AU LAS VEGAS 2019

Philippe Testard - Andreas Marschall – Nabil Nougha

CES321230 - Industrial BIM:

Best Practices learned in a Complex Hydroelectric Plant Project:

AUTODESK. UNIVERSITY

Agenda

- Presenters, Companies and Introduction
- The Project
- BIM Implementation
- Interoperability
- Dynamo / BIM360
- Wrap-Up

About the Speakers

Testard Philippe – BIM Manager

Vinci Construction Grands Projets

Marschall Andreas – BIM Manager

Andritz Hydro

Nabil Nougha – DSS Enterprise

Customer Success Organization


What does
BIM
mean to
you
?

Civil

- Change of mindset (Sharing is Caring)
- Parametric Elements instead of “Just 3D”
- Increasing designer skills
- Formworks drawing the “french way”
- Precast/Rebars need to be developed
- Sub-suppliers often not BIM compliant

Electromechanical

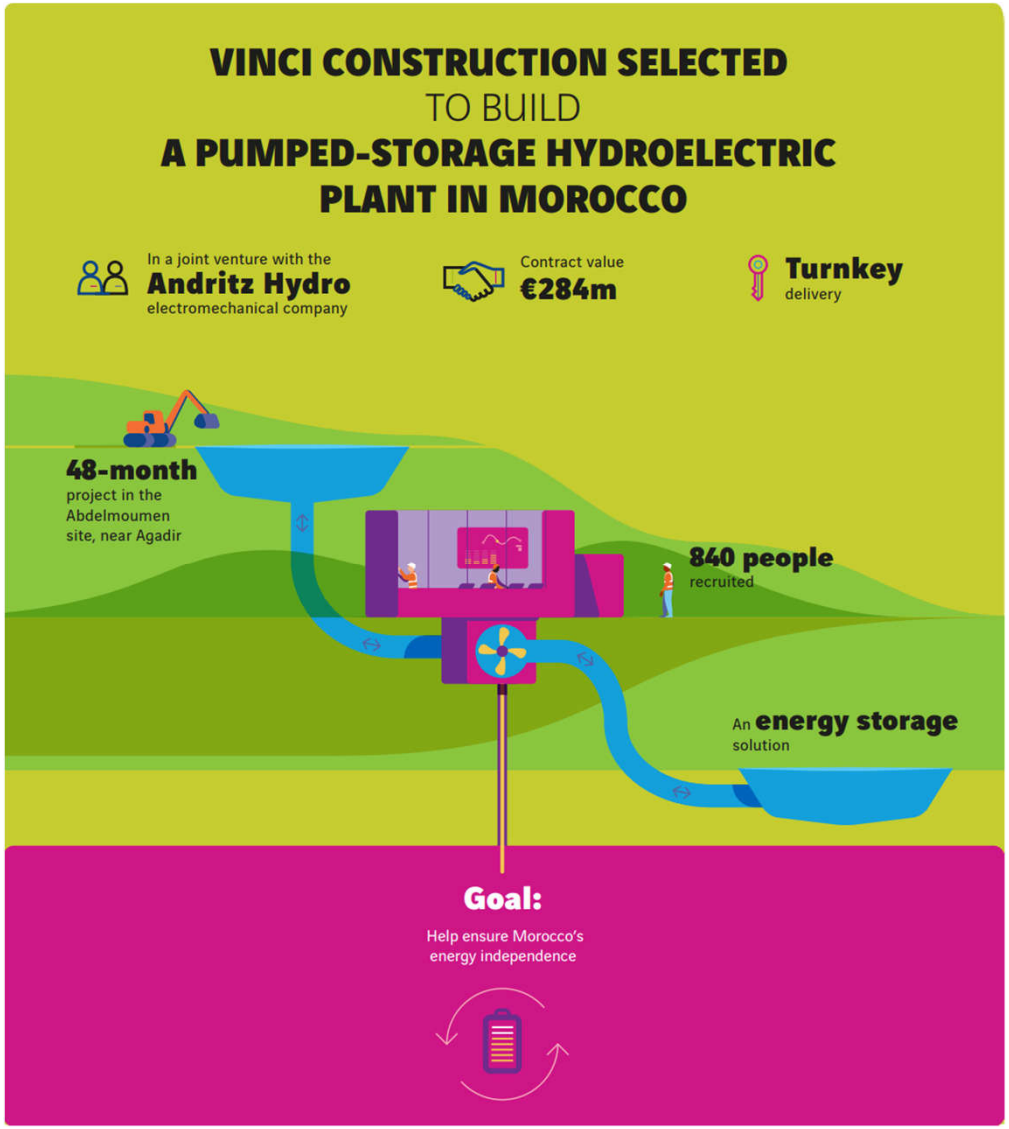
- Software, Software, Software!
- IFC classes not reflecting complete scope
- Concept design critical
- Silo mentality
- Long supply chain
- Cable routing not feasible in Revit
- O&M implementation
- Linking of external information
- Sub-suppliers often not BIM compliant

- Presenters and Companies

The Project

- BIM Implementation
- Interoperability
- Dynamo / BIM360
- Wrap-Up

Project Presentation



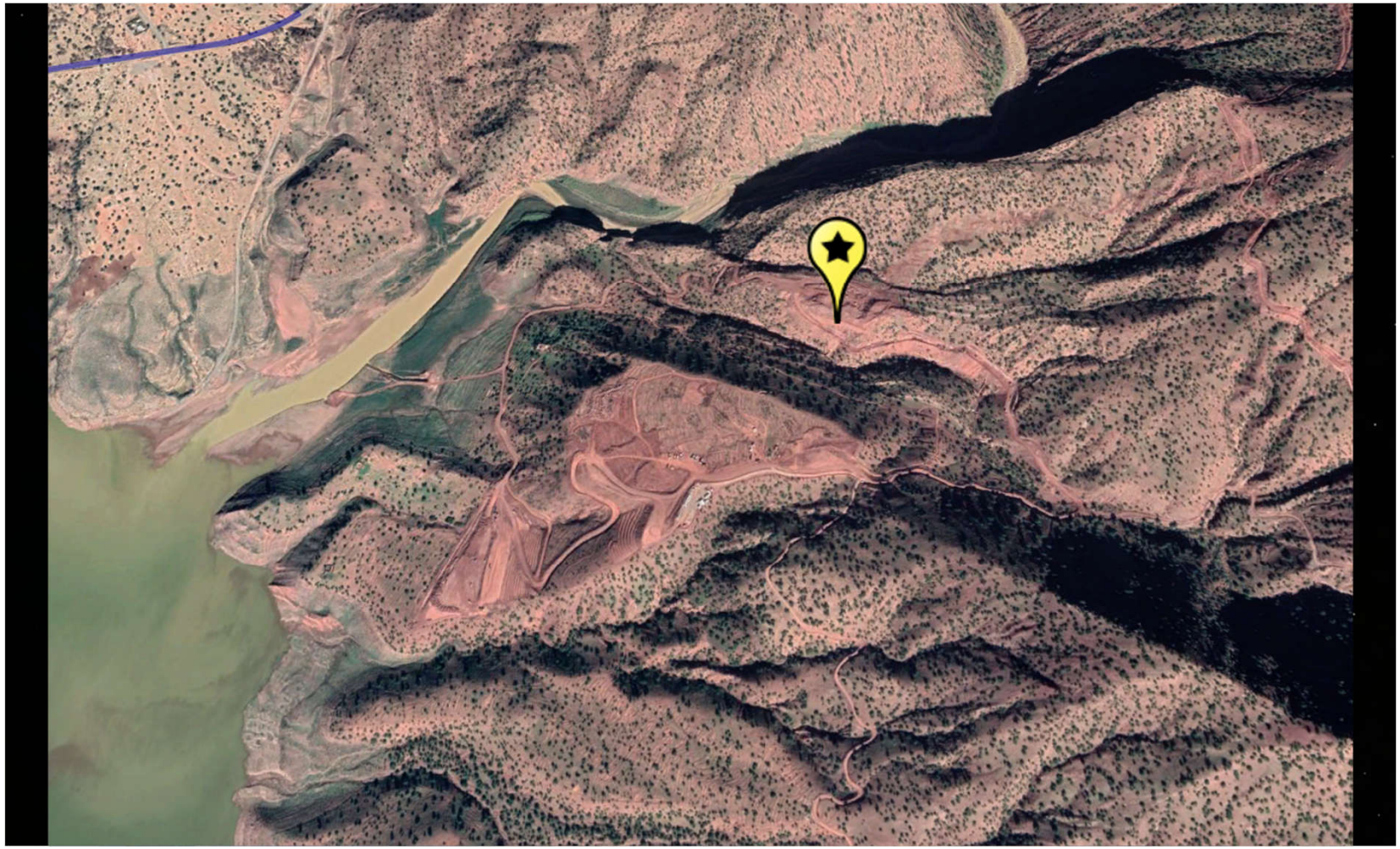
المكتب الوطني للكهرباء
Office National de l'Electricité

- **Client:**
  Office **N**ational de l'**E**lectricité et de l'**E**au Potable (**ONEE**)

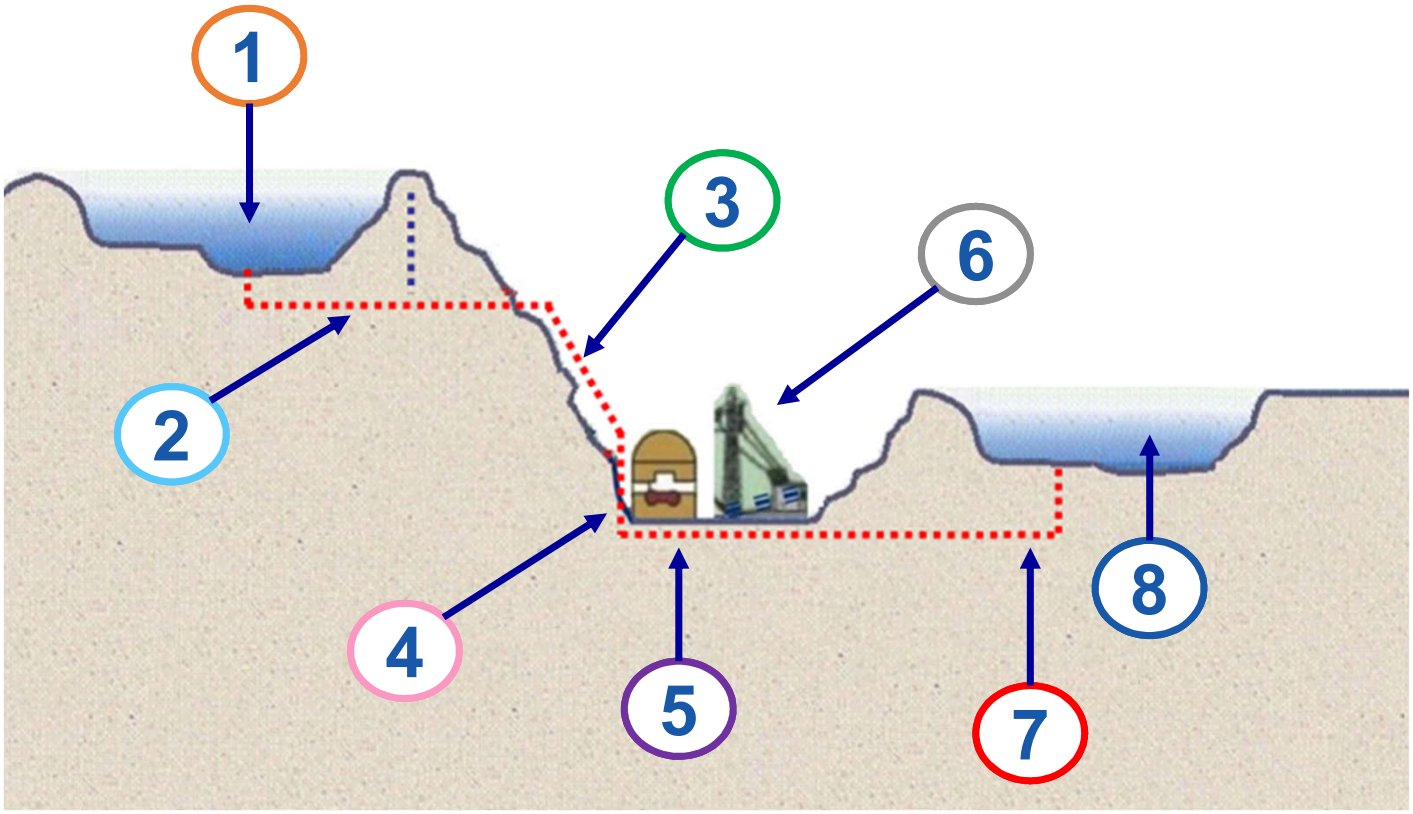
- **Financing:**
  - 25 % African Bank of Development
  - 75 % European Investment Bank

- **Contract**:
  « Turnkey »

Project Location

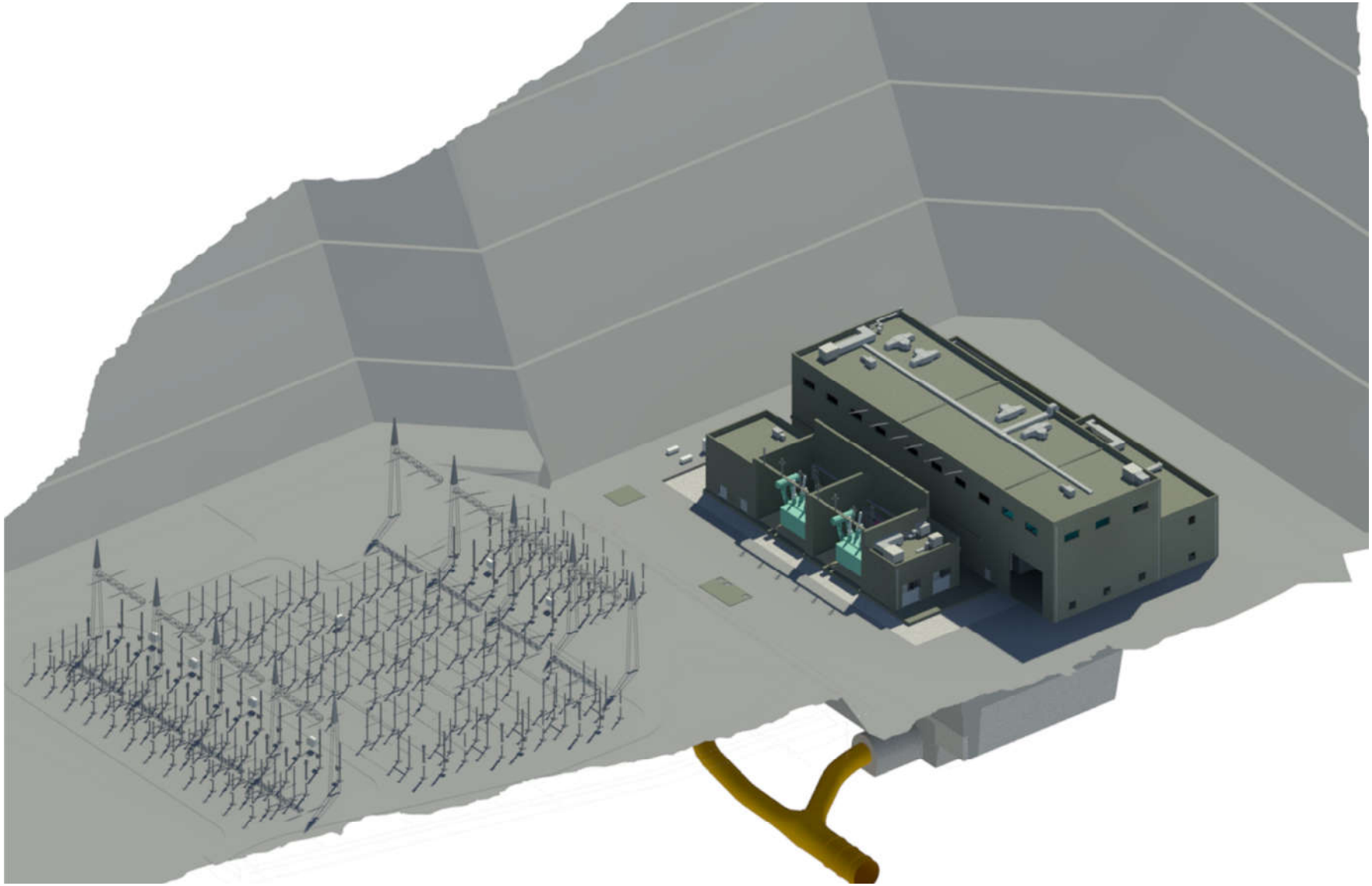


Scope of Work



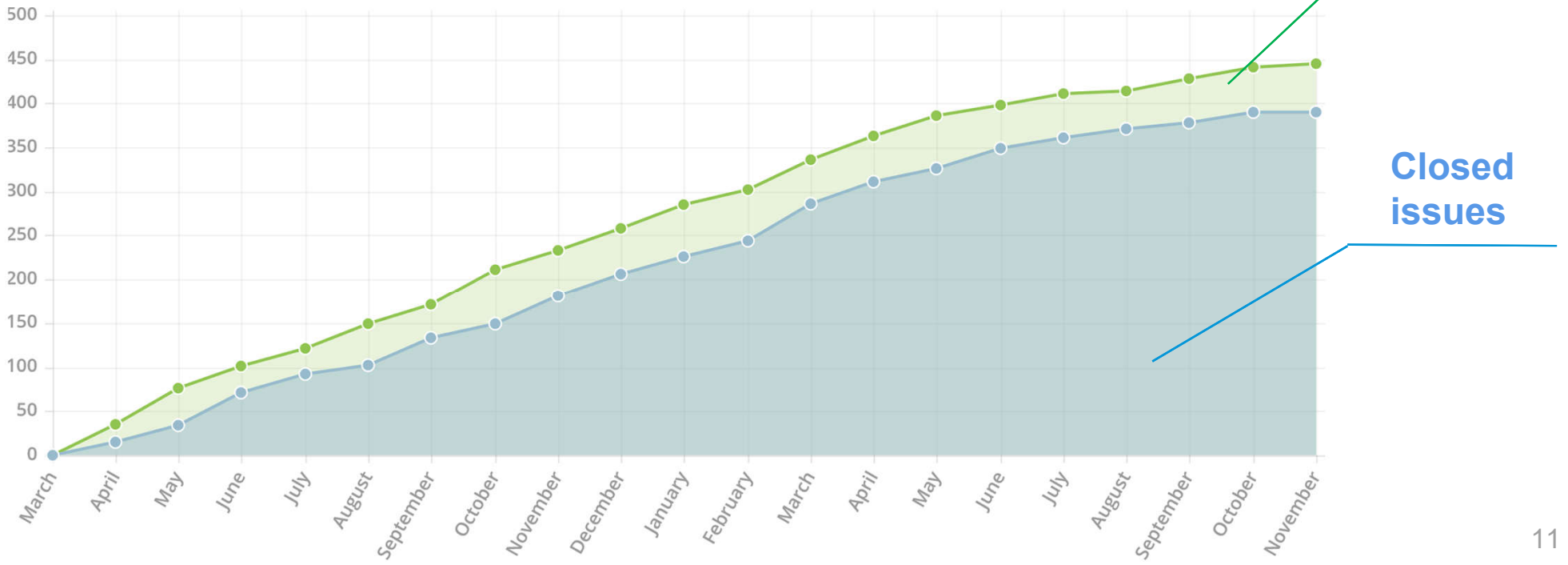
1. Upper Basin
2. Penstock Section 1
3. Penstock Section 2 (exposed)
4. Penstock Section 3
5. Powerstation
6. Switchyard
7. Penstock Section 4
8. Lower Basin

Project Overview

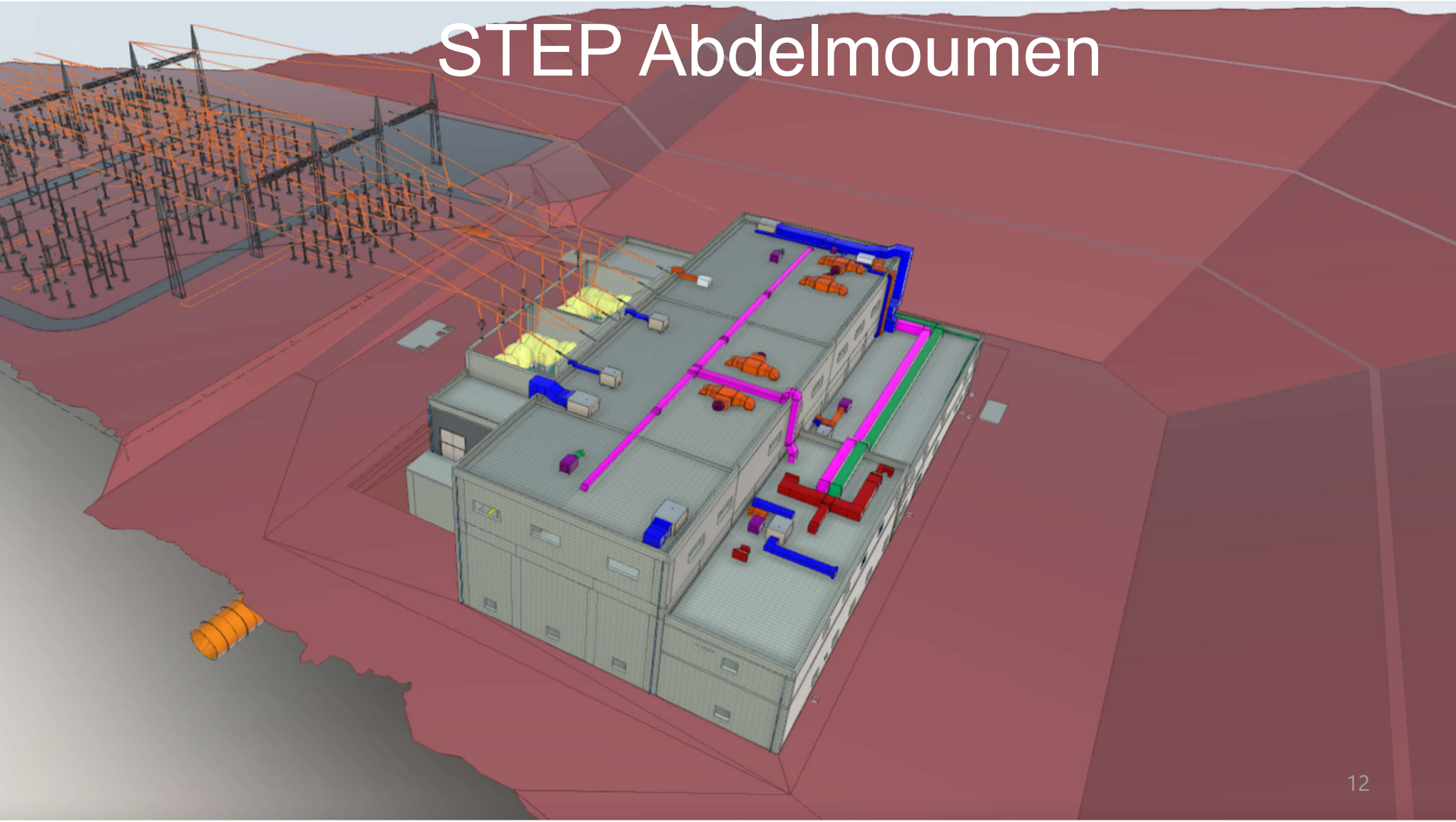


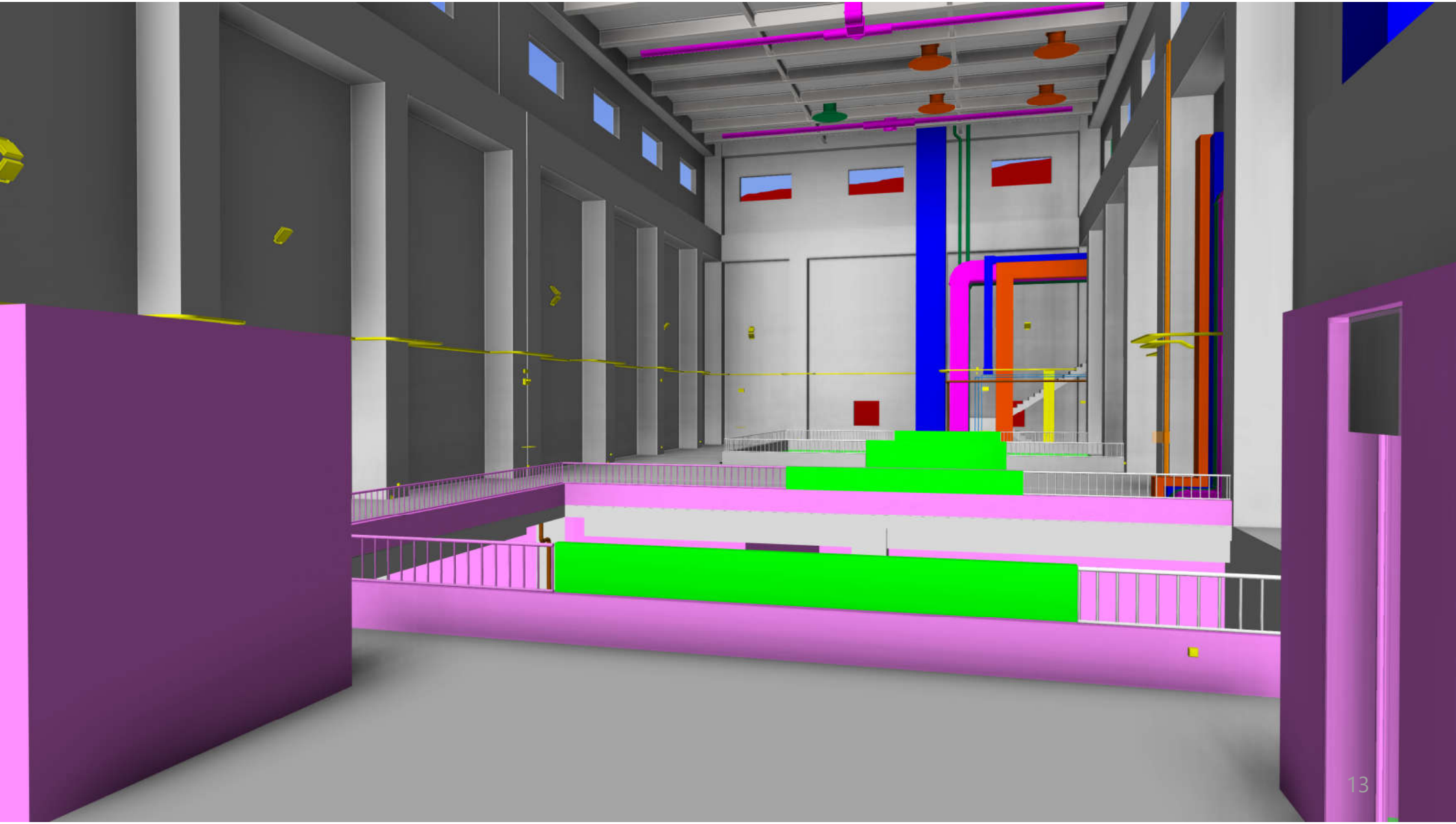
Basic BIM Figures

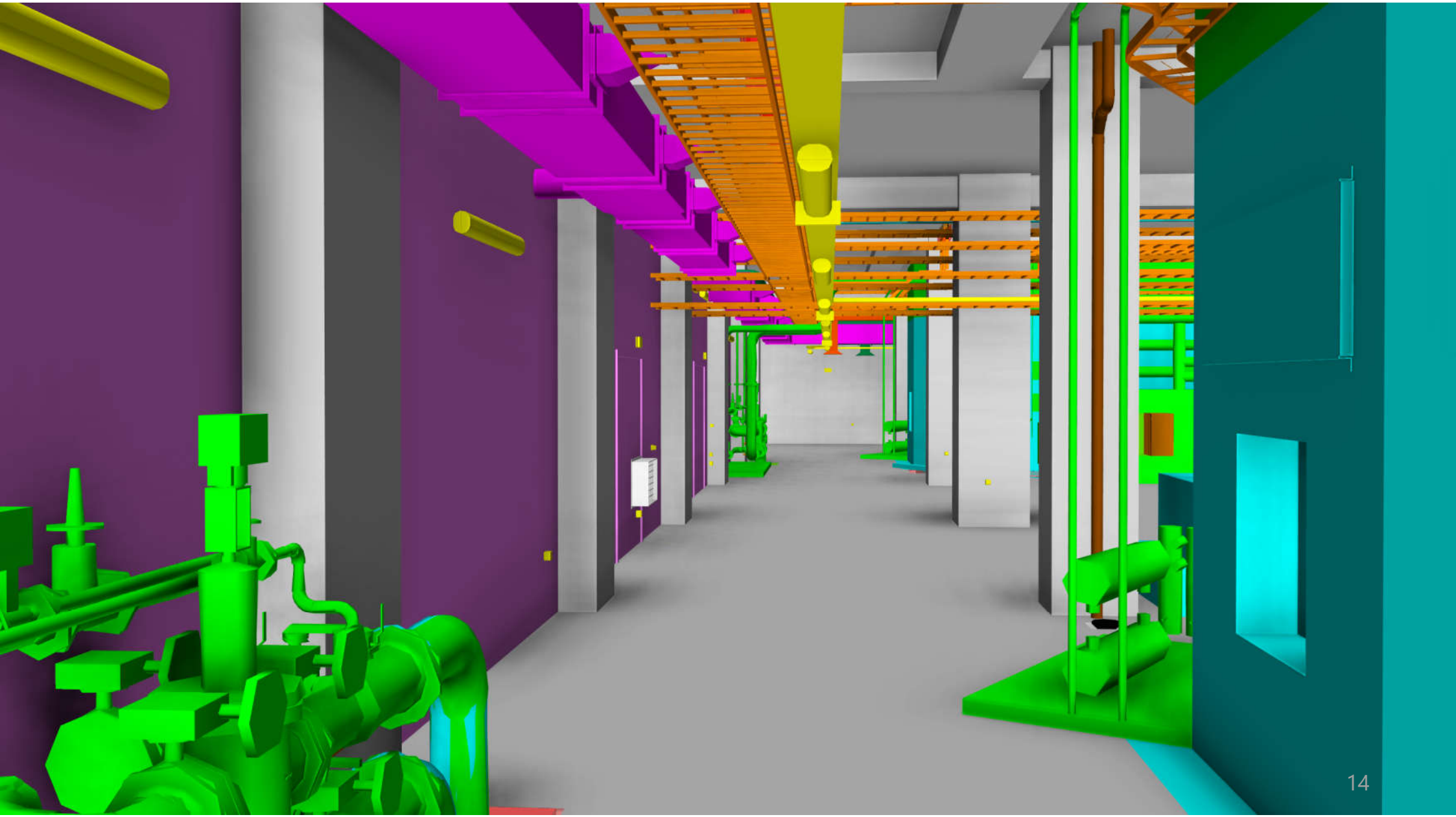
- **Number of People Involved in BIM:**
  - VCGP Structural Office: **8**
  - VCGP Project Team: **~10** (currently)
  - Andritz: **~10**
  - MEP: **4**
  - Architectural: **2**

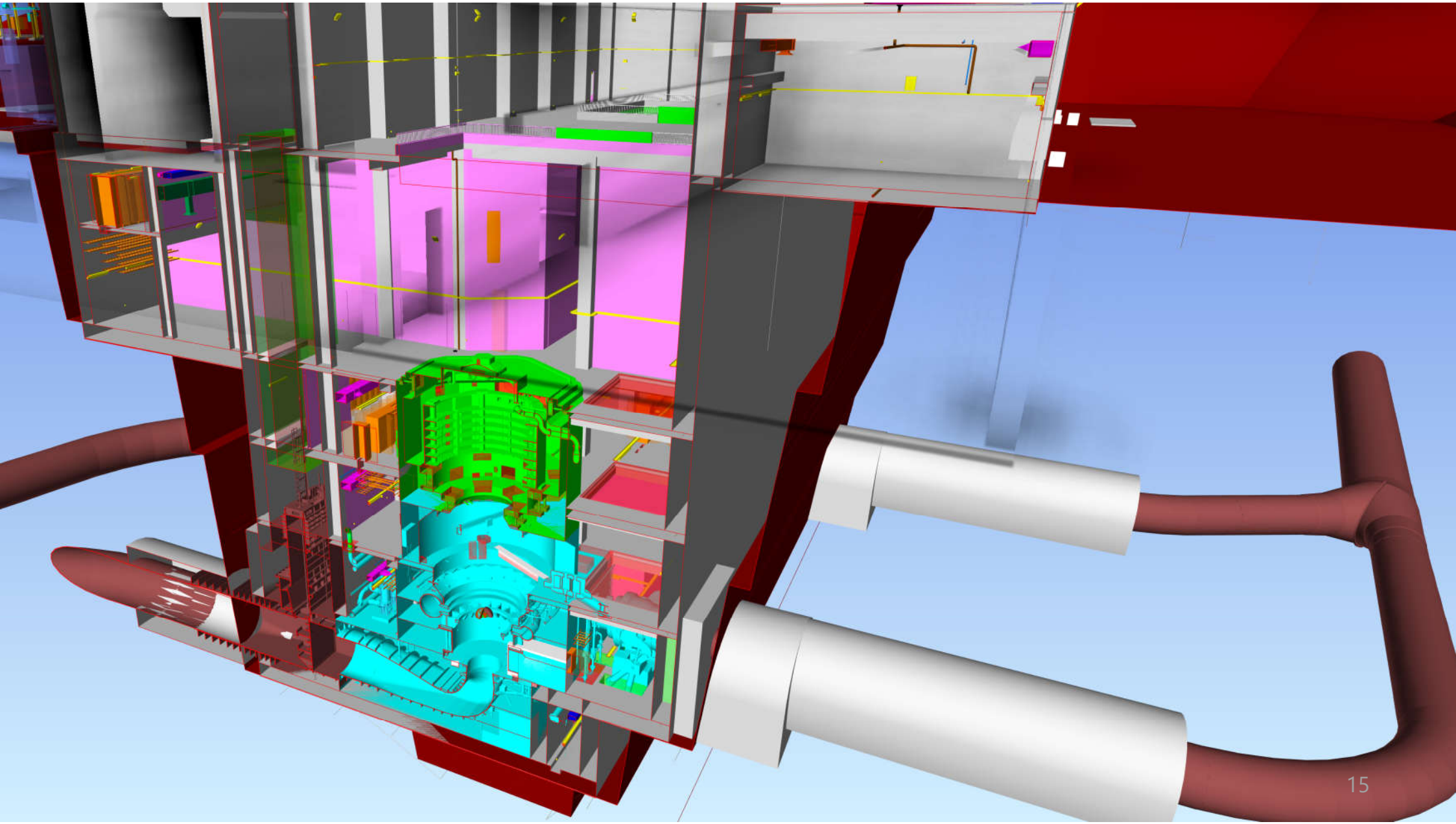


STEP Abdelmoumen









Site by end of April

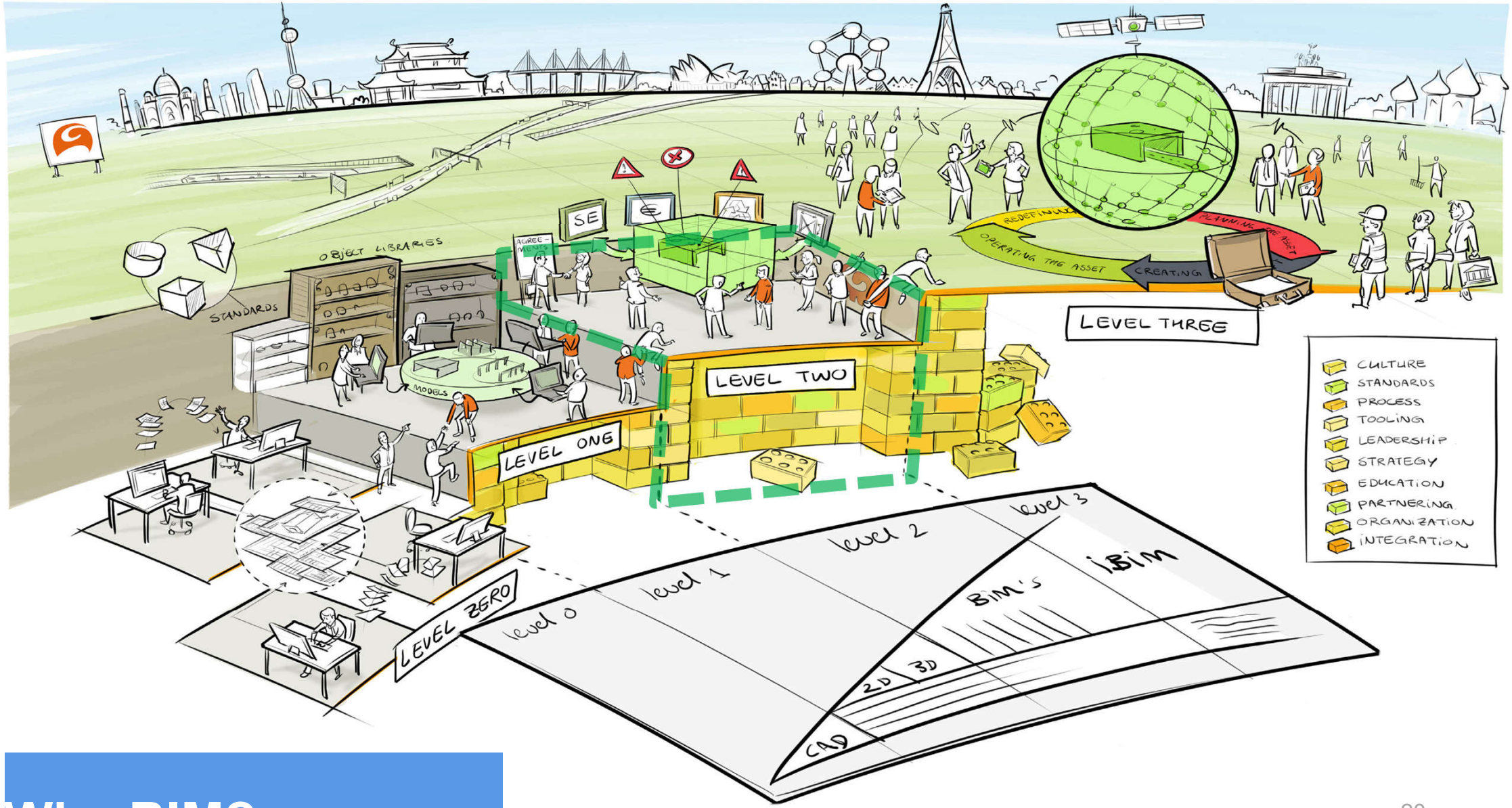
Site by November

It’s All About Planning!

- Presenters and Companies
- The Project

BIM Implementation

- Interoperability
- Dynamo / BIM360
- Wrap-Up


OBJECT LIBRARIES
STANDARDS
MODELS
AGREE-MENTS
SE
LEVEL ZERO
LEVEL ONE
LEVEL TWO
LEVEL THREE
OPERATING THE ASSET
CREATING
CULTURE
STANDARDS
PROCESS
TOOLING
LEADERSHIP
STRATEGY
EDUCATION
PARTNERING
ORGANIZATION
INTEGRATION
level 0
level 1
level 2
level 3
CAD
2D
3D
BIM's
iBim

Why BIM?

Software Interfaces

AUTODESK® INVENTOR®

PLM Software SIEMENS NX

AUTODESK® BIM 360™

NAVISWORKS

eproject

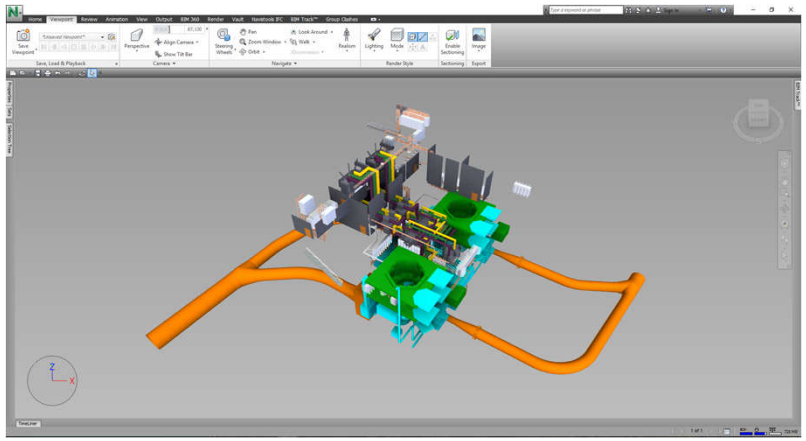
Dynamo

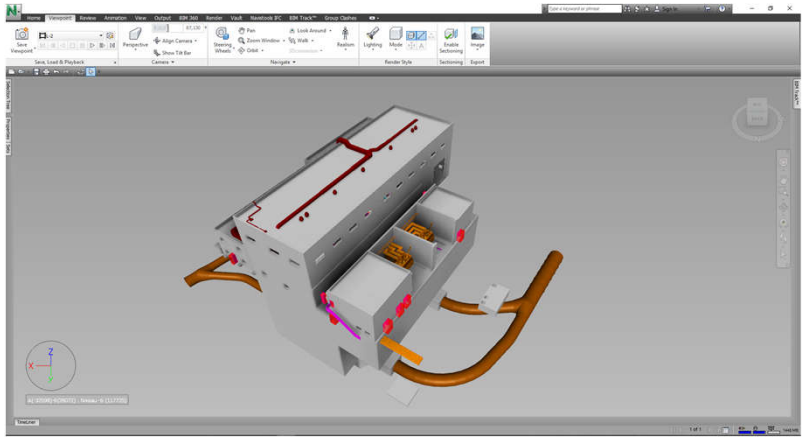
ARCHICAD
LM TEMPLATE APERTO ITA

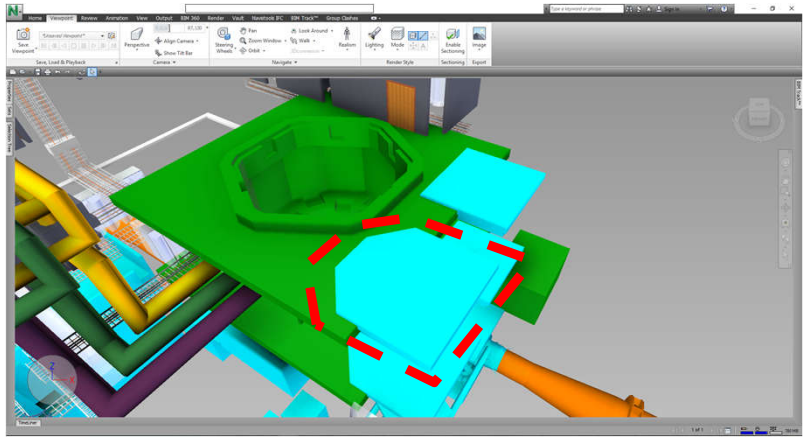
AUTODESK REVIT

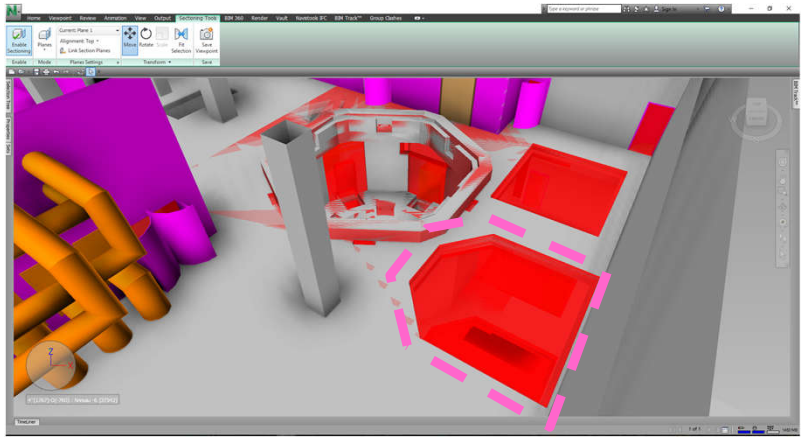
BIMTRACK™

Workflows of Interaction

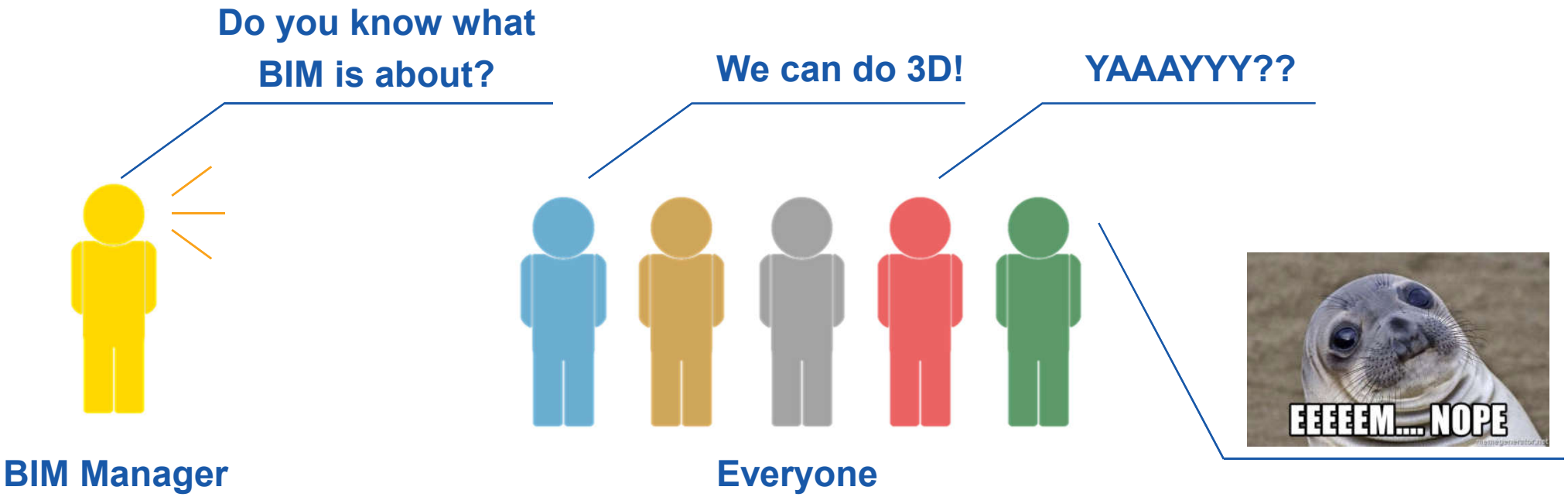






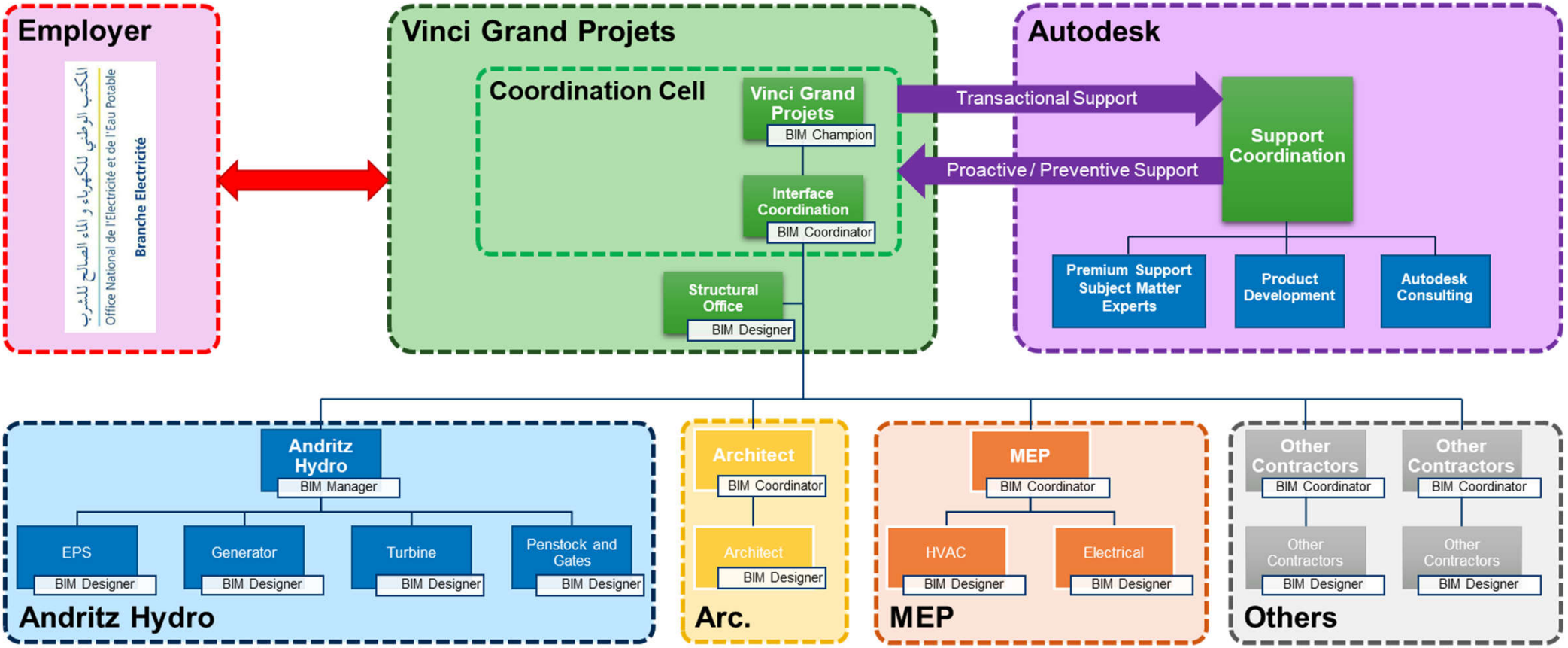


BIM Implementation: Everyday Hurdles

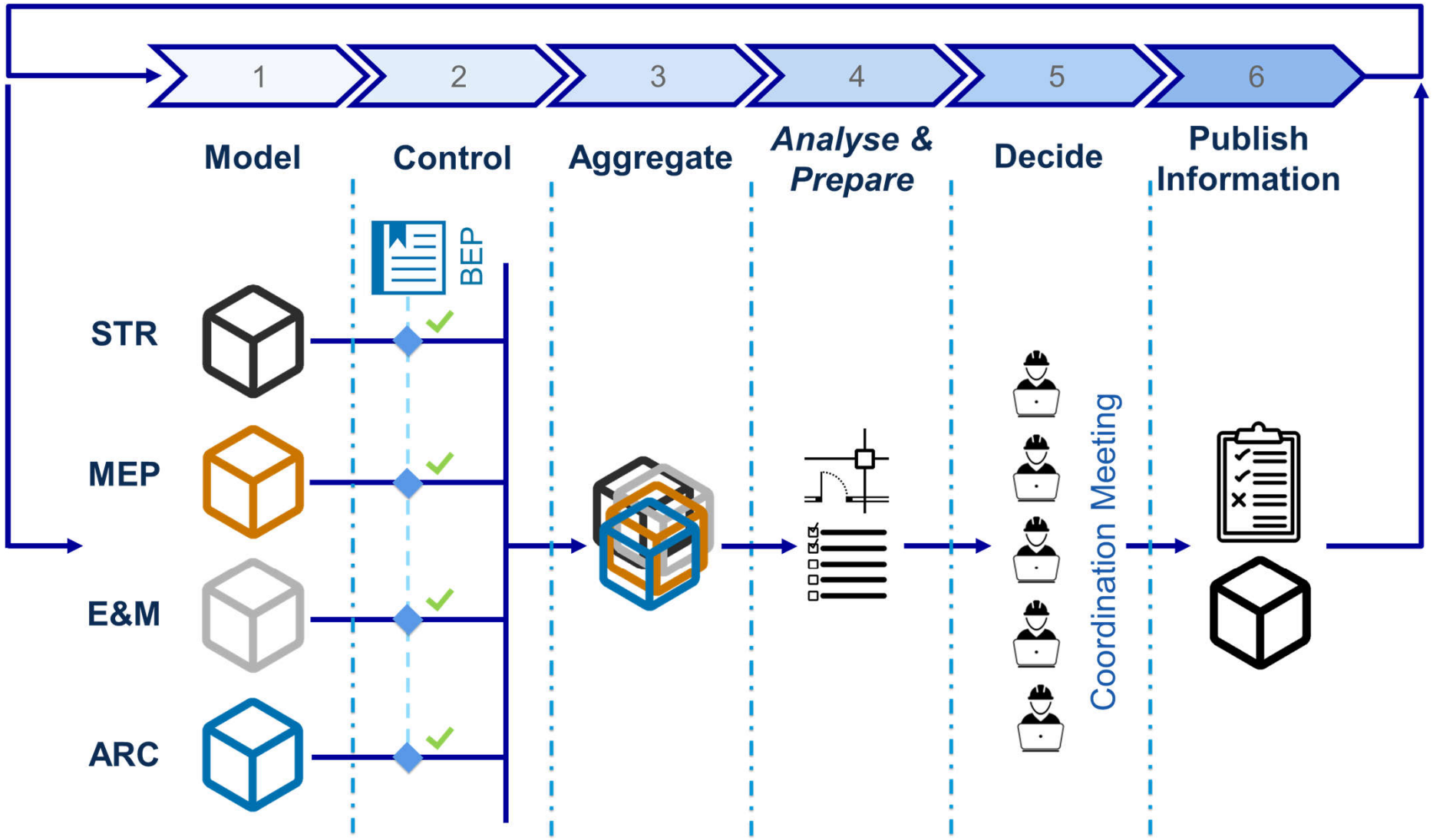


A Lot of Communication / Explanations / Trainings Needed

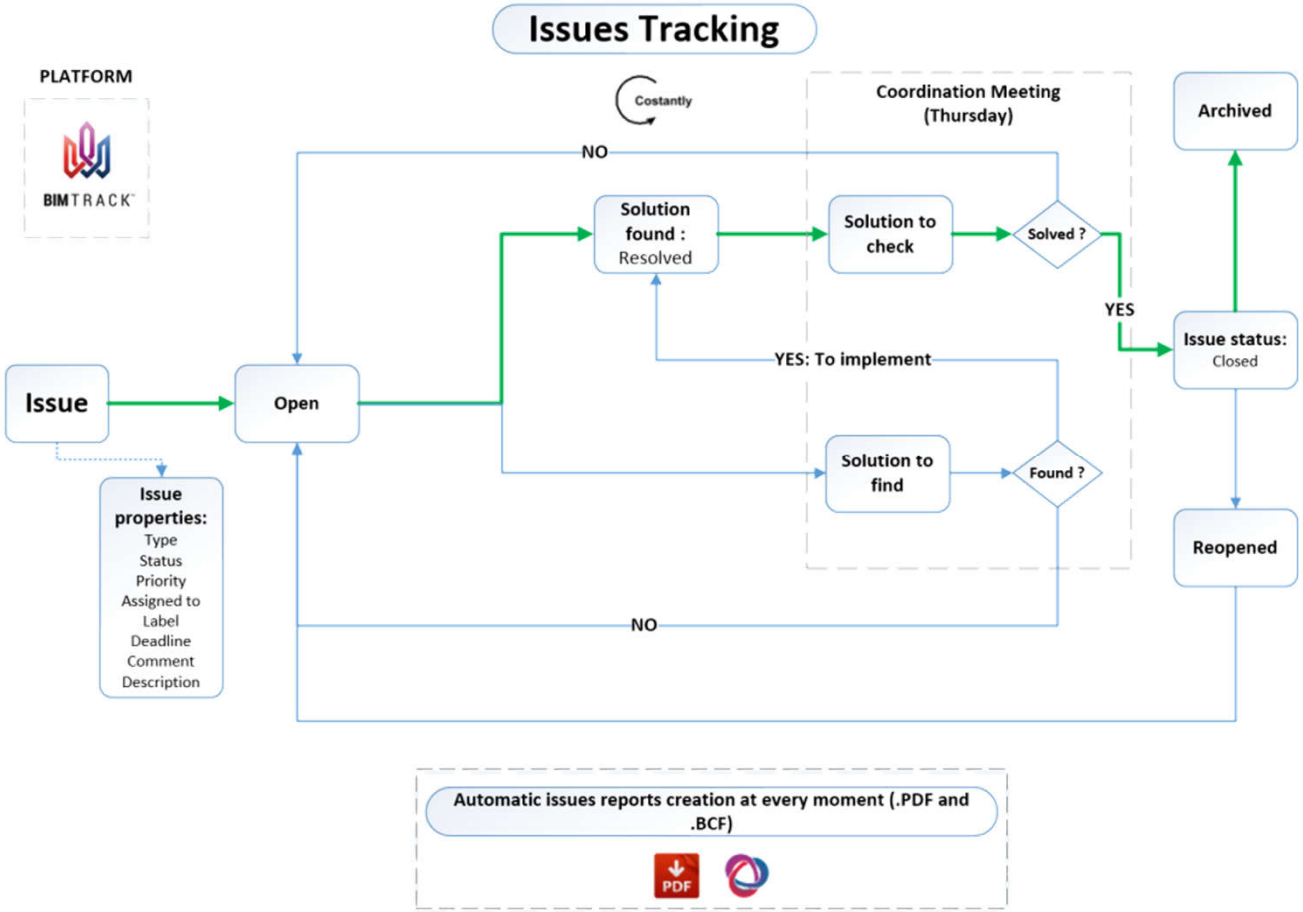
Coordination Team



Simplified Process



Issue Tracking Platform (BIMTrack®)



Goal:

- Create and follow-up issues
- Traceability of issues
- Coordination KPI's
- Live reporting
- Cloud based solution
- BCF server

- Presenters and Companies
- The Project
- BIM Implementation

Interoperability

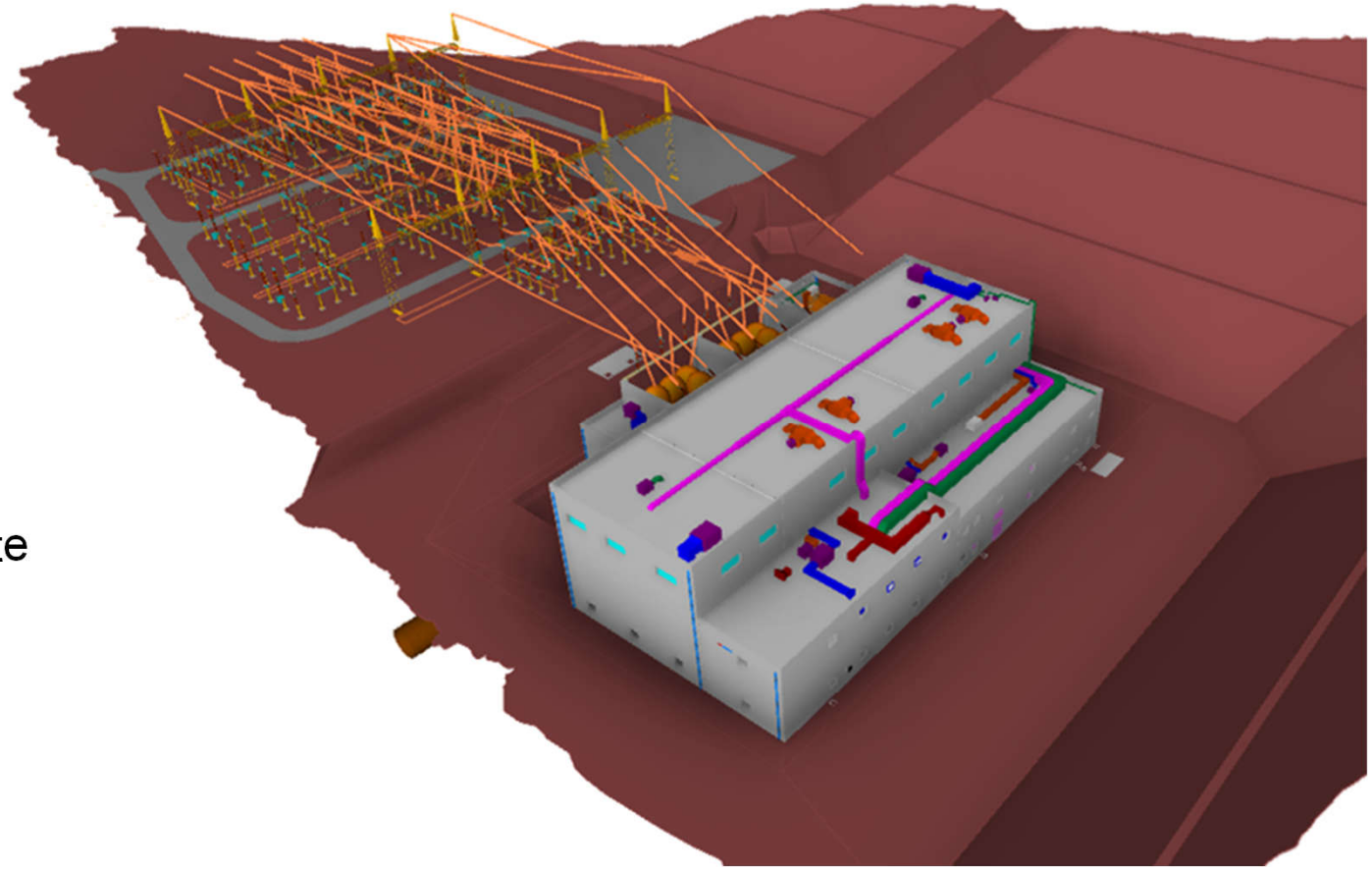
- Dynamo / BIM360
- Wrap-Up

Presentation Will Focus on…

Creating a Federated Model

Challenges:

- Software compatibility
- Geolocation
- Integration of Issue Management Platform
- File size
- Offline availability for site
- Viewing performance



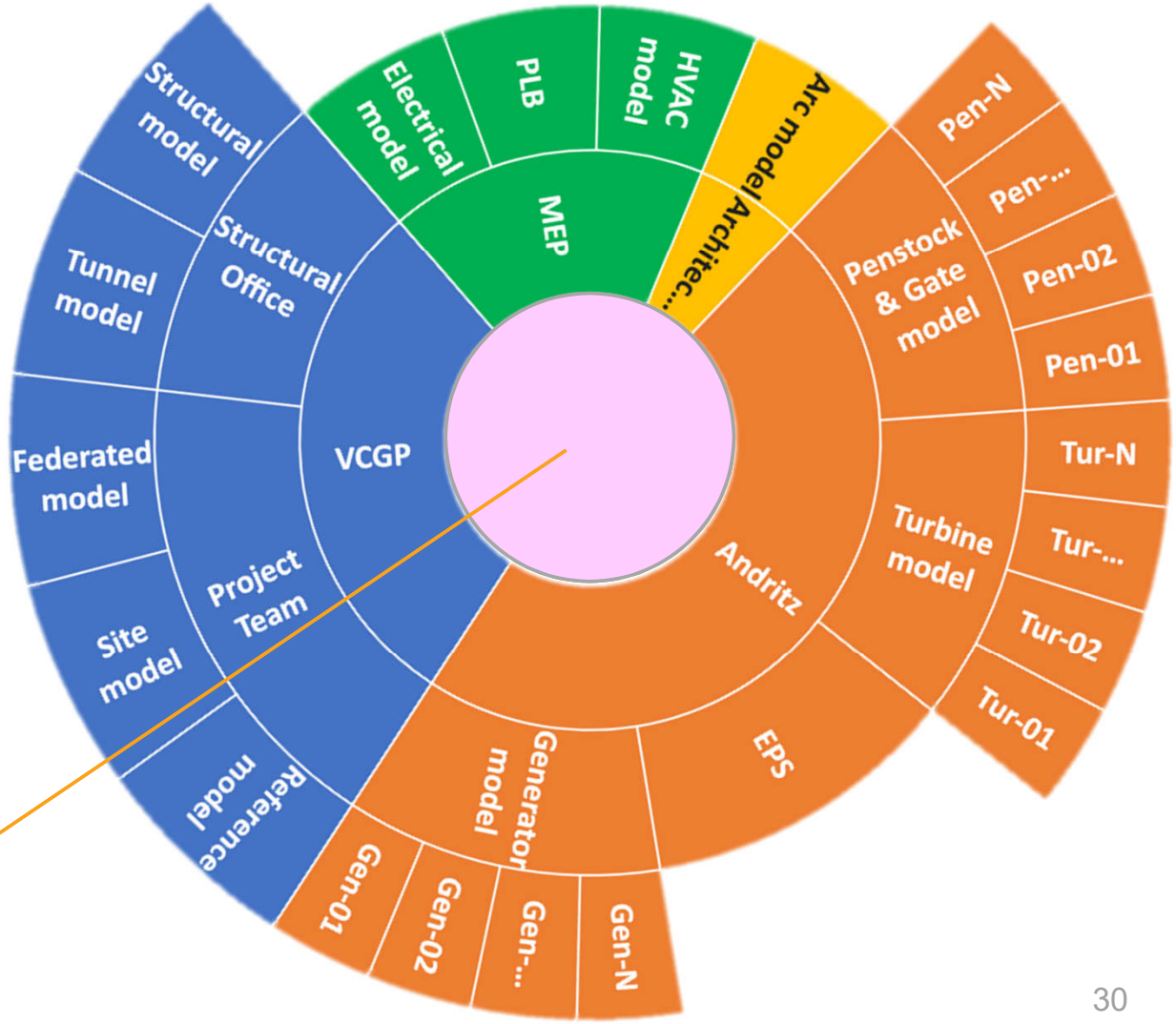
Model Organisation

VGCP

Andritz

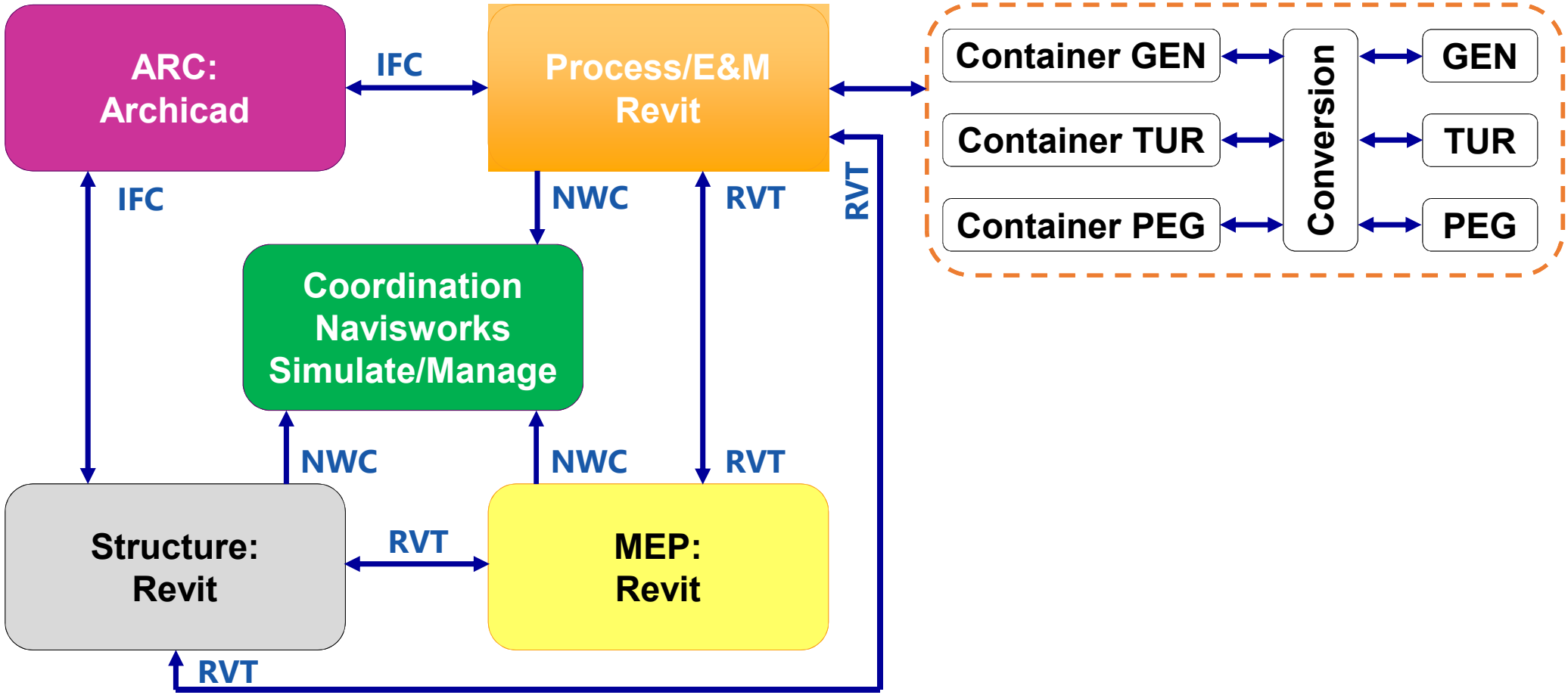
MEP

Architecture



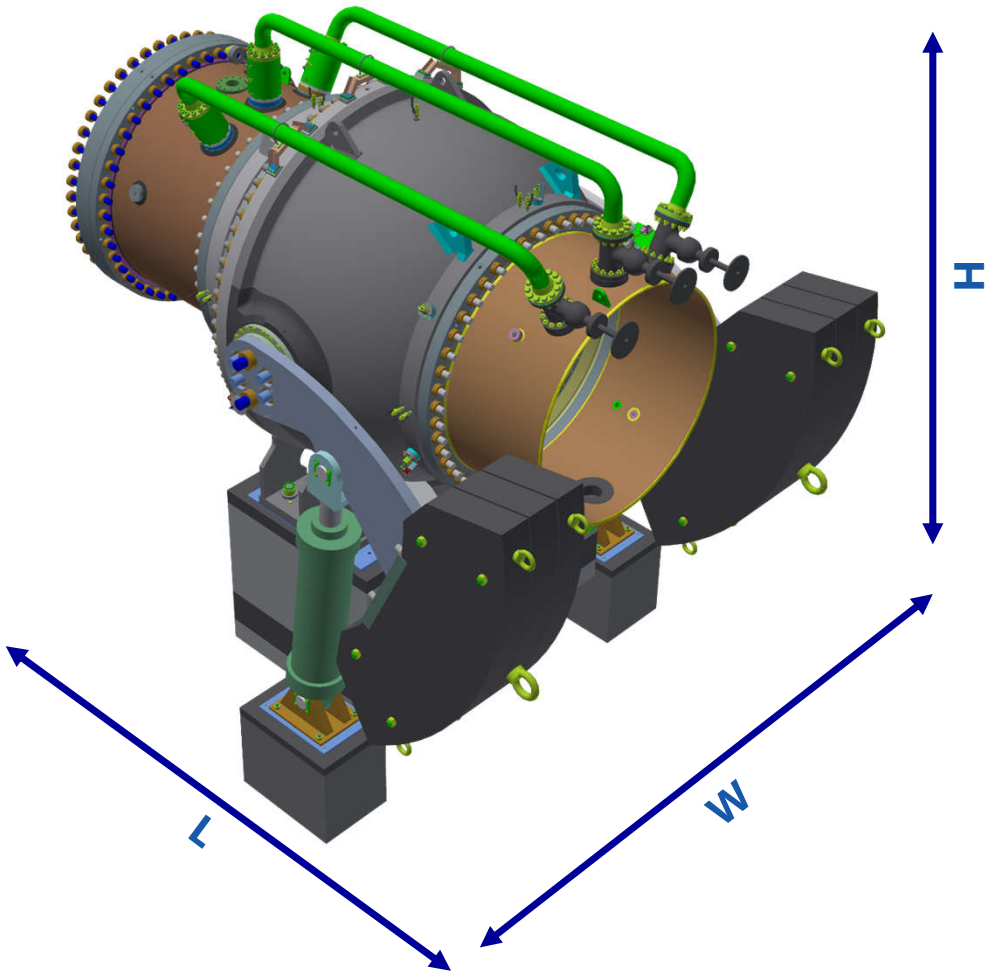
Federated Model

Workflow Model Exchange



Simplifying Models

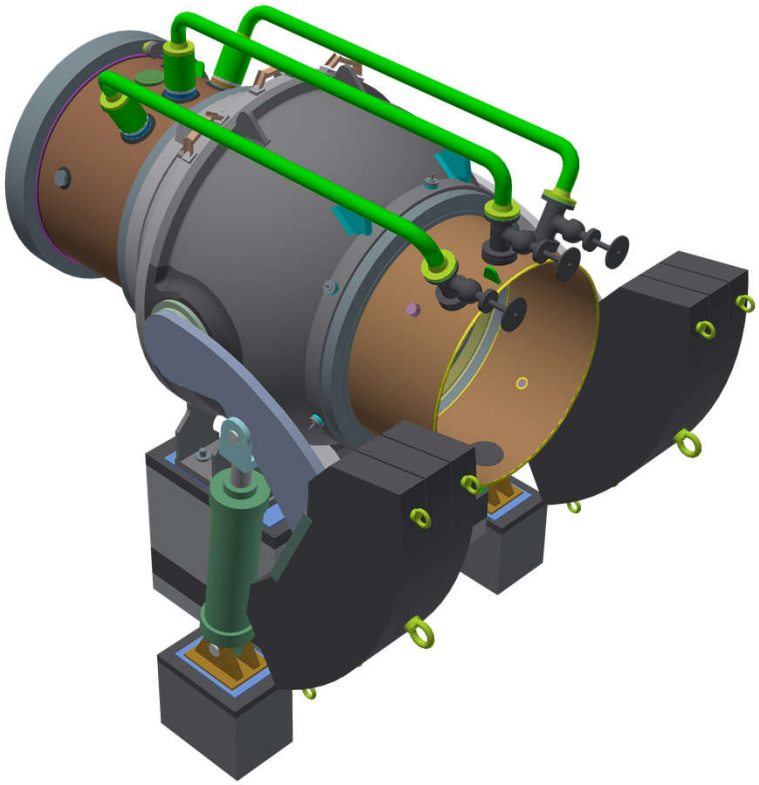
Simplifying Models in Inventor



Facts:

weight: ~70 tons
dimensions:
(L x W x H)
7,3 x 5,4 x 7,2m
Ø 1,25m

File Size Comparison



13%!

30 MB

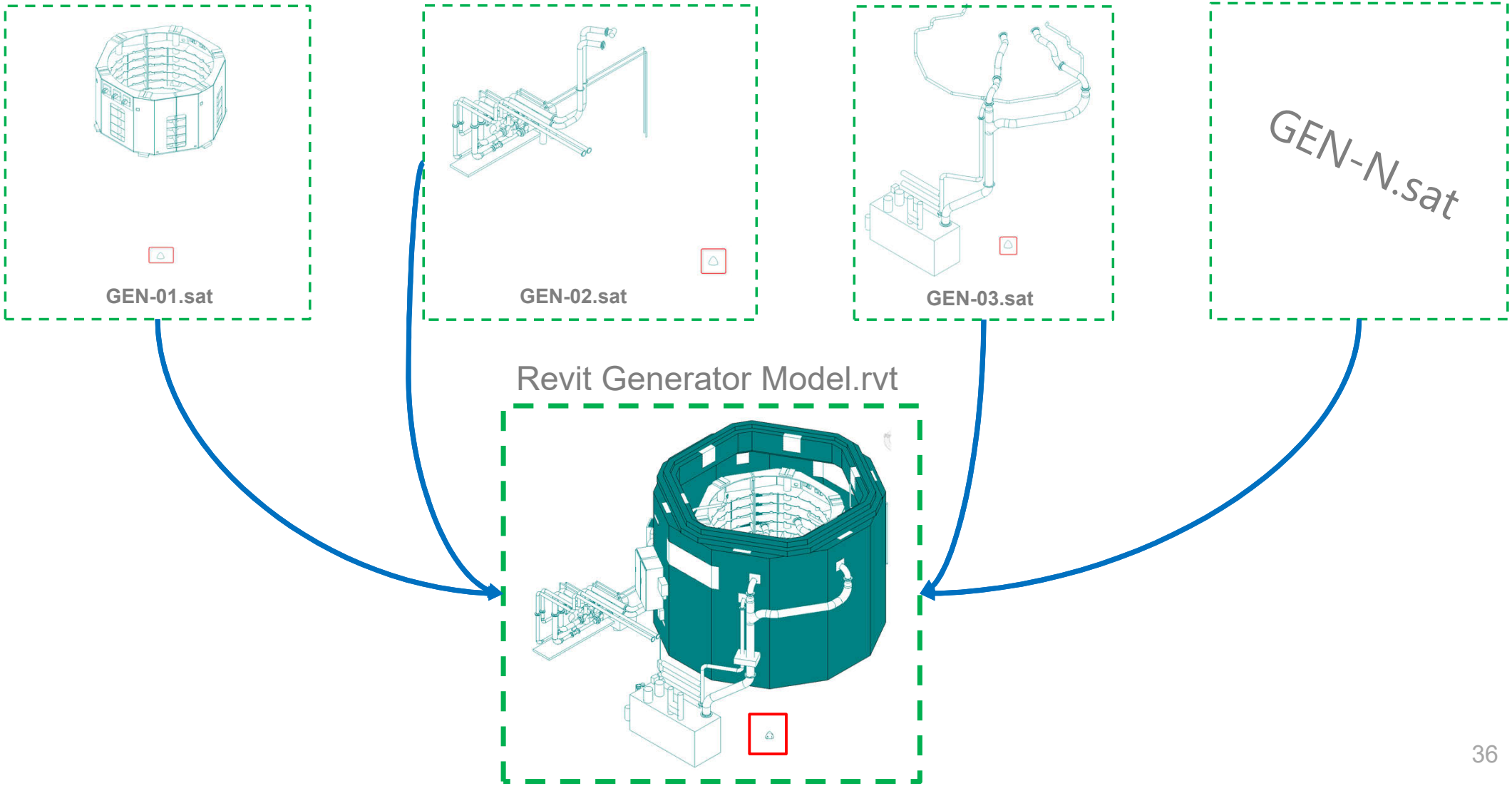
230 MB

Simplified Component

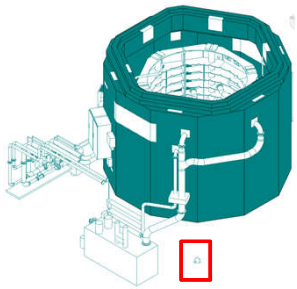
Original Version

Linking Models

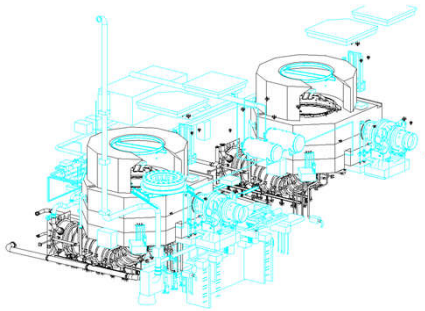
Andritz Model: PSA-VCAN7-GEN-ALT-MAQ-100003



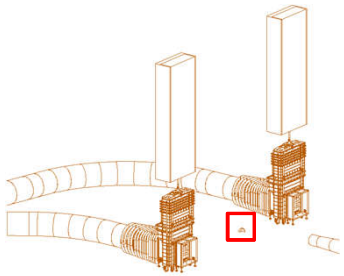
Andritz Models: Overview



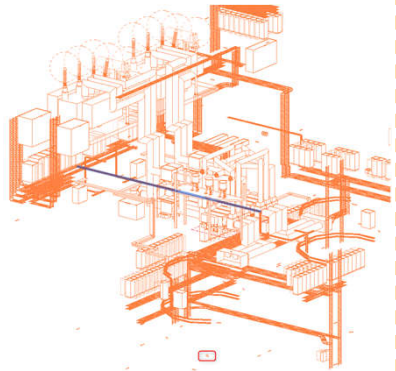
Generator Model



Turbine Model

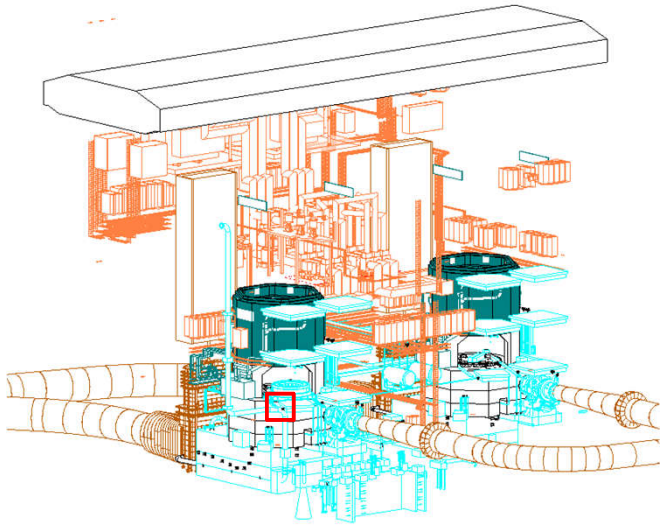


Penstock&Gates Model



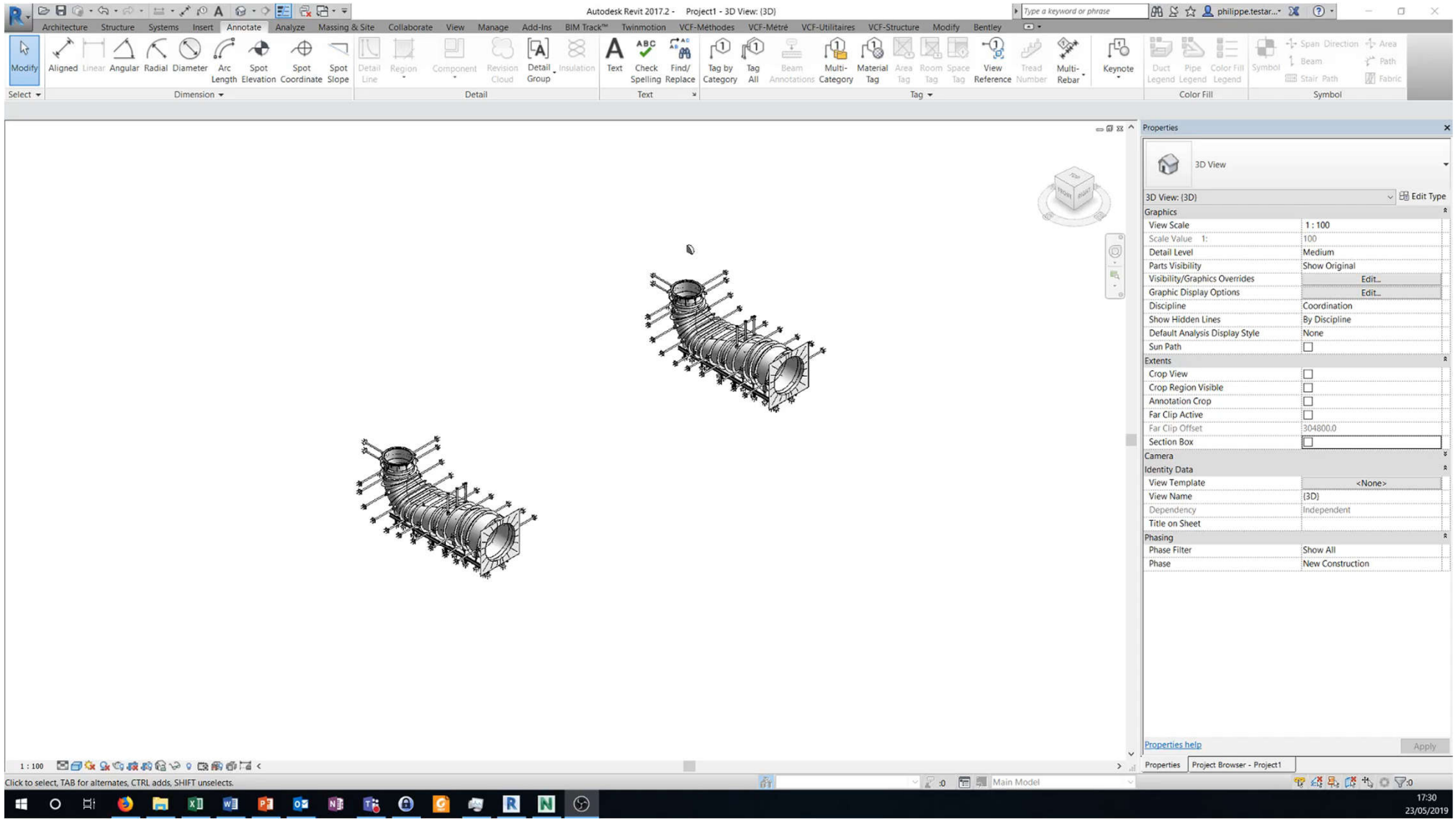
EPS Model

Revit Andritz model.rvt



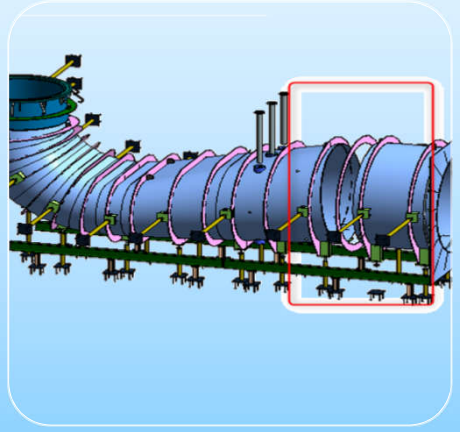
The Way to Wisdom…

We Have a Problem, Don't We?



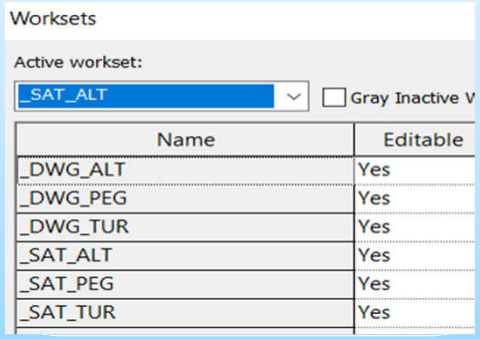

LIES! DECEPTION!!!

Methods To Create 2D Drawings



1. Inserting in generic or Mass families

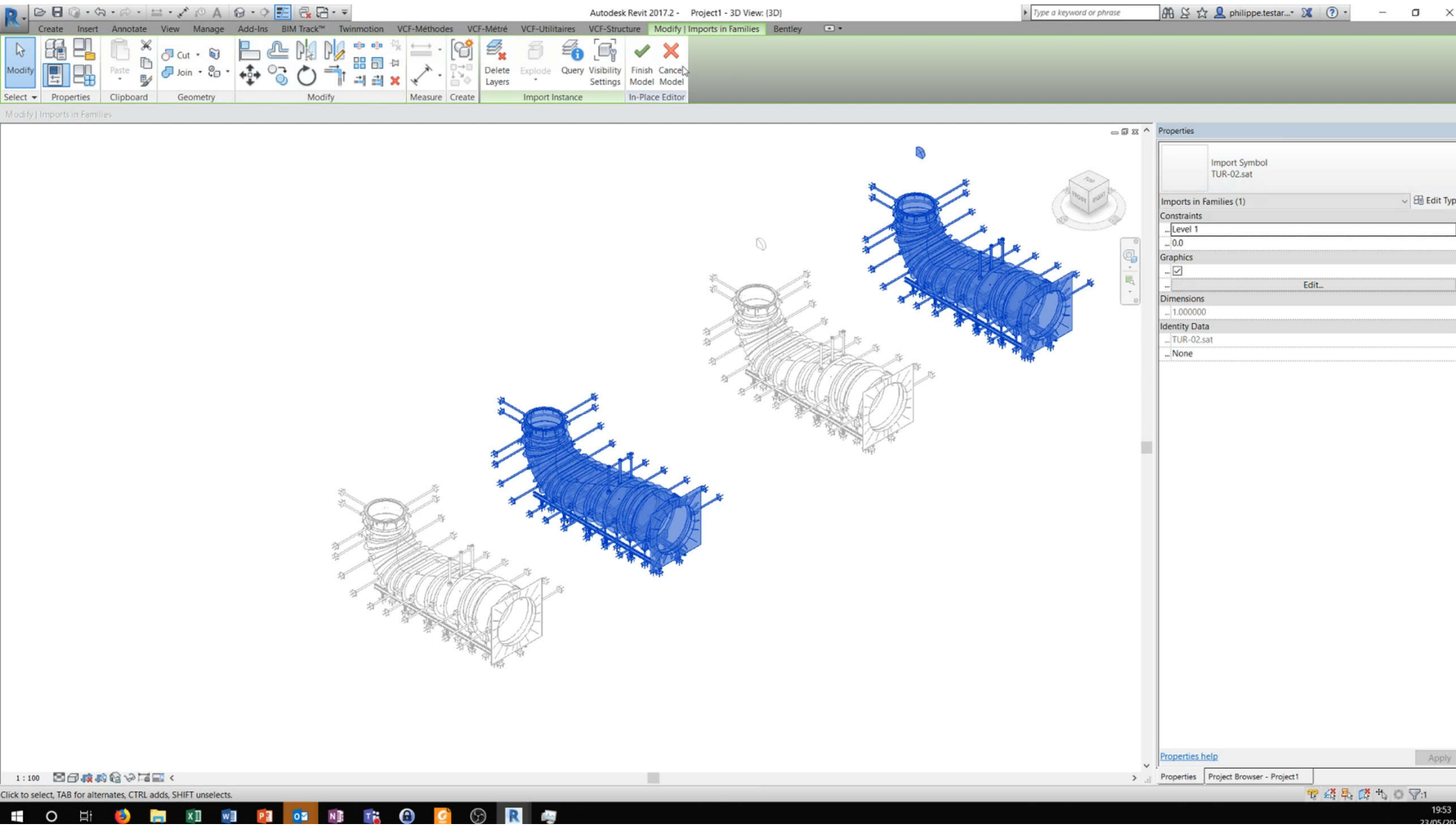
- Revit native file => All sectioning available
- **Missing geometry**
- No automatic placement in models
- Requires family management
- Generic families (filter to handle visibility of elements needed)

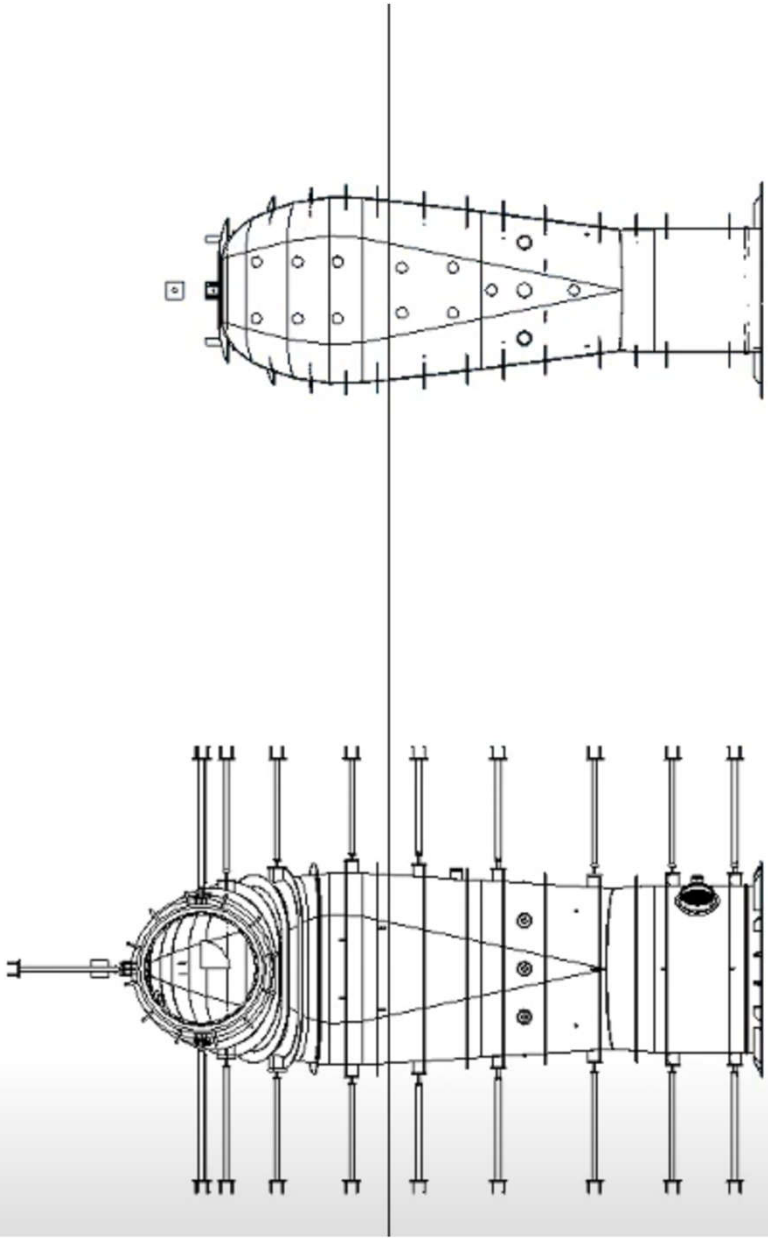


2. Link .sat, export in DWG, reinsert in families

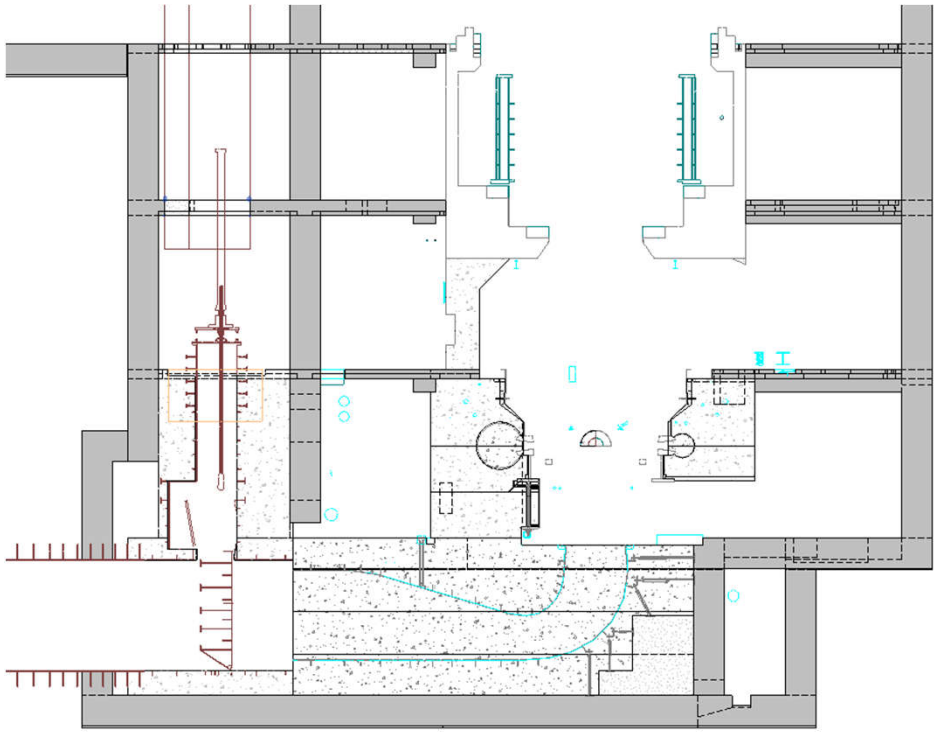
- All sectioning available
- File extremely heavy and slow
- Exporting may crash the computers
- Requires huge model organization
- No automatic placement in models
- Very time consuming

3. Create In-Place Generic Models and Link the .sat File!


Autodesk Revit 2017.2 - Project1 - 3D View: {3D}
Type a keyword or phrase
philippe.testar...
Create
Insert
Annotate
View
Manage
Add-Ins
BIM Track™
Twinmotion
VCF-Méthodes
VCF-Métré
VCF-Utilitaires
VCF-Structure
Modify | Imports in Families
Bentley
Modify
Select
Properties
Paste
Clipboard
Cut
Join
Geometry
Modify
Measure
Create
Delete Layers
Explode
Query
Visibility Settings
Import Instance
Finish Model
Cancel Model
In-Place Editor
Modify | Imports in Families
Properties
Import Symbol
TUR-02.sat
Imports in Families (1)
Edit Typ
Constraints
Level 1
0.0
Graphics
Edit...
Dimensions
1.000000
Identity Data
TUR-02.sat
None
Properties help
Apply
Properties
Project Browser - Project1
1 : 100
Click to select, TAB for alternates, CTRL adds, SHIFT unselects.
19:53

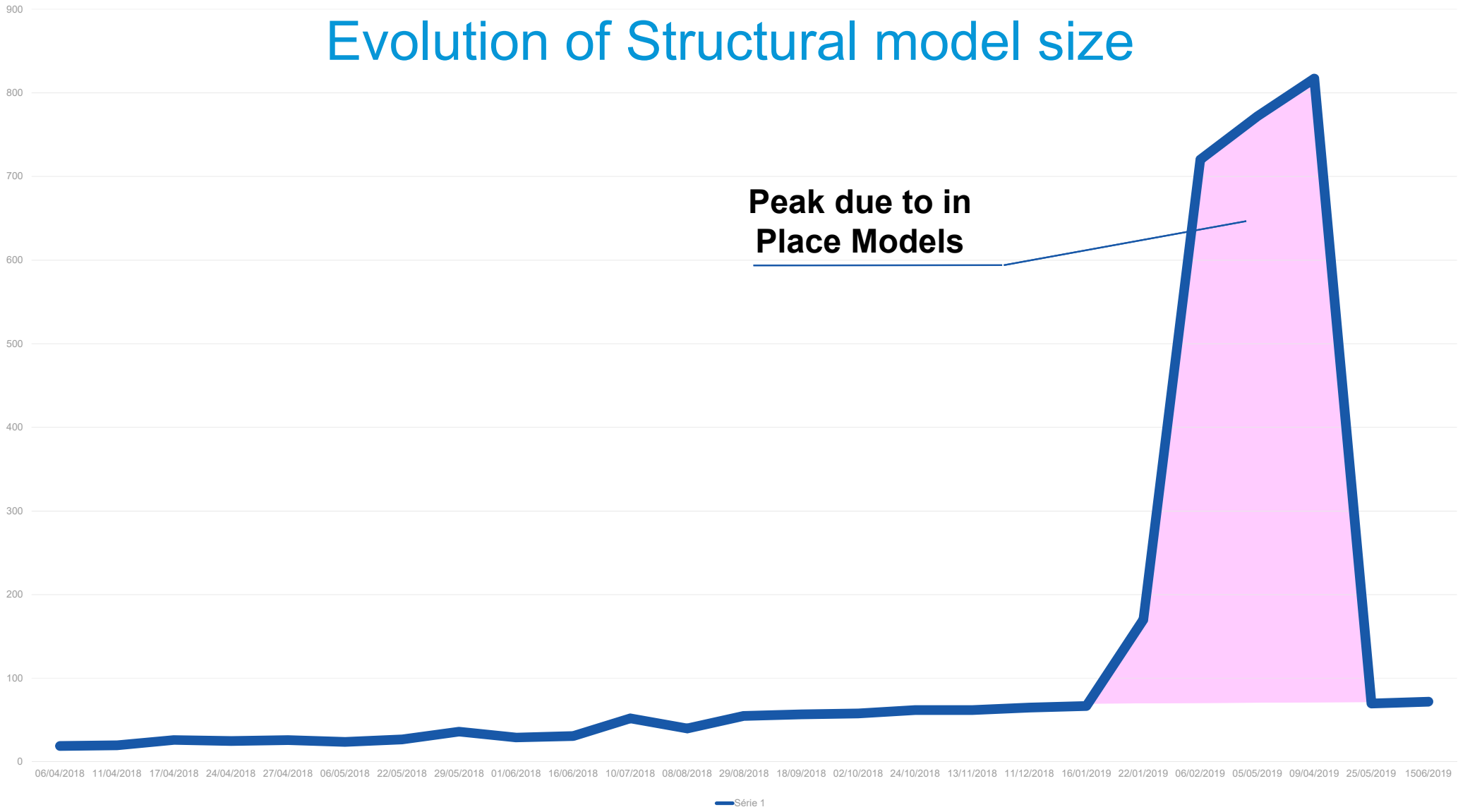


3. The Simple Method

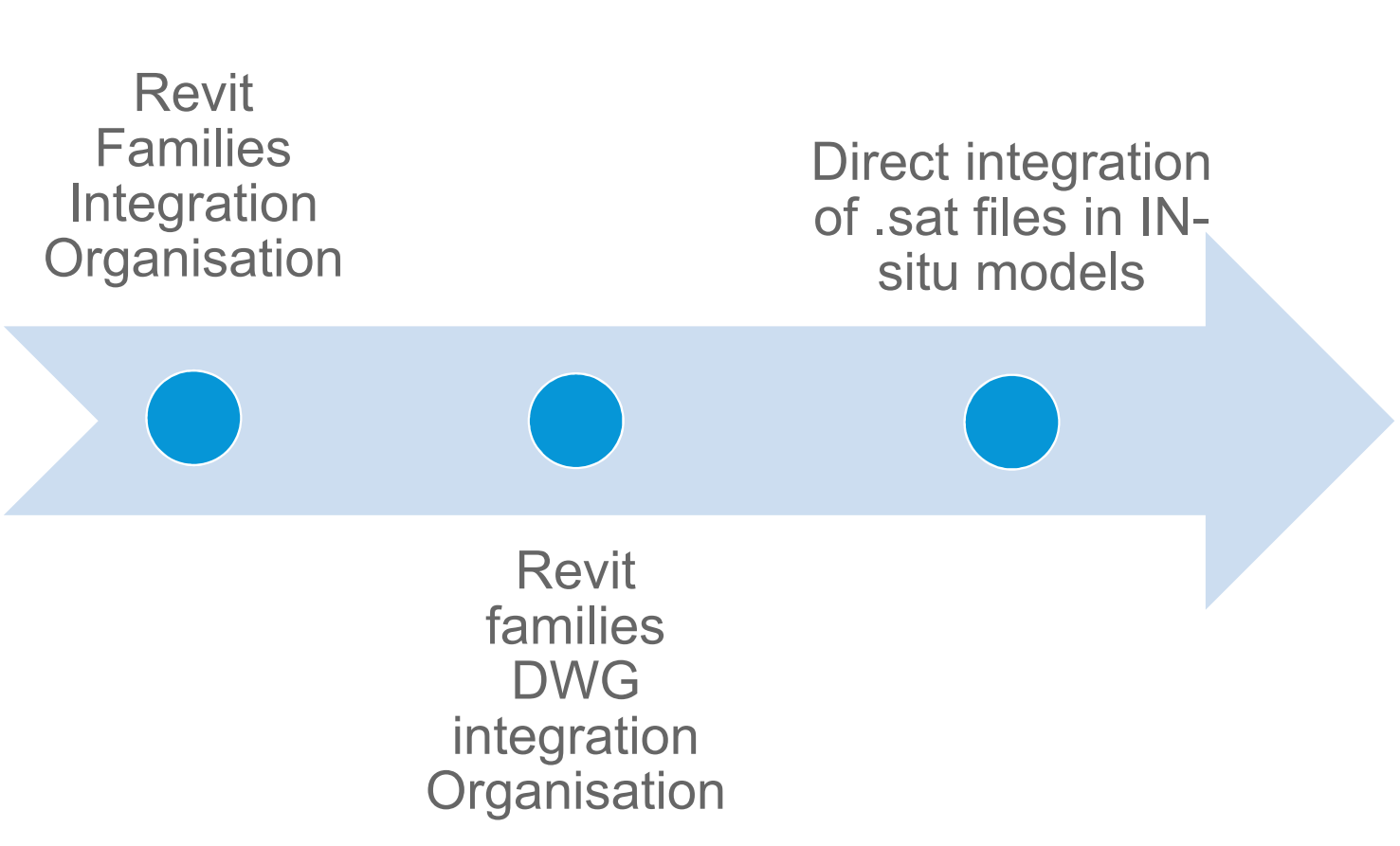


Advantages	Disadvantages
• View plan sectioning • Upper plan sectioning • Section plan sectioning • Automatic placement for others actors	• Limited classification (no mechanical equipment for example) • In-place models

Evolution of Structural model size



Models Organisation



Lose of time due to reorganisation

2D impacts on drawings

- Presenters and Companies
- The Project
- BIM Implementation
- Interoperability

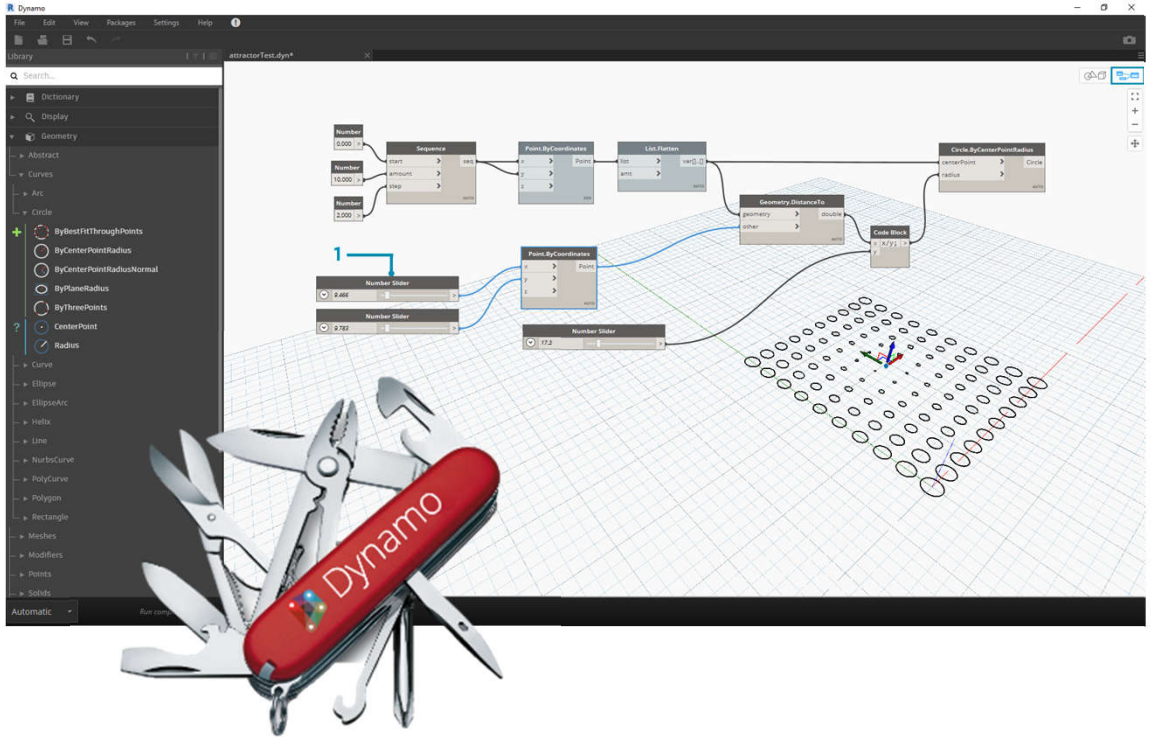
Dynamo / BIM360

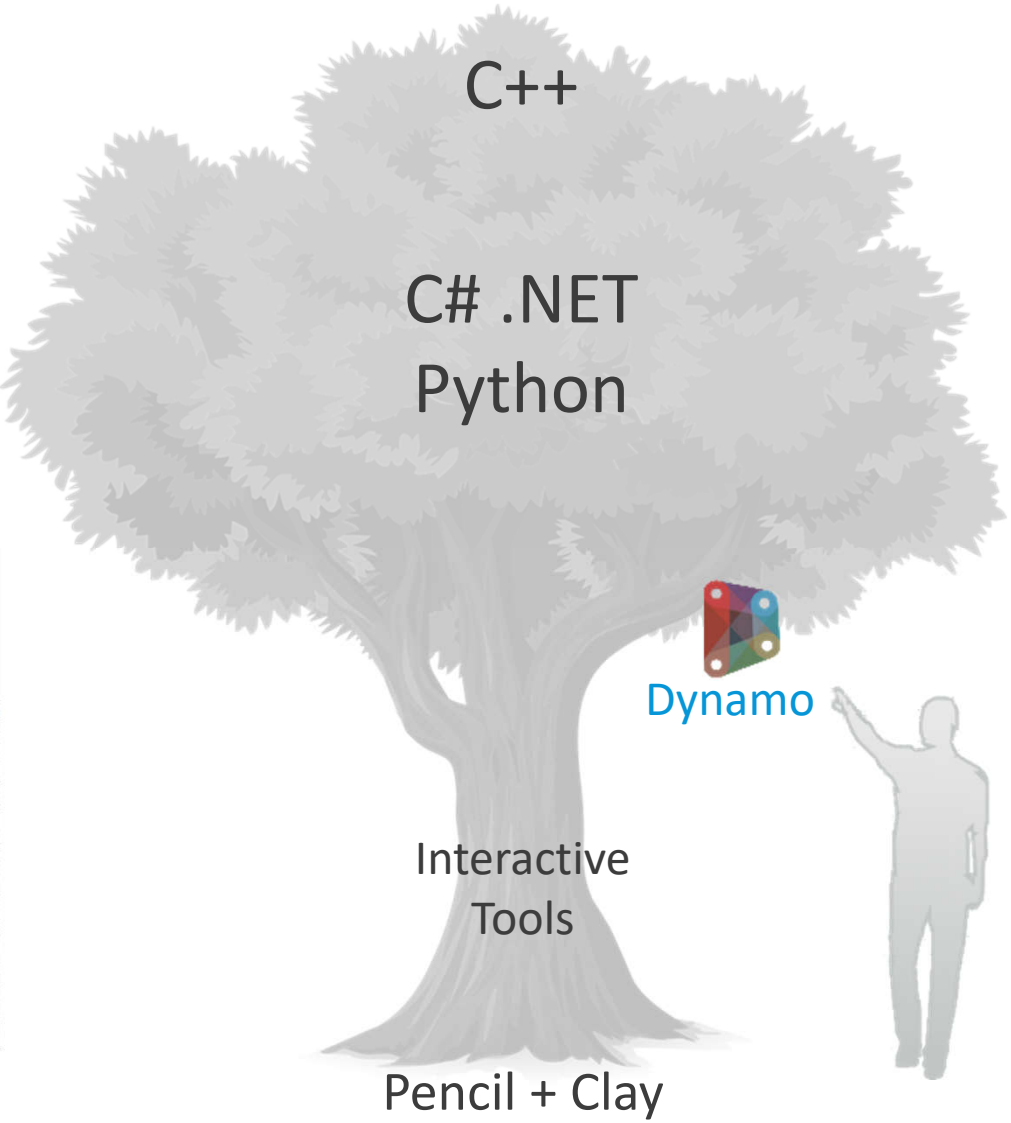
- Wrap-Up

Automation | The New Normal

Automation Is the Disruptor

- Visual interface to construct logic routines

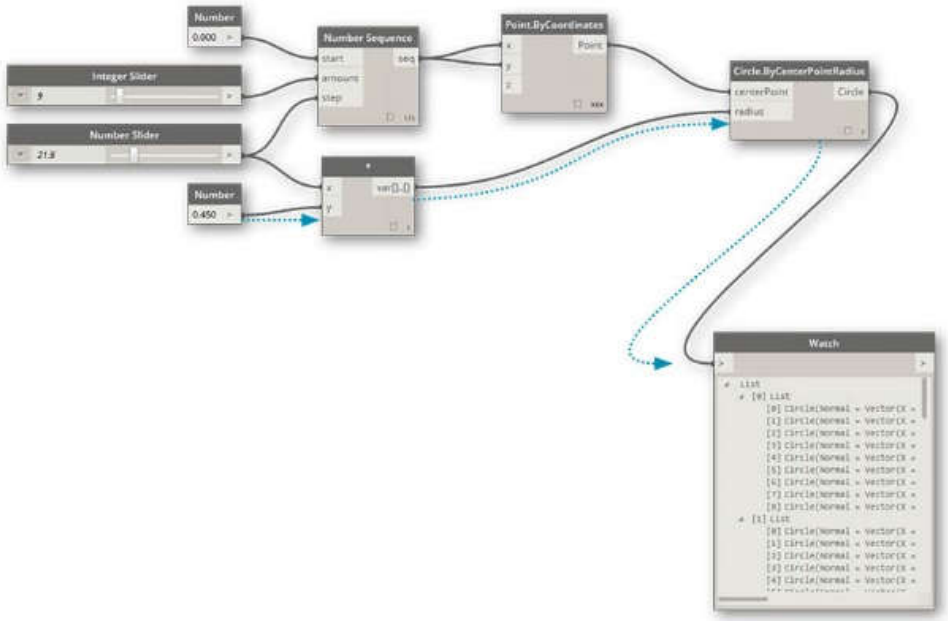




What is Dynamo ?

Dynamo

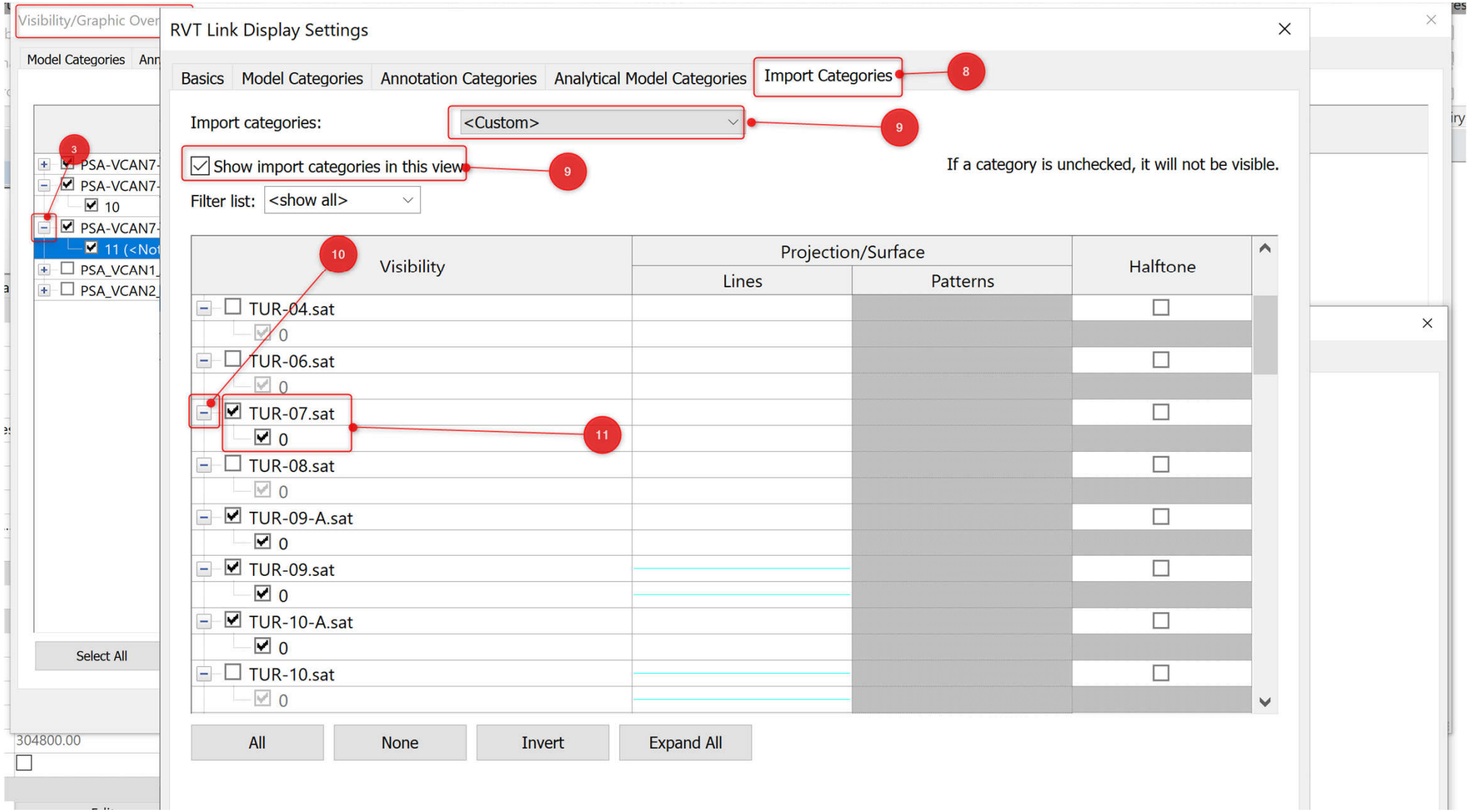
- Dynamo is a **visual programming interface** made to access the Revit API (Application Programming Interface). Programming Languages used to access Revit API are mainly Python & C# but you do not necessarily need to know how to code to use Dynamo
- Dynamo has been created by Autodesk to allow **experienced Revit users** to develop their own functions that cannot be achieve directly or easily in Revit
- Dynamo allows you to write scripts. **Scripts are chains of code blocks** (called nodes) linked together that forms a specific query
- Dynamo requires time to understand how nodes work, and how to use them. There is a quite strong **Dynamo users community at** http://dynamobim.org/ with tutorial videos and a forum



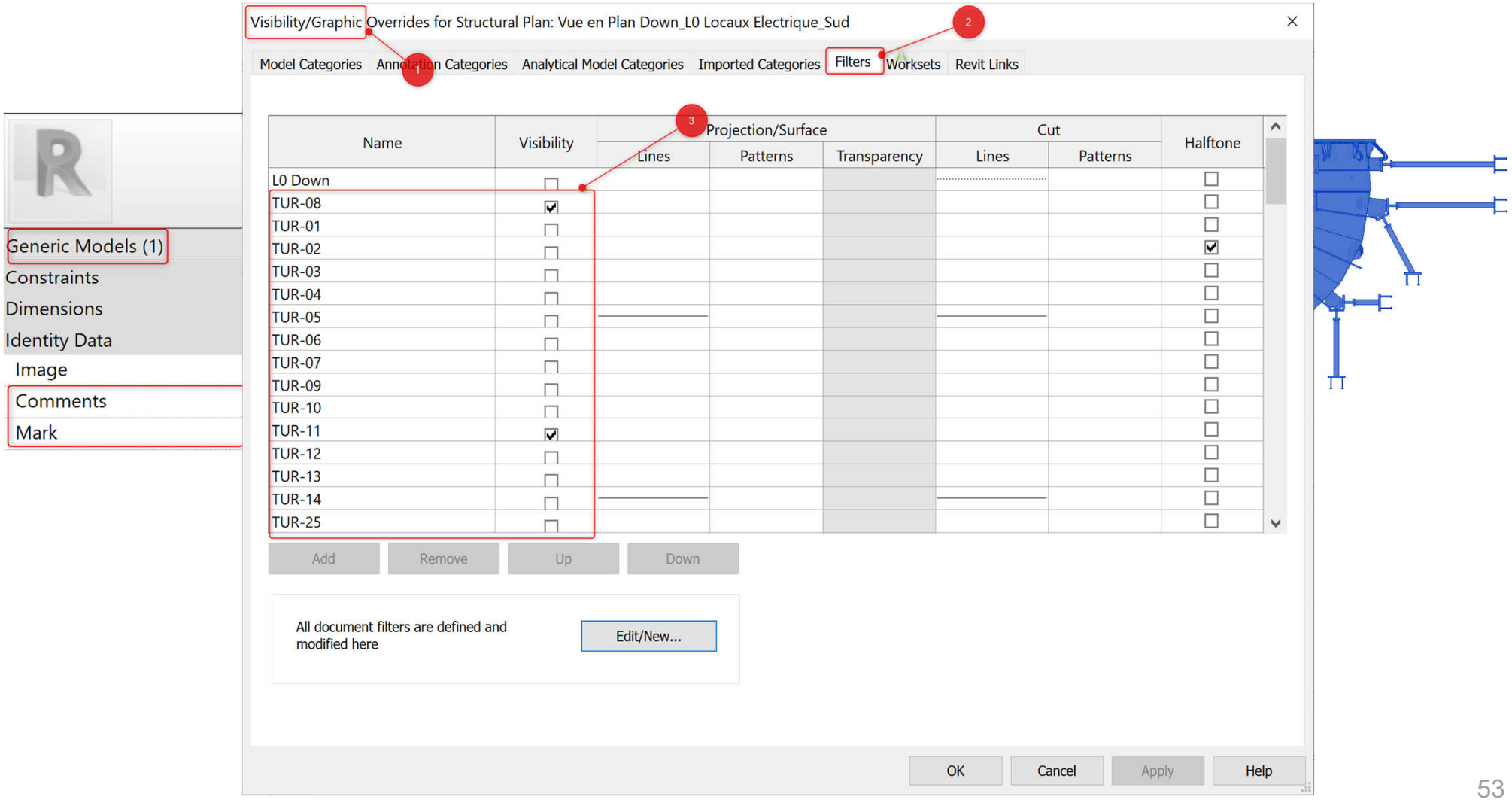
Dynamo often refers to computational design, but many non-graphical things can be achieved with it

Dynamo to reorganize your models

How to display .sat elements at the beginning ?



After reorganisation

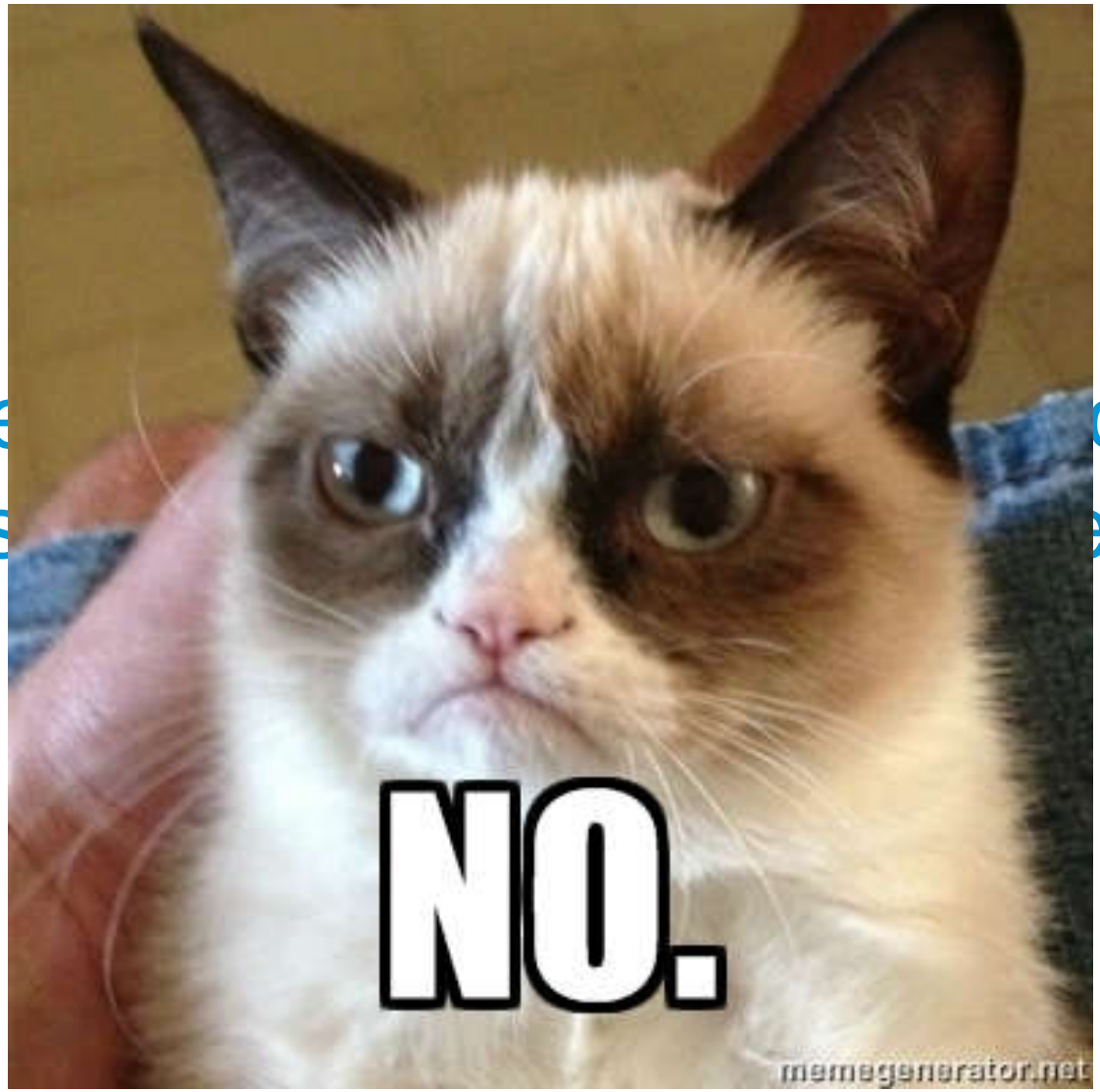


The list of filter to create :

GEN	01	GEN-01	Generator (all components in the generator-pit incl. brush holder bracket and slip ring cover)
GEN	02	GEN-02	Cooling water piping, required space: 2x piping appr. DN300
GEN	03	GEN-03	Oil piping for upper combined bearing incl. oil plant
GEN	04	GEN-04	Oil piping for lower guide bearing incl. oil plant
GEN	05	GEN-05	Carbon dust exhaust
GEN	06	GEN-06	Oil dust exhaust upper combined bearing
GEN	07	GEN-07	Oil dust exhaust lower guide bearing
GEN	08	GEN-08	~~Compressed air tank~~
GEN	09	GEN-09	Mobile lifting plant
GEN	10	GEN-10	Generator Openings
GEN	11	GEN-11	Generator Foundation
GEN	12	GEN-12	Generator Terminal Boxes
GEN	13	GEN-13	Generator Brake Piping
GEN	14	GEN-14	Openings Barrier Machine Hall Floor
GEN	15	GEN-15	Drainage Generator Pit
GEN	16	GEN-16	Drainage Interface Points Auxiliary Equipment Generator
GEN	17	GEN-17	Generator Top Cover
TUR	01	TUR-01	Spiral Case and Stay Ring
TUR	02	TUR-02	Draft Tube
TUR	03	TUR-03	Pit Liner
TUR	04	TUR-04	Hydraulic Governor and Accumulators
TUR	05	TUR-05	Turbine Speed Governor
TUR	06	TUR-06	Main Inlet Valve (MIV)
TUR	07	TUR-07	Foundation Modification Spiral Case
TUR	08	TUR-08	Foundation Modification Turbine Pit
TUR	09	TUR-09	Openings Level Generator Cover
TUR	10	TUR-10	Openings Level Generator Entrance
TUR	11	TUR-11	Openings Level Turbine Entrance
TUR	12	TUR-12	Openings Level Spiral Case
TUR	13	TUR-13	Openings Level Turbine Sump
TUR	14	TUR-14	Embedded Pipings
TUR	25	TUR-25	Openings MIV
TUR	26	TUR-26	Oil Separator
TUR	27	TUR-27	~~Drainage Channel~~
TUR	28	TUR-28	~~Walls~~
TUR	29	TUR-29	Opening Foundation MIV
TUR	30	TUR-30	Foundation Plates
TUR	31	TUR-31	Crane Drainage Pumps
TUR	32	TUR-32	Foundation Modification Draft Tube
TUR	33	TUR-33	Opening Dewatering Pipe
TUR	34	TUR-34	Turbine Piping not Embedded
TUR	35	TUR-35	Turbine Pit Crane
TUR	36	TUR-36	Openings Piping (temporary)
TUR	37	TUR-37	Openings Spiral Case Foundation
TUR	38	TUR-38	Openings Turbine Pit Foundation
TUR	39	TUR-39	Openings Draft Tube Foundation
TUR	40	TUR-40	~~Openings MIV~~
TUR	41	TUR-41	Trolley
TUR	42	TUR-42	Powerhouse Crane 130t
TUR	43	TUR-43	Drainage Interface Points Turbine
TUR	44	TUR-44	Guide Rails Trolley
TUR	45	TUR-45	Concrete Guide Rails Trolley
TUR	46	TUR-46	MIV Foundation
TUR	47	TUR-47	Powerhouse Crane Rail
TUR	48	TUR-48	Foundation Plates - Turbine Pit Crane
TUR	49	TUR-49	Ladders Turbine Sump
TUR	50	TUR-50	MIV Foundation Second Stage Concrete
TUR	51	TUR-51	Wall Guide Bearing Oil Tank
EPS	01	EPS-01	MV Equipment (GCB, NGC, IPB, SFC)
EPS	02	EPS-02	LV Equipment (Protection, Control, Excitation, AC/DC Equipment)
EPS	03	EPS-03	Grounding
EPS	04	EPS-04	Cabeling
EPS	05	EPS-05	Main Transformer
EPS	06	EPS-06	Auxiliary Transformer
EPS	07	EPS-07	Fire Fighting System
EPS	08	EPS-08	Blockouts
EPS	09	EPS-09	HV Equipment (Cables, OHL Lines, Switchgears,...)
EPS	10	EPS-10	Blockouts Precast Slabs
PEG	01	PEG-01	Penstock Intake
PEG	02	PEG-02	Penstock Draft Tube
PEG	03	PEG-03	~~Draft Tube Gate Opening~~
PEG	04	PEG-04	Draft Tube Gate Slot (Concrete)
PEG	05	PEG-05	Draft Tube Gate
PEG	06	PEG-06	Draft Tube Gate Opening (Permanent)
PEG	07	PEG-07	Draft Tube Gate Installation Opening (Temporary)

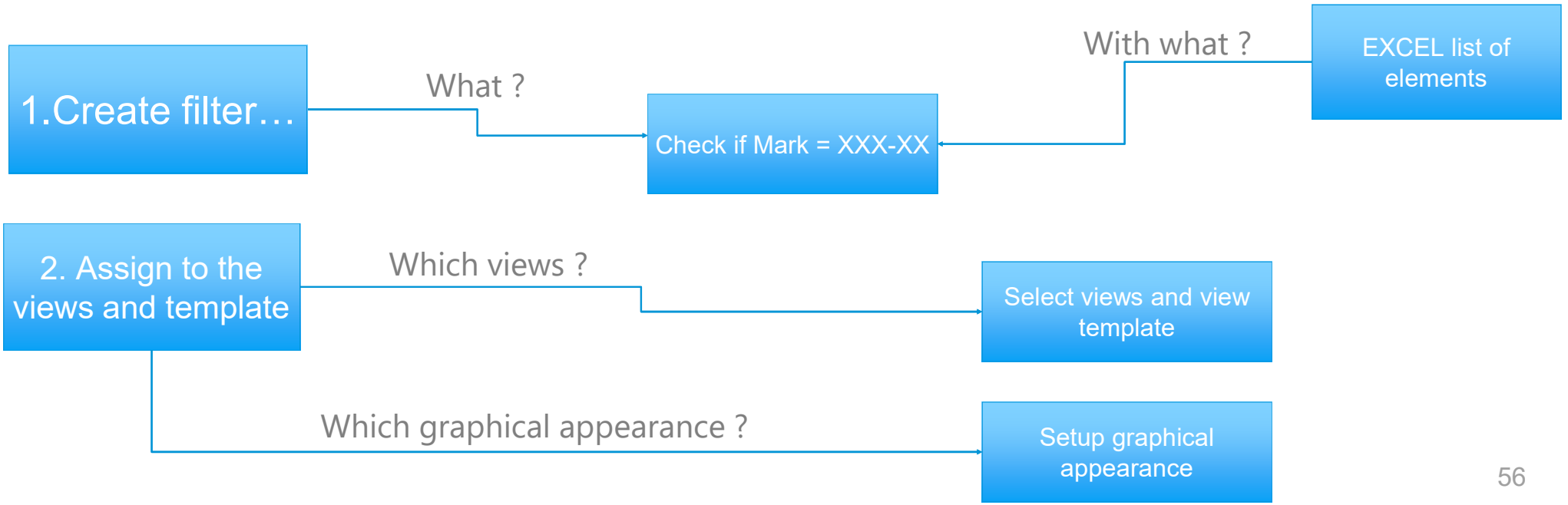
Around 70 !

Now, create d assign it to the views ed please !

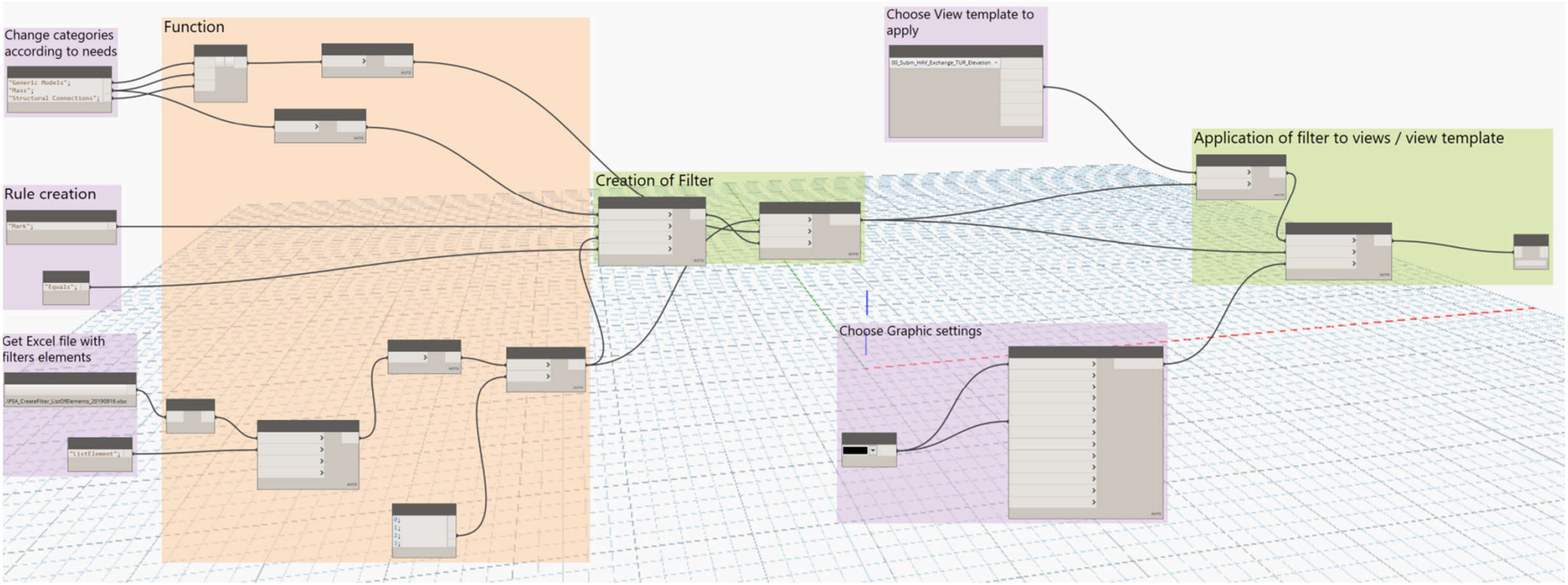


If we decompose the sentence :

« Now, create all this filters[1] manually and assign[2] it to the views and template that you need please ! »

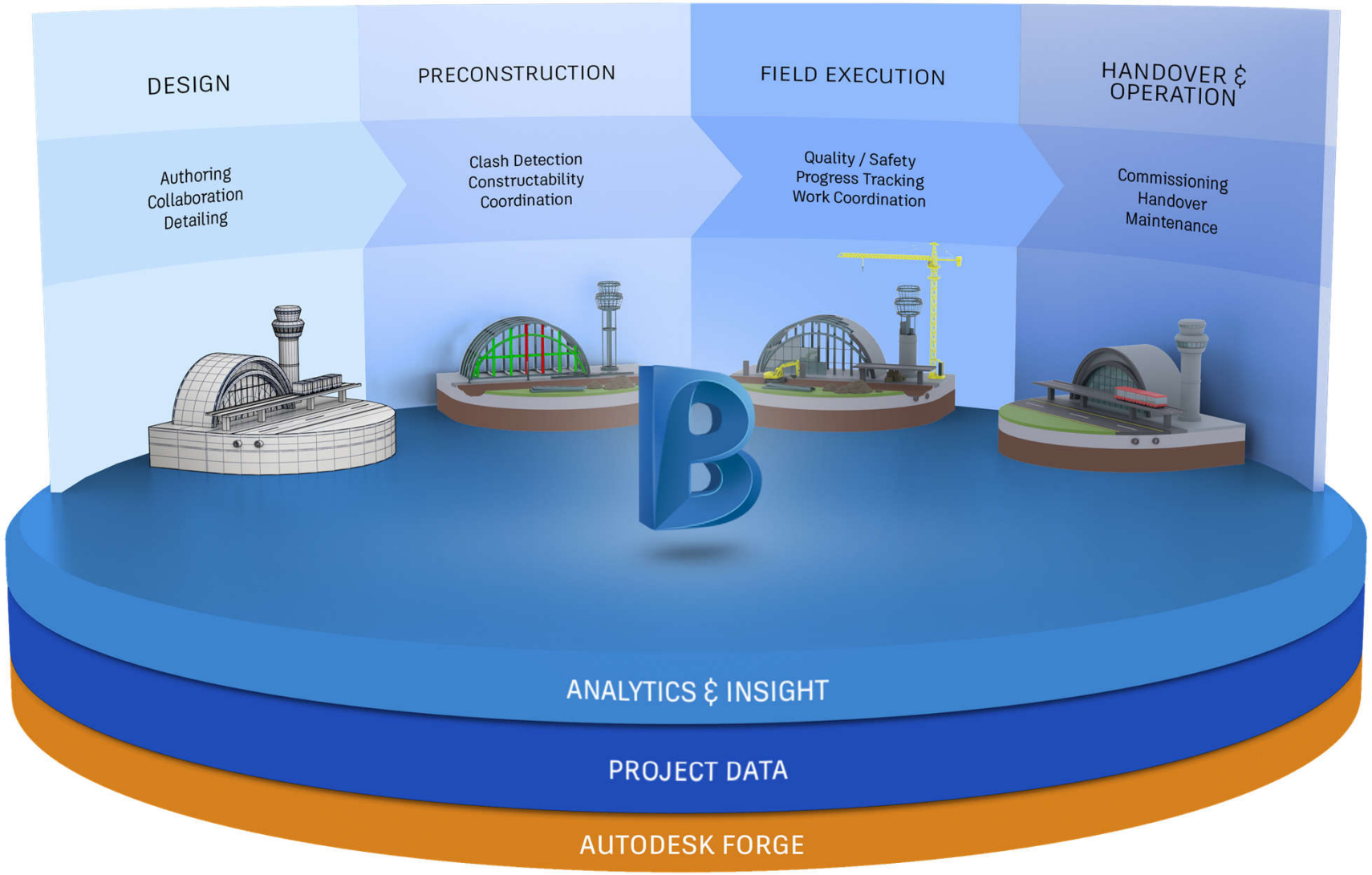


Make a little Ecosia research and…

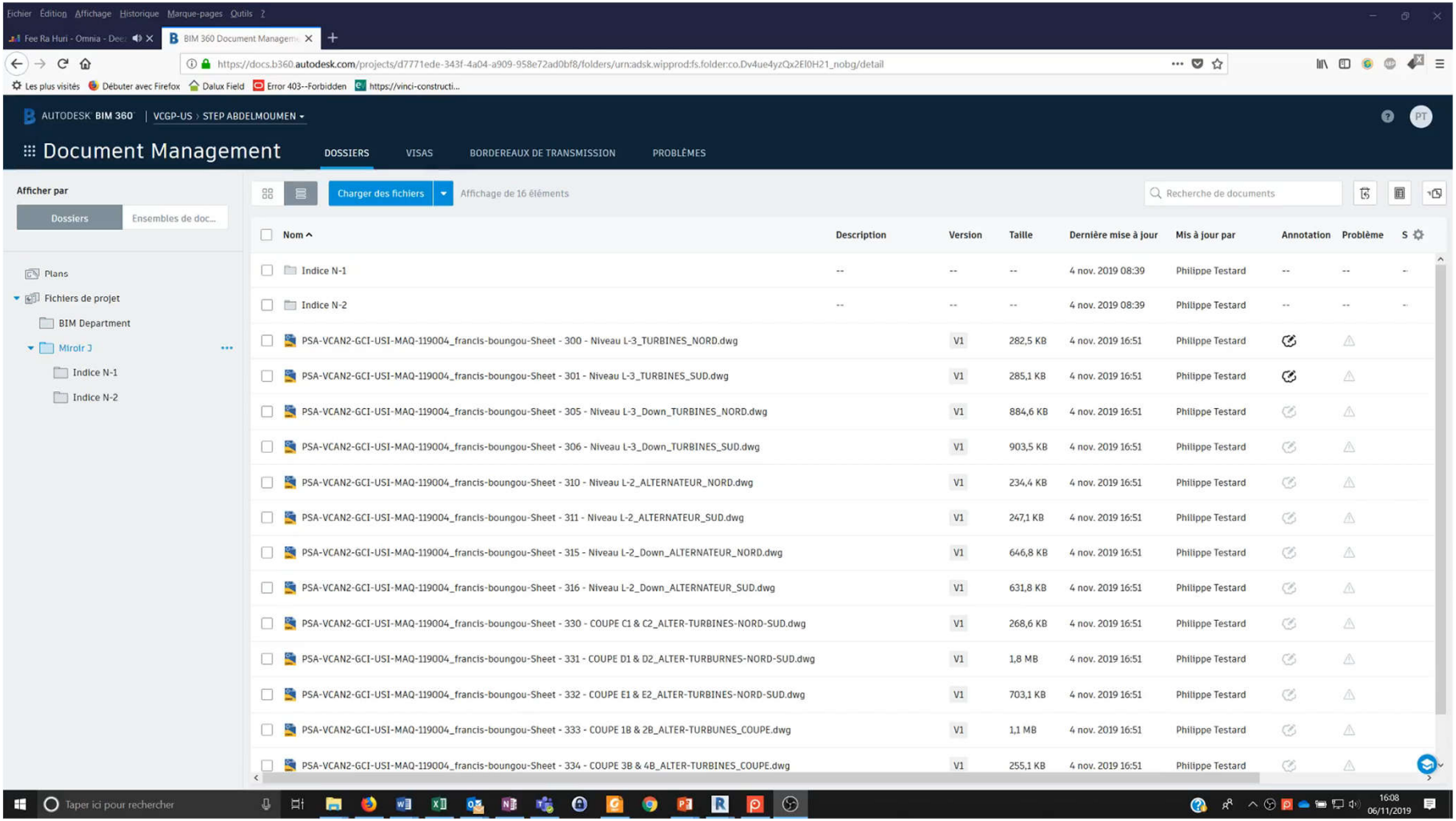


BIM 360 PDF Workflows

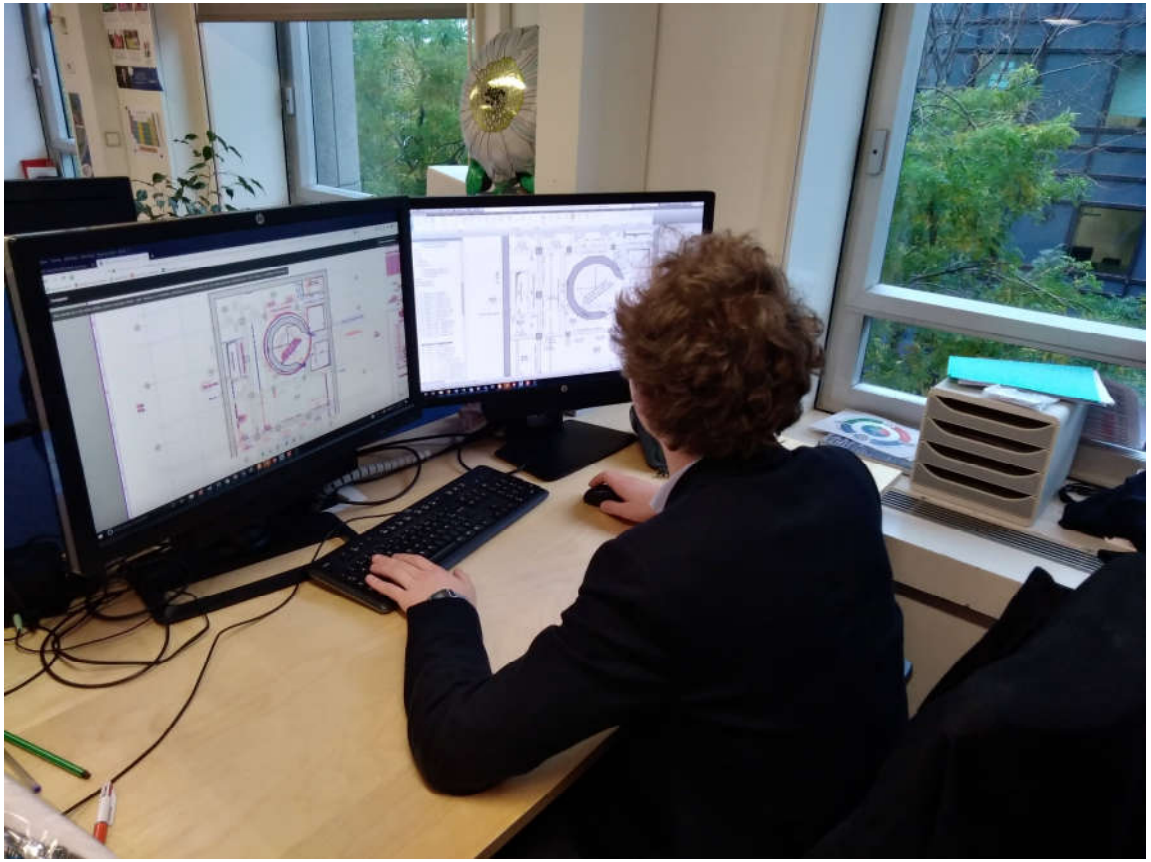
What is BIM 360 ?



How to use BIM 360 2D Comparison Tool

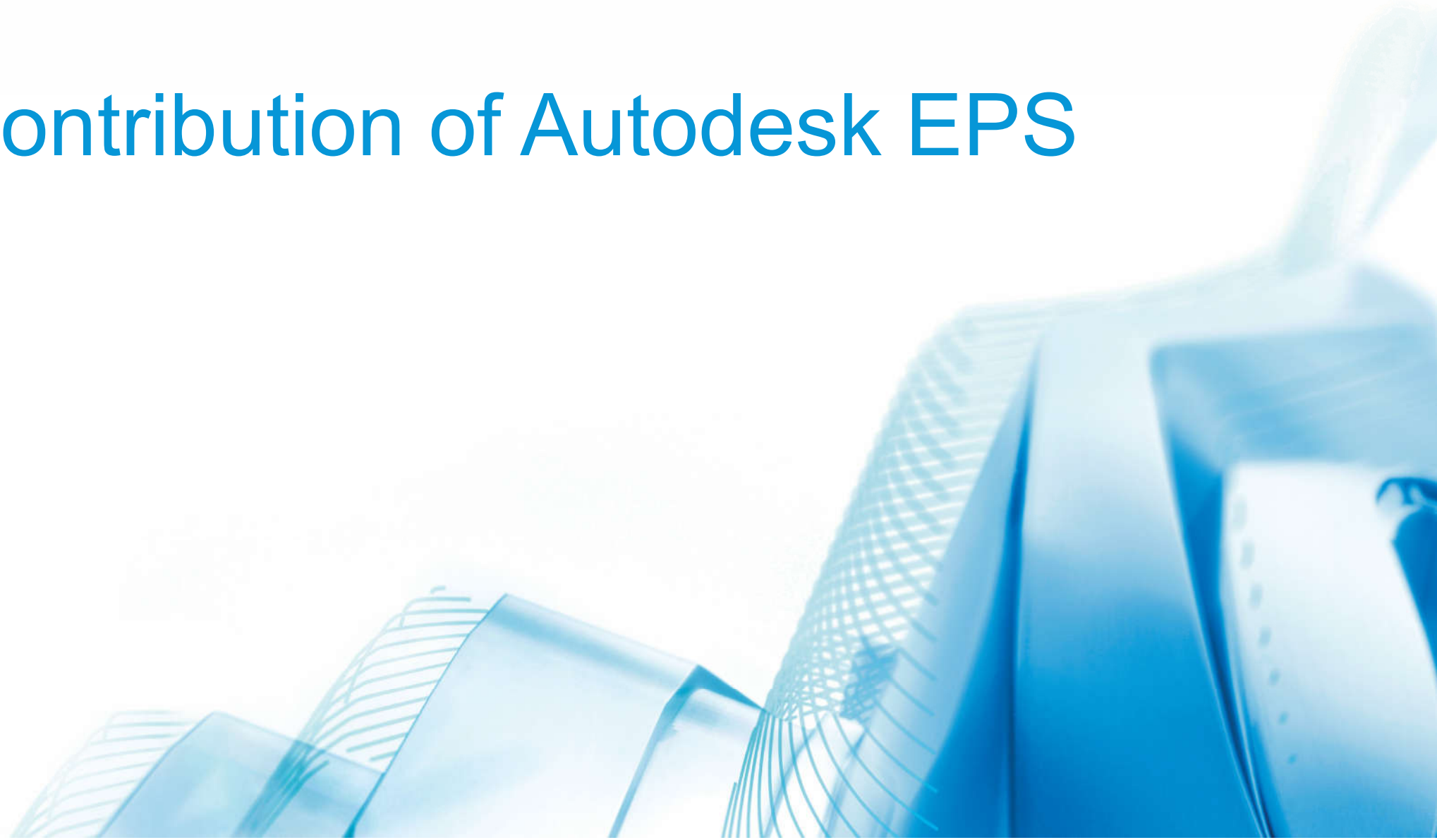


BIM 360 Comparison tool feedback



- Easy detection of elements that disappeared / changed
- User friendly
- Sometimes unstable => Autodesk support

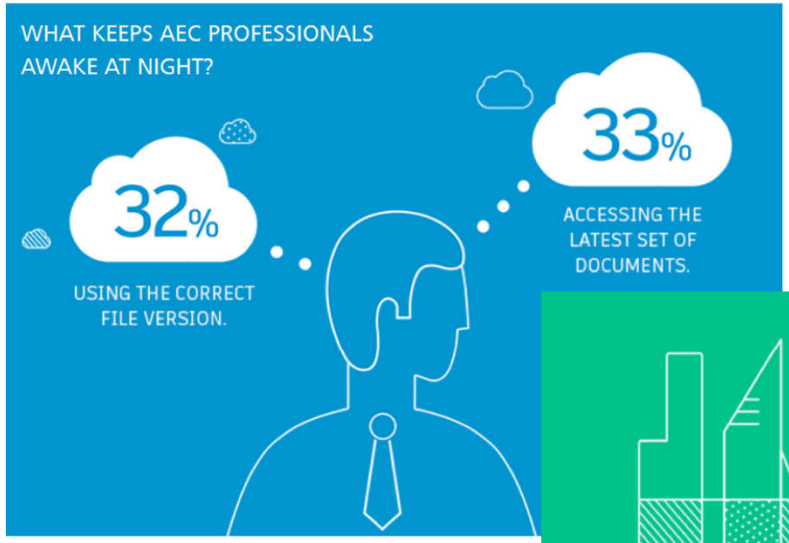
Contribution of Autodesk EPS

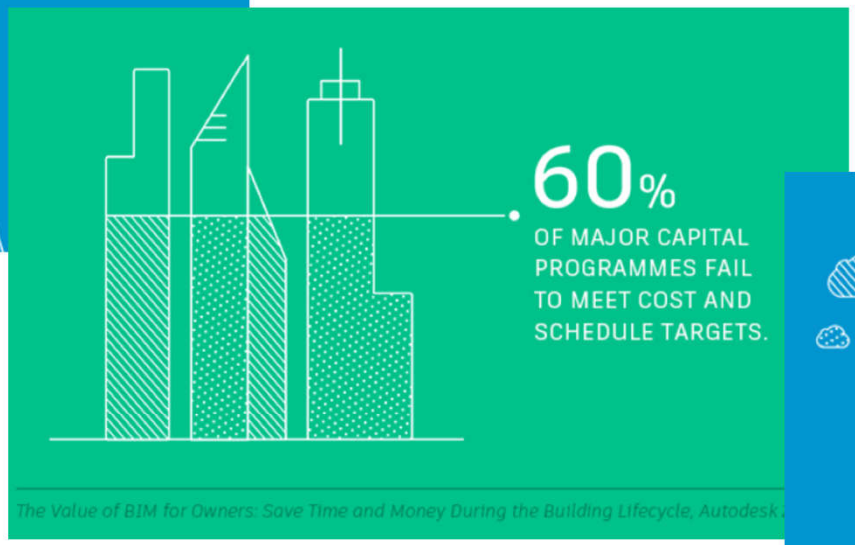


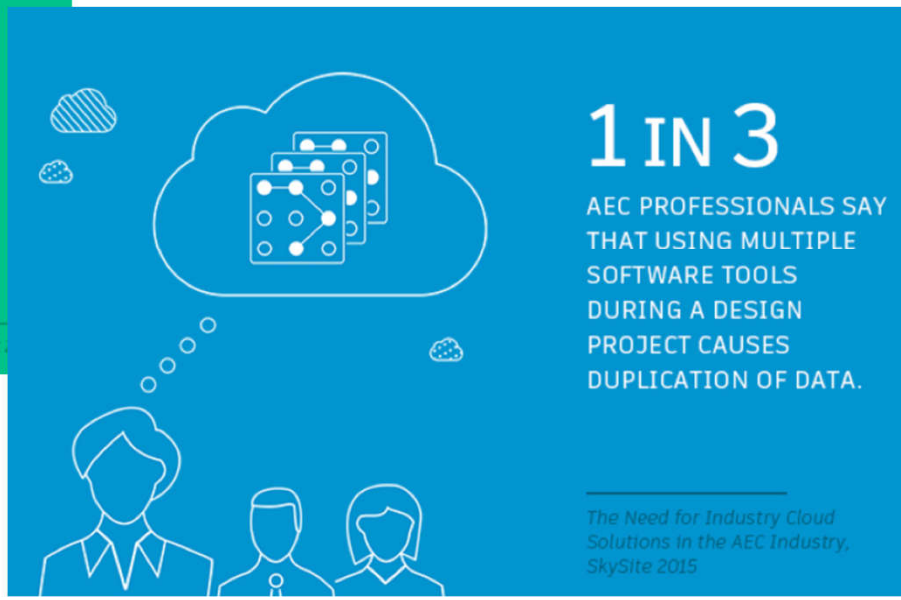
52cases

24	8	10	6
DIRECT SOLUTION	ENHANCEMENT REQUESTS	CONFIRMED BY DEVELOPMENT TEAM	FIX PLANNED
24 Direct Solutions (or workarounds)	8 Enhancement Requests (or linked to existing Ideas)	10 Escalations (or linked to existing escalation)	6 Fix planned (1 fixed - 2019)

The top 3 ways to boost your BIM ROI







[Link]

- Presenters and Companies
- The Project
- BIM Implementation
- Interoperability

Wrap-Up

#good

- Better Design
- Improved Communication
- Issue Tracking!
- Ecological: Less Physical Meetings!
- Less Travel Time -> More Time to Work!
- Platform Access for Everyone to Check Issues
- Automation of painful and time consuming tasks

#couldbebetter

- Hard to Train People from Abroad
- Software Limitations
- (Global) Understanding of BIM
- BIM≠BIM in Some Cases
- Easier Transfer of Information

#perspectives

- Dynamo knowledge and implementation
- Improve simplification of Equipment
- Training, Education and Certification
- Data Exchange between Software Packages
- Processes for O&M
- Standards ?
- …


We
are
BIM
!

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