

# Building Information Modeling Technology for HV Substations

**linxon**

A HITACHI ABB POWER GRIDS &  
SNC-LAVALIN COMPANY



# What is BIM?

Building Information Modeling (BIM) is a new and innovative approach to designing and building substations that considers all dimensions such as width, height, depth, and even time and cost into a single view.

The BIM process allows the substation designer to share detailed plans and information regarding all aspects of the substation internally or externally with the customer, suppliers, and sub-contractors. With the information compiled into an easy to interpret 3D model, users can easily see any upfront challenges or identify potentially needed changes to ensure the project meets its technical and commercial requirements.

At Linxon, we have been developing our in-house BIM capabilities, delivering on customer values and expectations. Our capabilities include:

- 3D realistic visualization & established libraries of equipment data
- Easily generate 2D floor plans, elevations, sections, schedules automatically
- 5D estimating (Bill of Material Reports ) and value engineering
- 4D - 5D planned progress with cost and side by side comparison with actual progress and costs
- Controlled publishing, viewing, and sharing of information
- Multi-discipline collaboration real-time
- Future ability for asset management program to interface with the client
- LiDAR scan to integrate into the process to help existing data convert into BIM 3D

## Benefits of using BIM

### For Substation Design & Execution



#### Improve Project Collaboration

Leveraging cloud-based tools, BIM models allow all key stakeholders, suppliers and contractors access the project information instantly, staying up to date on any design changes.



#### More Accurate Cost Estimates

BIM allows for more effective cost estimations as you are able to more accurately quantify the quantities of materials needed in the early planning stages.



#### Reduce and Mitigate Risks

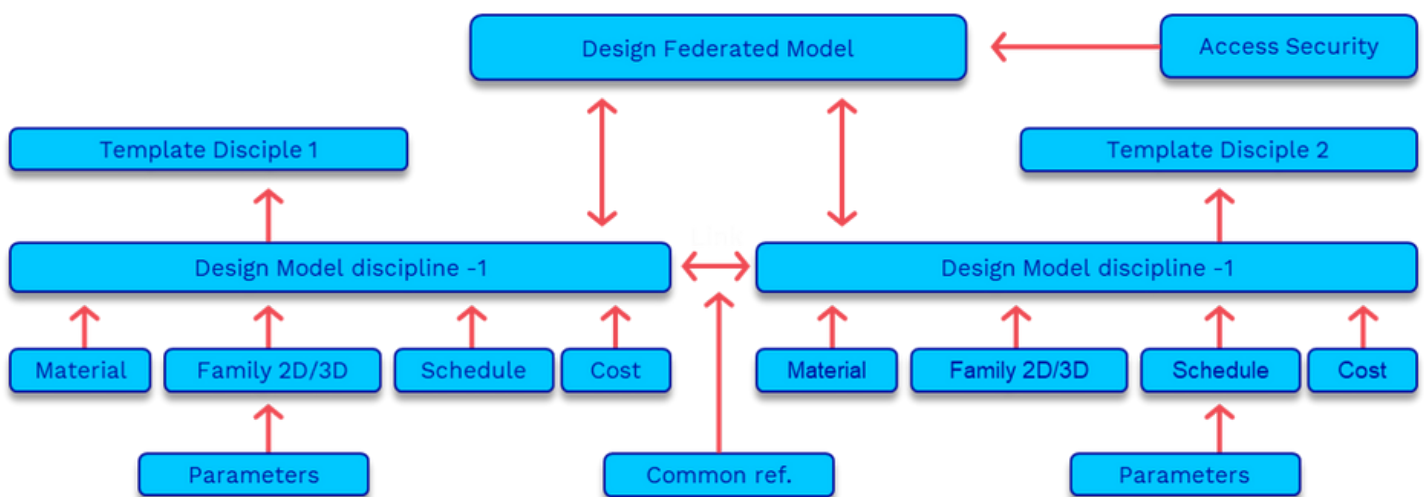
Through instant coordination and information sharing, contractors and suppliers everyone involved has precise and actionable information that improves the planning and execution.



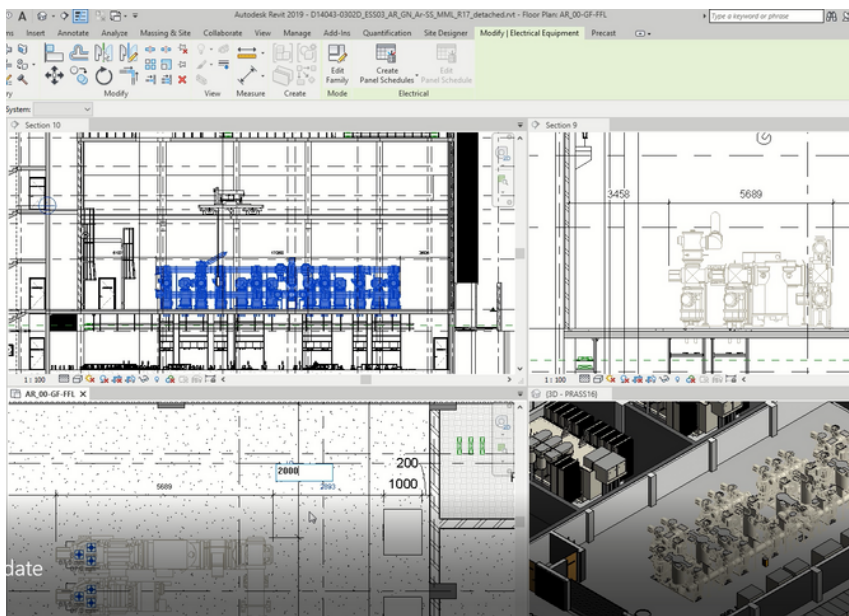
# Instant and Accurate Project Information

## Create a Shared Data Environment to Benefit all Stakeholders

By using a federated model approach we are able to take several different models from each discipline combining them into one model to create a single source of information with built in controls tracking any and all changes. Each discipline specific model will contain all the 3D non-graphic information necessary for the correct representation of the project.



## Automatically Generate Bill of Materials and 2D Drawings



Accurate and up-to-date information is key in any project. BIM allows instant BOM reports to extract the most recent BOM, allowing the project team to see any changes, why it was changed, and who approved the changes.

BIM also enables a quick generation of 2D drawings from any perspective, making it easy to submit information for permitting applications, management approvals, and to share with suppliers or contractors.

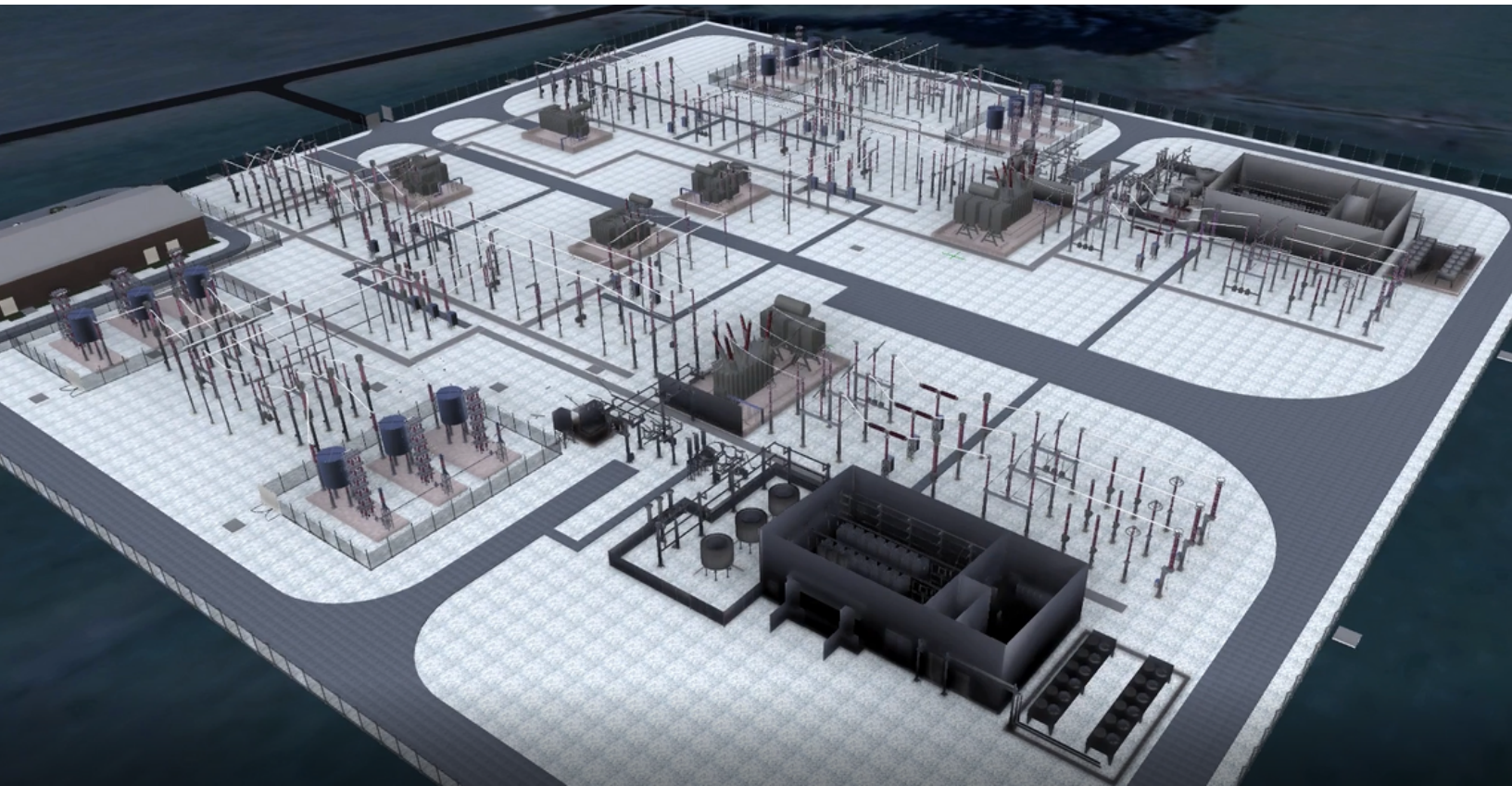


# 4D BIM Planning and Scheduling

## Linking 3D Models with Time and Schedule Related Information

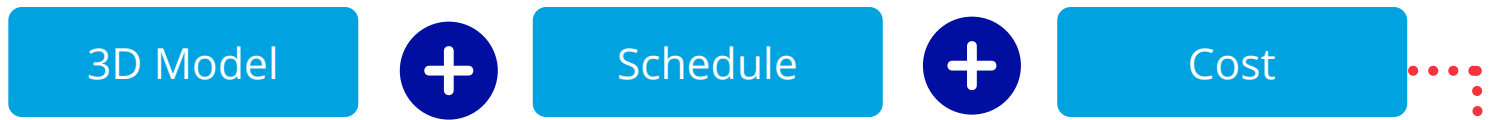
Creating a single source of project-related information such as materials and cost information is only the first step in helping our customers meet their targets and goals. As many common issues are related to scheduling and planning, Linxon is also able to incorporate elements of time to visualize the project from start to finish. This enables us to coordinate with multiple disciplines, ensure accurate planning, identify for any potential challenges before they arise, reduce project risks, and ensure that safety is not compromised along the way. Additional benefits include:

- Improve design quality by testing against construction sequencing
- Improve project planning and coordination
- Identify issues in scheduling and lead times
- Identify safety risk early on in the projects
- Ability to monitor actual progress vs planned progress

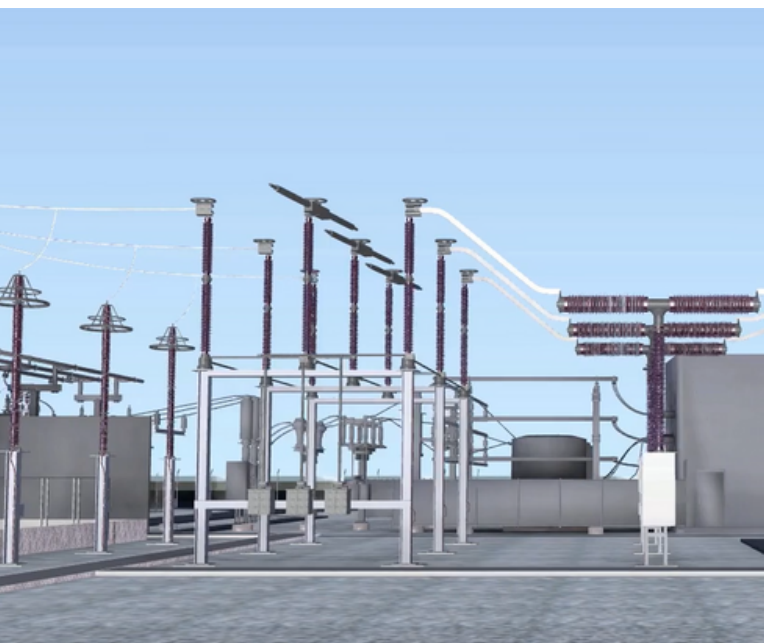
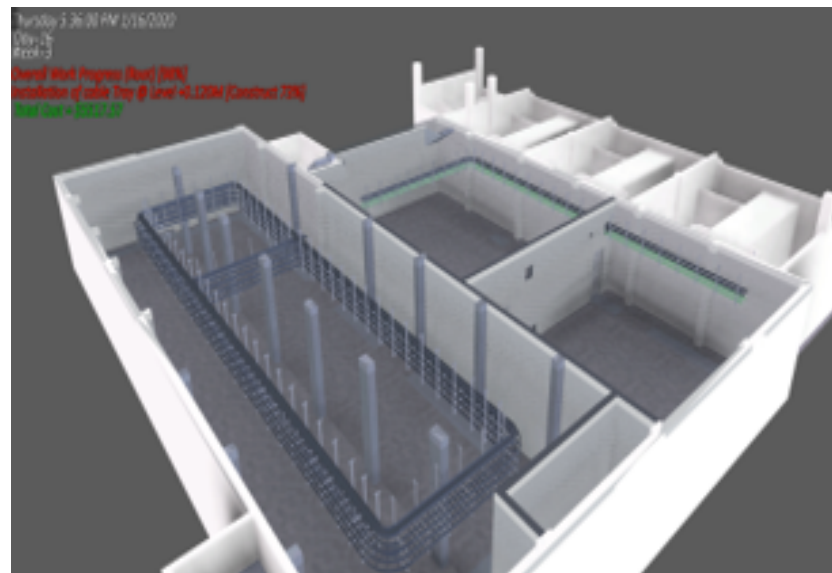
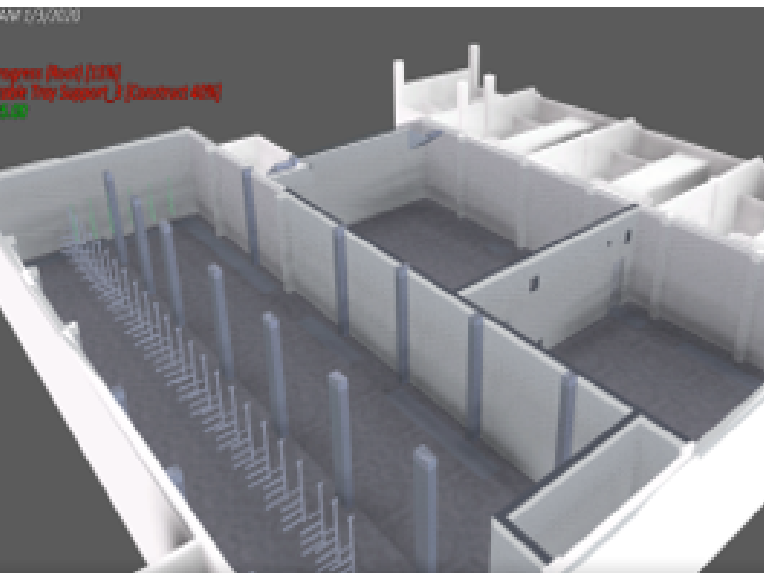


# 4D Scheduling that Includes Real Time Costs

Including time-related information into our BIM models allows us to create a more detailed schedule that reduces errors and improves overall project coordination. These 4D BIM models are then further enhanced by including cost estimates throughout the project's lifetime. Leveraging 5D BIM technology allows for more accurate assessments of costs and the impacts of any changes to the overall design, layout, or schedule. During the construction phase, 5D BIM enables project planners to predict expenditures and analyze discrepancies between forecasted costs versus actuals.



Intelligent linking of a 3D digital model with time and cost to create a 5D simulation for robust constructability reviews



Parameter	Value	Formula	Locked
<b>Electrical</b>			
Voltage			
Wattage			
<b>Dimensions</b>			
Creepage Dist.	14325.0		<input type="checkbox"/>
<b>General</b>			
Enclosure (default)			
Mounting (default)			
Panel Name (default)			
Mass of Oil	270.0		
Total Mass	1900.0		<input type="checkbox"/>
<b>Electrical - Circuiting</b>			
Neutral Rating			
Neutral Bus			<input checked="" type="checkbox"/>
Ground Bus			<input checked="" type="checkbox"/>
Buswing			<input checked="" type="checkbox"/>
Subfeed Lugs			<input checked="" type="checkbox"/>
MCB Rating			
Mains Type			
Feed (default)			
Circuit Naming (default)			

# Clash Detection and Resolution

Early in the design phase the ability to have a virtual visual check-in will help resolve potential constructability and identify any soft or hard clashes along with resolutions by the appropriate party. As each of the disciplines involved create models independent from each other, BIM offers a comprehensive overview of the entire system once all the models are integrated into a single source. Clash detection identifies where each of these independent models will clash with each other before it happens on the construction site.

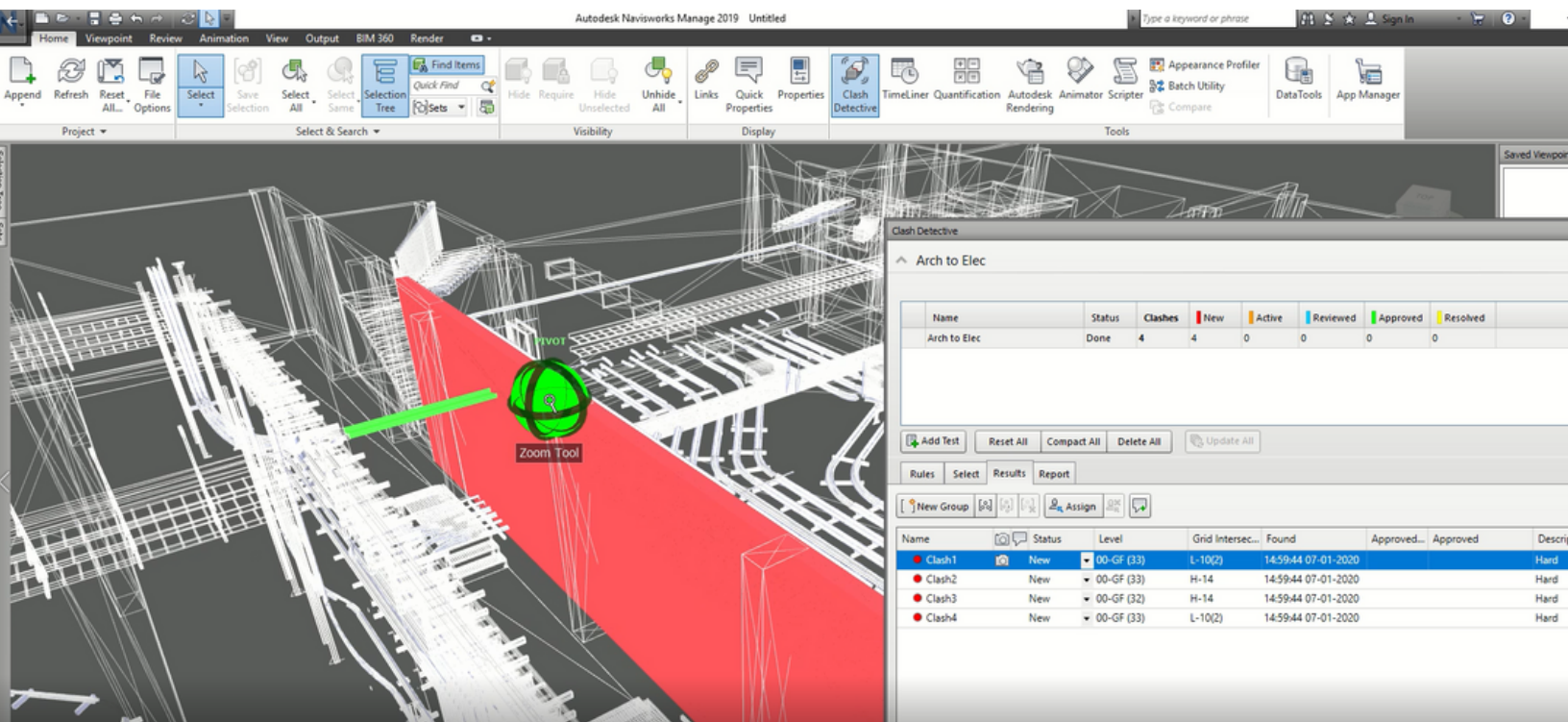
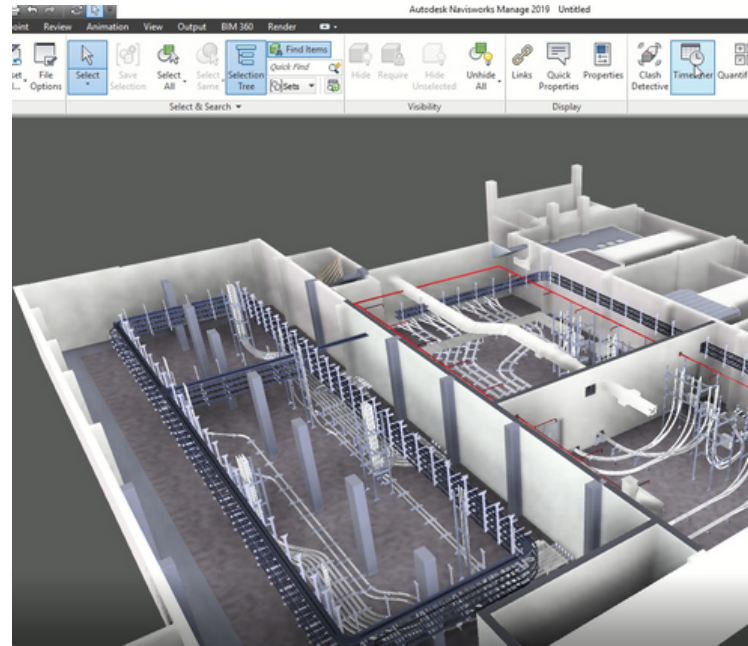
By utilizing advanced software such as Autodesk's Navisworks, we are able to detect the three primary types of clashes that can occur including:

**Hard Clash.** This occurs when two components intersect or pass through each other.

**Soft Clash.** This occurs when one element is not given the spatial or geometric tolerance and a buffer zone is breached.

**Workflow Clash.** This occurs when there are timeline conflicts or a mismatch in scheduling of suppliers and contractors.

Linxon is able to quickly identify and resolve these clashes and collisions to improve project deliverables, reduce change orders, and maintain schedule requirements.





## ABOUT LINXON

Linxon is a joint venture company set up by SNC-Lavalin and Hitachi ABB Power Grids to deliver turnkey electrical AC substation projects. Linxon undertakes turnkey electrical alternating current substation projects related to renewable and conventional power generation, power transmission and transportation solutions. Turnkey solutions includes project design, engineering, procurement, construction, management, commissioning and after-sales support.



## PARENT PARTNERS

Founded in 1911, SNC-Lavalin is a fully integrated global professional services and project Management Company and a major player in the ownership of infrastructure. From offices around the world, SNC-Lavalin provides comprehensive end-to-end project solutions to expertly manage project risk and ensure customer return on investment in oil and gas, mining and metallurgy, infrastructure, clean power, nuclear and EDPM (engineering design and project management), improving lives around the world.

Hitachi ABB Power Grids is a pioneering global technology leader in electrification products, robotics and motion, industrial automation and power grids, serving customers in utilities, industry and transport and infrastructure. Their innovation spans more than 130 years, and today includes industrial digitalization solutions to bring electricity from any power plant to any plug, and to automate industries from natural resources to finished products.

## OUR EXPERTISE

Linxon represents the first time an original equipment manufacturer (OEM) has teamed up with an engineering, procurement, design/delivery constructions (EPC) business to create added value for customers by leveraging the key strengths from both companies. Linxon provides Hitachi ABB Power Grids leading knowledge of applications, system integration expertise, and world-class products, systems and services, and SNC-Lavalin's top-tier expertise in managing engineering, procurement, design/delivery projects in a variety of industrial and utility applications.

SNC-Lavalin's scalable, world-class expertise and specialized services can be contracted flexibly, from niche mandates to megaprojects. From sustainable, light rail transit to state-of-the-art clean hydropower dams, it provides effective execution strategies to expertly manage project risk and protect return on investment for customers.

ABB engineers have built and serviced complete turnkey electrical substations all over the world for more than 100 years, delivering more substation projects than any other supplier in the world, operating at all voltage levels and in all climates and locations. This turnkey substation expertise has now moved into Linxon.

Linxon is a new company with a long experience. With around 1000 references, over 100 years of technology expertise – and 60 years of substation and electrification project experience worldwide.

