



PAC Review - Fermilab

CFS SITING STUDIES

CONVENTIONAL FACILITIES AND SITING

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Overview

- *Progress Toward the TDR*
- *Regional Status of Site Studies*
- *Implications of Regional Site Conditions*
- *Summary*



RDR Civil Design

- ***“Sample Sites” were Identified in Each Region***
- ***Generic Civil Design for All Three Regions***
- ***Twin Tunnel Main Linac Enclosure***
- ***Tunnel Construction Assumed the Use of Tunnel Boring Machines (TBM’s) in All Regions***
- ***Local Conditions were Considered but Without Site Specific Geologic Investigation***

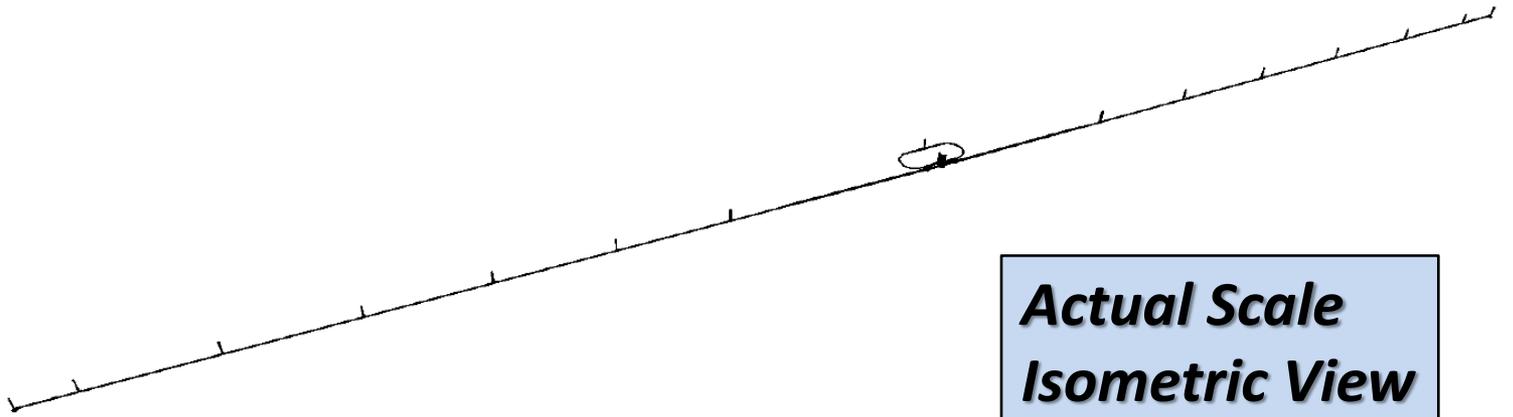
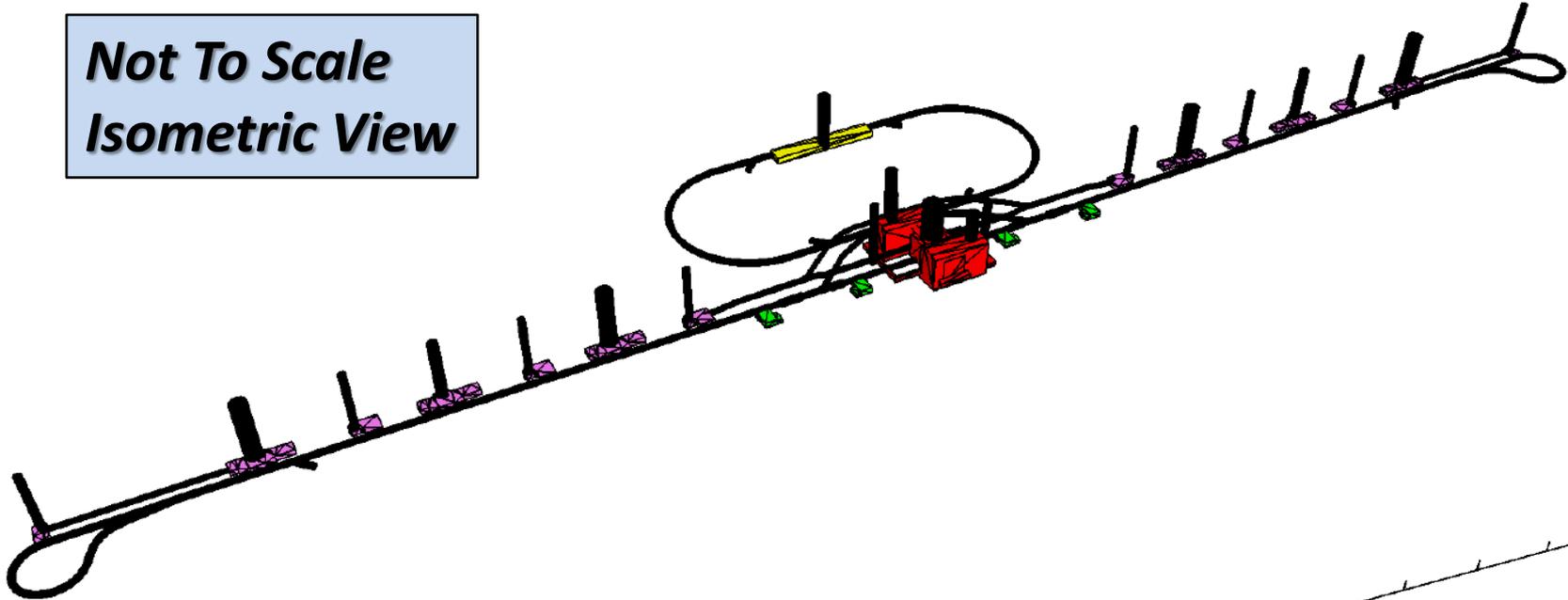


TDR Civil Design

- ***“Sample Sites” Still Used in Americas and European Regions***
- ***Two “Candidate Sites” Identified in Asian Region***
- ***SB 2009 Eliminated the Main Linac Service Tunnel and Optimized Central Region***
- ***Designs in All Regions Adapted to Available Geologic Information***
- ***Americas and European Sites have Relatively Uniform Surface Elevation***
 - ***Klystron Cluster Scheme (KCS) Used for HLRF***
 - ***Klystrons and Cryogenic Equipment Housed in Surface Buildings***
 - ***Vertical Shaft Access to Underground Enclosures***
- ***Asian Sites are Located in Mountainous Areas***
 - ***Distributed Klystron Scheme (DKS) Used for HLRF***
 - ***Klystrons are Located in the Main Linac Tunnel***
 - ***Cryogenic Equipment Located in Caverns Adjacent to Main Linac Tunnel***
 - ***Horizontal (Downwardly Inclined) Access Tunnels are Used for Access to Underground Enclosures***
 - ***Surface Buildings are Minimized to Reduce Environmental Impact***
 - ***Two Separate Site Tours (Oct 2011, Jan 2012) have been Provided to GDE Members for Both Candidate Sites***

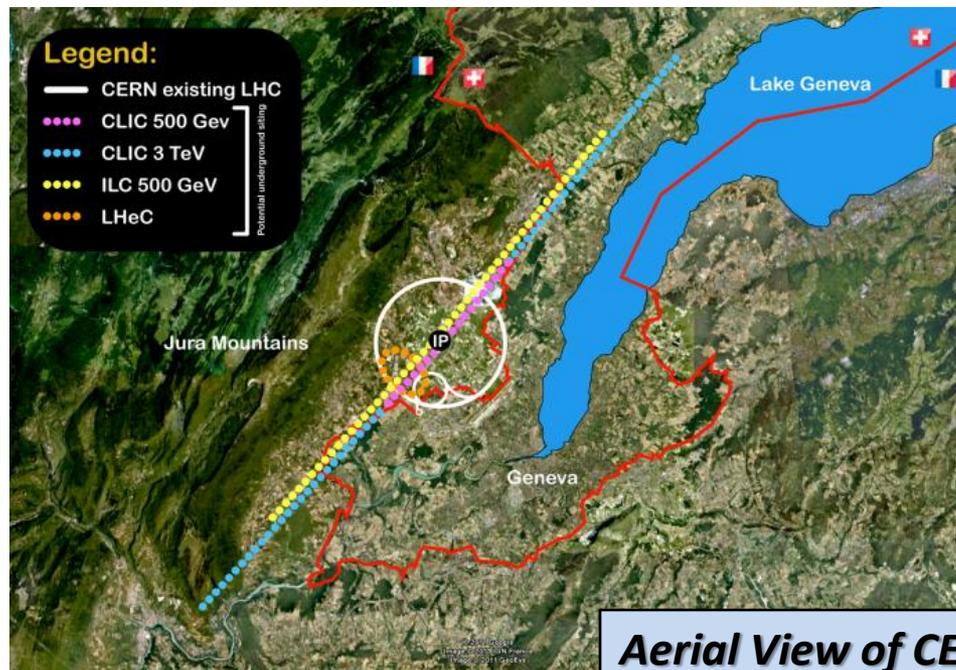


**Not To Scale
Isometric View**



**Actual Scale
Isometric View**

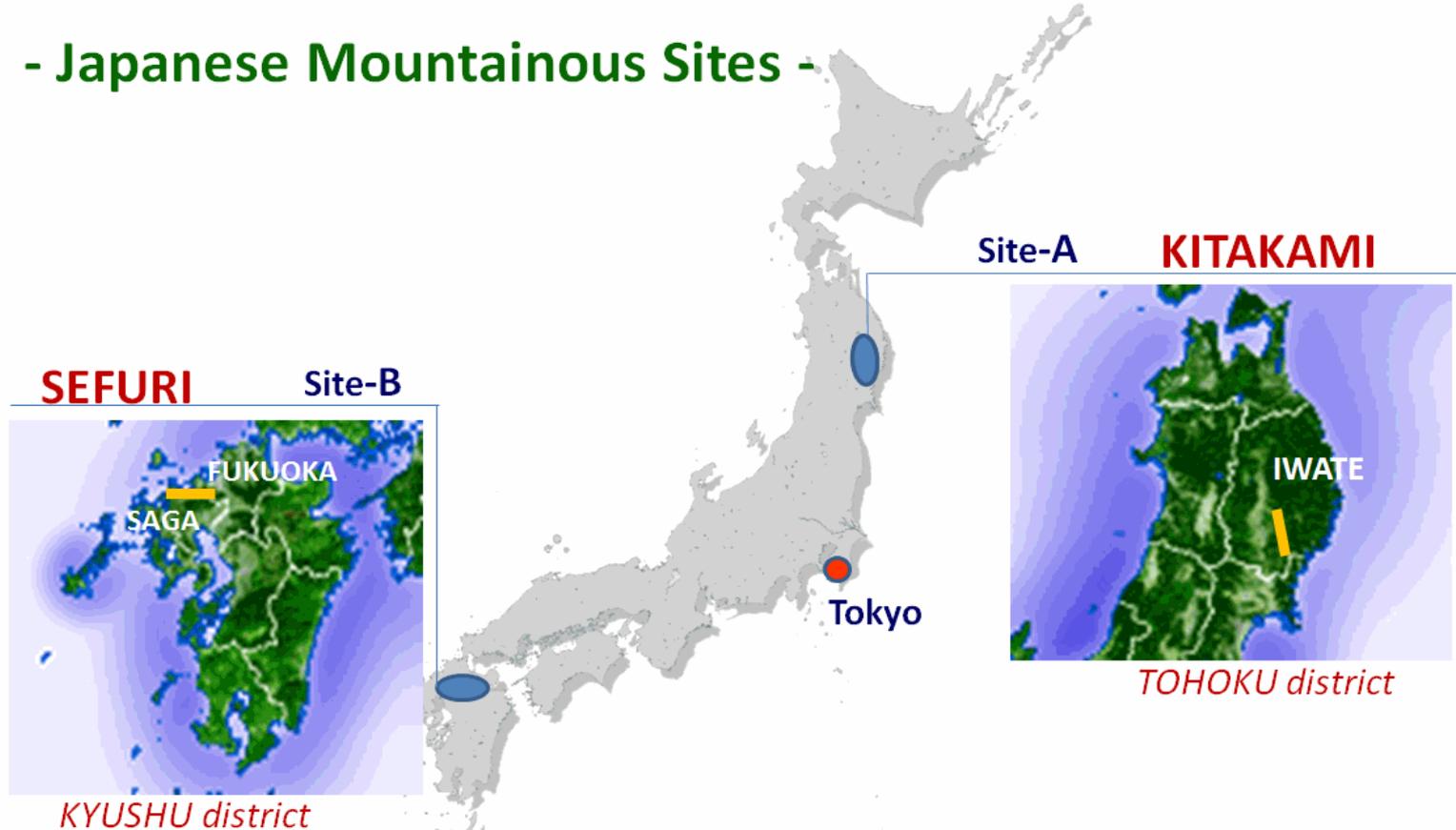
**Aerial View of
Fermilab
ILC Americas
Sample Site**



**Aerial View of CERN
CLIC/ILC European
Sample Site**

Two Candidate Site in Asian Region

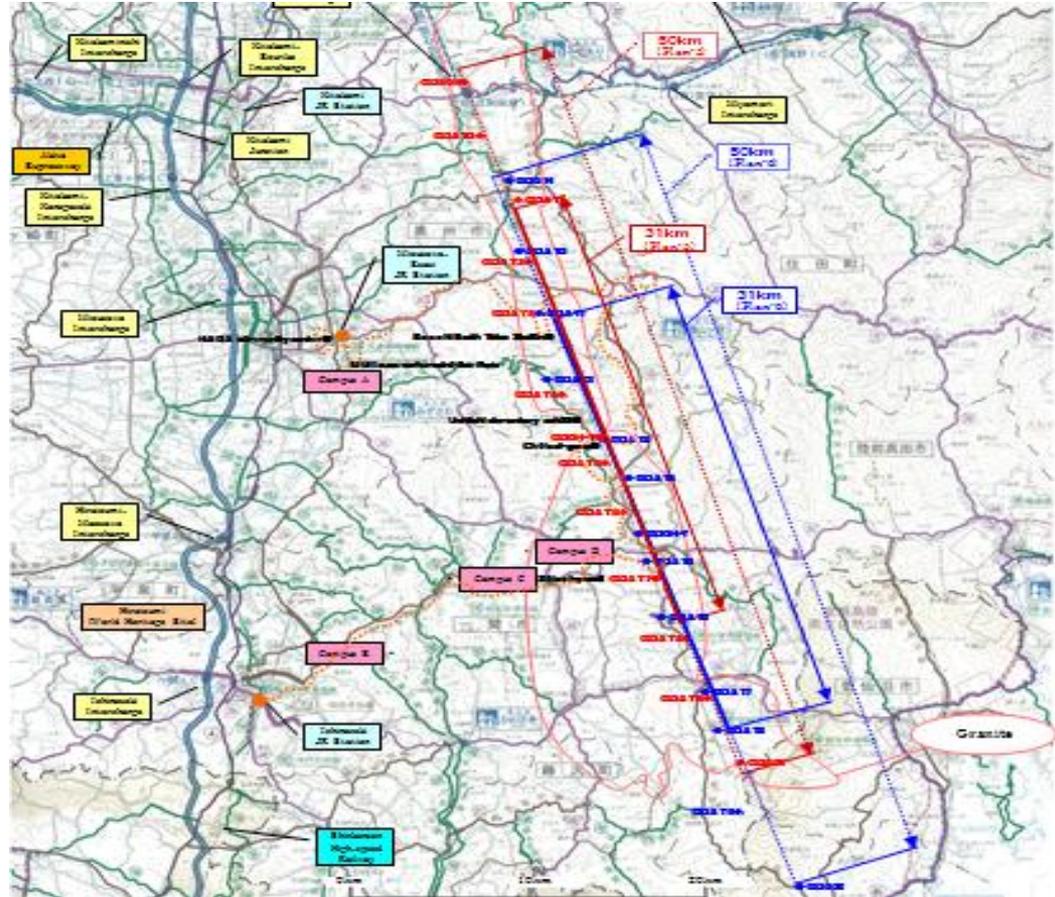
- Japanese Mountainous Sites -



The Current Candidate Site in 2011

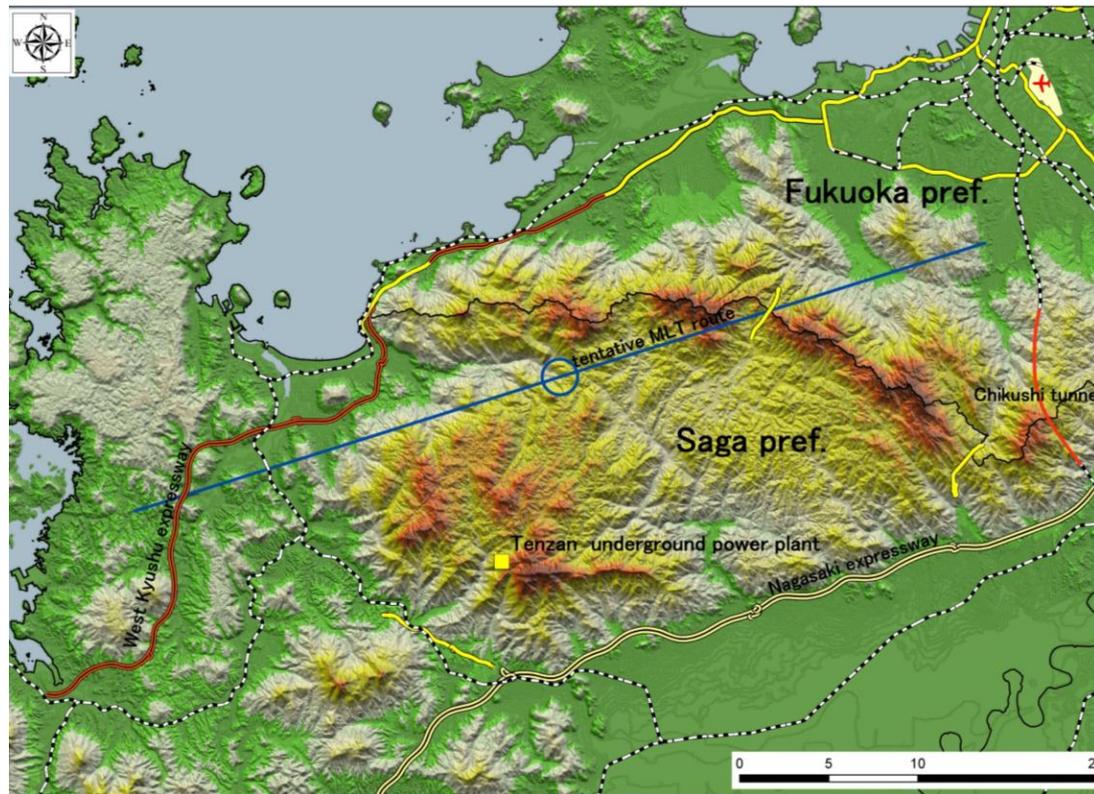


KITAKAMI Site in TOHOKU District





SEFURI Site in Kyushu District





Regional Status of Site Studies

• **Americas Region**

- **No Specific Site Studies have been Completed for the ILC Project**
- **Fermilab and SSC Soil Borings Provided Information**
- **Deep Tunnel TARP (Tunnel and Reservoir Plan) Water Treatment Projects Using TBM Excavation in Chicago and Milwaukee Provided Recent Tunneling Data in the Galena Dolomite Strata**

• **Asian Region**

- **Japan's Topology has Produced a Large Quantity of Tunneling Data**
- **New Austrian Tunneling Method (NATM – Drill and Blast) is the Preferred Tunneling Method in Japan**
- **NATM is Economically Competitive with TBM Excavation in Other Regions**
- **200,000 KY (~2.5 M\$) Over Two Years from Japan's Earthquake Recovery Funding will be Devoted to Geologic and Survey Investigation at the Two Candidate Sites**

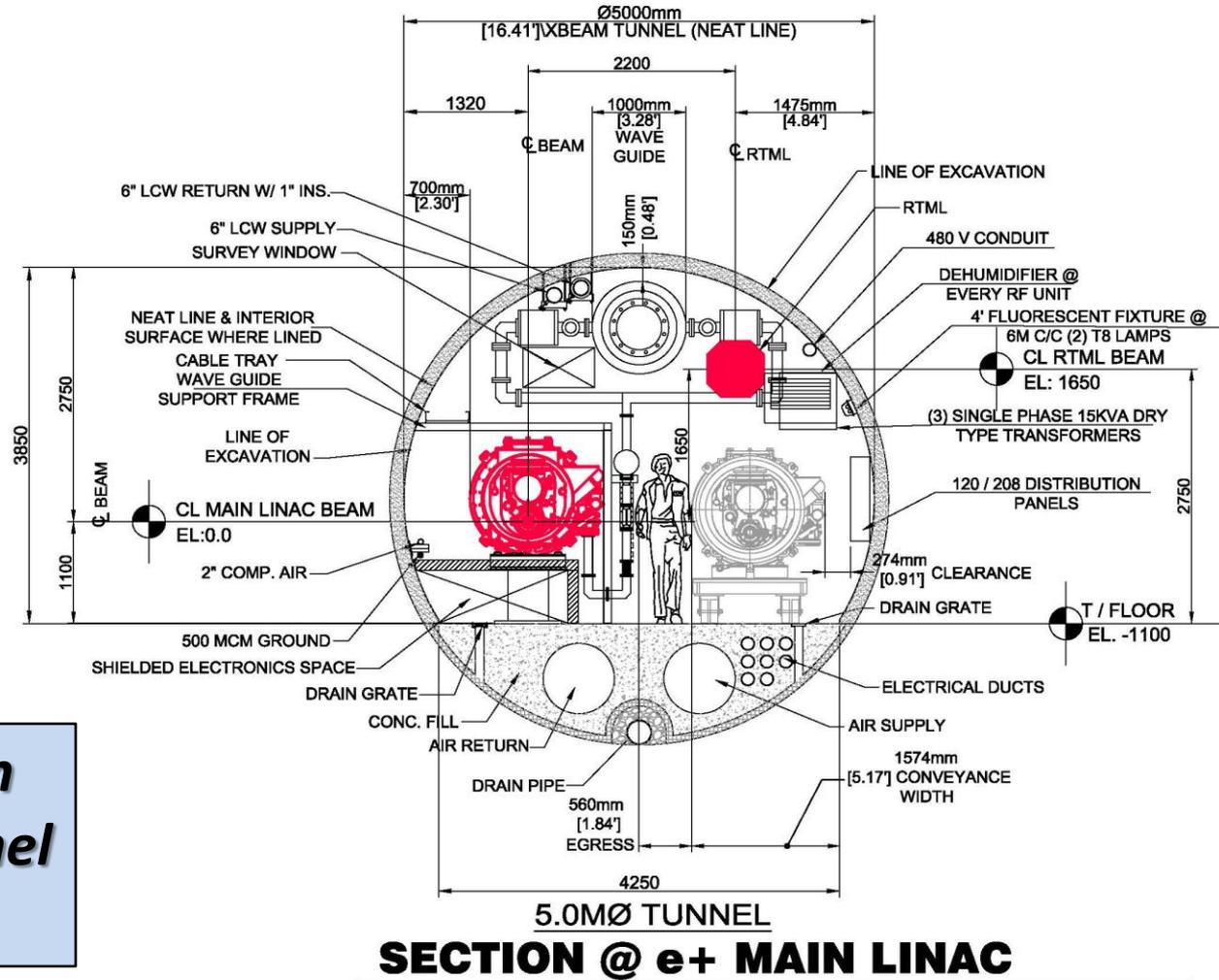
• **European Region**

- **No Specific Site Studies have been Completed for the ILC Project**
- **CERN/LHC Soil Borings have Provided Information**
- **Environmental Research has been Completed for the CLIC Project**



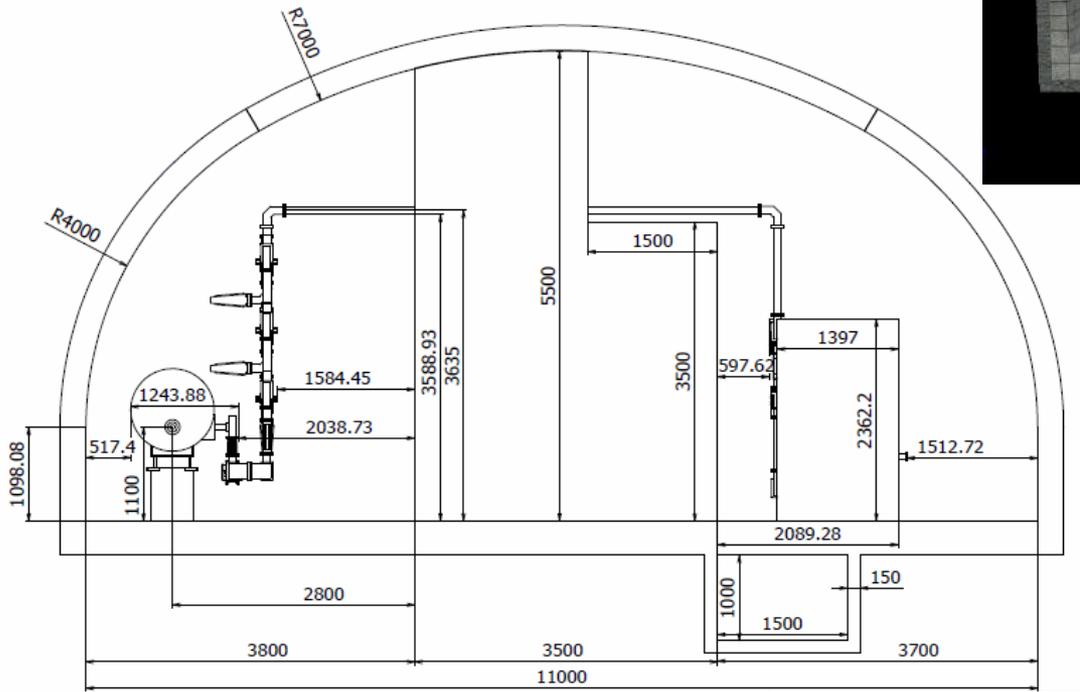
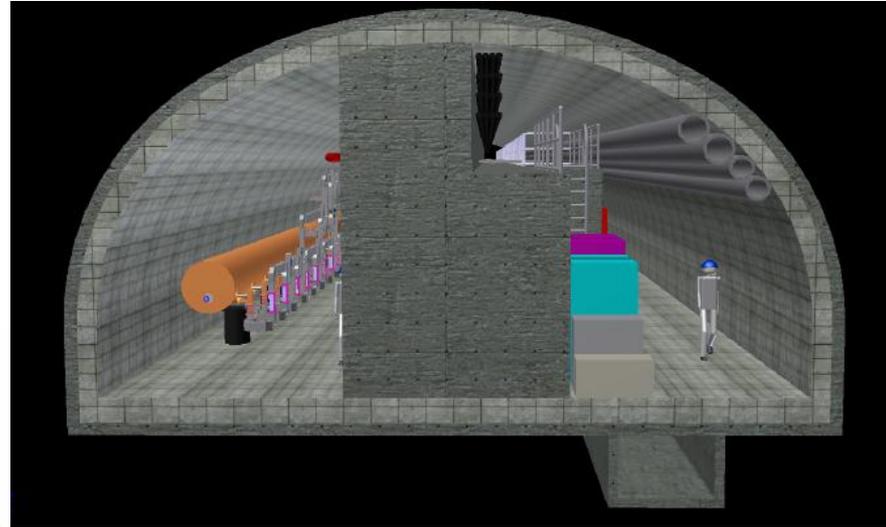
Implications of Regional Site Conditions

- **Machine Lattice is Fundamentally Consistent In All Regions**
- **Americas and European Regions**
 - **Consistent Overall Design Approach**
 - **Single Main Linac Tunnel, Independent Vertical Shaft Access to Damping Ring and Both Detectors, Main Tunnel and Service Tunnel at BDS**
 - **TBM Technology for Main Tunnel Construction**
 - **Similar Z-Shaped Interaction Region Configuration**
 - **Klystrons, Cryogenic, Mechanical and Electrical Equipment Located in Surface Buildings**
- **Asian Region**
 - **Single Two-Compartment Main Linac Tunnel, Horizontal Access, Main Tunnel and Service Tunnel At BDS**
 - **NATM Technology for All Underground Enclosure Construction**
 - **Linear Interaction Region Configuration**
 - **Single Access Tunnel to Damping Ring and Both Detectors – MDI Group**
 - **Additional Underground Enclosures for Cryogenic, Mechanical and Electrical Equipment**
 - **Minimal Surface Building Presence at Typical Access (Exception is the Detector Assembly Hall)**



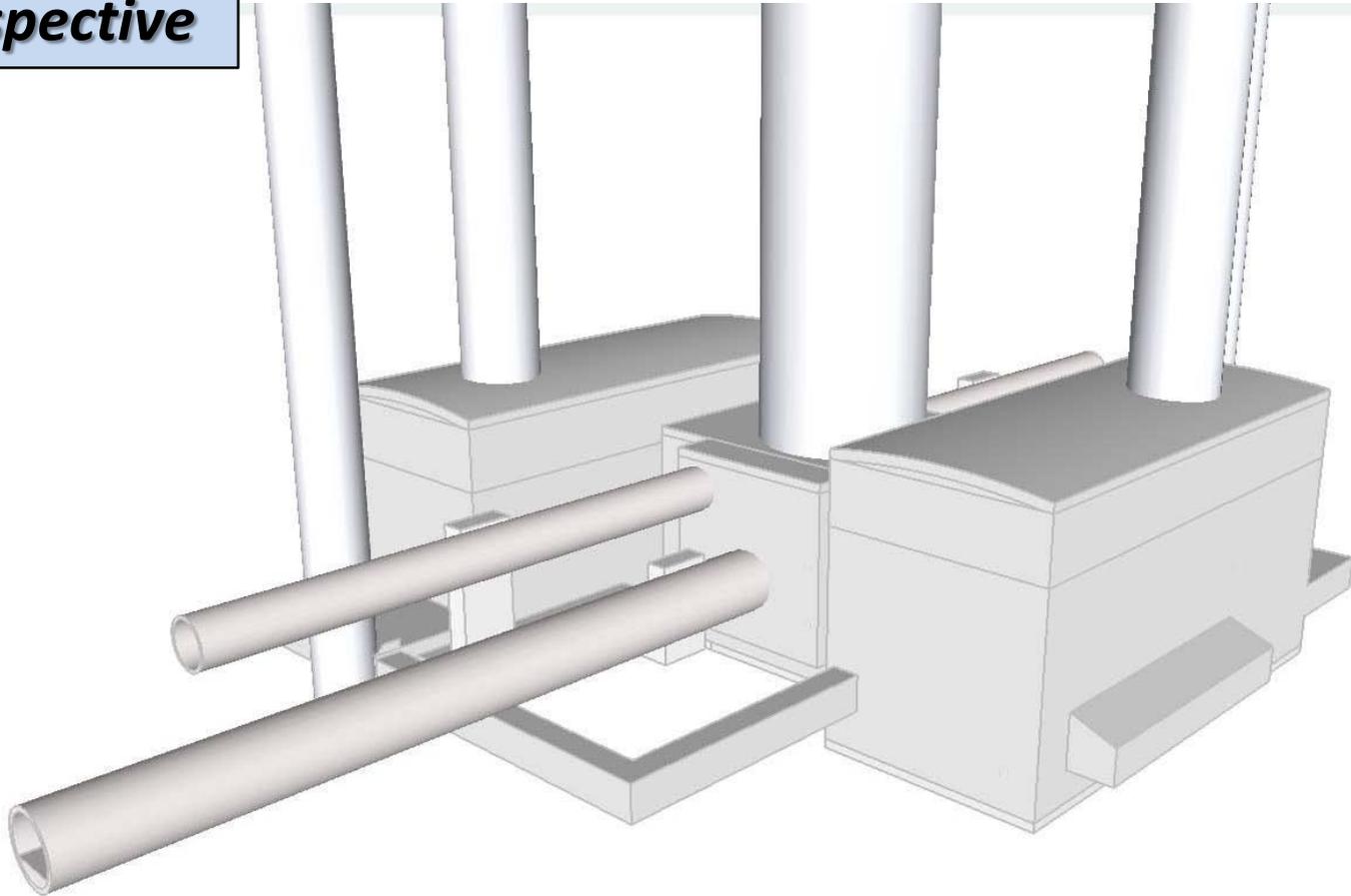
**Americas Region
Main Linac Tunnel
Cross Section**

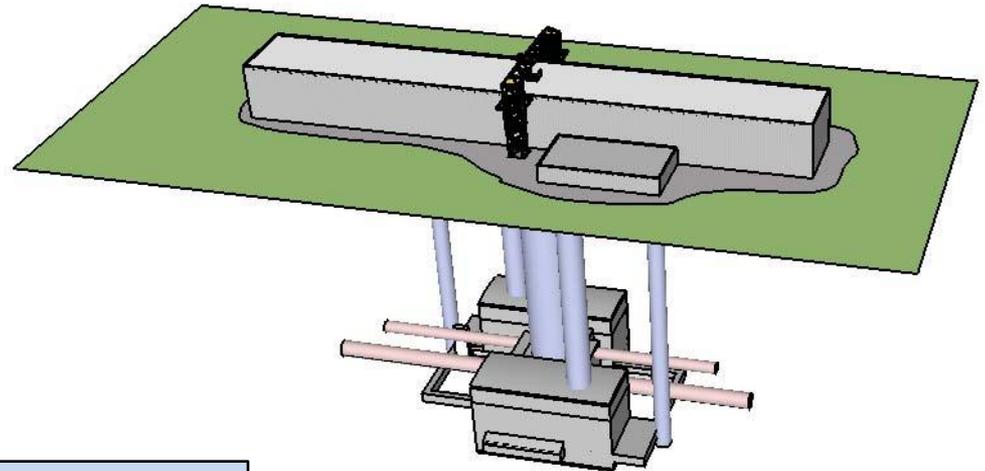
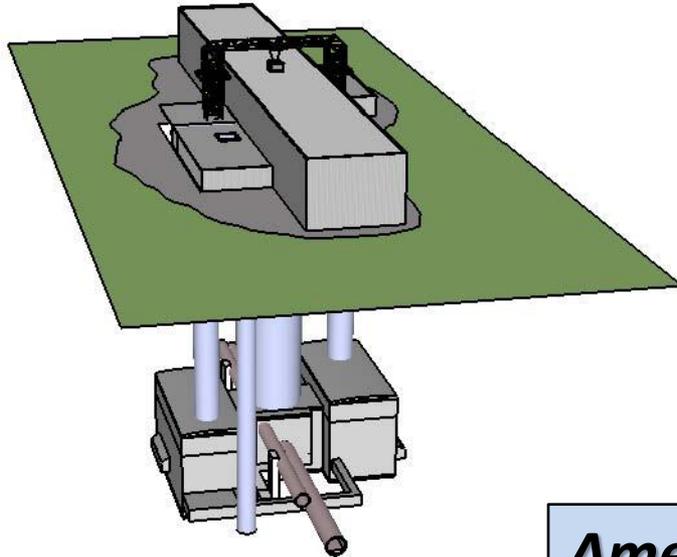
**Asian Region
Main Linac Tunnel
Cross Section**





**Americas
IR Perspective**

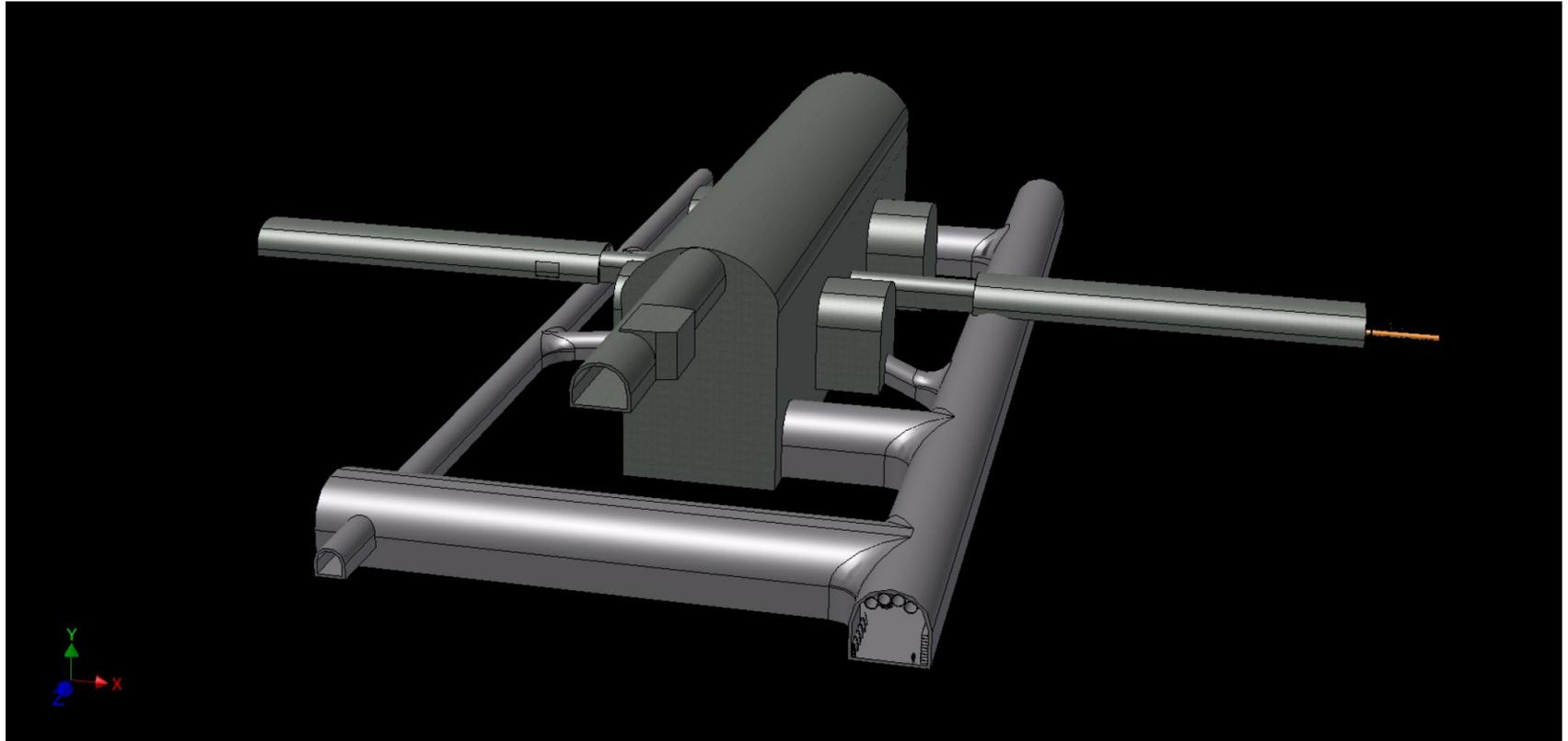




**Americas
IR Perspective
With Surface
Building**

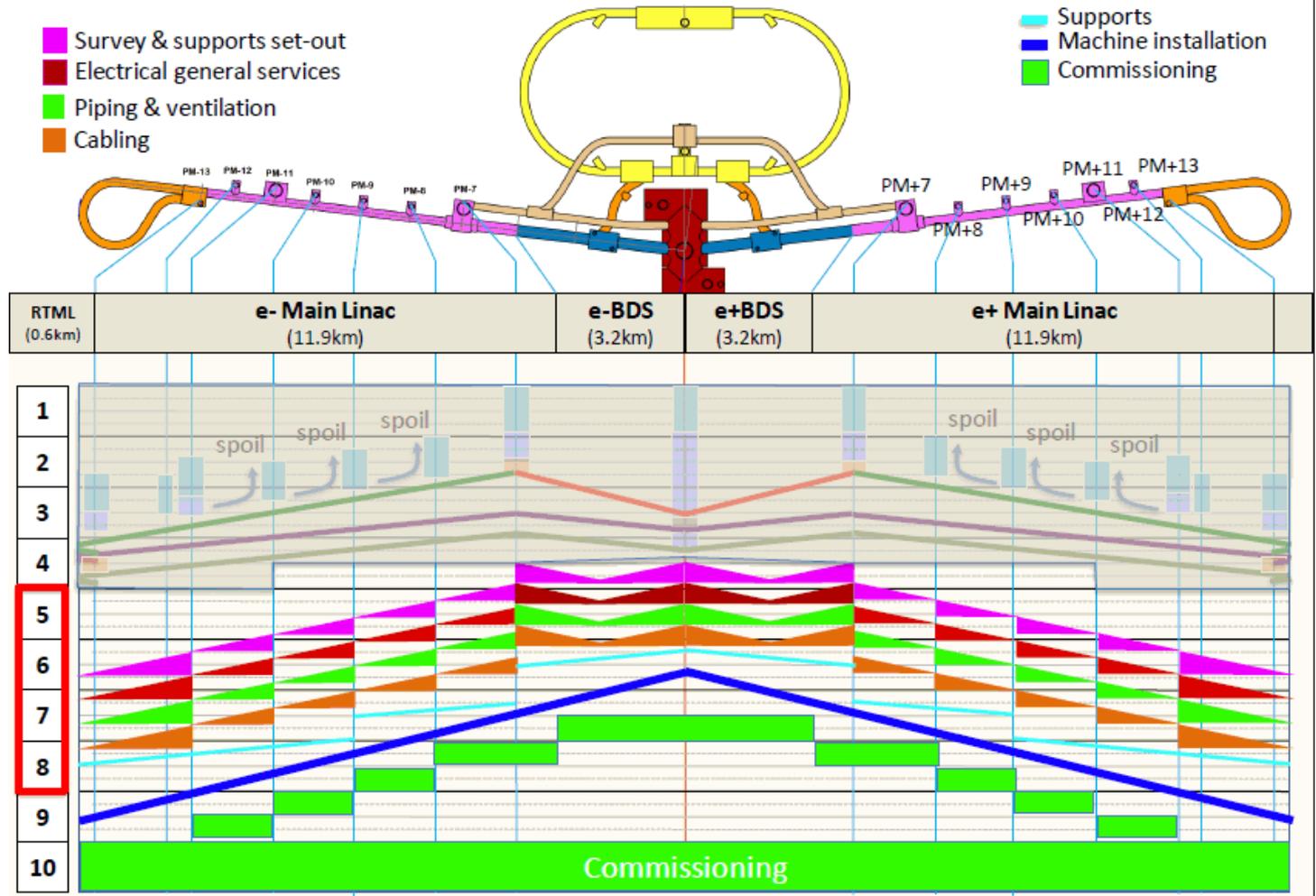


Asian IR Perspective





**Initial
Integrated
Project
Schedule**





Summary

- ***From RDR to TDR the Civil Design has Evolved***
 - ***Site Specific Conditions have a Substantial Affect on the Conventional Facilities Design for the ILC***
 - ***HLRF Schemes have been Adjusted to Local Conditions***
 - ***Other Viable Candidate Sites Could Require Adjustments to the Conventional Facilities Design***
- ***Local Site Conditions Determine Underground Enclosure Configuration and Tunnel Access***
- ***Tailoring the Civil Design to Local Conditions will Affect Other Aspects of the ILC Project***
 - ***Detector Assembly and Movement***
 - ***Installation of Technical Equipment in General***
 - ***Overall Project Schedule***
 - ***Project Cost***