

BIM&DIGITALIZATION FOR RENEWABLE ENERGIES

BIM to Make Renewable Energies More Sustainable



SPEAKERS



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Capgemini  engineering



Ubert Monzu

BIM EXPERT

enel
Green Power



SUMMARY

1. Capgemini Presentation
2. Scope and Goals of Enel Green Power
3. BIM Implementation strategy
4. Life cycle management with BIM
 - Standardization (CS & PIR)
 - BIM for Design (Design Toolkit)
 - BIM in Execution (ACC, CPM to Project)
 - Handover to O&M (AVEVA & SAP)
5. BIM benefits: monitoring time, cost & SDGs application

CAPGEMINI, A LEADER FOR LEADERS

As a global leader in consulting, digital transformation, technology and engineering services – with unrivalled industry expertise – we enable our clients to **design and build tomorrow's businesses**, make the most of the opportunities offered by technology, and **boost their competitiveness and agility**.

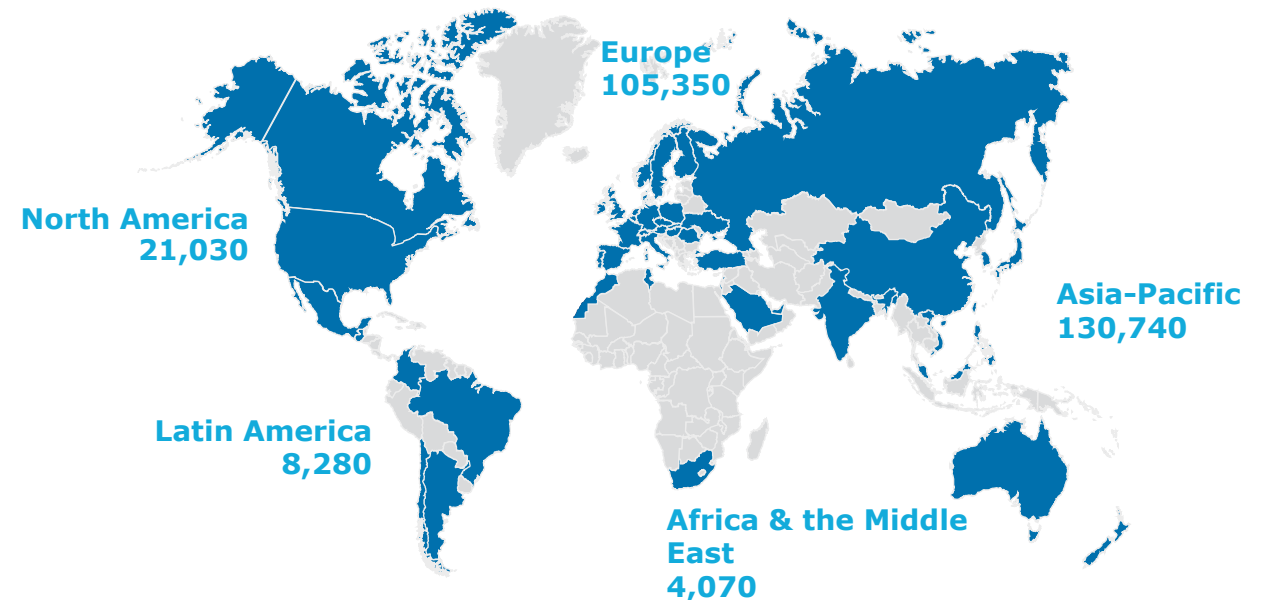
€18bn
revenue

320,000
people
with more than
110,000 in India alone

Nearly 50
countries
with more than 120
nationalities



Strong international footprint





Capgemini engineering

Capgemini and Altran join forces in Engineering and R&D to create the global digital transformation leader for industrial and tech companies



CAPGEMINI ENGINEERING

We are everywhere our clients need us to extend their engineering and transformation capabilities.



Capgemini
Engineering
presence

Australia
Austria
Belgium
Canada
China
Czech Republic
Finland

France
Germany
India
Ireland
Israel
Italy
Japan

Luxembourg
Malaysia
Mauritius
Mexico
Morocco
Netherlands
Norway

Poland
Portugal
Romania
Slovakia
South Korea
Spain
Sweden

Switzerland
Taiwan
Tunisia
United Arab
Emirates
Ukraine
United Kingdom

United States of
America

KEY ENGINEERING DISCIPLINES

Product & systems engineering

- Mechanical & Physical Engineering
- Electrical, Electronics & Semiconductors
- Systems Engineering & Product Design

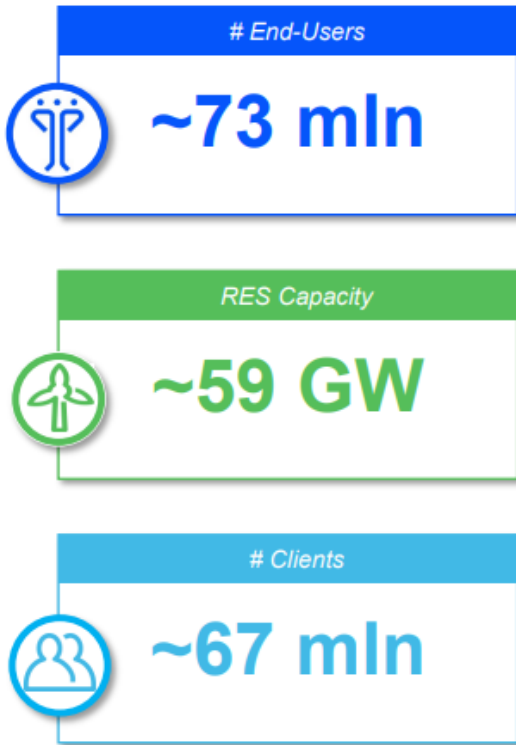
Digital & Software

- Software Engineering
- Connectivity & Network Engineering
- Data Science, Analytics & AI

Industrial Operations

- Manufacturing & Process Engineering
- Operations Management
- Product Support & Services

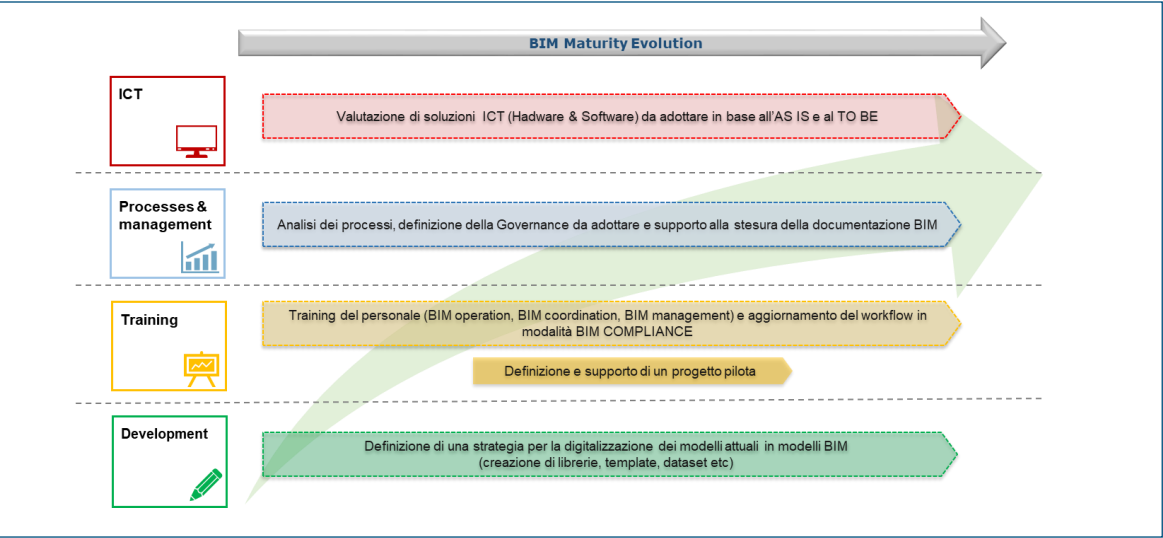
We are present with operational or under construction assets in 21* countries and we manage development activities in 5 other countries. We operate over 1,200 plants on all 5 continents. Our installed renewable capacity is over 59 GW through a generation mix that includes the main renewable sources including wind, solar, hydroelectric and geothermal.



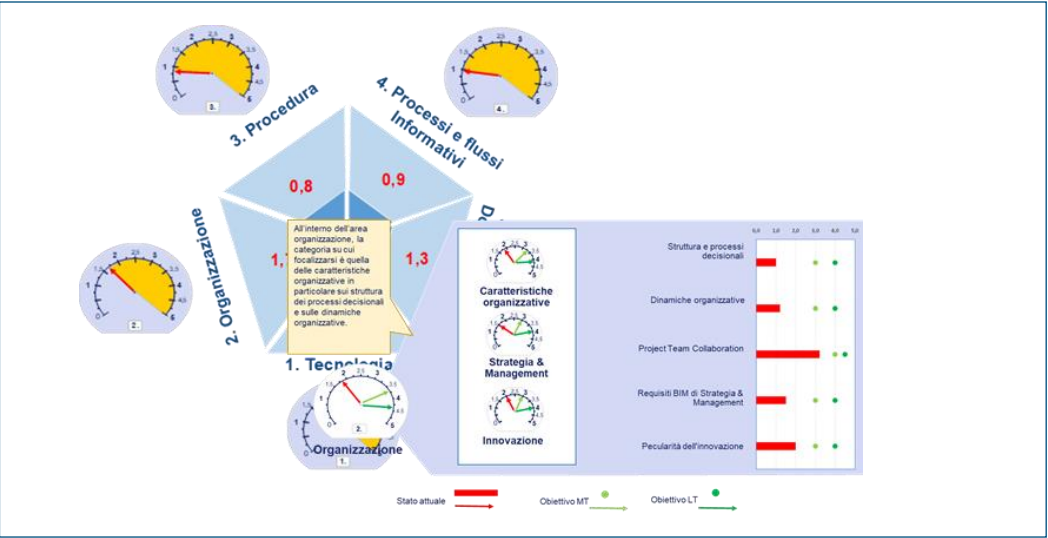
BIM IMPLEMENTATION STRATEGY

A FEW PROJECT TOOLS AND METHODS

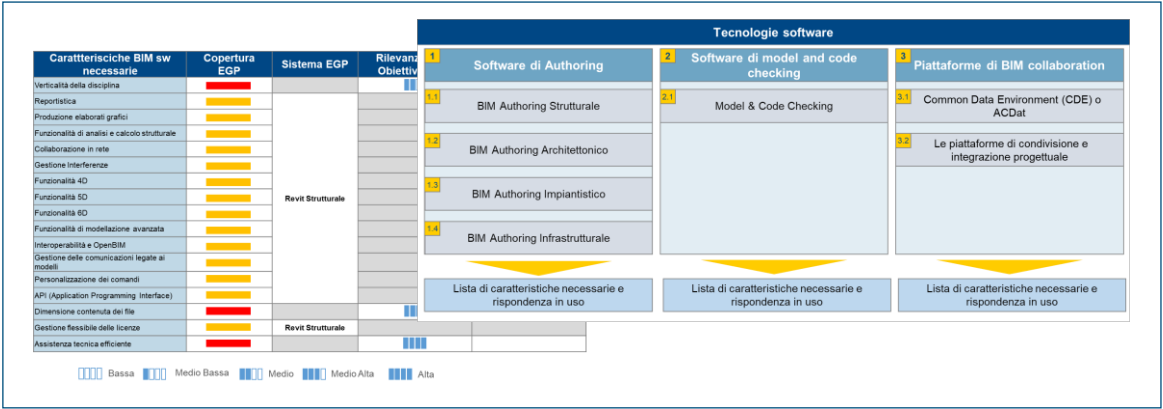
BIM Impelementation Approach



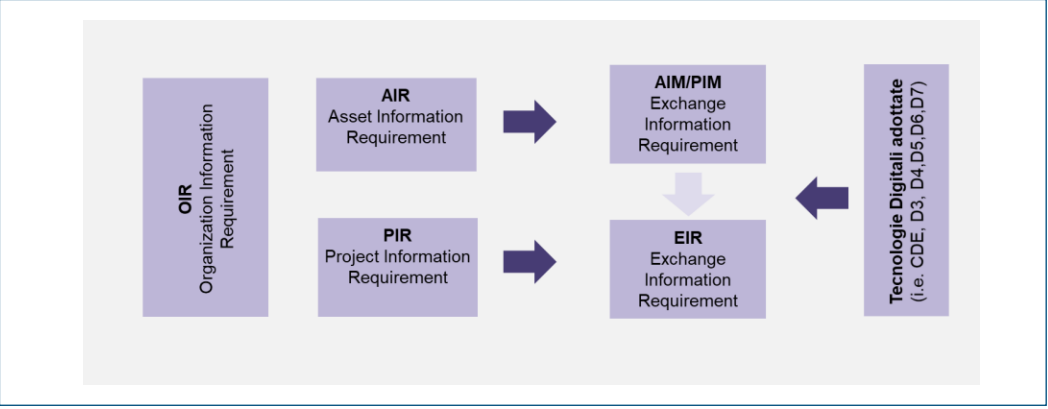
BIM Maturity Assessment



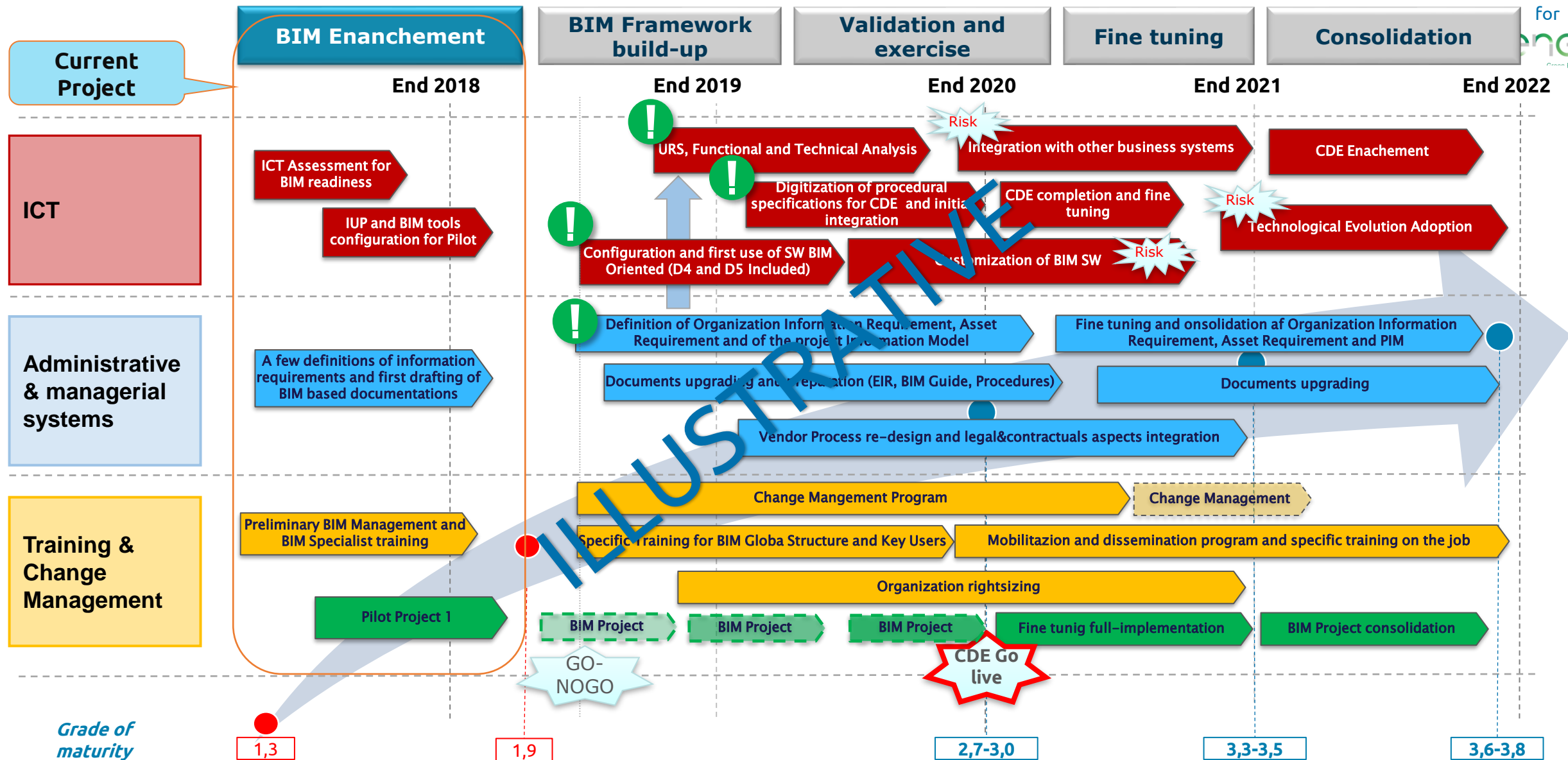
BIM Digital Evolution



Information Requirement Framework



Roadmap Wind e Solar



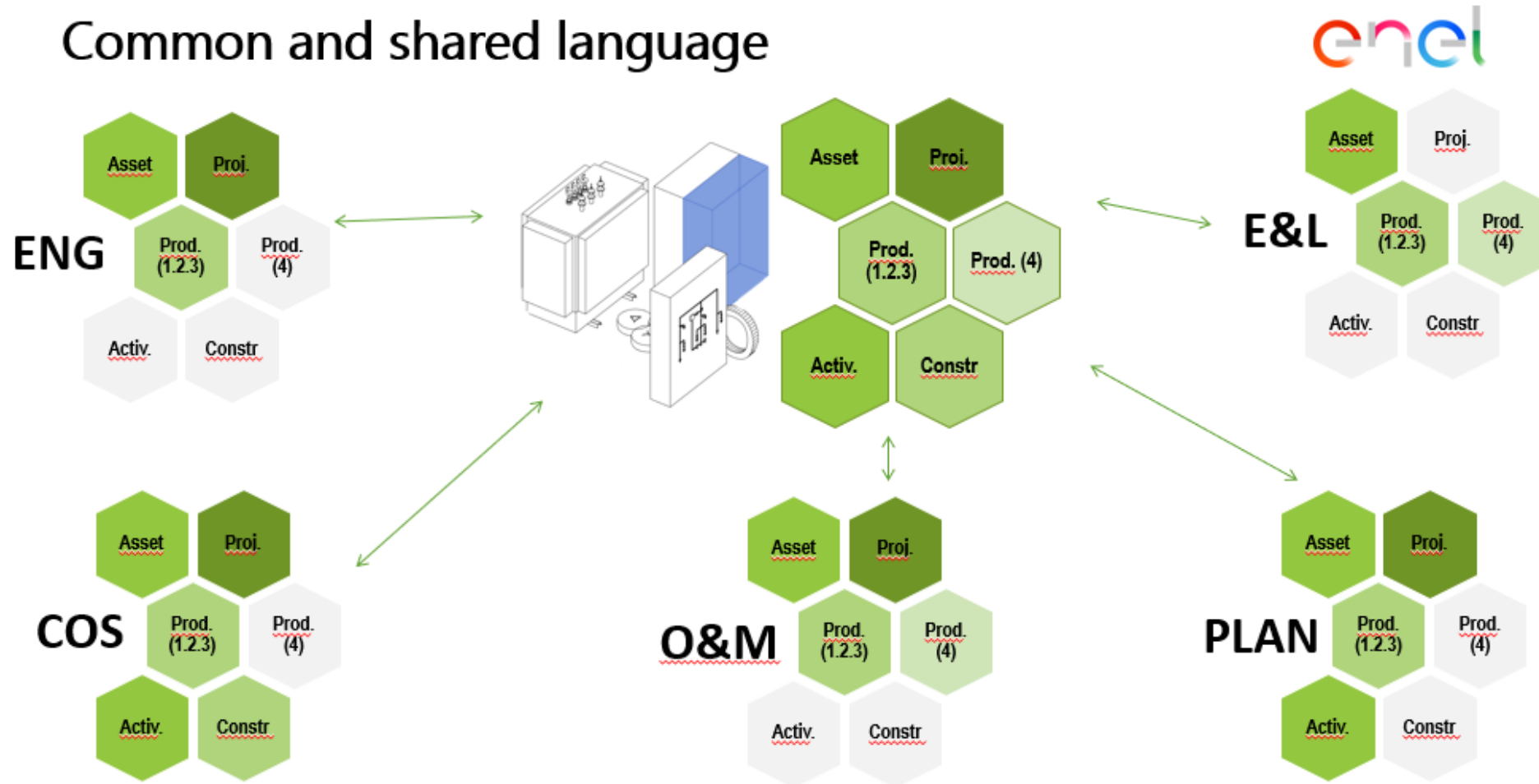
Maturity Measured

Maturity Targets

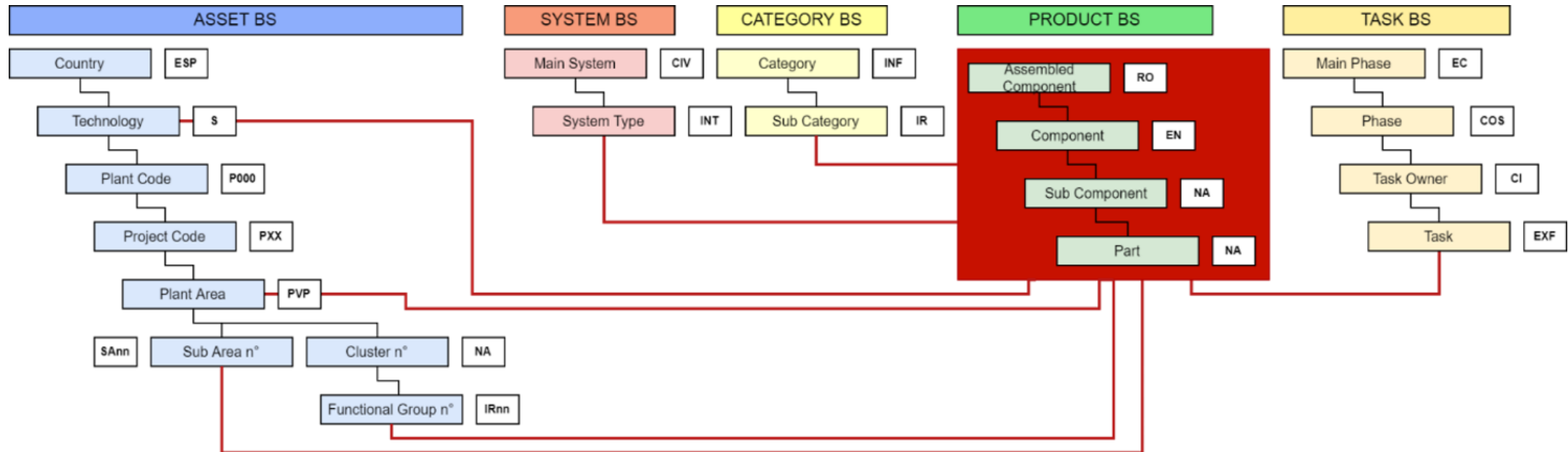
Tasks to be boosted

STANDARDIZATION

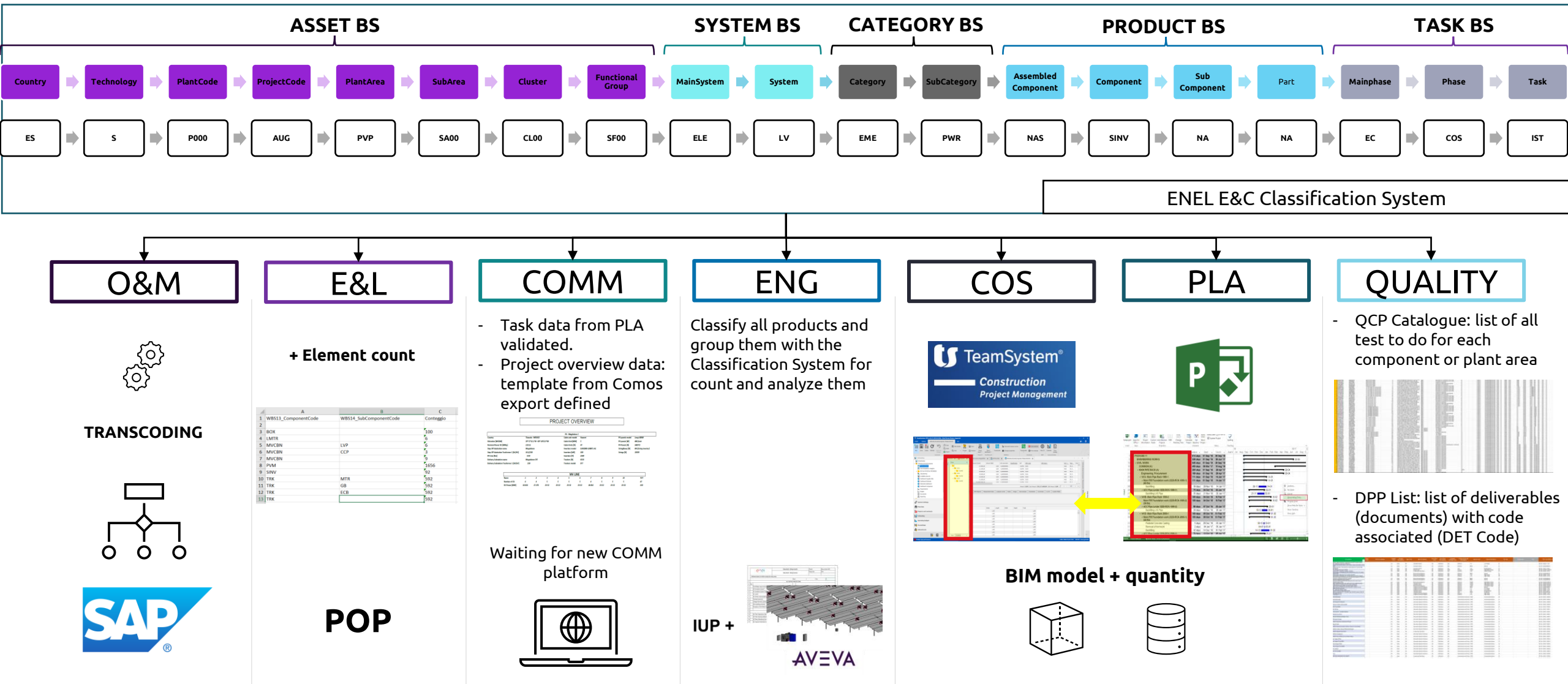
Common and shared language



STANDARDIZATION



STANDARDIZATION

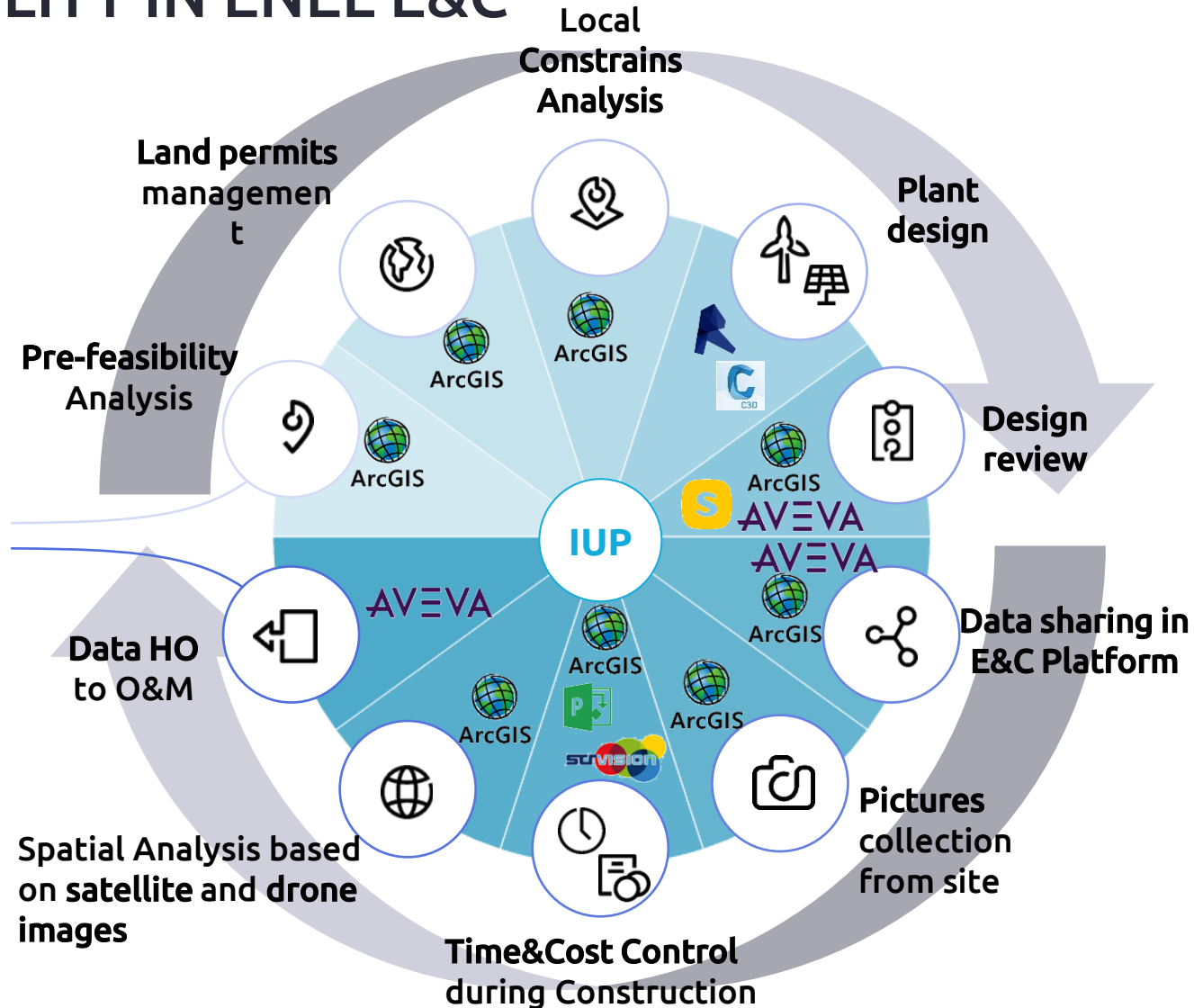


BIM APPROACH IN ENEL GREEN POWER

INTEROPERABILITY IN ENEL E&C

System Integration

BIM
The journey to
date



BIM and GIS data modelling to overcome the document management and achieve the Data Management

LIFE CYCLE MANAGEMENT WITH BIM

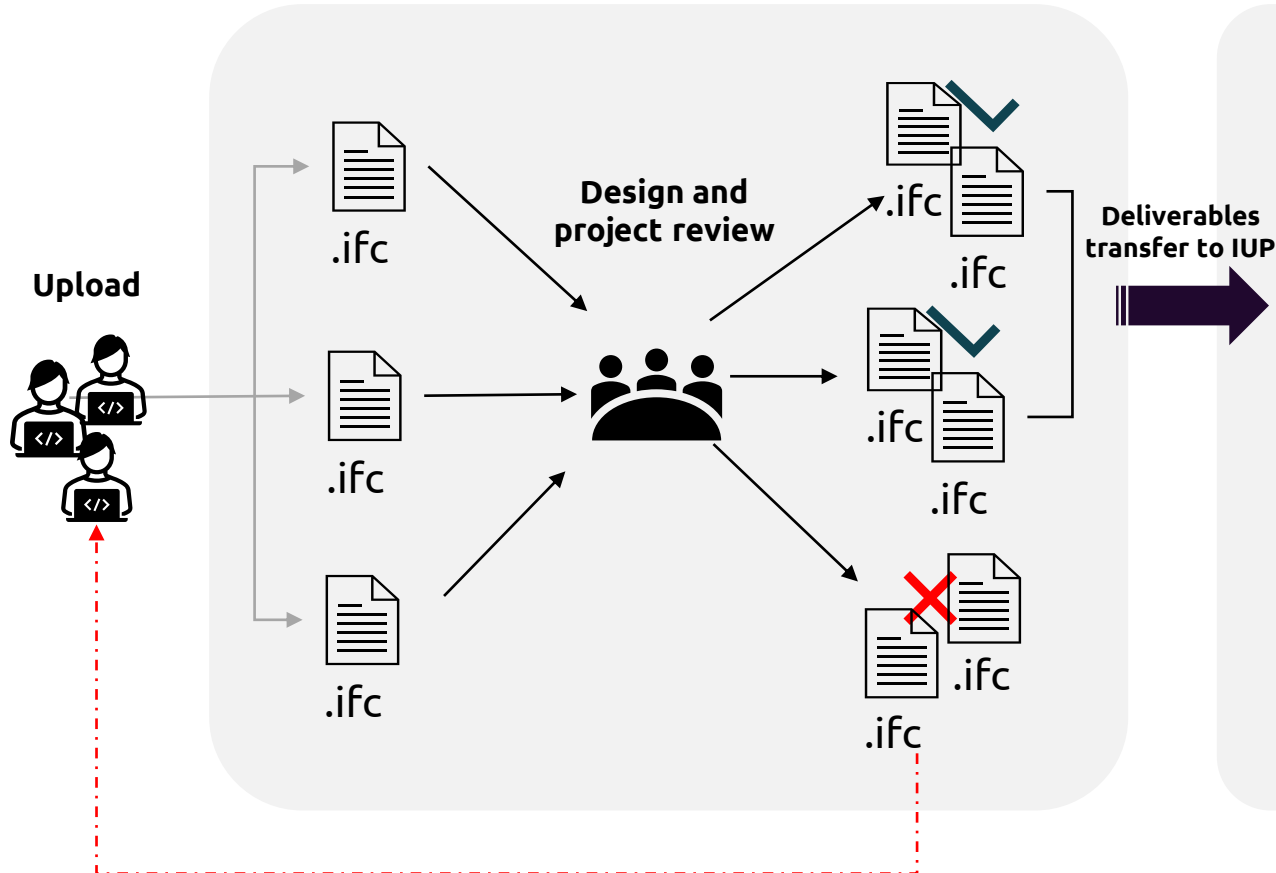


COMMON DATA ENVIRONMENT

Collaboration Phase



ACC or Similar Tool



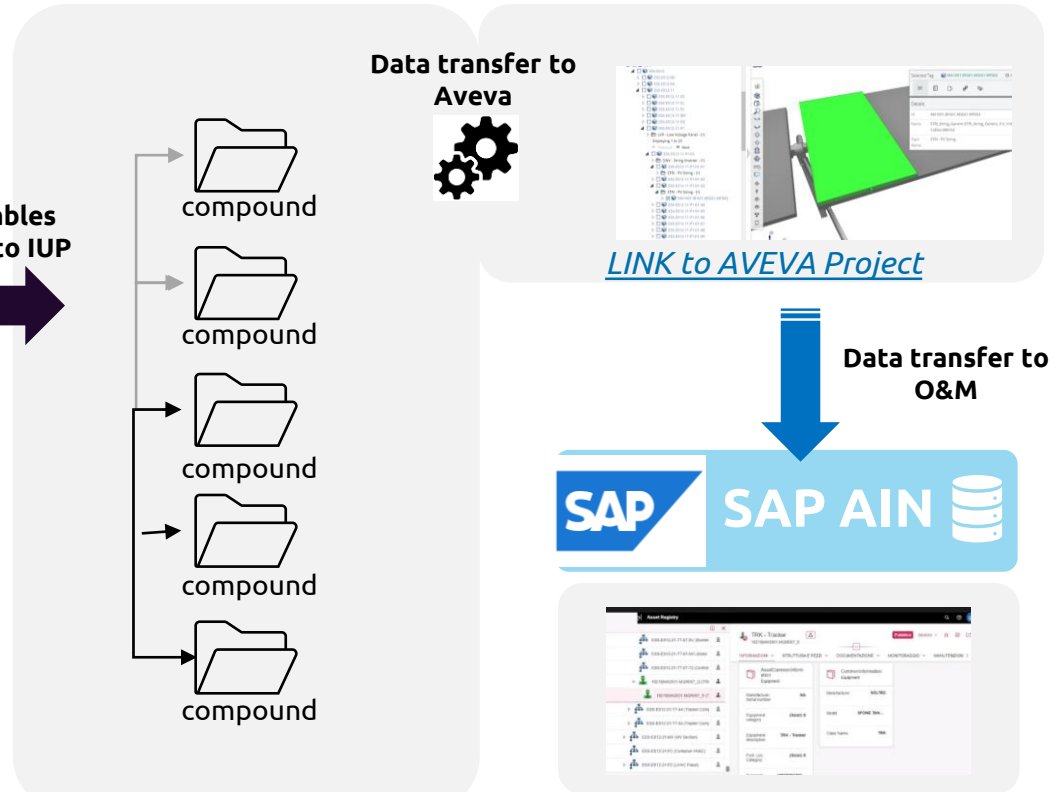
Publishing

opentext™

IUP

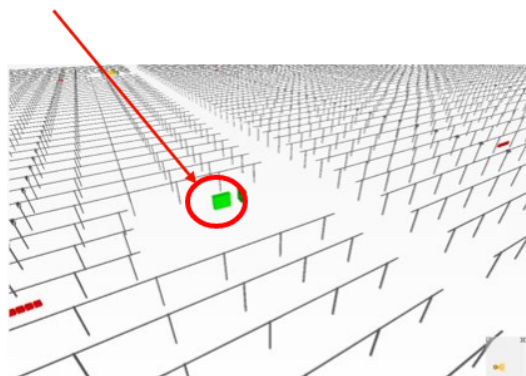


AVEVA

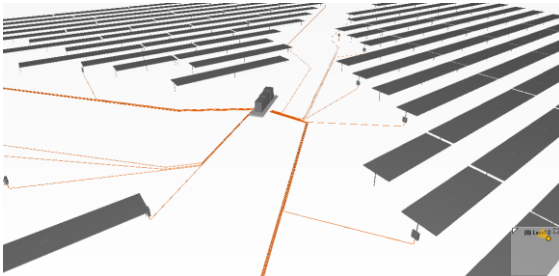


BIM REQUIREMENTS

Project Information Requirement (PIR)



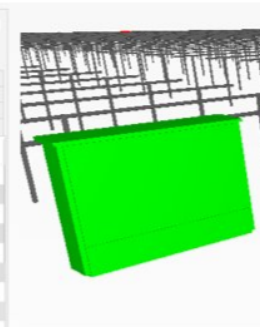
3d model Object



Parameter from CS

PlantArea
Cluster
FunctionalGroup
MainSystem
System
Category
SubCategory
AssembledComponent
Component
SubComponent

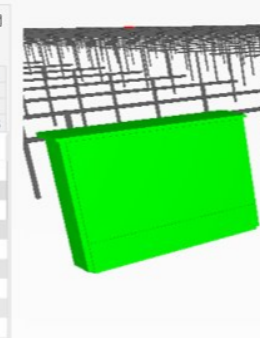
① INFO			
Object.b.17			
ELE-OB1-EDD-ElectricalDataDesign	ELE-OB1-SSY-SupplementarySystems	GEN-OB1-CSY-ASS-AssetBS	
Identification	Location	Quantities	Relations
GEN-OB1-INF-Information	PLA_WorkPhase	STRCPM_BoQ	STRCPM_Code
GEN-OB1-CSY-PRD-ProductBS	GEN-OB1-CSY-SYS-SystemBS	GEN-OB1-DIM-Dimension	
Property	Value		
AssembledComponent_Text	NAS		
Category_Text	ELQ		
Component_Text	CINV		
SubCategory_Text	PWR		
SubComponent_Text	NA		



Parameter from PIR

Eg.
Manufacturer
Model
Volume
Frequency
Rated Power
Max Power
Degree
Voltage
Etc.

① INFO			
Object.b.17			
ELE-OB1-EDD-ElectricalDataDesign	ELE-OB1-SSY-SupplementarySystems	GEN-OB1-CSY-ASS-AssetBS	
Identification	Location	Quantities	Relations
GEN-OB1-INF-Information	PLA_WorkPhase	STRCPM_BoQ	STRCPM_Code
GEN-OB1-CSY-PRD-ProductBS	GEN-OB1-CSY-SYS-SystemBS	GEN-OB1-DIM-Dimension	
Property	Value		
NumberMotorsEachTracker	tbd		
OperatingTemperatureRangeMax (Fo)	140		
OperatingTemperatureRangeMin (Fo)	-13		



19

BIM FOR DESIGN

Discipline

- ☒ Asset Management
- ☐ Electrical
- ☐ General

LMTR

Product Code

LV MV Transform...

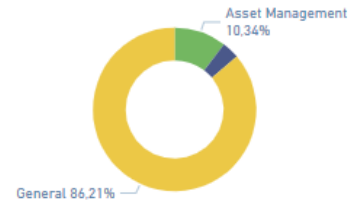
Product Name

Electrical CoC

Process Owner

29

Attributes

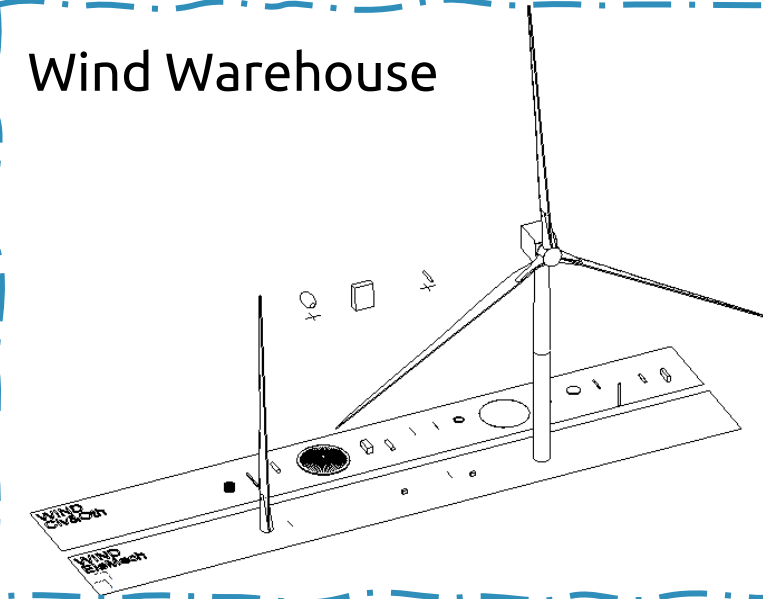


Product Name

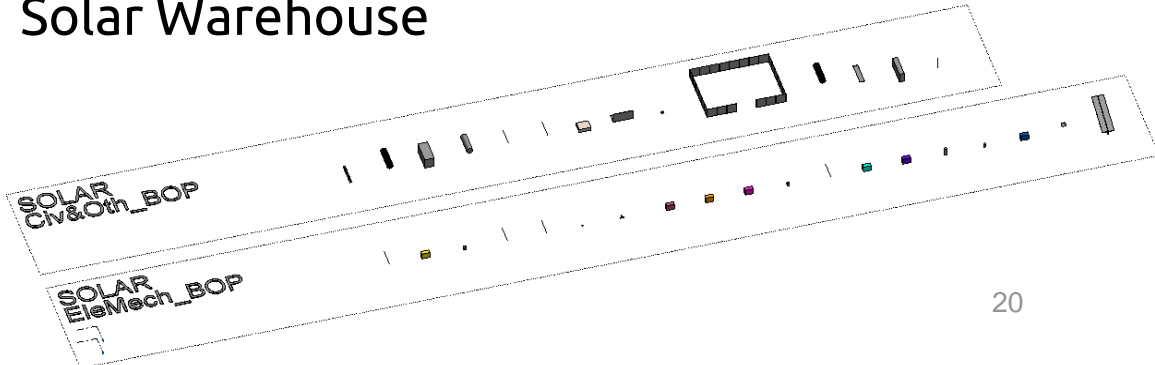
- ☐ AC Cabinet
- ☐ Anchorage Set
- ☐ Auxiliary Services Cabinet
- ☐ Base Layer
- ☐ Battery Bank
- ☐ Blade
- ☐ Cable Conduits Concrete
- ☐ Cable Way
- ☐ Capacitor Bank
- ☐ Centralized Inverter
- ☐ Circuit Breaker
- ☐ Concrete Slab
- ☐ Connection Box
- ☐ Conservator Tank
- ☐ Construction Site
- ☐ Construction Site Barrack
- ☐ Control Building
- ☐ Conversion Unit
- ☐ Crane Pad
- ☐ Culvert
- ☐ Current Transformer

Product Name	Discipline	Information Requirement	PSET Description	Parameter Description
LV MV Transformer	Asset Management	Manufacturer Serial number	CommonInformation	The serial number is the number that is assigned by the manufacturer to a single technical object
LV MV Transformer	Asset Management	Funt. Loc. Category	CommonInformation	Key for displaying the type of technical location
LV MV Transformer	Asset Management	Position	CommonInformation	Rebar position
LV MV Transformer	Electrical	Ele Tag-no.	CommonDesignAndTechnicalData	Representing the hierarchical relation between plant's electrical components
LV MV Transformer	General	Documentations Link Layout	Documentation	Document identification code of Layout output (in case of several codes, separate with comma)
LV MV Transformer	General	Documentations Link Test Report	Documentation	Document identification code of Test Report output (in case of several codes, separate with comma)
LV MV Transformer	General	Documentations Link Datasheet	Documentation	Document identification code of Datasheet output (in case of several codes, separate with comma)
LV MV Transformer	General	Documentations Link Manual	Documentation	Document identification code of Manual output (in case of several codes, separate with comma)
LV MV Transformer	General	Documentations Link Ele Scheme	Documentation	Document identification code of Ele Scheme output (in case of several codes, separate with comma)
LV MV Transformer	General	Documentations Link Drawing	Documentation	Document identification code of Drawing output (in case of several codes, separate with comma)
LV MV Transformer	General	Documentations Link Wiring Scheme	Documentation	Document identification code of Wiring Scheme output (in case of several codes, separate with comma)
LV MV Transformer	General	Manufacturer	CommonInformation	Manufacturer name
LV MV Transformer	General	Model	CommonInformation	Manufacturer Model
LV MV Transformer	General	Material	CommonInformation	Material Type
LV MV Transformer	General	Status	CommonInformation	i.e. New, Existing (new roads, existing roads)
LV MV Transformer	General	ProductCode	CommonInformation	Code of Product compliant with ENEL E&C Classification System (Important for mapping)
LV MV Transformer	General	Other Tagging	CommonInformation	Other Typology of Tagging
LV MV Transformer	General	PlantArea	ClassificationSystemAssetBS	Classification System: Asset
LV MV Transformer	General	SubArea	ClassificationSystemAssetBS	Classification System: Asset
LV MV Transformer	General	Cluster	ClassificationSystemAssetBS	Classification System: Asset
LV MV Transformer	General	FunctionalGroup	ClassificationSystemAssetBS	Classification System: Asset
LV MV Transformer	General	Category	ClassificationSystemCategoryBS	Classification System: Category
LV MV Transformer	General	SubCategory	ClassificationSystemCategoryBS	Classification System: Category

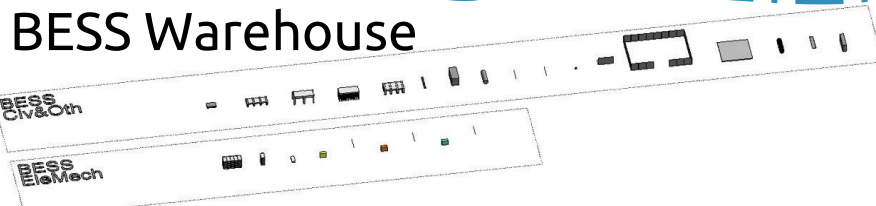
Wind Warehouse



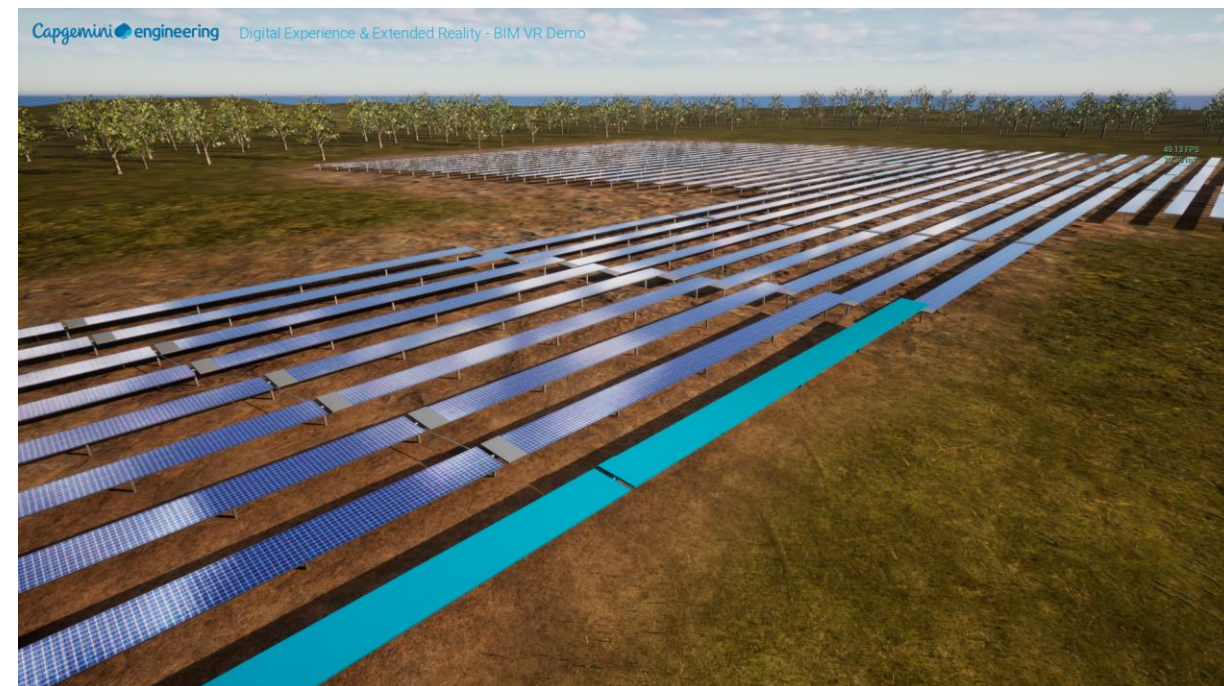
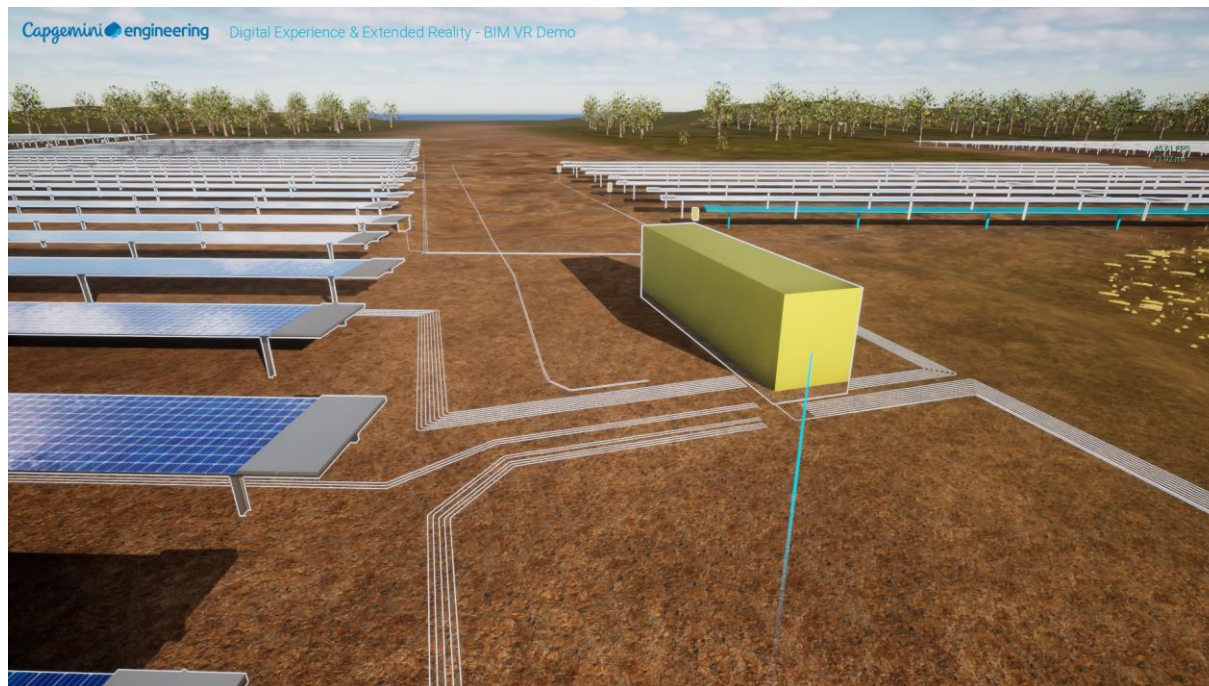
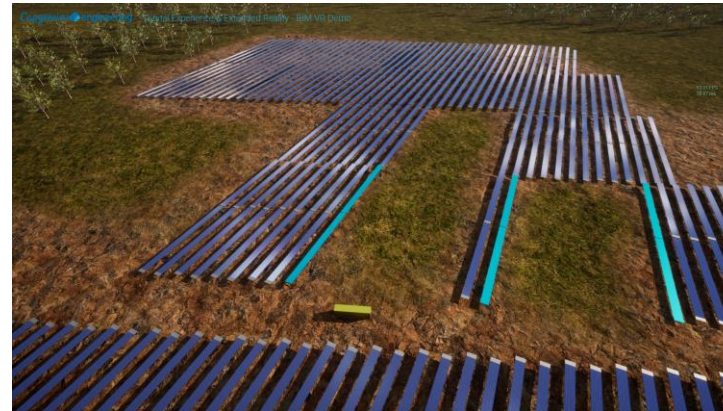
Solar Warehouse



BESS Warehouse

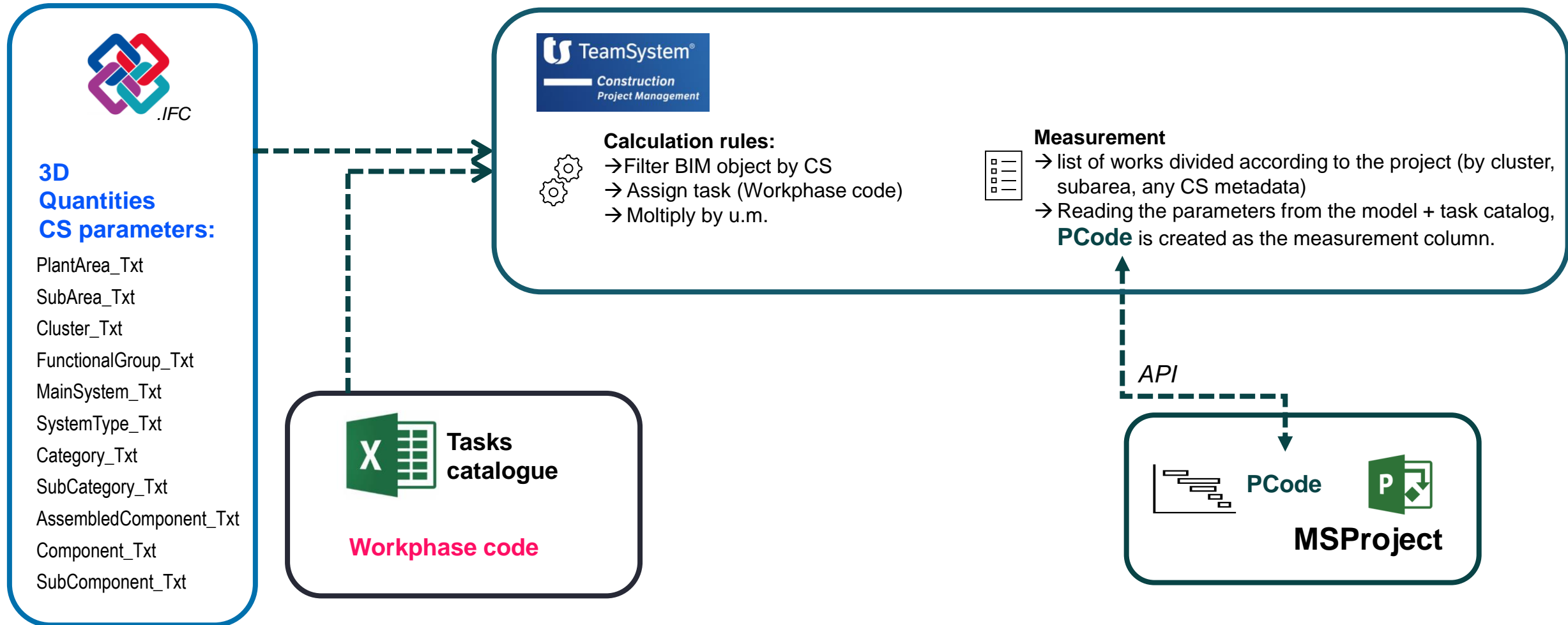


BIM FOR DESIGN WITH VR

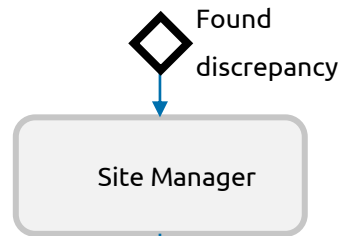


BIM IN EXECUTION

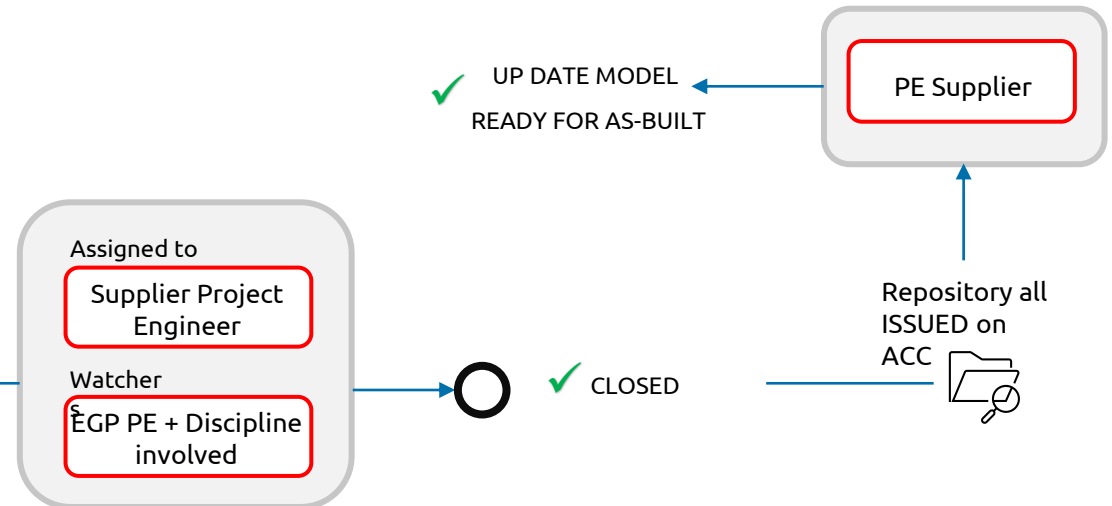
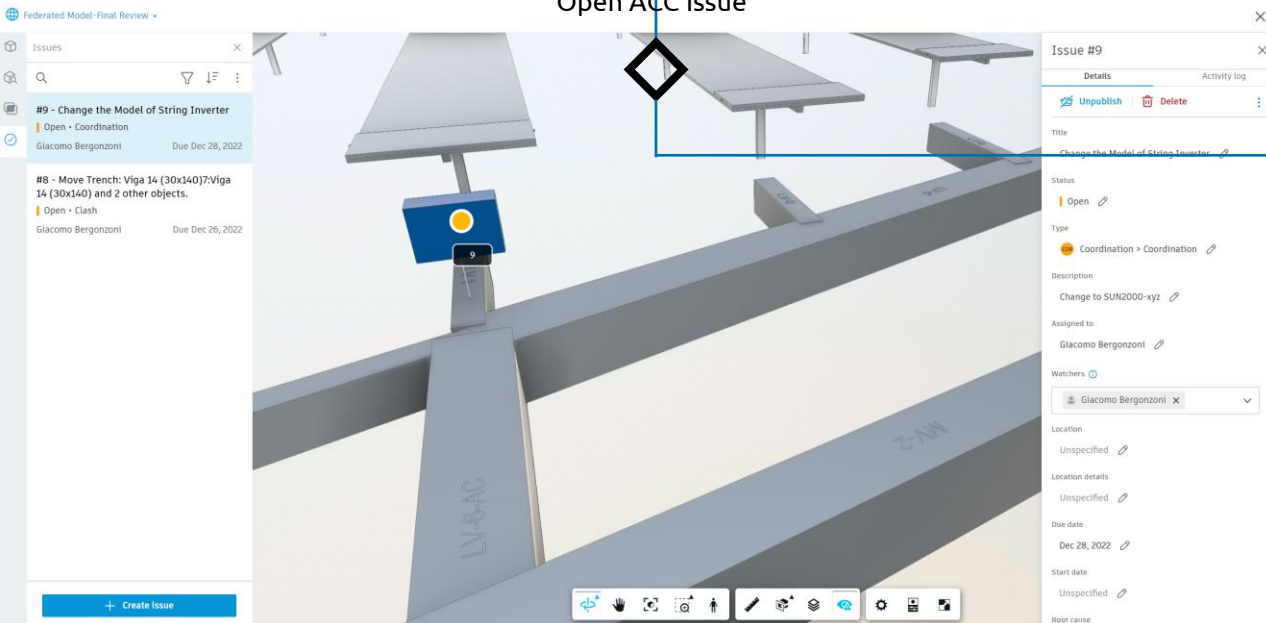
CPM allows to link BIM model elements to Tasks



BIM IN EXECUTION



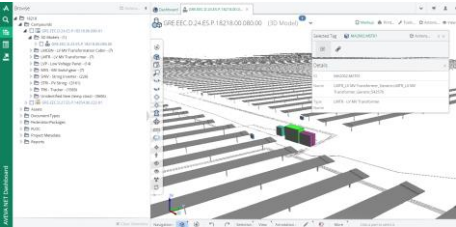
Open ACC Issue



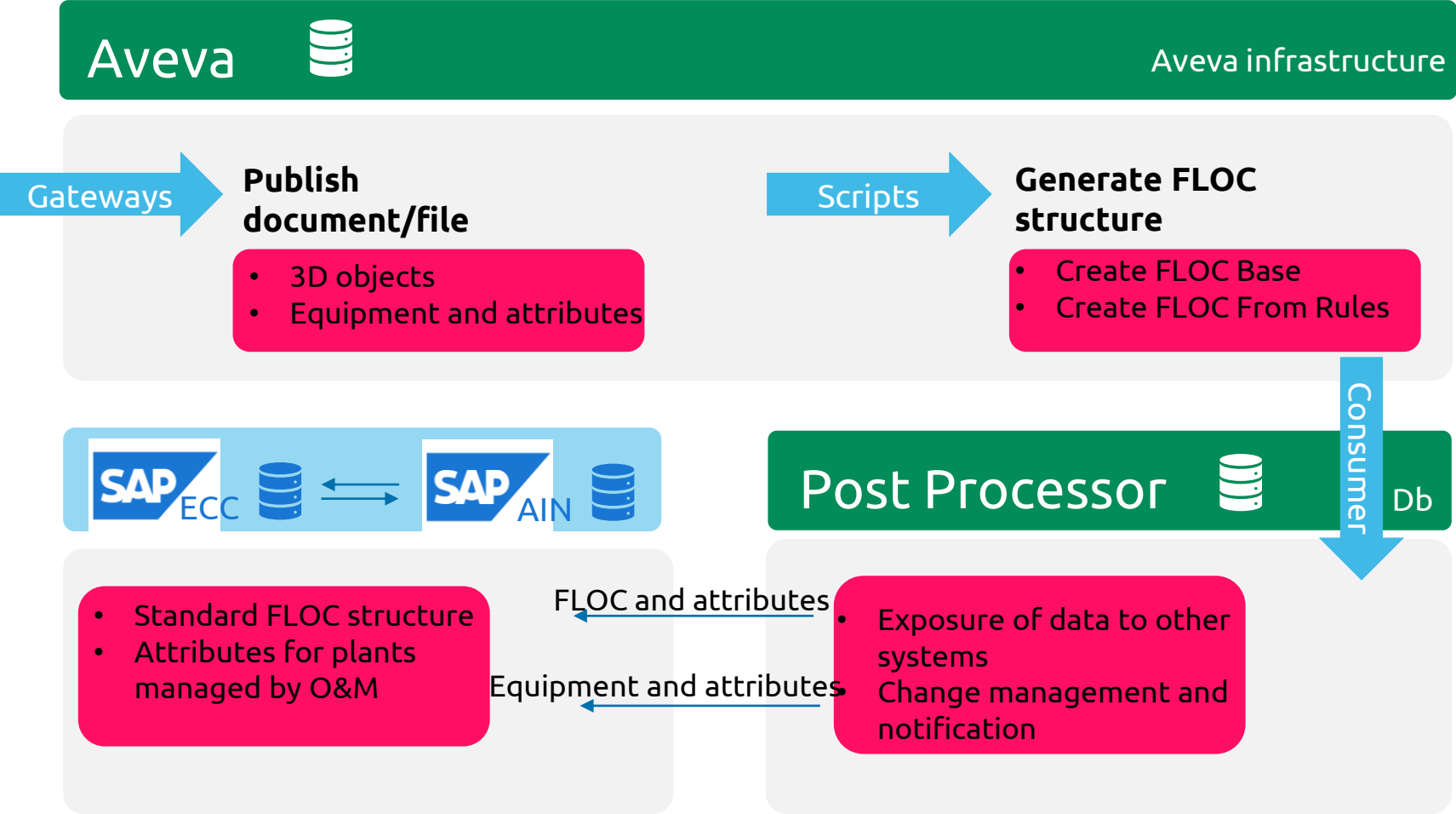
HO TO O&M THROUGH DATA IN THE BIM MODELS

Data & Document Management for Asset Registry

3D Model composed of geometry + attribute



[LINK to AVEVA Project](#)

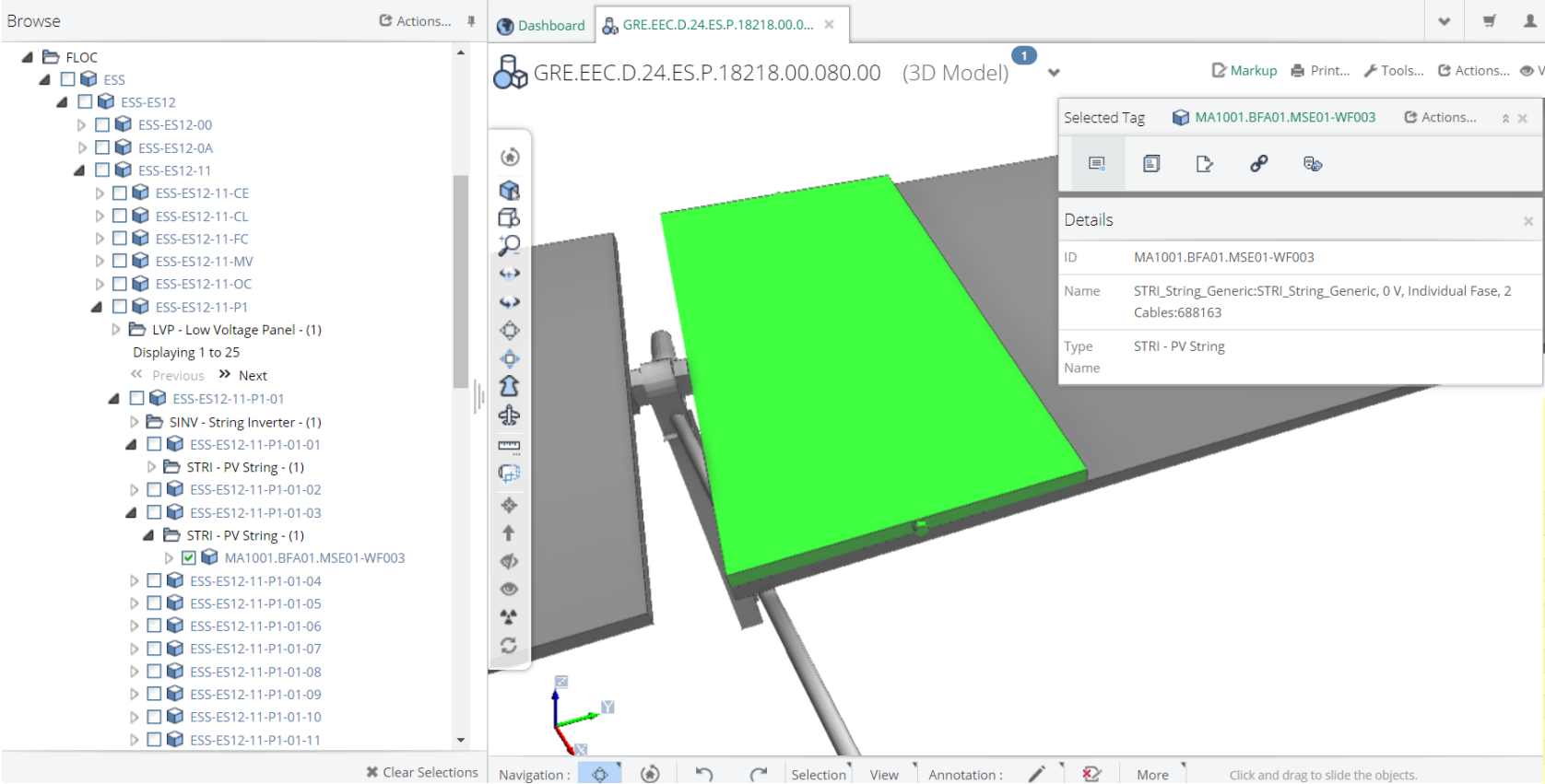


HO TO O&M THROUGH DATA IN THE BIM MODELS

Aveva interface

Query forms:
FLOC: All Flocs with Tags

➔



Selected Tag: MA1001.BFA01.MSE01-WF003

Details

ID: MA1001.BFA01.MSE01-WF003

Name: STRI_String_Generic:STRI_String_Generic, 0 V, Individual Fase, 2 Cables:688163

Type: STRI - PV String

Name:

EleTag	EleTag Type	Floc	Floc Description	Context
		ESS	Country-Technology	16398 FLOC
		ESS-TIRR	Plant Code	16398 FLOC
		ESS-TIRR-00	Common infrastructures and Services	16398 FLOC
		ESS-TIRR-00-AS	Anti rodent system	16398 FLOC
		ESS-TIRR-00-CL	Underground Cables and Overhead Power Lines	16398 FLOC
		ESS-TIRR-00-CL-CT	Cable trays	16398 FLOC
		ESS-TIRR-00-CL-JC	MV junctions and connections	16398 FLOC
		ESS-TIRR-00-CL-MC	MV cables	16398 FLOC
		ESS-TIRR-00-FF	Fire Protection System	16398 FLOC
		ESS-TIRR-00-GG	Grounding grid	16398 FLOC
		ESS-TIRR-00-IC	Internal Communications	16398 FLOC
		ESS-TIRR-00-IC-HT	Telephone Devices	16398 FLOC
		ESS-TIRR-00-IL	Overhead lighting	16398 FLOC
		ESS-TIRR-00-IL-CL	CL LV cables	16398 FLOC
		ESS-TIRR-00-IL-LS	LS Lamps	16398 FLOC
		ESS-TIRR-00-IL-LU	LU luminaries	16398 FLOC

EleTag	EleTag Type	Floc	Floc Description	Context
		ESS-TIRR-11-P2-06-IP	AC Interface Protection system	16398 FLOC
		ESS-TIRR-11-P2-06-MP	DC MPPT control system	16398 FLOC
MA1001.BFA02.MSE07	SINV - String Inverter	ESS-TIRR-11-P2-07	String Inverter	16398 FLOC
MA1001.BFA02.MSE07-WF001	STRI - PV String	ESS-TIRR-11-P2-07-01	String - String Inverter	16398 FLOC
MA1001.BFA02.MSE07-WF002	STRI - PV String	ESS-TIRR-11-P2-07-02	String - String Inverter	16398 FLOC
MA1001.BFA02.MSE07-WF003	STRI - PV String	ESS-TIRR-11-P2-07-03	String - String Inverter	16398 FLOC
MA1001.BFA02.MSE07-WF004	STRI - PV String	ESS-TIRR-11-P2-07-04	String - String Inverter	16398 FLOC
MA1001.BFA02.MSE07-WF005	STRI - PV String	ESS-TIRR-11-P2-07-05	String - String Inverter	16398 FLOC
MA1001.BFA02.MSE07-WF006	STRI - PV String	ESS-TIRR-11-P2-07-06	String - String Inverter	16398 FLOC
MA1001.BFA02.MSE07-WF007	STRI - PV String	ESS-TIRR-11-P2-07-07	String - String Inverter	16398 FLOC
MA1001.BFA02.MSE07-WF008	STRI - PV String	ESS-TIRR-11-P2-07-08	String - String Inverter	16398 FLOC
MA1001.BFA02.MSE07-WF009	STRI - PV String	ESS-TIRR-11-P2-07-09	String - String Inverter	16398 FLOC
MA1001.BFA02.MSE07-WF010	STRI - PV String	ESS-TIRR-11-P2-07-10	String - String Inverter	16398 FLOC
MA1001.BFA02.MSE07-WF011	STRI - PV String	ESS-TIRR-11-P2-07-11	String - String Inverter	16398 FLOC
MA1001.BFA02.MSE07-WF012	STRI - PV String	ESS-TIRR-11-P2-07-12	String - String Inverter	16398 FLOC
MA1001.BFA02.MSE07-WF013	STRI - PV String	ESS-TIRR-11-P2-07-13	String - String Inverter	16398 FLOC
MA1001.BFA02.MSE07-WF014	STRI - PV String	ESS-TIRR-11-P2-07-14	String - String Inverter	16398 FLOC

➔

RDS-PP code and associated FLOCs

HO TO O&M THROUGH DATA IN THE BIM MODELS



Data transfer to SAP-AIN

enel Asset Registry

ESS (Country-Technology)

ESS-ES12 (Plant Code)

ESS-ES12-22 (Subfield)

ESS-ES12-0A (Substation)

ESS-ES12-ZZ (Systems and Various Equ)

ESS-ES12-32 (Subfield)

ESS-ES12-9Z (Logistic Tools)

ESS-ES12-00 (Common Infrastructures e

ESS-ES12-23 (Subfield)

GearBox

ESS-ES12-21-TT-40-GB

ID esterni

Stato: Non pubblicato

Lingue: EN

Informazioni

Struttura e pezzi

Sequenza cronologica

Scheda tecnica

Tutti gli attributi 61

Valori modificati confrontati con default 0

Attributi senza valori 55

Modifica

AssetCommonInformation

Pubblica

Gestisci

corresponding item in Aveva

ESS-ES12-21-TT-40-GB (Functional Location)

DESCRIPTION

TYPE NAME

GearBox

Functional Location

Attributes

Query Forms

Relations

Attributes

ESS-ES12-21-TT-40-GB Dataset

ASM-Obj-COM-INF (6/39)

Country Key	ES
Funct. Loc Level	6
Funct. Loc. Description	GearBox
Functional Location (WBS)	ESS-ES12-21-TT-40-GB
Funt. Loc. Category	S
Superior FunctLoc.	ESS-ES12-21-TT-40

Sustainable Places | Capgemini Engineering | June 2023

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HOW TO O&M THROUGH DATA IN THE BIM MODELS



Data transfer to SAP-AIN

Asset Registry

ESS-ES12-21-TT-67-BU (Bushin)

ESS-ES12-21-TT-67-MO (Motor)

ESS-ES12-21-TT-67-T2 (Control)

18218|MA2001.MQR067_Q (TRK - Tracker)

18218|MA2001.MQR067_S (TRK - Tracker)

ESS-ES12-21-TT-4A (Tracker Comp)

ESS-ES12-21-TT-84 (Tracker Comp)

ESS-ES12-21-MV (MV Section)

ESS-ES12-21-FC (Container HVAC)

ESS-ES12-21-P2 (LV/AC Panel)

TRK - Tracker

18218|MA2001.MQR067_S

Informazioni

Struttura e pezzi

Documentazione

Monitoraggio

Manutenzione

AssetCommonInformation Equipment

Manufacturer Serial number

NA

Equipment category

(Solar) S

Equipment description

TRK - Tracker

Funt. Loc. Category

(Solar) S

Superord. Equipment

18218|MA200...

CommonInformation Equipment

Manufacturer

SOLTEC

Model

SFONE TAN...

Class Name

TRK

MA2001.MQR067 (TRK - Tracker)

DESCRIPTION

TRK_Tracker_SF1_2ROW_V1:TRK_Tracker_SF1_2ROW_V1:541902

TYPE NAME

TRK - Tracker

Attributes

Compounds

Documents

Attributes

ELE-OBJ-COM-DIM (0/5)

ELE-OBJ-COM-DTD (1/26)

Ele Tag no.

MA2001.MQR067

ELE-OBJ-COM-MAT (0/6)

ELE-OBJ-EIN-DTD (0/1)

ELE-OBJ-HST-INF (0/2)

(0/1)

GEN-OBJ-COM-DIM (0/4)

GEN-OBJ-COM-DOC (7/7)

GEN-OBJ-COM-INF (5/36)

Manufacturer

SOLTEC

Model

SFONE TANDEM

Other Tagging

NA

ProductCode

TRK

Status

NEW

corresponding item in Aveva

ENEL BIM SHOWREEL

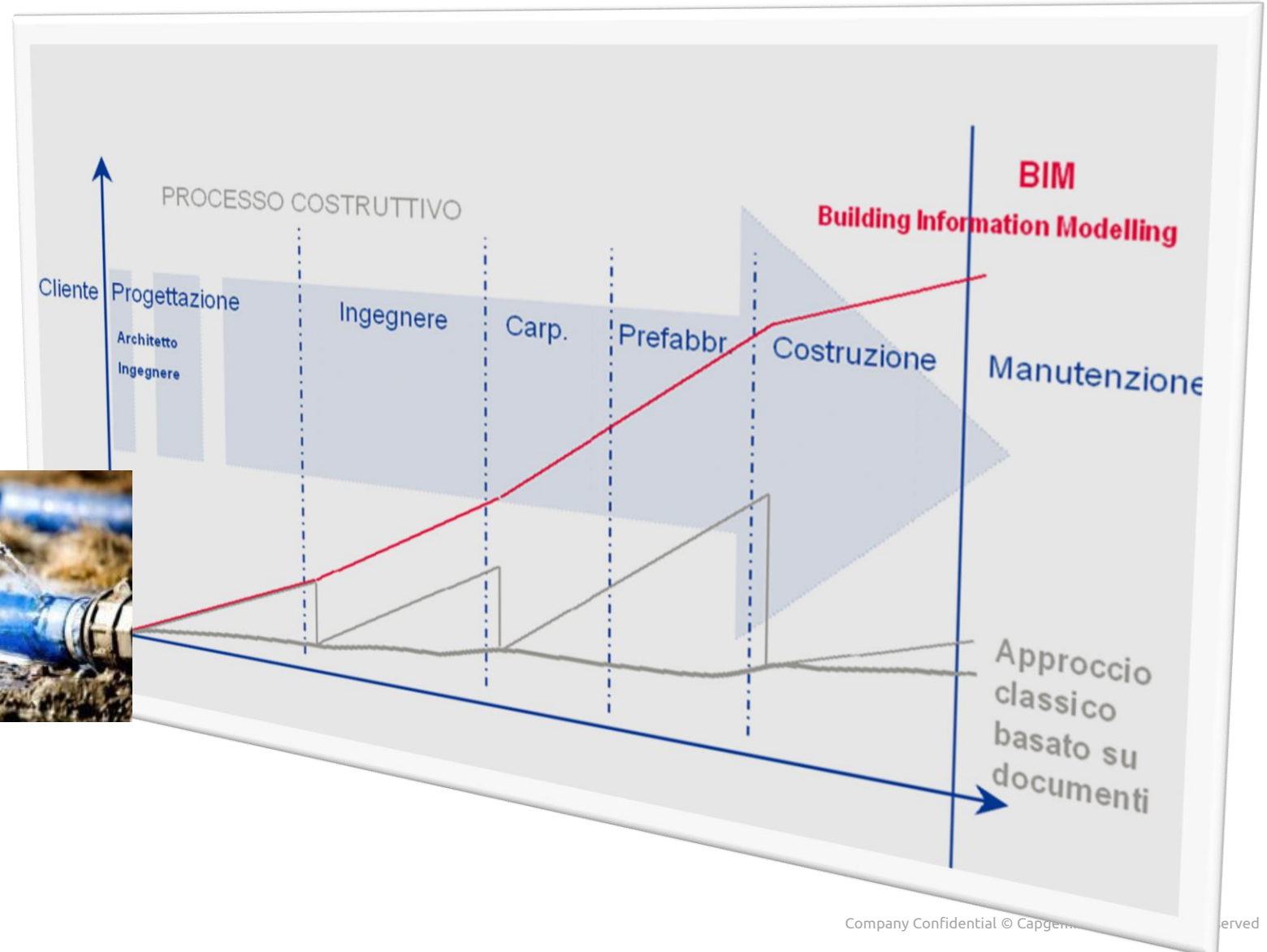


BIM BENEFITS

02 BENEFITS

Business value

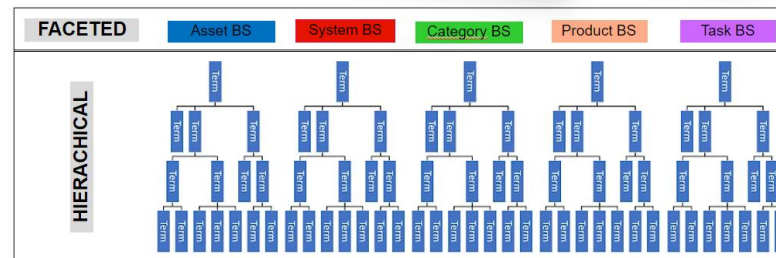
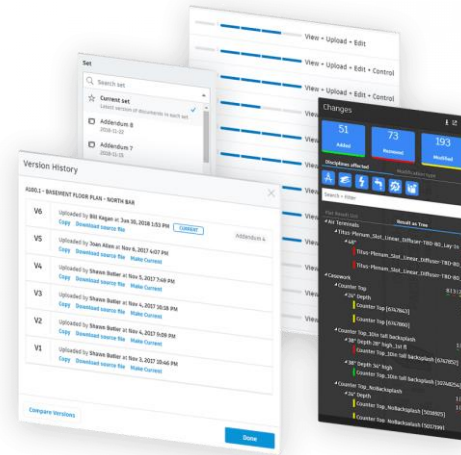
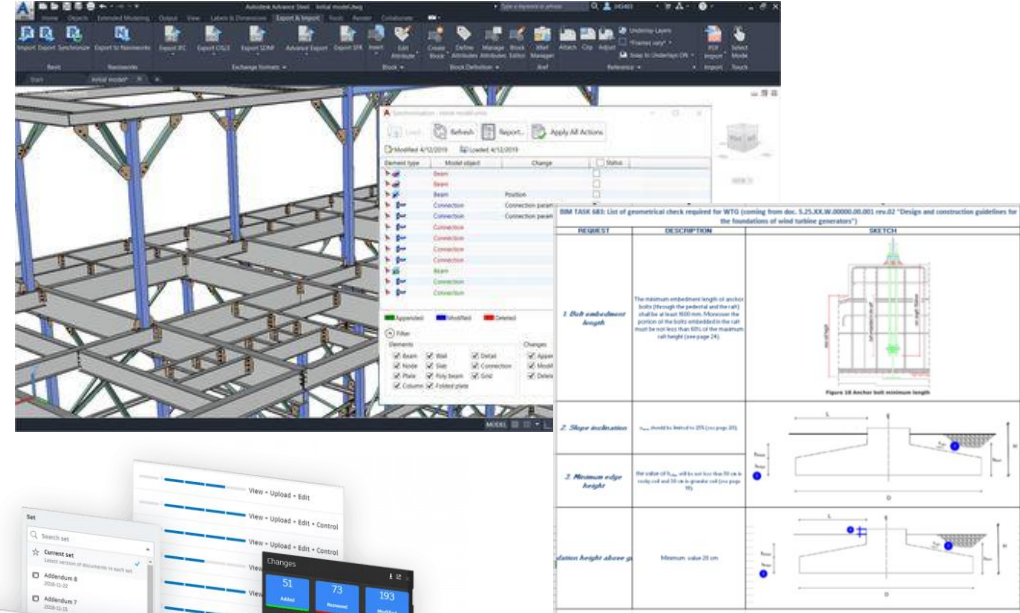
La «*single source of truth*», automatizzando il recupero dei dati e il loro trasferimento agli altri partner di filiera, sino a chi deve gestire e mantenere l'opera.



02 BENEFITS

BENEFIT BIM for ENGINEERING

ACTIVITY	Benefit
1 - Automatical check on design	Time saving average 25%
2 - CDE verify and emission documents	Time saving average 30%
3 - Deleted problem of misalignment data	Time saving/Data Quality
4 - All equipment and object catalogue with Classification System	Time saving/Data Quality
5 – Reduce capex at risk	Data Quality (5% Estimate)

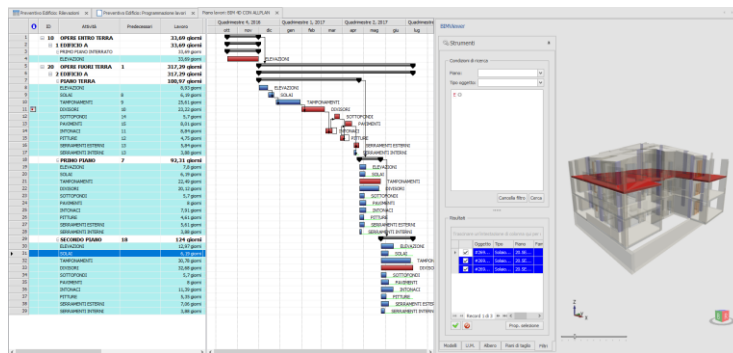


02 BENEFITS

BENEFIT BIM for CONSTRUCTION

ACTIVITY	Benefit
6 - Project set up by IFC	Time saving average 50%
7 - Progress monitoring by IFC	Time saving average 50%
8 - Red Mark by IFC	Time saving/Data Quality midle 25%
9 - 4D - Analysis Gantt by IFC	Time saving/Data Quality
10 - 5D - Economical progress by IFC	Time saving/Data Quality

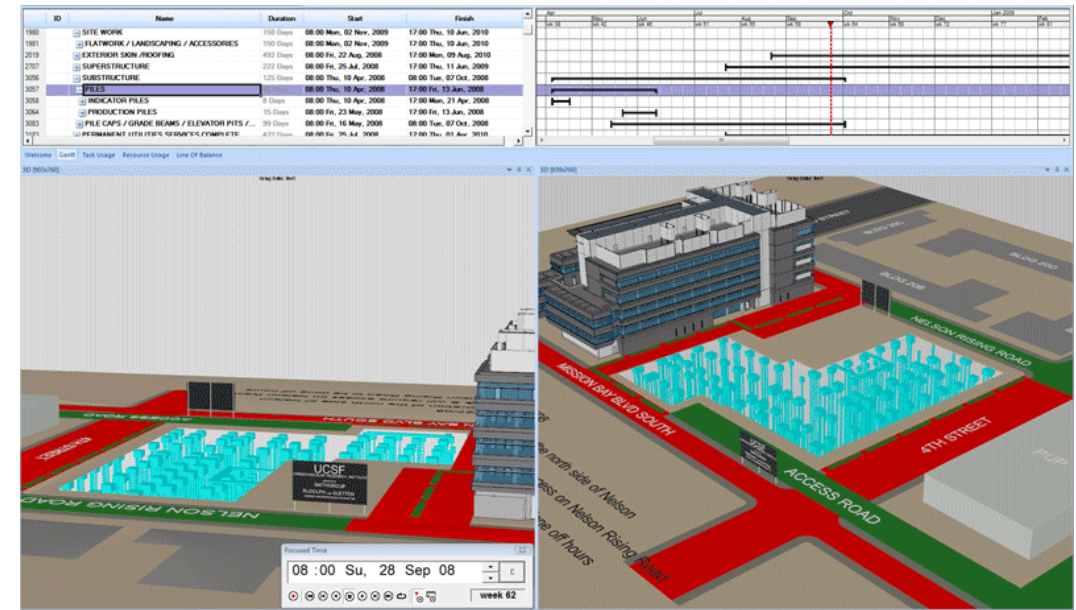
1-2



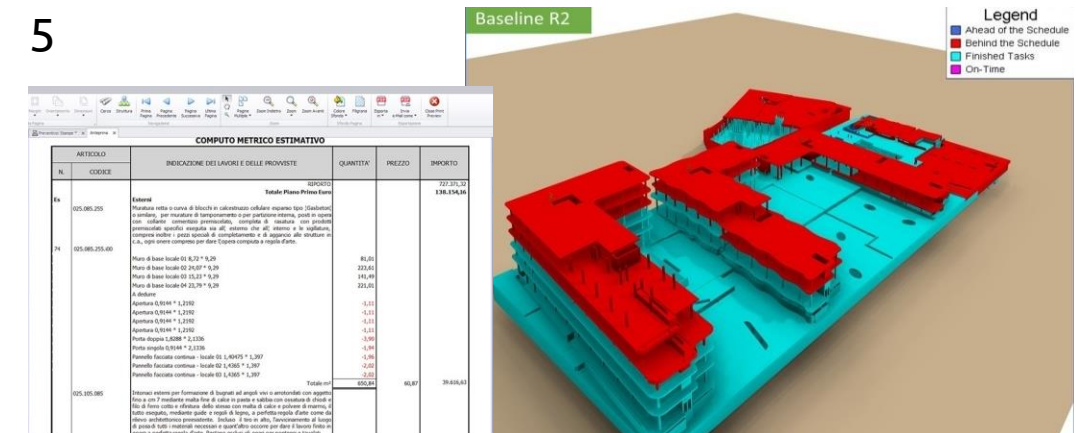
3



4



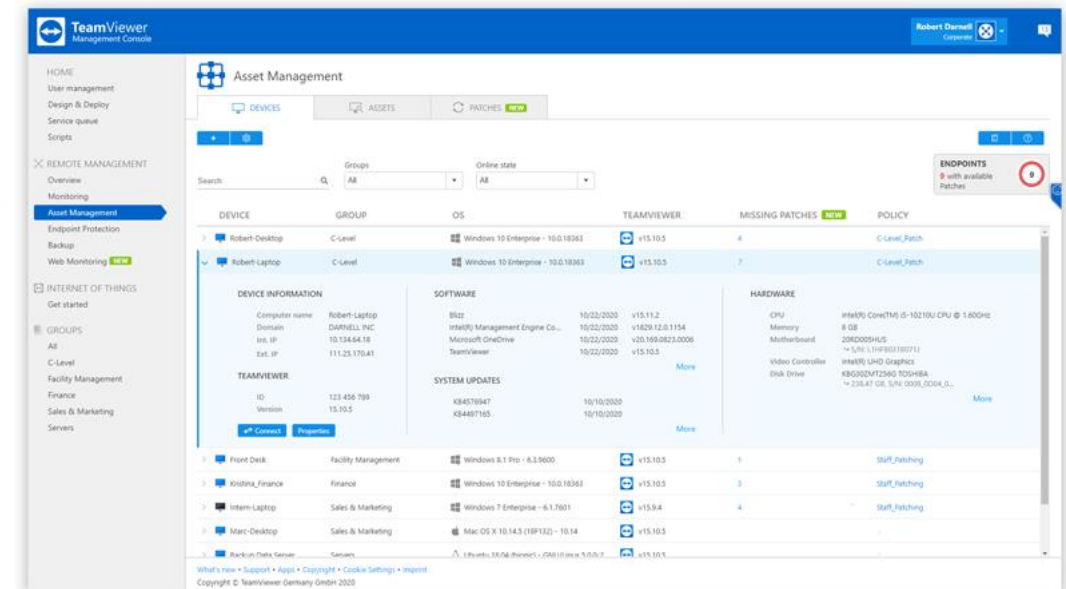
5



02 BENEFITS

BENEFIT BIM for O&M

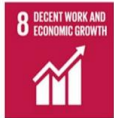
ACTIVITY	Benefit
11 – Asset Registry - Transcode functional location	Time saving midle 90%
12 – Digital Twin	Time saving/Data Quality



BIM BENEFITS WITH SDGS APPLICATION



SDGs



BENEFIT OF SUSTAINABLE

ACTIVITY	Benefit
1 – INCREASE QUALITY OF PROJECTS	
2 – REDUCE AND MITIGATION POSSIBLE RISKS	
3 – IMPROVE COLLABORATION AND INFORMATION EXCHANGE DURING DESIGN	
4 – REDUNCING ACTIVIT OF EARTH MOVEMET, REDUCTION OF CO2 EMISSION AND DUST IN THE AIR	
5 – REDUCING QUANTITY OF DISPOSAL MATERIAL, REDUCTION OF CO2 EMISSION AND DUST IN THE AIR	
6 – REDUCE THE CONSUMPTION OF WATER DURING THE CASTING AND ROAD PREPARATION, REDUCTION OF WATER CONSUMING	



15.71 FPS
21.92 ms

THANK YOU

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