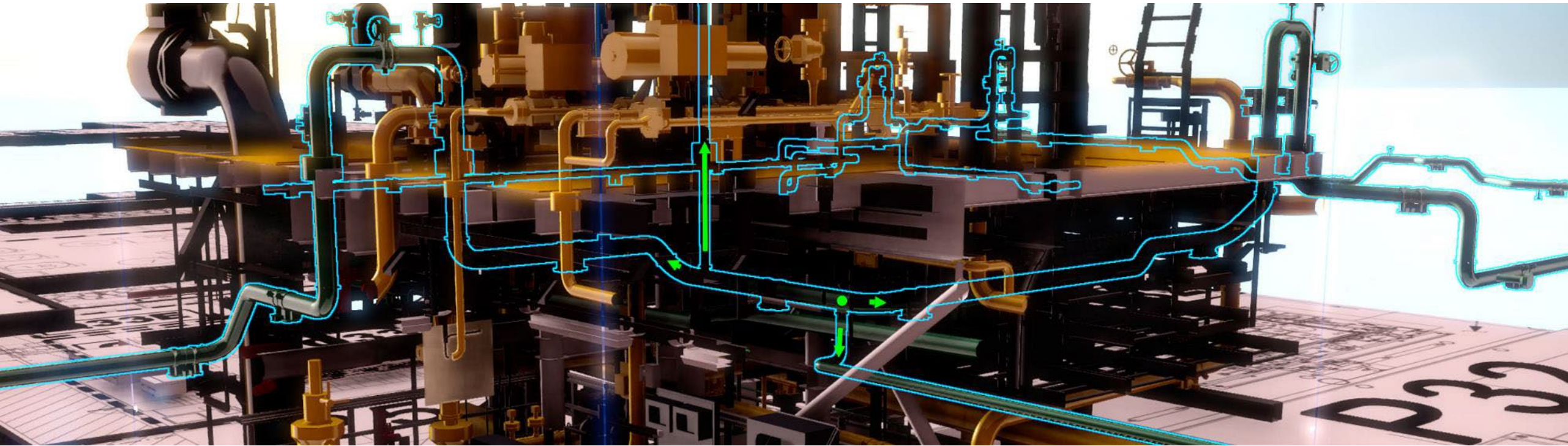


# Presentation ITA COSUF 06.12.2023

## Digital Twins in the Oil&Gas industry



Bernd Gmeiner  
Dipl. Betriebswirt (FH)

 Gmeiner Marketing Services  
Excellence in Communications

**VISCO**

# About VISCO

Founded in 1993

More than 5000 projects

More than 120 employed people

**Headquarter in Stavanger (NO)**

Offices in Norway, Germany, USA, Poland, Ukraine and Vietnam



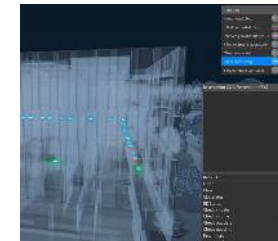
Experienced leader in industrial visualization



Supporting the complete value chain



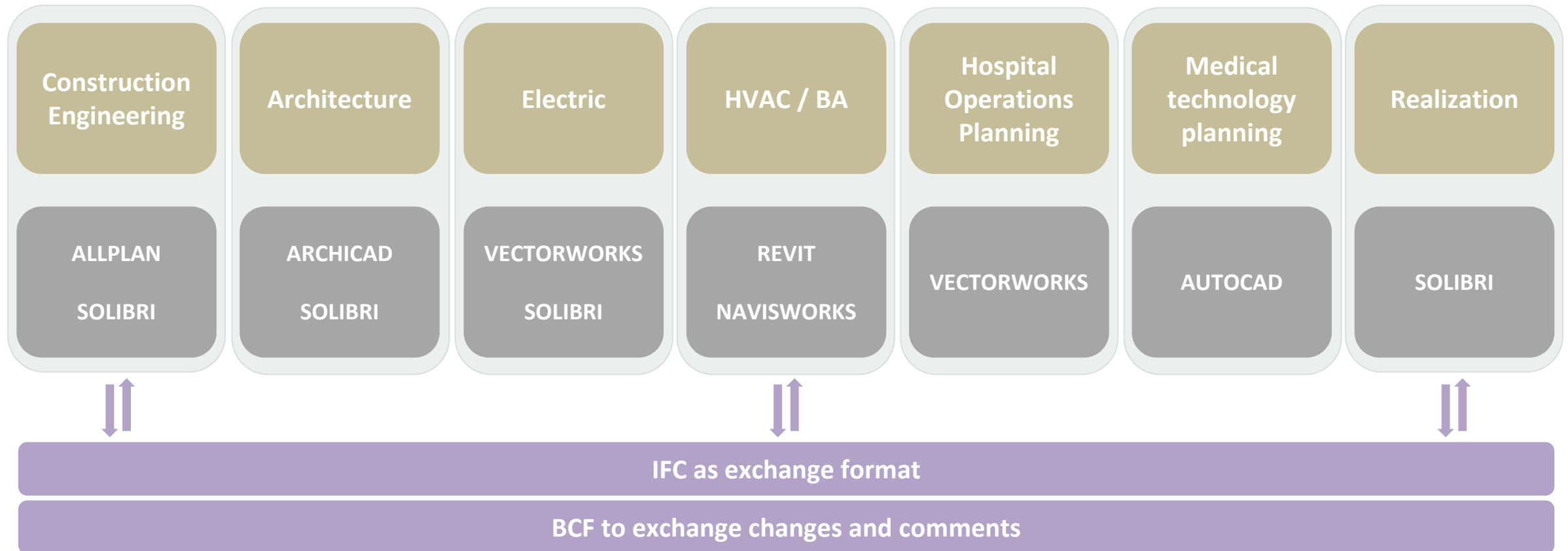
Visualization powered by AI



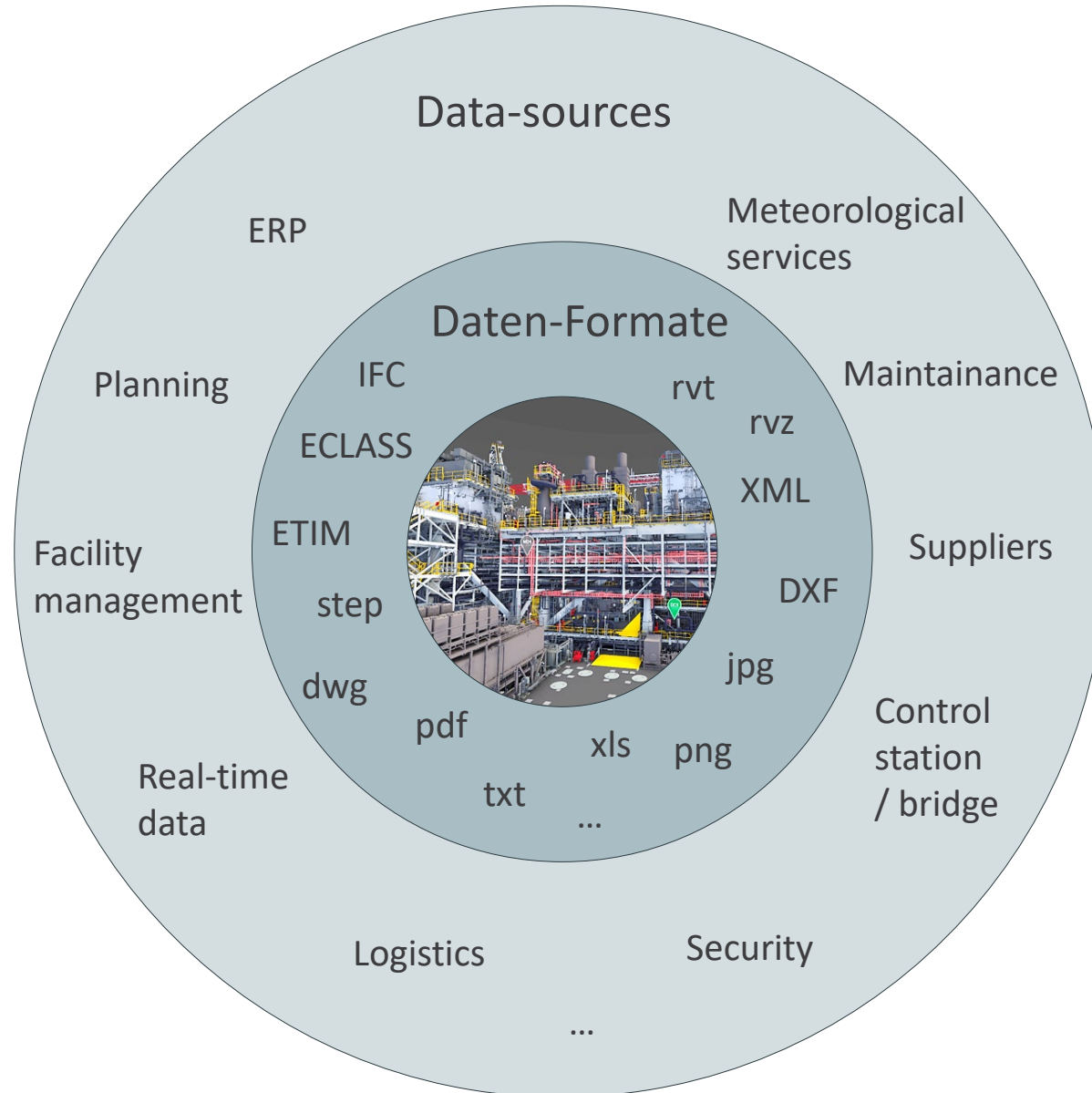
Fit for purpose frontends and user journeys as part of our meta twins

# Why open-BIM is so important

Example of the use of IFC as an exchange format between software from different manufacturers in a hospital project



# BIM and digital twins in the industry in general



- BIM is making its way into industrial planning step by step. VisCo has been using this data in digital twins for more than a decade now
- The challenge with BIM data is that many BIM models only contain 3D information, which unfortunately has not been enriched with metadata in a standardized way
- This is why open-BIM standardization is so important here as well. It is a rare situation where only a few vendors can agree on a single application.

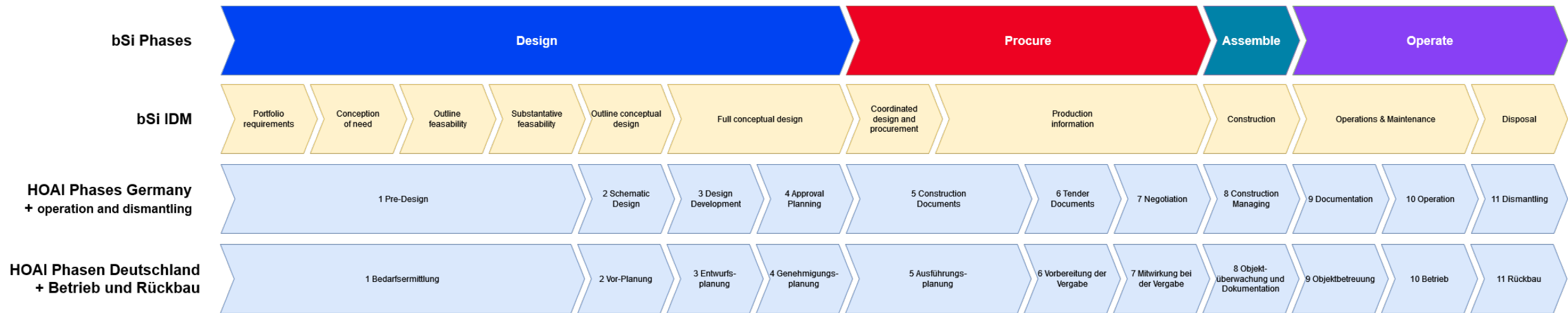


# Planning and construction phases are currently in focus in the BIM process - But BIM is important for the entire life cycle

bSI Phases	bSI IDM	ISO 12006-2	HOAI (Germany)	HOAI (Germany) English	LOD	ÖNORM	2017 Phases	RIBA (UK)	CSI / CSC OmniClass (Canada / USA)	
Design	Portfolio Requirements	Inception / Procurement	LP1: Grundlagenermittlung	Pre-design	100		Requirements	Strategic Definition	31-10 00 00	Inception Phase
	Conception of Need	Feasibility					Need	31-20 00 00	Conceptualization Phase	
	Outline Feasibility	Outline Proposals, Programme Preparation					Feasibility			
	Substantive Feasibility									
	Outline Conceptual Design	Scheme Detail / Costing	LP2: Vorplanung	Schematic Design			Concept	Developed Design	31-30 00 00	Criteria Definition Phase
	Full Conceptual Design		LP3: Entwurfsplanung	Design Development	200			Technical Design		31-40 00 00
		LP4: Genehmigungsplanung	Approval Planning	300						
Procure	Coordinated Design and procurement	Detail design / costing	LP5: Ausführungsplanung	Construction Documents	400		Coordination		31-50 00 00	
	Production Information	Production information and Bills of Materials	LP6: Vorbereitung der Vergabe	Tender Documents, BOQs			Production			
		Tender Action		Negotiations						
			LP7: Mitwirkung bei der Vergabe							
Assemble	Construction	Construction Preparation	LP8: Objektüberwachung	Construction Managing	500		Construction	31-60 00 00	Implementation Phase	
		Construction operations on-site								
		Completion					Handover & Closeout	31-70 00 00	Handover Phase	
Operate	Operations & Maintenance		LP9: Objektbetreuung	Documentation, Controlling			O&M	31-80 00 00	Operations Phase	
	Disposal	Feedback						31-90 00 00	Closure Phase	

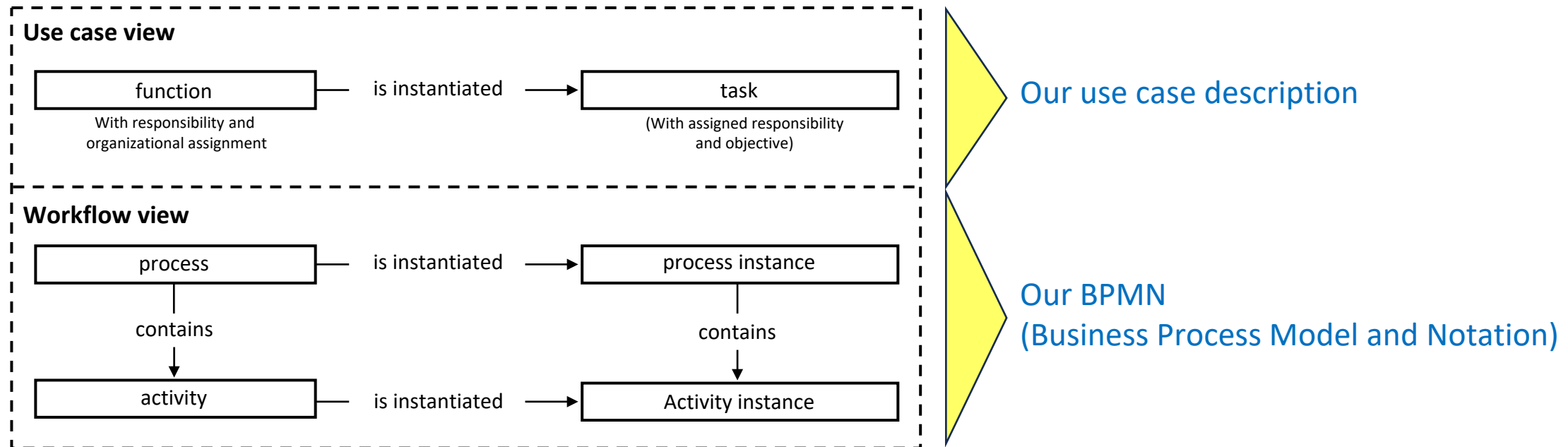
(Source: buildingSMART International / International User Group (Adapted: 2019.05.09))

# That's why we adjusted the workflow phases in several buildingSMART working groups



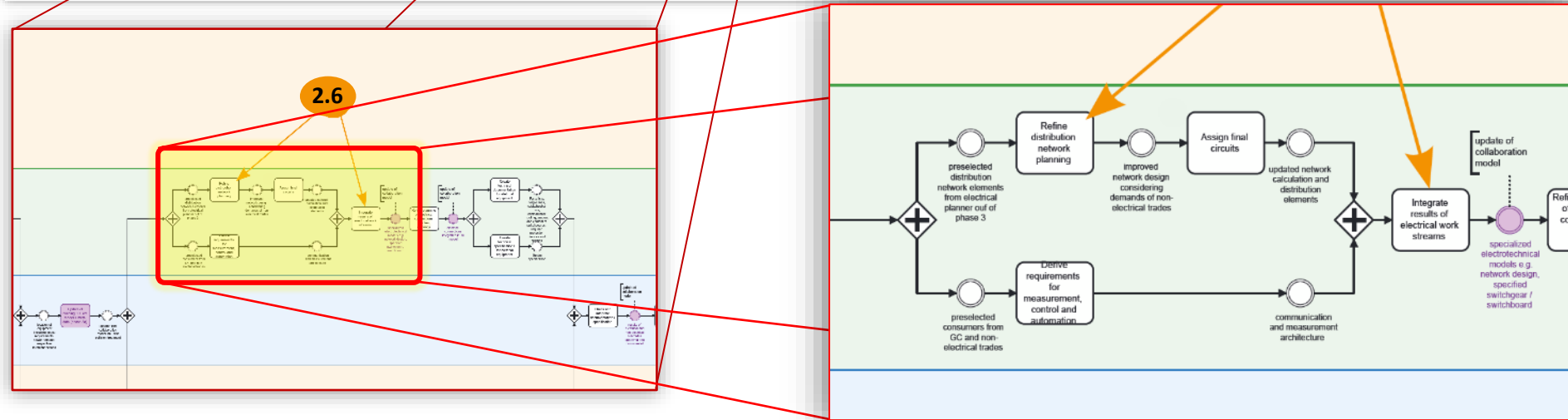
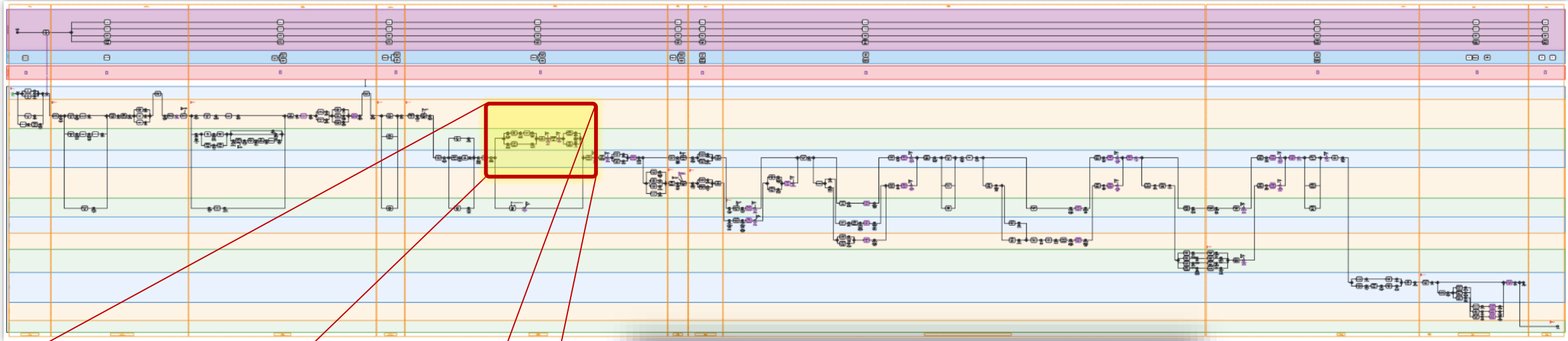
# Foundation of Electrical Domain Use Cases - Our primary blueprint is the DIN EN ISO 19650 standard

- **Blueprint: DIN EN ISO 19650 standard**
- **BPMN for lifecycle clarity**
- **Use cases for digestable workflow refinement**



Source: Comment on DIN EN ISO 19650 part 1 - CC-BY-NC-SA 3.0

# Use Case 2.6 Electrical planner – Location within the overall process



## Phase 5 Electrical Planner

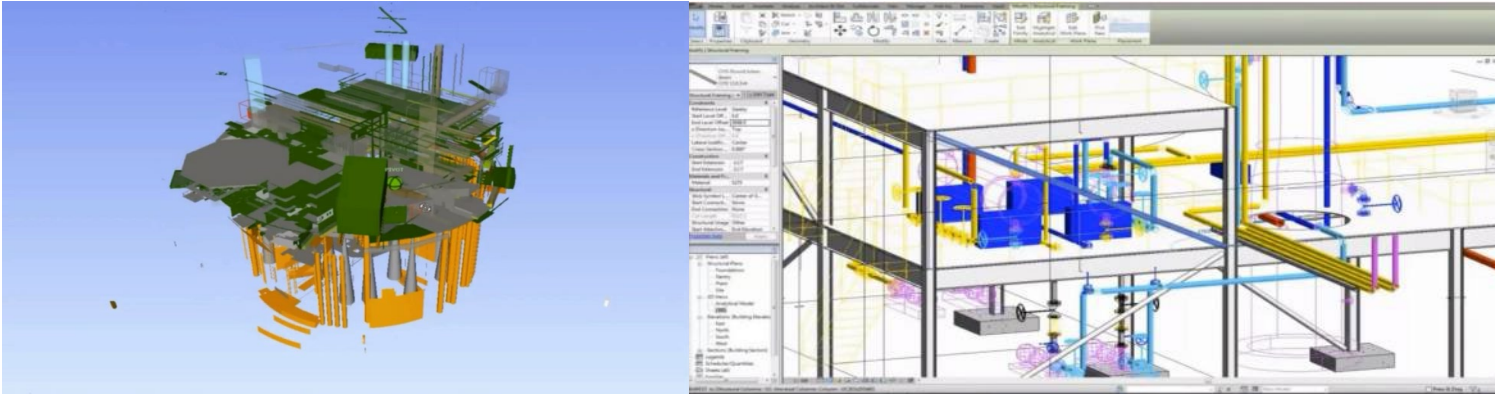
Focus activities in UC 2.6:

- Refine distribution network planning
- Integrate results in collaboration model

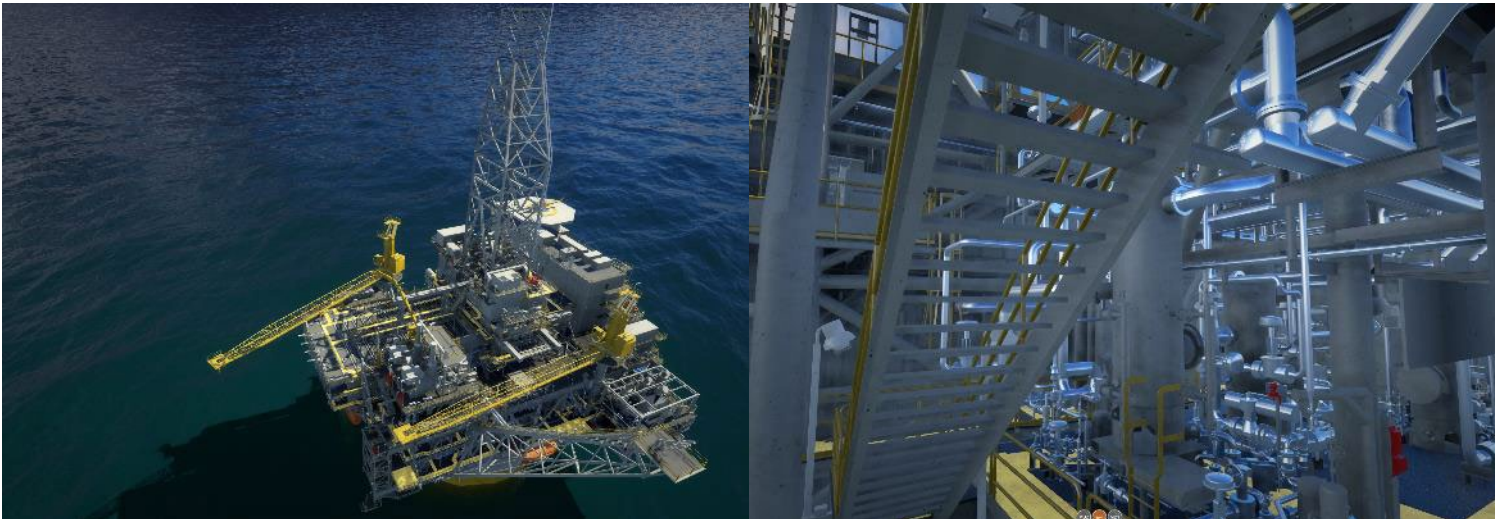
Source: bSi Electrical Domain



# Difference between a CAD environment and a digital twin environment like we use in industry



Incremental rendering vs. full frame rendering

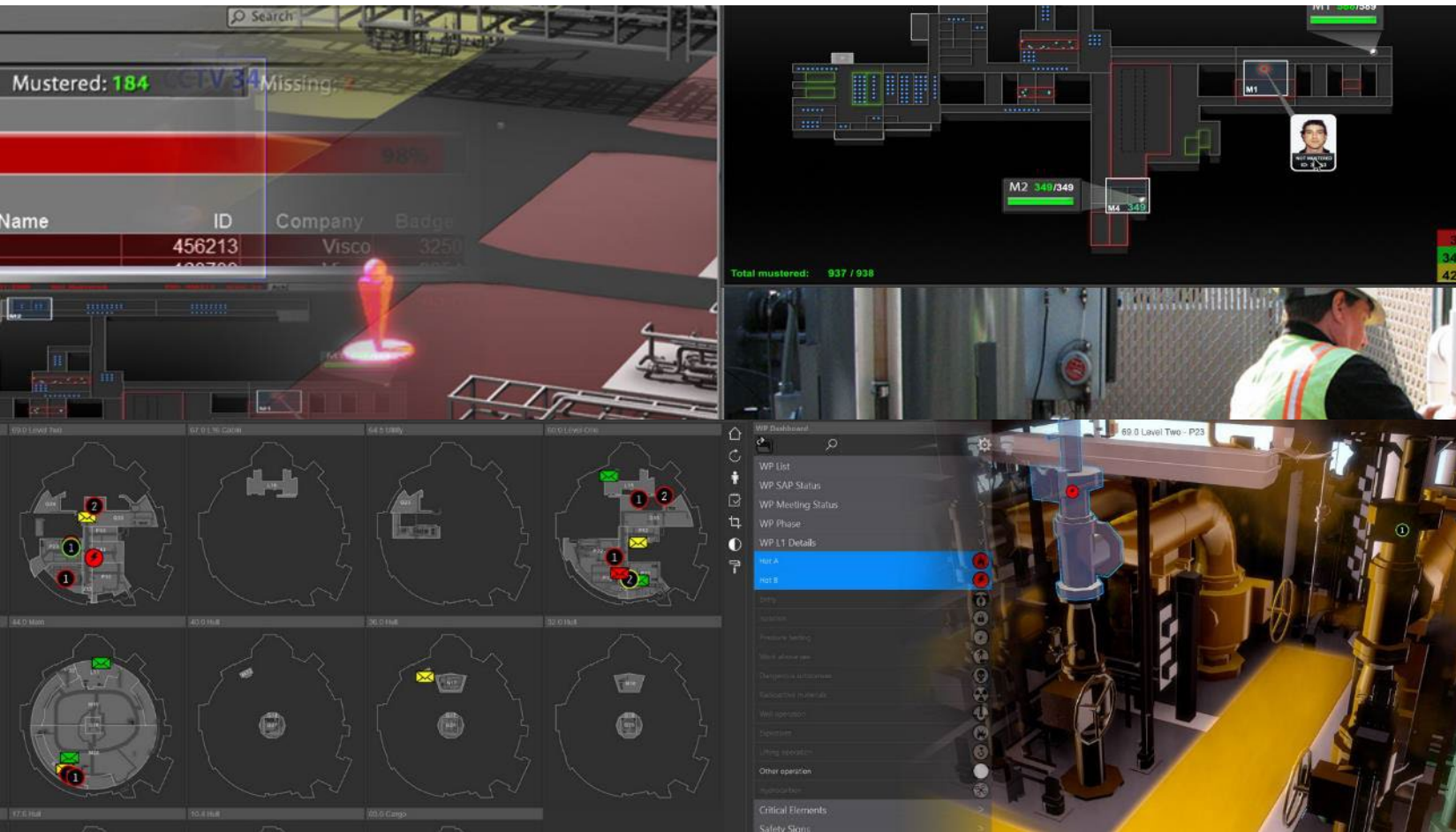


The difference between

- a CAD application,
- a gaming environment,
- a digital twin
- and an immersive digital twin

=> they have different application purposes

# Digital twins must work in real time for all stakeholders in everyday life



- The difference between a BIM model and its digital twin in operation is that you need to think about day-to-day activities and workflows in addition to change management.
- In addition to designs and sections through various objects, you need to be able to keep track of spare parts handling, risk-based assessments, deck handling, equipment handling, commissioning workflows, asset monitoring, and more.



# As-built-models



The as-built model (BIM or not) must be kept alive and constantly aligned with its digital twin.

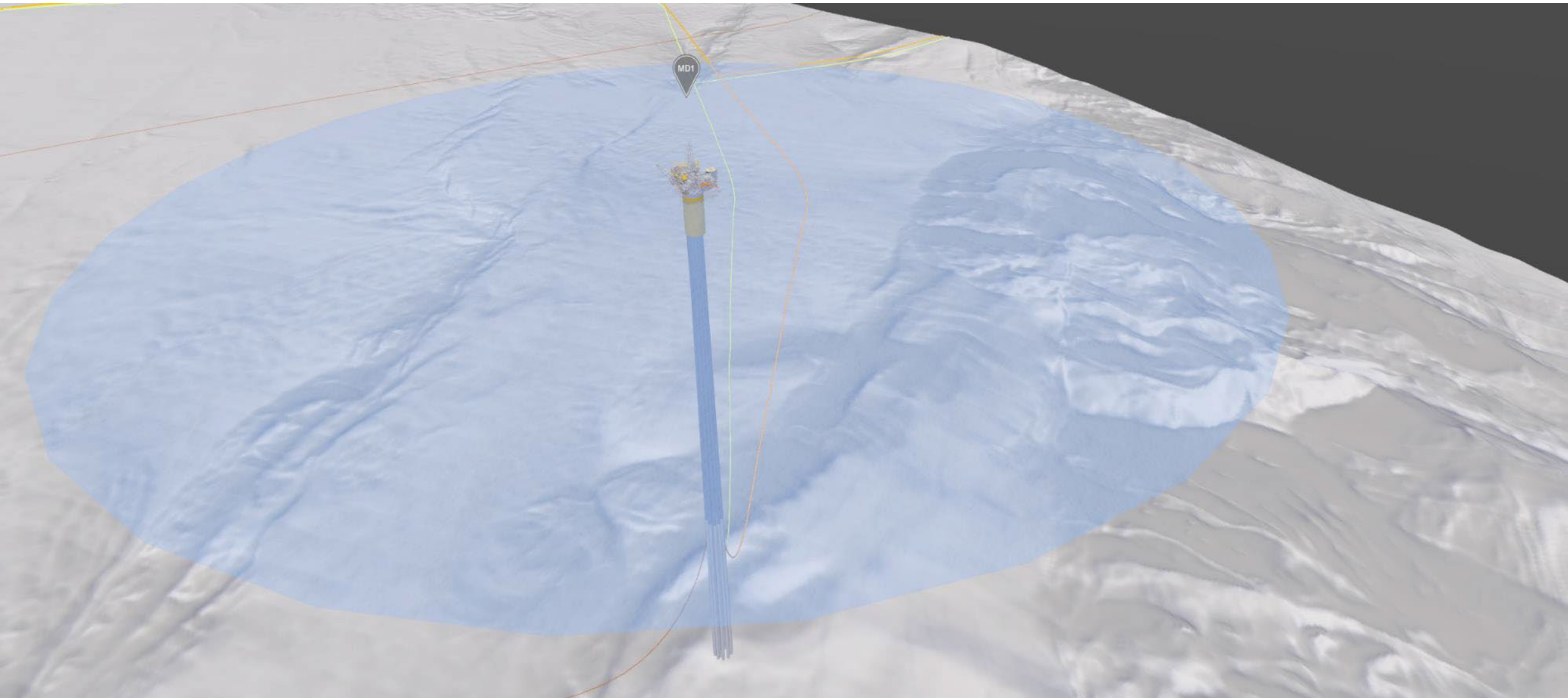
# BIM in industrial planning in general

- Standardization will make it increasingly easy to harmonize workflows between different software solutions
- When it comes to digital twins, the challenge reaches a new level as they have to work with live automated systems and interact not only with people but also with machines, e.g. IoT information flows
- Information flows need to go both ways -> forward and backward to enable it on the BIM side to match the as-built model -> of course if there is no as-built model, it is difficult to follow up with updates as changes occur when components need to be replaced

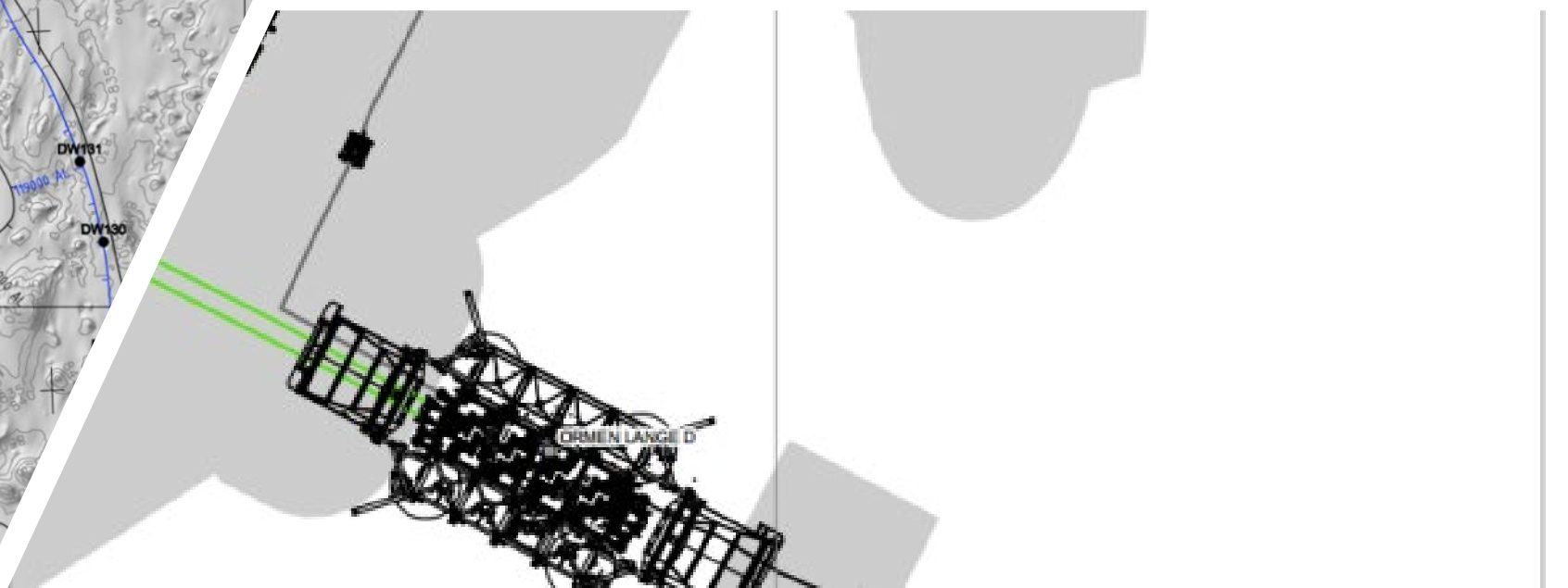
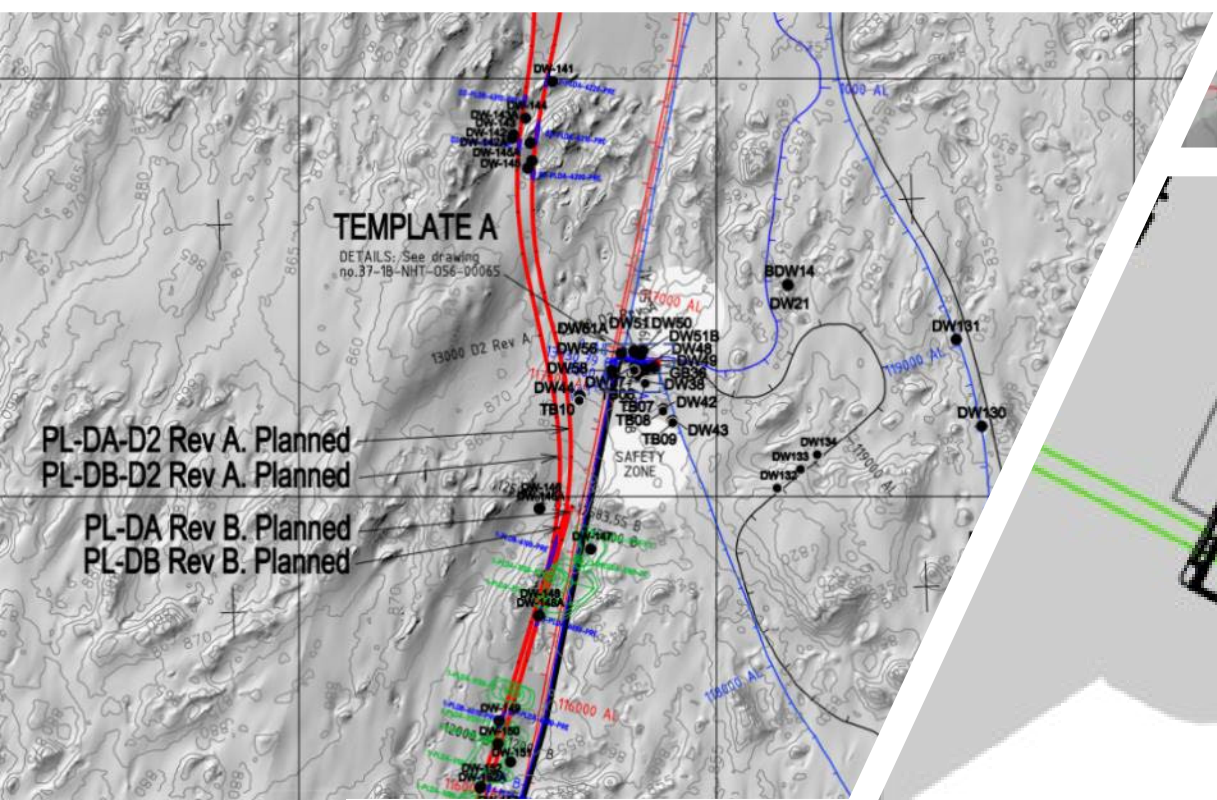
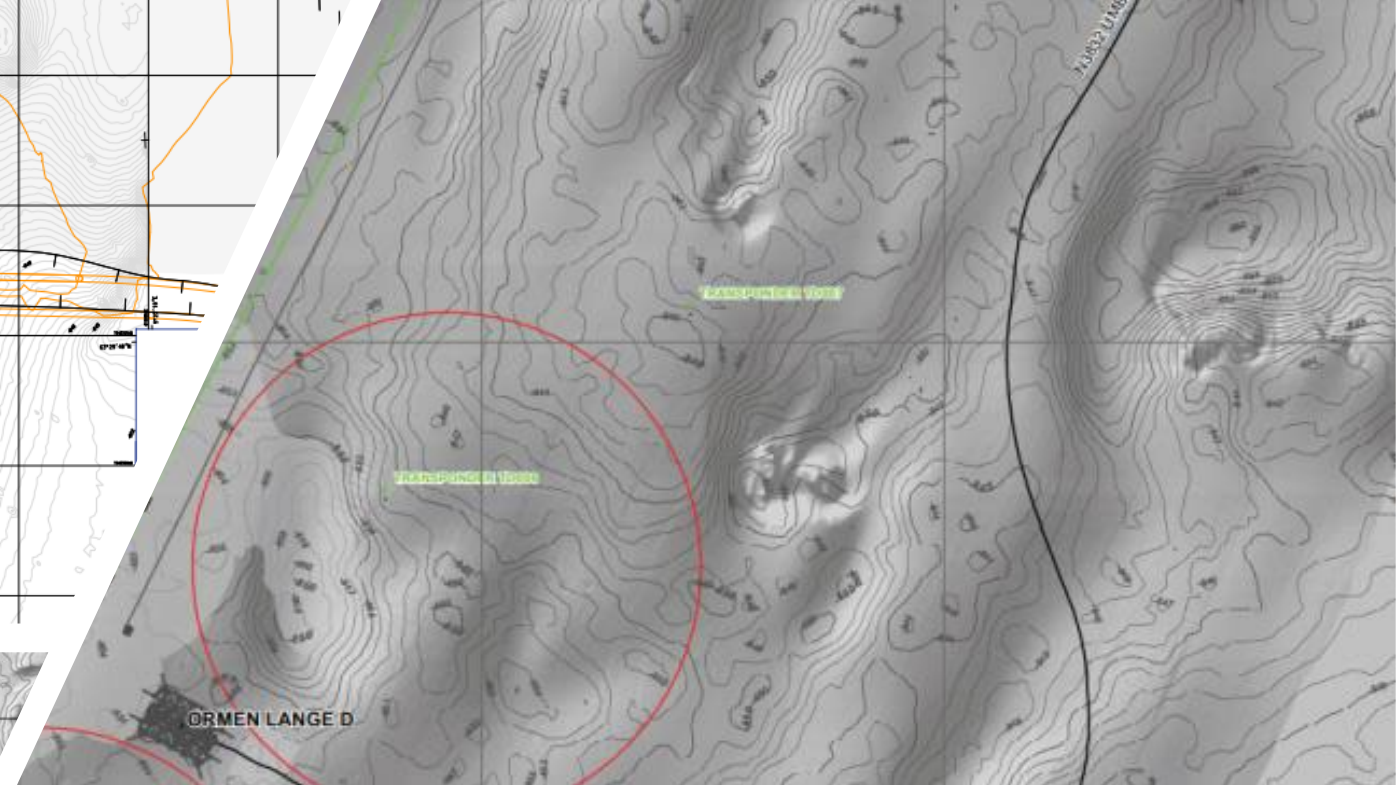
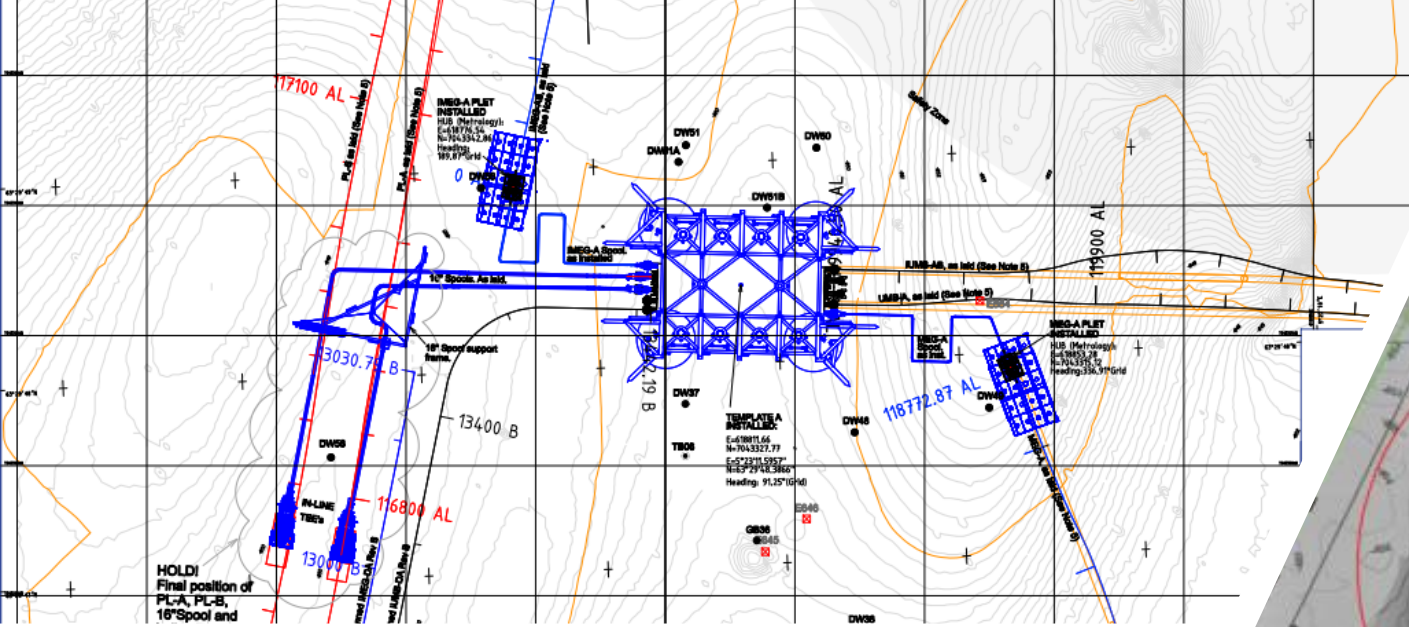
# What does this mean for digital twins in practice?

- For example, if you have a model with 6 million objects, they must be present individually
- No limitation in size and accuracy
- Immediate response when searching and filtering (not possible in most CAD environments)
- You need to have a realistic look and feel, because you need to guide people in the field, not in front of their PCs
- Dynamic in real time
- Can be integrated independently from all sources
- Intuitive and easy to use -> fit for purpose -> because after the construction phase, it won't be the engineers who use it, but also people on site who have nothing to do with CAD programs. It just has to work.
- Because you want to find things and not read tons of manuals

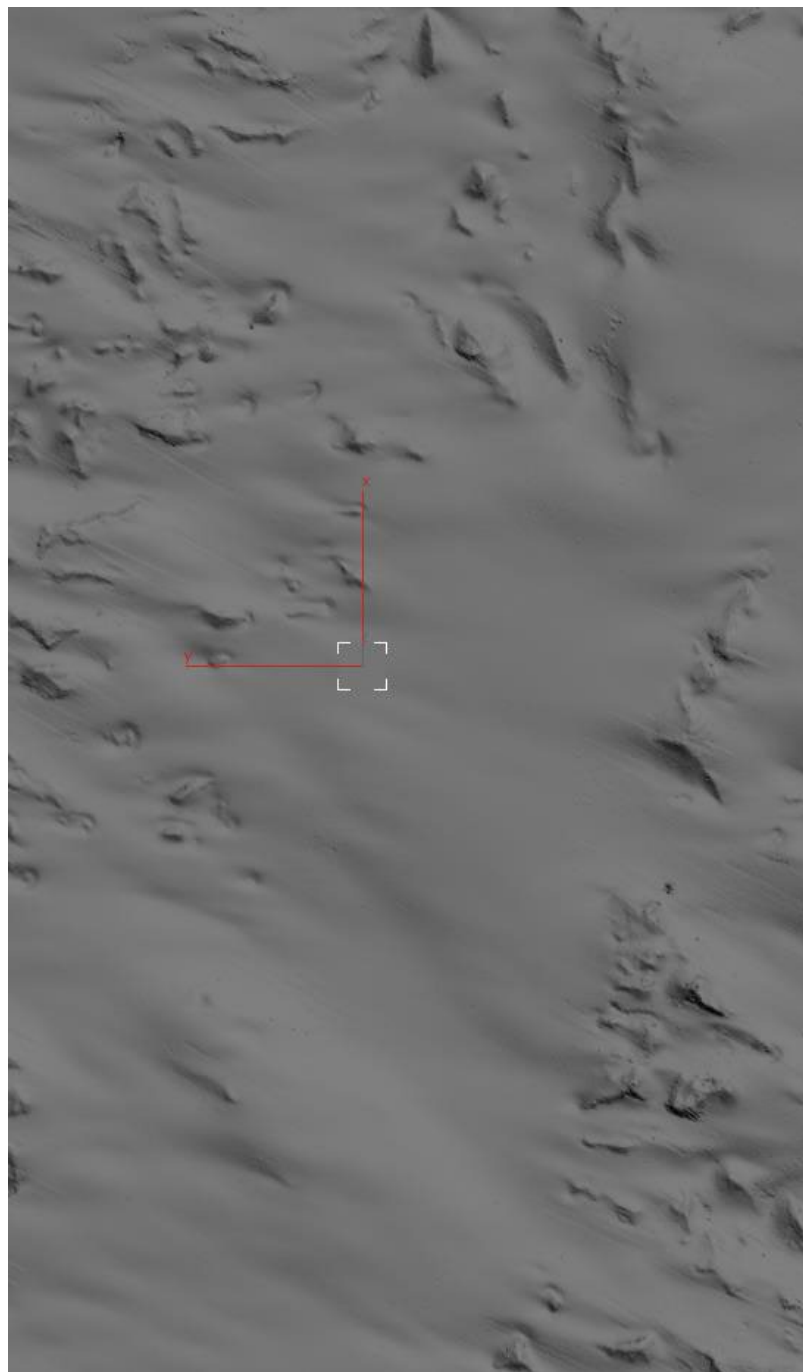
The digital twin must be able to handle GIS in addition to BIM data and other data formats



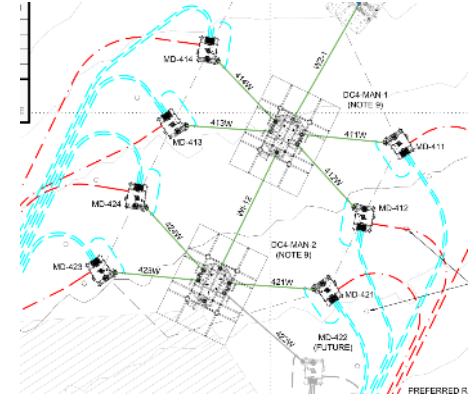
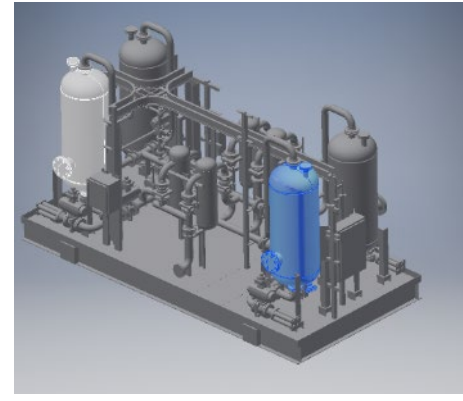
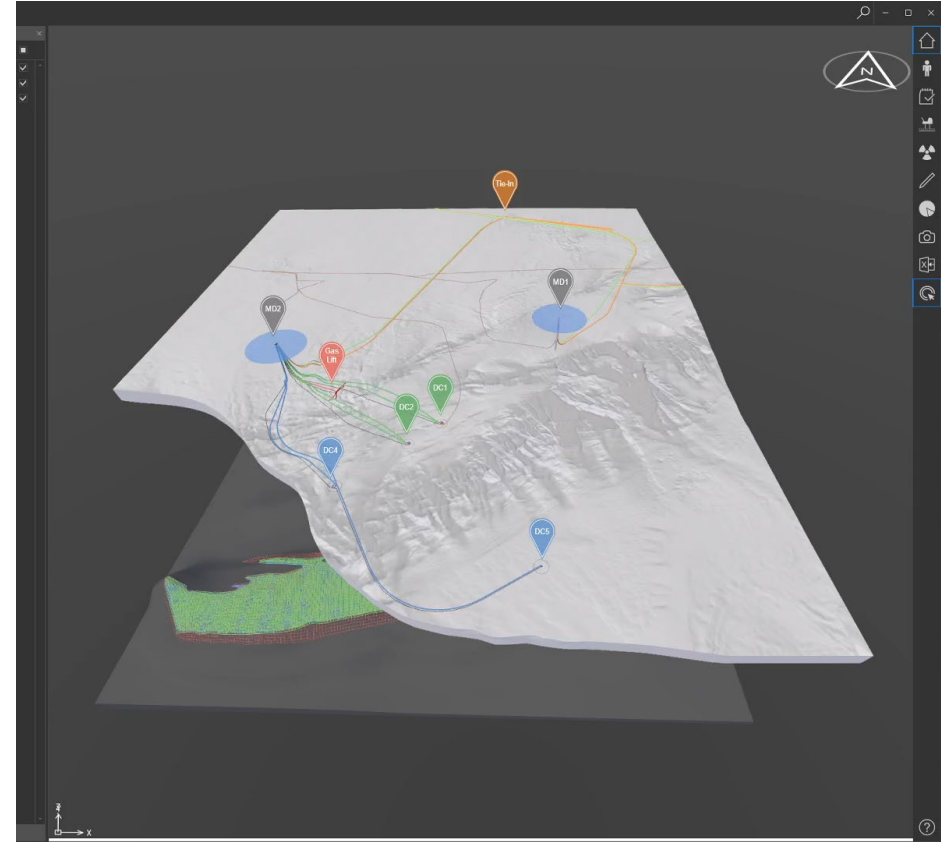
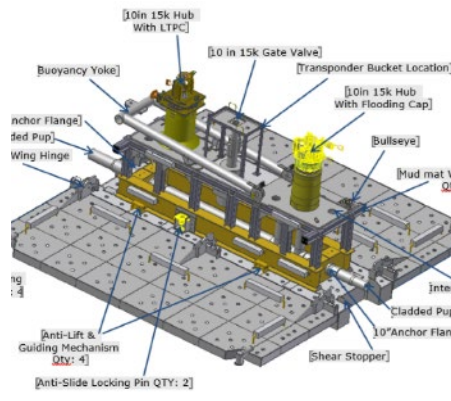
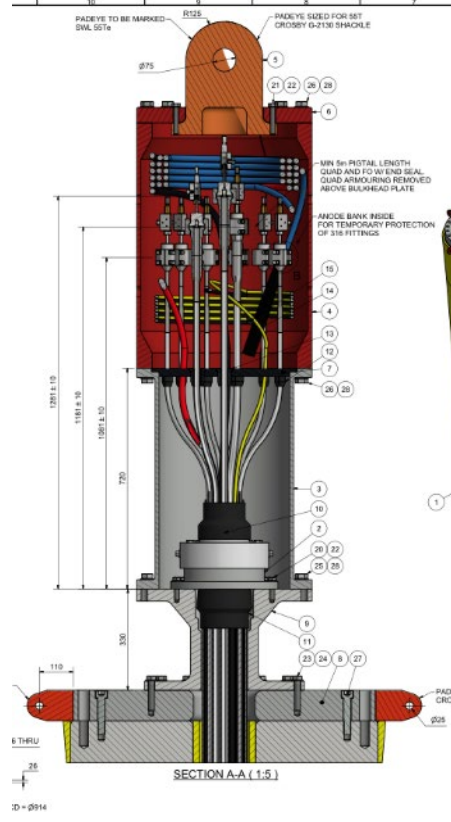
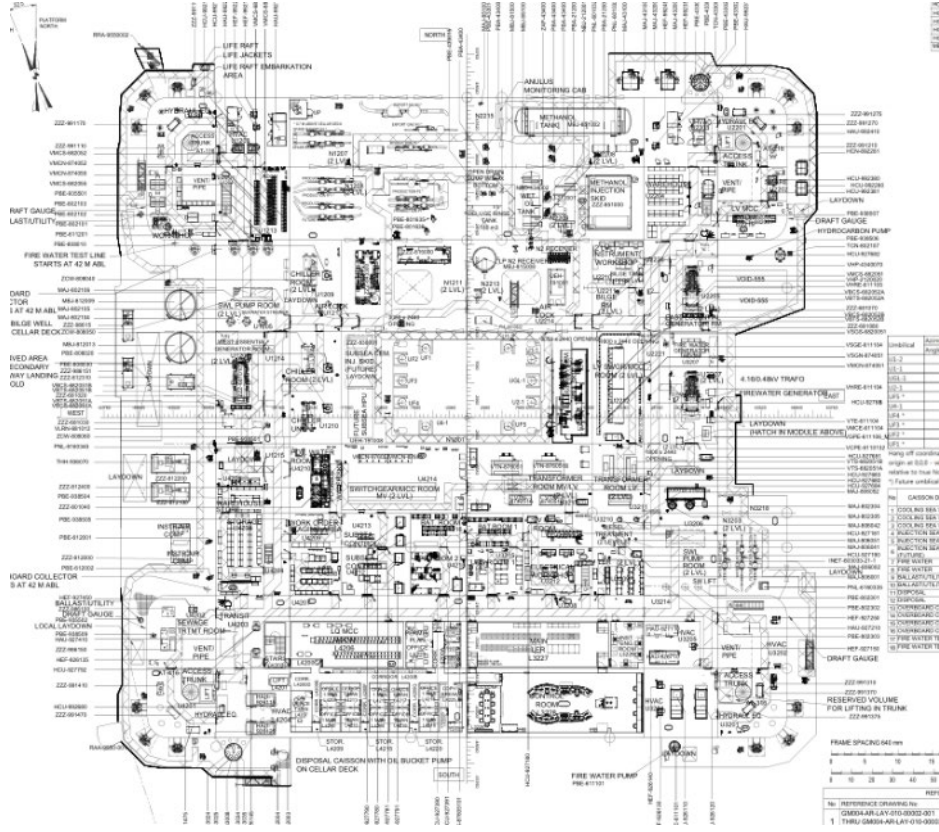
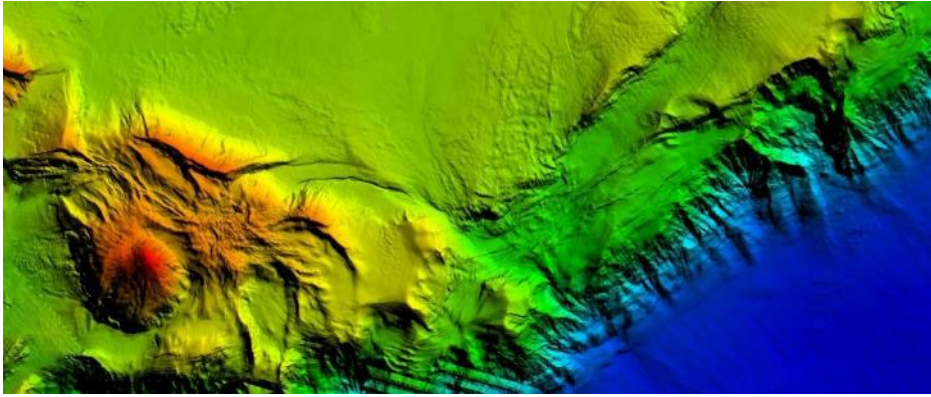




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618516.2	7042943	.19999984	-863.5
618516.2	7042942	.99999984	-863.549987792969
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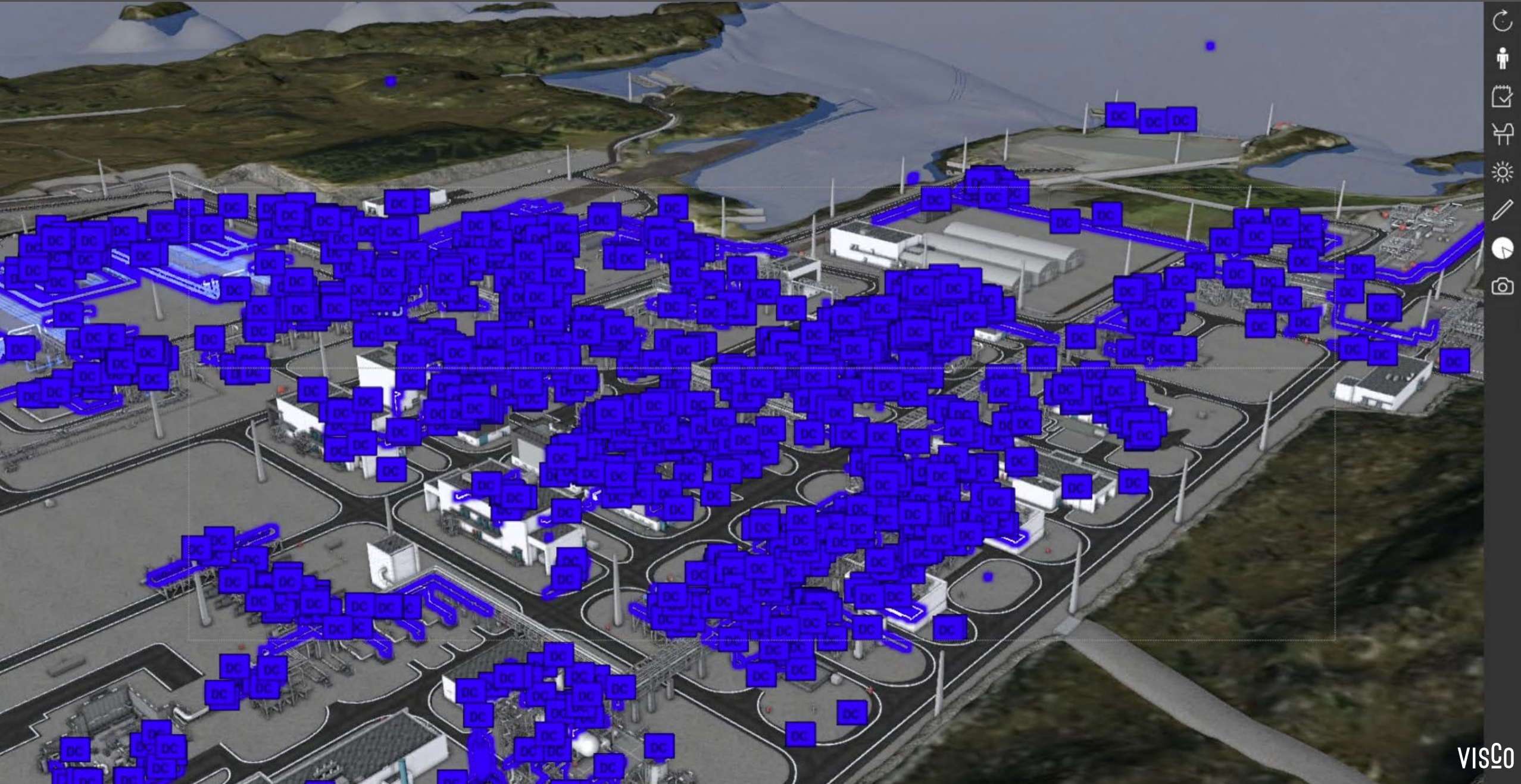
Maintenance work in the  
virtual world with live  
data





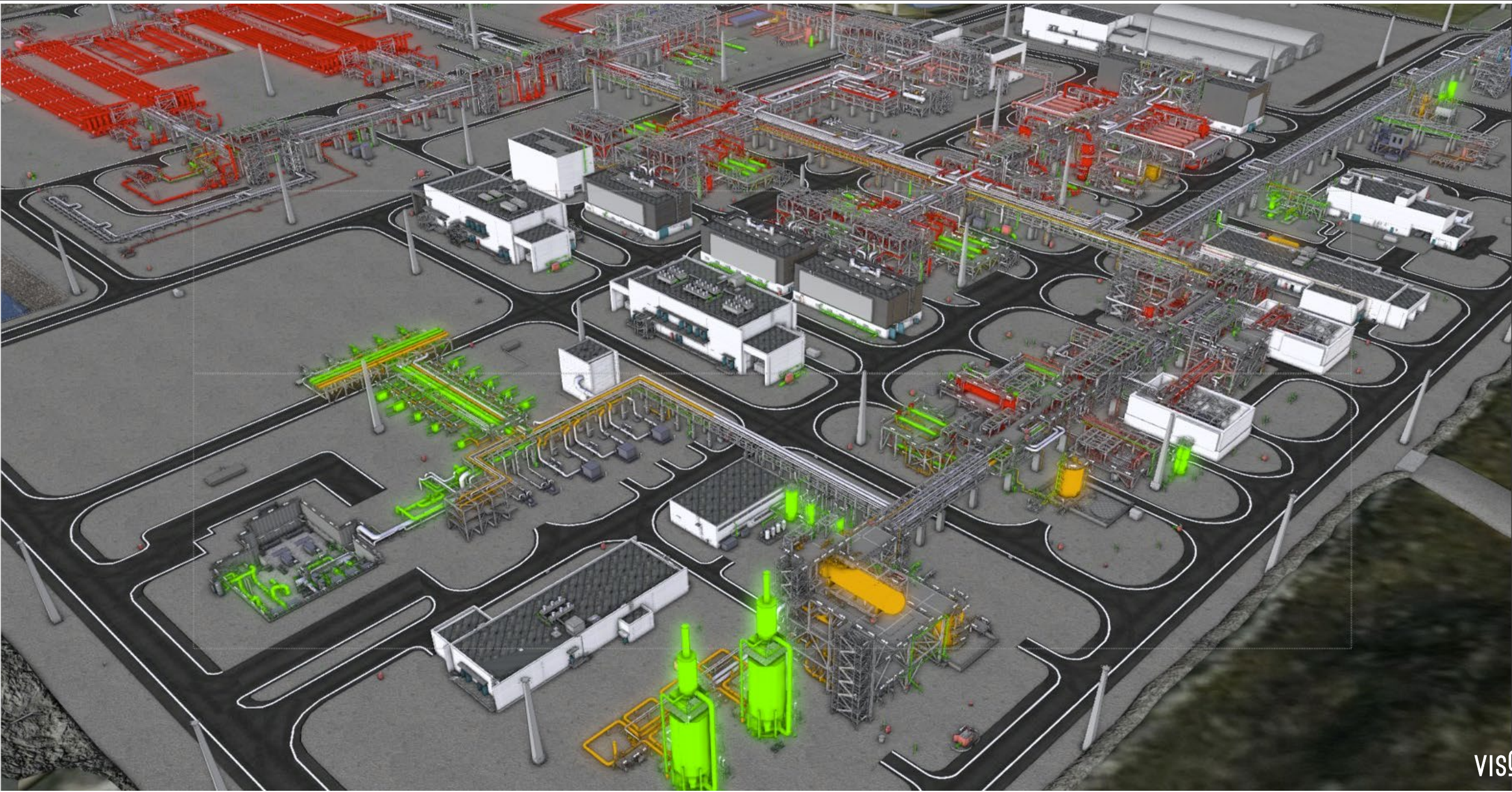


# Inspection points in 3D model





# Inspection points presented in an easier to understand way

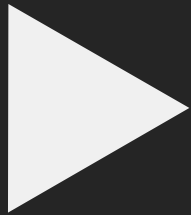




# Next step: Immersive collaboration with colleagues



# Video link to the Meta Twin solution of visCo



[Please click here for the link!](#)

# Isolating trades and elements





DC1

DC2

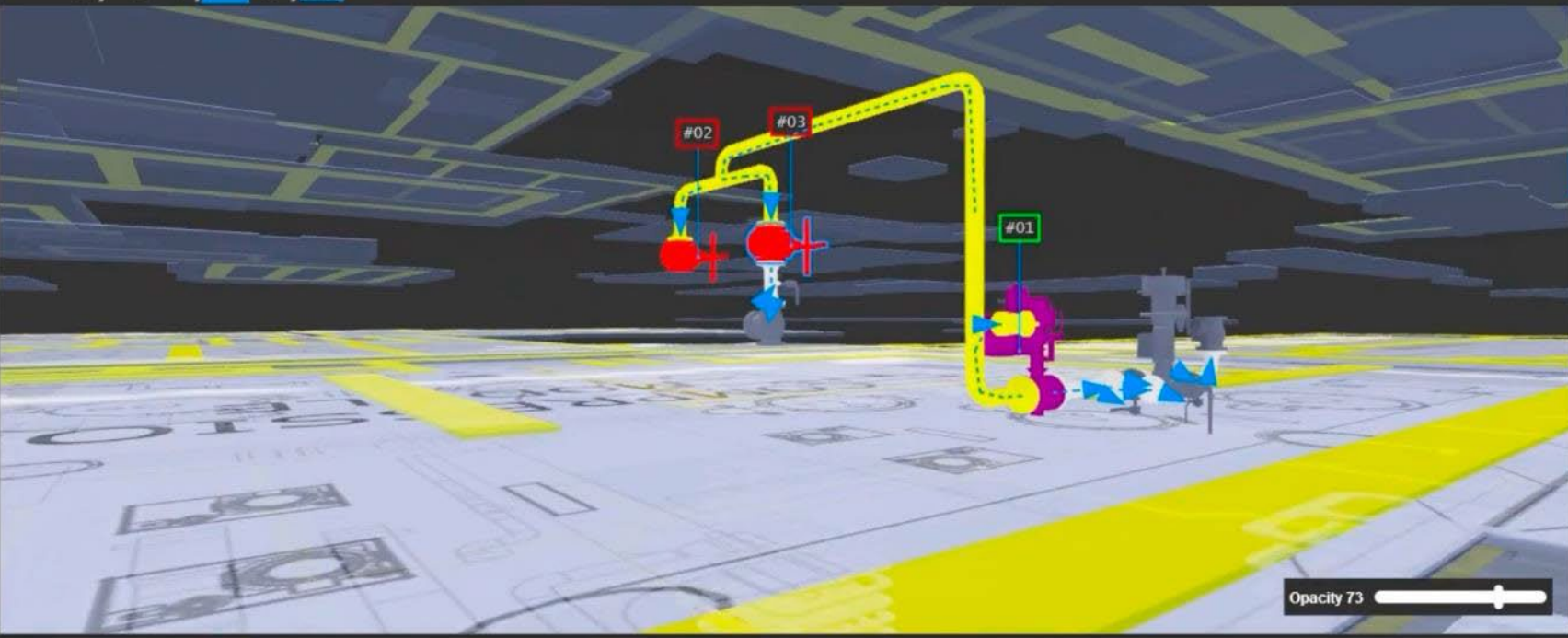
DC4

Gas Lift

DC5 MD1 Tie-In MD2







Opacity 73



Isolation Cog

New project

Equipment...

Color Scheme

Follower

Enable

Filter

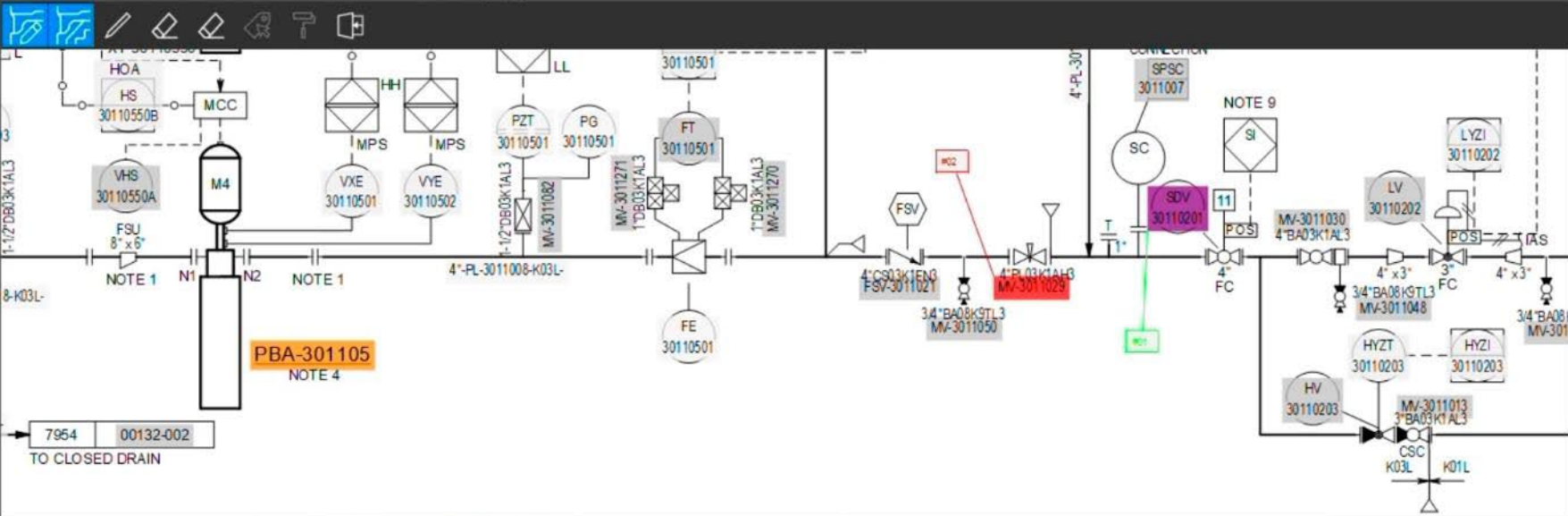
PR-PID

GM004-PR-PID-010-00084-001 (Z01).pdf

Valves

Name	State
MV-3011049	Neutral
MV-3011047	Neutral
MV-3011048	Neutral
HV-30110203	Neutral
MV-3011013	Neutral
FSV-3011018	Neutral
MV-3011028	Closed
SDV-30110201	Opened

Document - 1. PR-PIDs\FPU\GM004-PR-PID-010-00084-001 (Z01).pdf[1]



Isolation List : SDV-30110201

NO	Name	Notes	State
#01	SDV-30110201		Opened
#02	MV-3011029		Closed
#03	MV-3011028		Closed

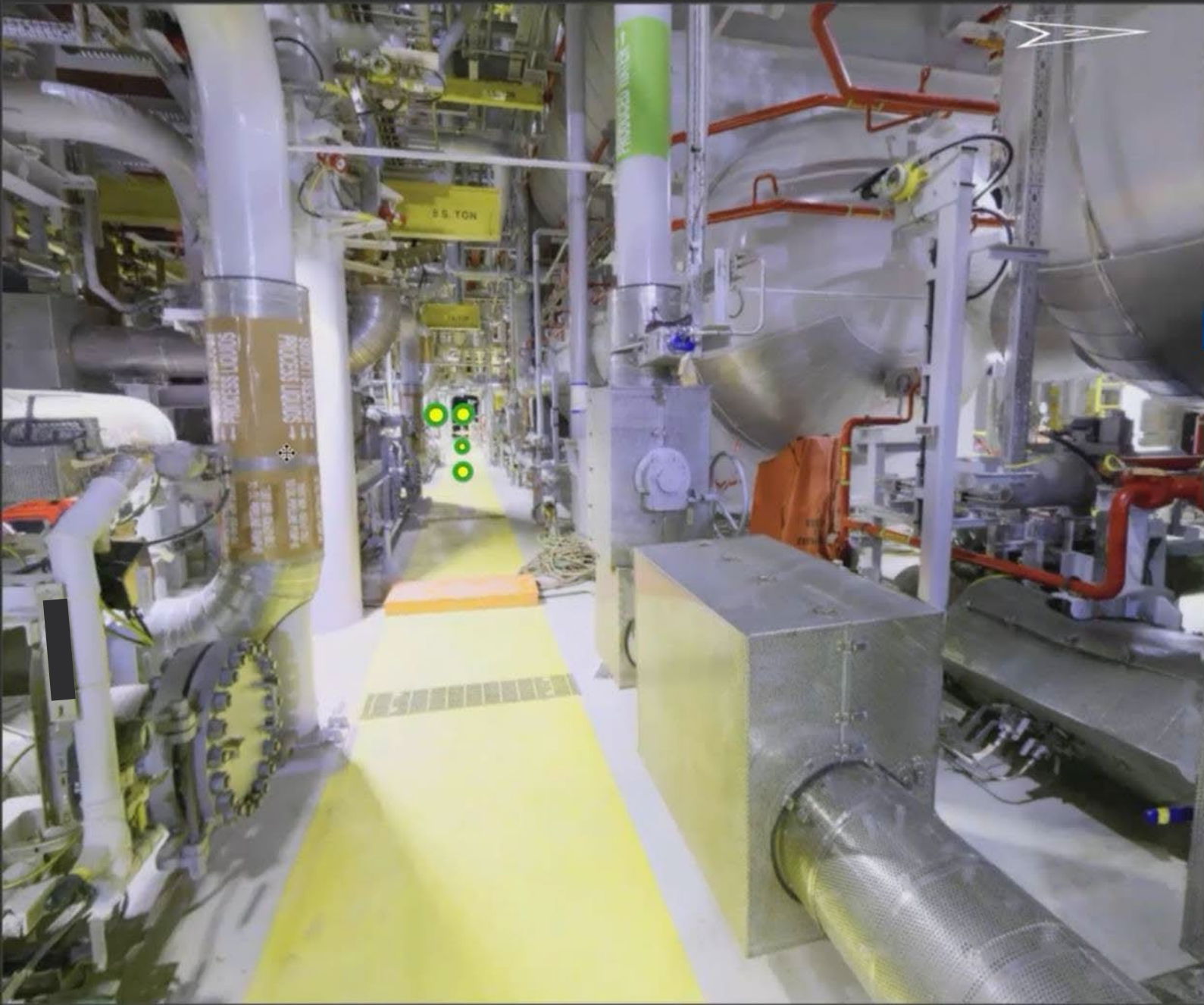
Info

Name	Value

	/JOK	/HFK	NMH/SHJ	SDP
	/JOK	/YHB	NMH/SHJ	SDP

# Point cloud and as-built model

Deck



PCP

Area

Internal

Switch to Point Cloud    Unlock View    Fit

Geometry Opacity

Panorama Opacity

Filters

Groups

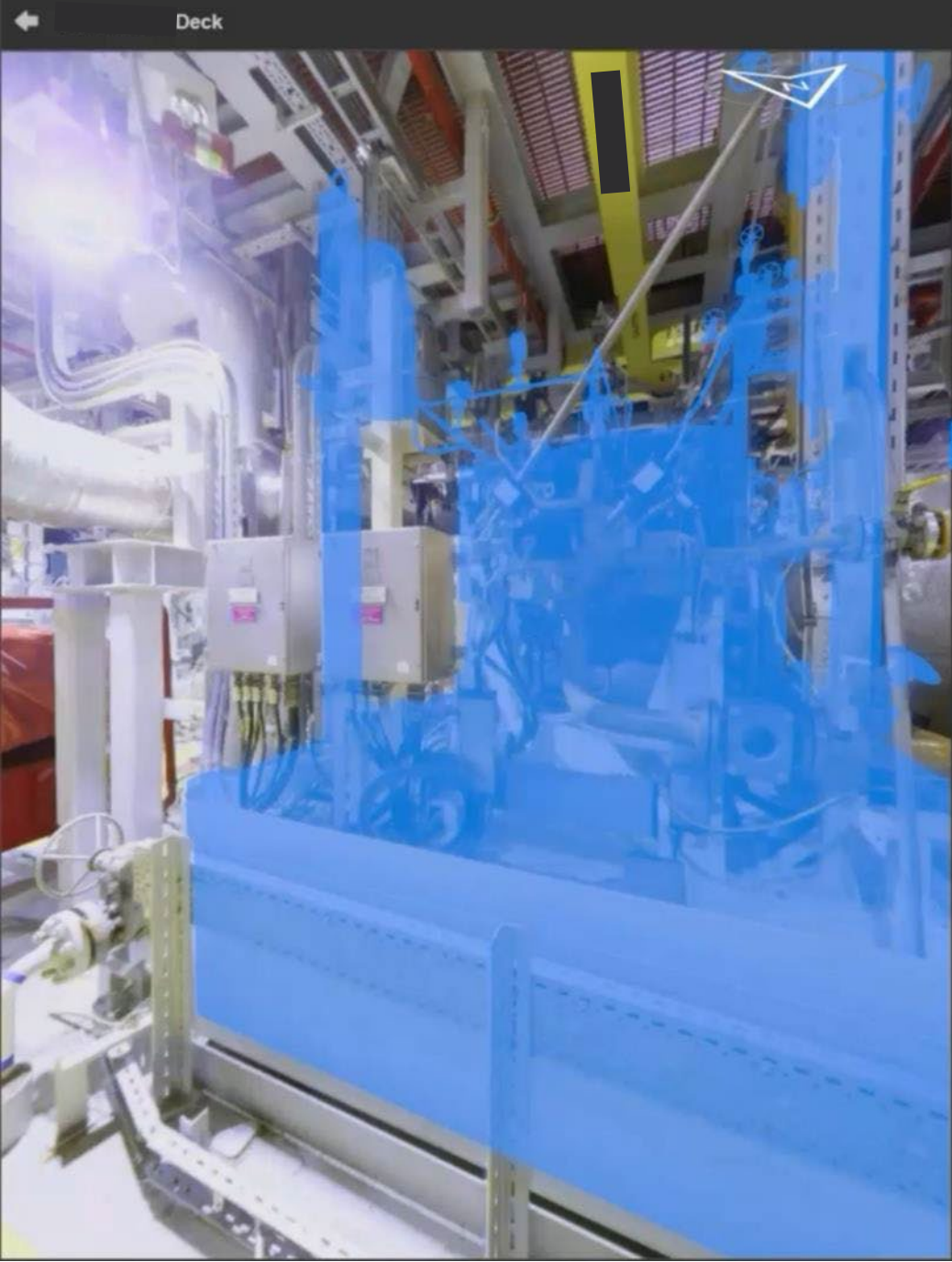
ScanWorld sample

GDI scans

Map

 A 2D floor plan map of the facility shown in the 3D view. The map is outlined in grey and contains numerous green circular markers representing scan points. A blue line with an arrow indicates the camera's path through the facility. The map is divided into several rooms and corridors, with the scan points distributed throughout the space.





**PCP**

**Area**  
Internal

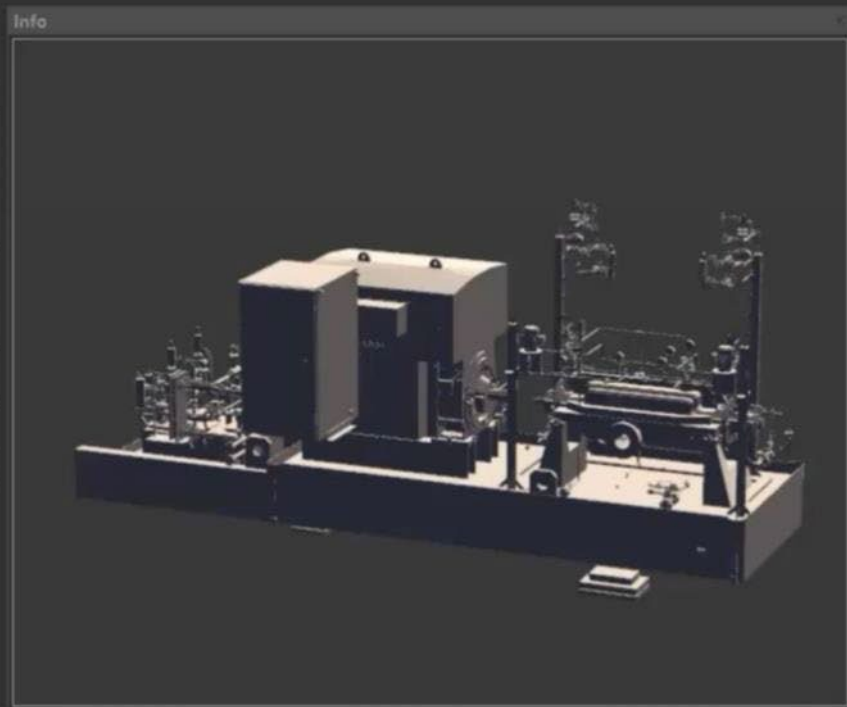
Switch to Point Clou    Unlock View    Fit

Geometry Opacity

Panorama Opacity

**Filters**

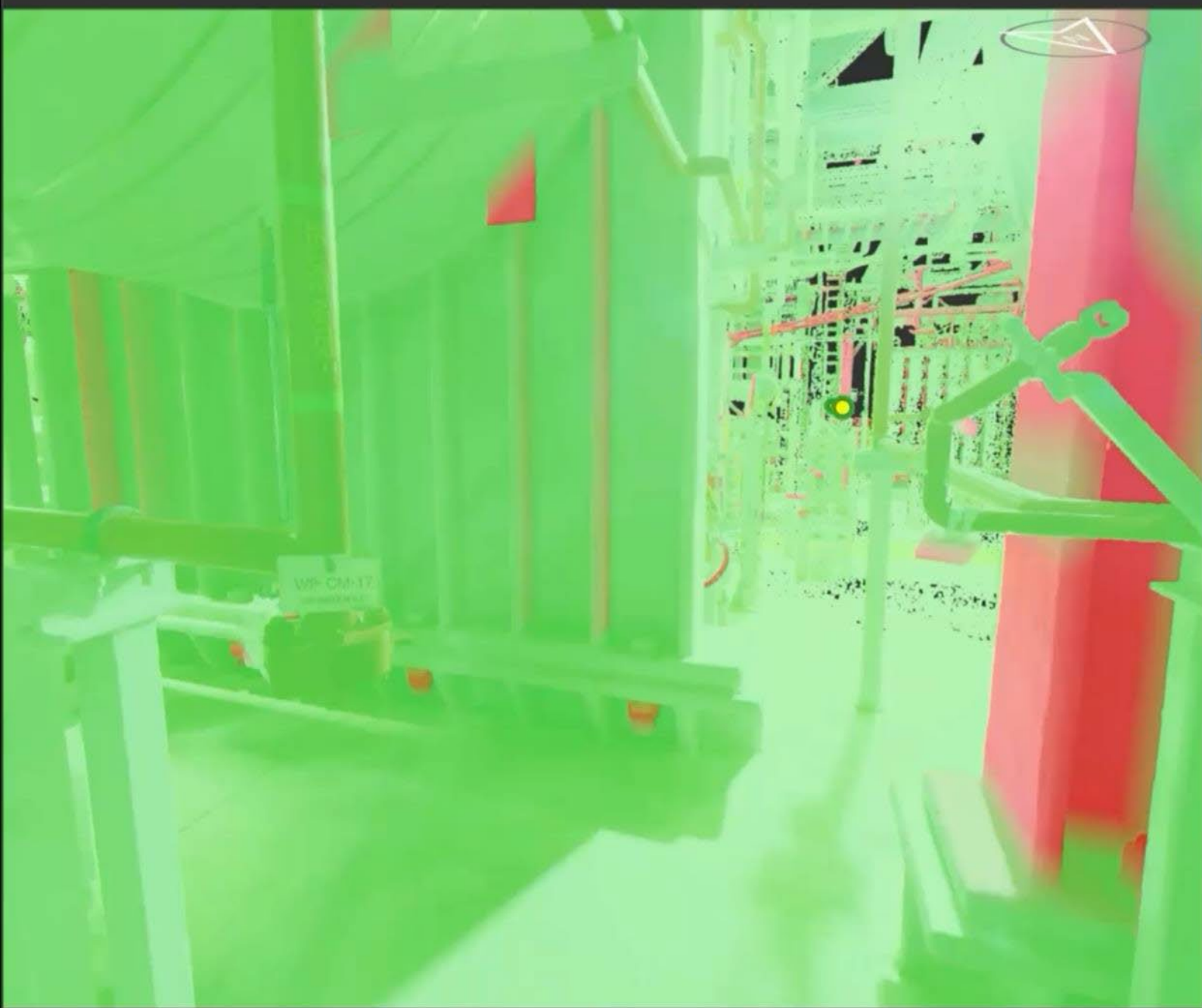
**Groups**  
ScanWorld sample  
GDI scans



**Info**

Properties (384)		Documents (19)	Media (0)
Field	Value		Source
Name			CTDB
Owner			CTDB
Component type			CTDB
Ref.no			CTDB
Hook-up drawing			CTDB
Positioner type			CTDB
Element type			CTDB
Integrity level - safety (sil)			CTDB
From gland type			CTDB
Alarm response manual flag			CTDB
Trace temperature			CTDB
Valve operator type			CTDB
Api / iso reference			CTDB
Trip rpm			CTDB
Attached equipment			CTDB
Backwash maximum pressure			CTDB
Piping generic type identifier			CTDB
Cooling capacity			CTDB
Thermal classification			CTDB

Add fields



Point cloud fit

Points Distance To Geometry

■ #FF46FF46 | 50

■ Red | 200

Weight: | 50

Add Remove Asc Desc Apply

PCP

Area

Internal

Switch to Panorama Unlock View Fit

Geometry Opacity |

Point Cloud Opacity |

Filters

Groups

ScanWorld sample  ■

GDI scans  ■

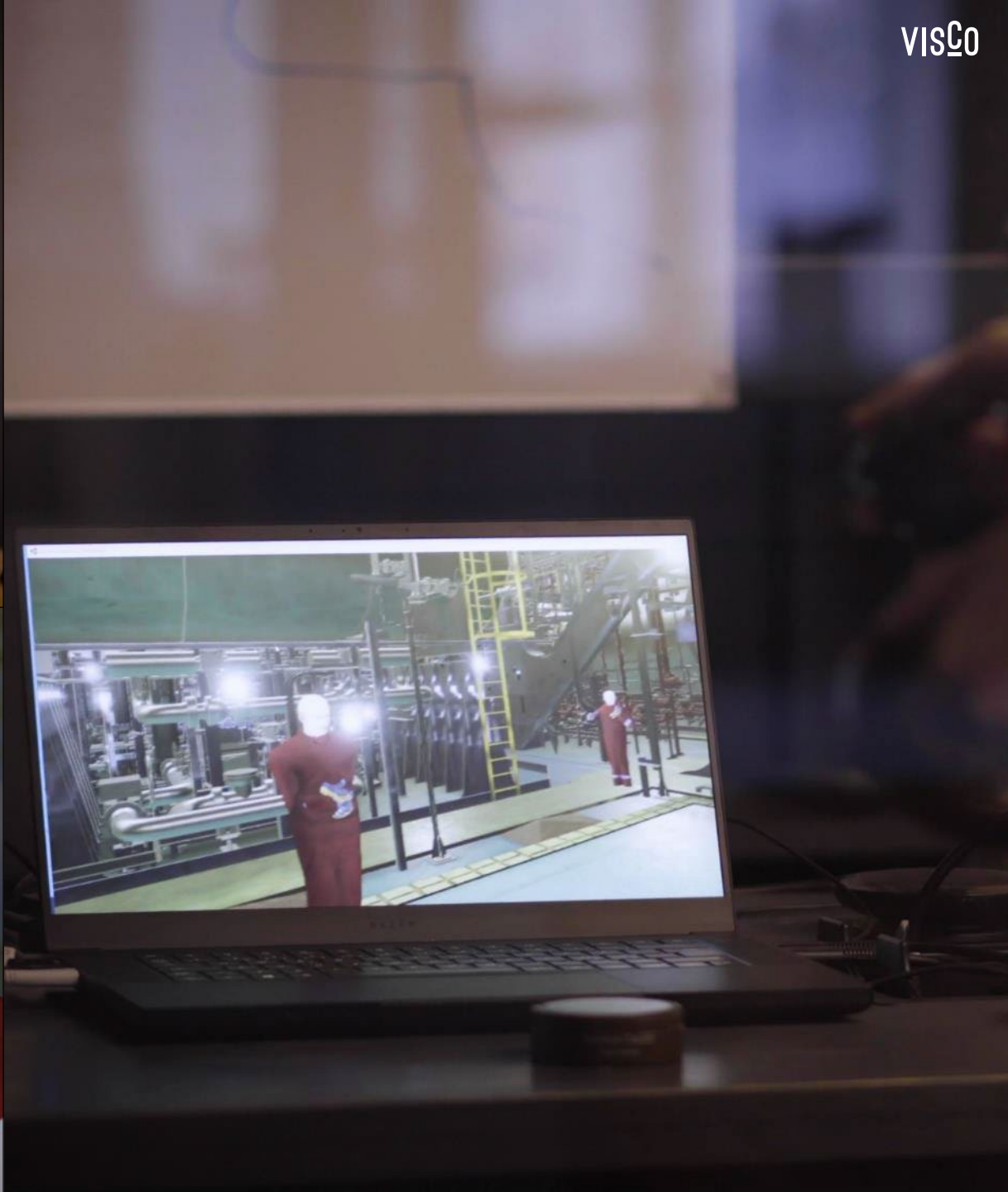
Map

56.0 Lower Deck



Use of avatares for  
collaboration and  
training situations  
with live data





Switching between technical  
representation and photorealistic  
representation of a system where you  
can freely move around

(absolutely fluid visual movements, even in high-end mode,  
are a necessity for comfortable working)









DC1

DC2

DC5

DC4

Gas Lift

Maintenance





Bendik Bendiksen

# TABLET TOOLS



# SUPPORTING MULTIPLE WORKFLOWS END-TO-END



**PLANNING OPTIMIZATION**



**FAMILIARIZATION**



**EVALUATION**

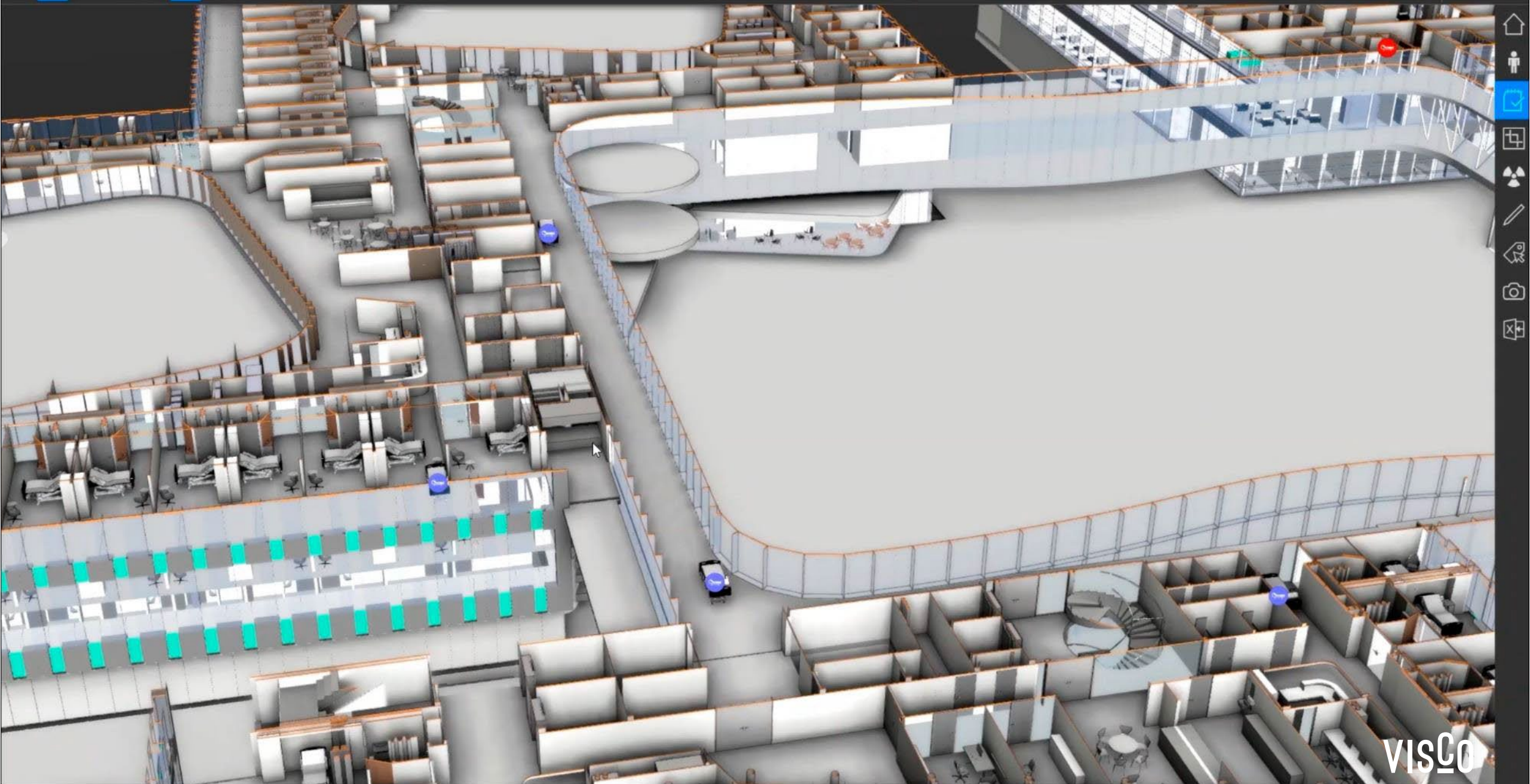


**FIELD EXECUTION**



# Digital Twins in other industries







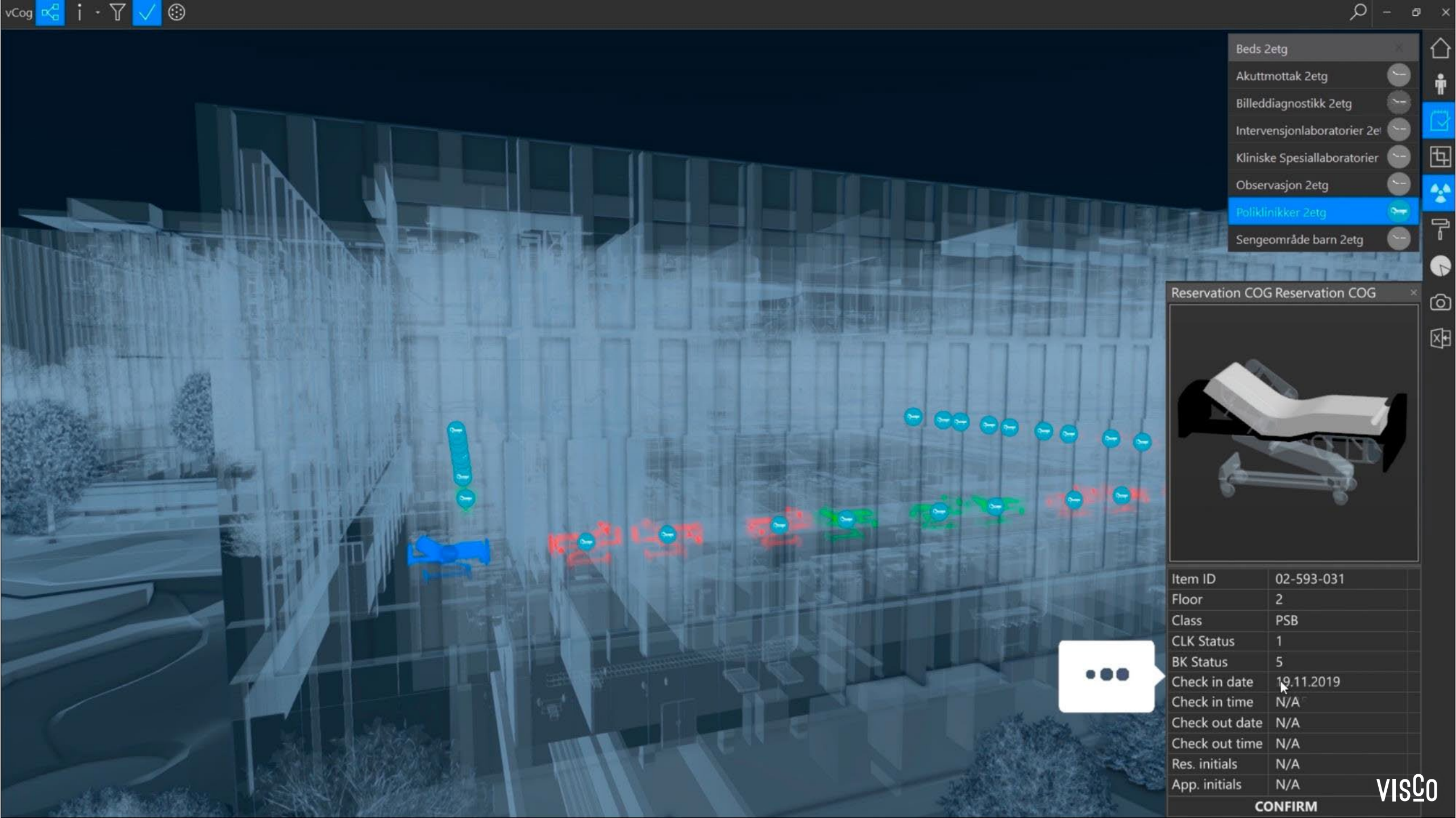
- Beds 2etg
- Akuttmottak 2etg
- Billediagnostikk 2etg
- Intervensjonlaboratorier 2e
- Kliniske Spesiallaboratorier
- Observasjon 2etg
- Poliklinikker 2etg**
- Sengeområde barn 2etg

Reservation COG Reservation COG



Item ID	02-593-031
Floor	2
Class	PSB
CLK Status	1
BK Status	5
Check in date	19.11.2019
Check in time	N/A
Check out date	N/A
Check out time	N/A
Res. initials	N/A
App. initials	N/A

CONFIRM



**Bernd Gmeiner**  
Dipl. Betriebswirt (FH)

**Gmeiner Marketing Services**  
Asamstr. 8  
92269 Ensdorf  
Germany

Office Nürnberg:  
Neumühlweg 129  
D-90449 Nürnberg

Phone: +49 170 5830543

E-Mail: [bernd.gmeiner@gmeiner-marketing-services.de](mailto:bernd.gmeiner@gmeiner-marketing-services.de)

Web: [www.gmeiner-marketing-services.de](http://www.gmeiner-marketing-services.de)



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Germany/Austria/Switzerland



**buildingSMART**  
International BIM Association

- IFC4Lab – Speaker of the working group (BIM standardization in Laboratories)
- Open-BIM in industrial Planning – Lead of MEP working group (Also BIM and digital twins)
- Electrical Room – Member of the international steering committee (BIM standardization for Low and Medium Voltage power distribution)
- BIM & GIS – Part of the working group