10,000+ practitioners globally supporting clients to transform digital operations by unlocking the value of enterprise data, building an AI-driven organization and driving intelligent automation at scale

Secure Hybrid Cloud Expertise – deep capability in building secure microservices-based applications and complex integration services of on-premises and in-the-cloud applications and data sources as a key enabler for digital operations/Digital Twins
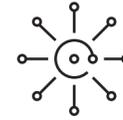
Best-of-Breed Platform – comprehensive platform natively designed for OT/IoT streaming data processing based on proven architecture and models with accelerators to deliver rapid results in just a few weeks

Open Architecture – open, multi-cloud architecture based on low cost Open-Source technology that can be deployed on Azure as well as on-premise hence providing increased flexibility
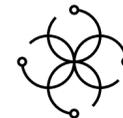
Ecosystem & Partners – strategic partnerships with leading industry OEMs such as ABB, Aspentech OSI, GE, Itron, L+G, Schneider Electric, Siemens, Venios etc. as well as Microsoft and IBM Technology to accelerate the implementation of data-driven Clean Energy use cases