

An ICFA View

(and some personal comments)

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ICFA Role

- ✱ **ICFA**

- ❖ ***To promote international collaboration in all phases of the construction and exploitation of very high energy accelerators***

- ✱ ***International Collaboration demands an international view of the field, its directions and best allocation of resources***

- ✱ ***Guided by:***

- ❖ ***Physics, Technology and Resources***

- ❖ ***On International scale!***

- ✱ ***Promotion includes ALL major HEP accelerators, even if the ILC has dominated considerations for two decades***

Precision and Energy Frontiers

Without specific theoretical direction, the field needs diversity

Precision realm

- Precision High Energy Searches (LHC -> HL-LHC)
- Flavour Factories
- **Future Higgs factory!**

- Neutrinos:
 - mixing parameters
 - Lepton CPV?
 - RH currents?
- Non-accelerator Physics - BSM
 - EDM
 - Neutrino mass, Dirac/Majorana properties

Precision and Energy Frontiers

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High Energy Frontier

- LHC -> HL-LHC
- Proton collider remains key tool for the energy frontier
 - Energy the way ahead
 - High Luminosity critical too. But,
 - Higher Energy most effective at pushing the frontier
 - Diversity:
 - Heavy ion collisions; e-p collisions
- In future, innovative techniques will be essential
 - Future use of large tunnels (circular and linear) essential

Europe's View of the Future

EPPSU Scenarios being considered:

	2020-2040	2040-2060	2060-2080
		1st gen technology	2nd gen technology
CLIC-all	HL-LHC	CLIC380-1500	CLIC3000 / other tech
CLIC-FCC	HL-LHC	CLIC380	FCC-h/e/A (Adv HF magnets) / other tech
FCC-all	HL-LHC	FCC-ee (90-365)	FCC-h/e/A (Adv HF magnets) / other tech
LE-to-HE-FCC-h/e/A	HL-LHC	LE-FCC-h/e/A (low-field magnets)	FCC-h/e/A (Adv HF magnets) / other tech
LHeC-FCC-h/e/A	HL-LHC + LHeC	LHeC	FCC-h/e/A (Adv HF magnets) / other tech

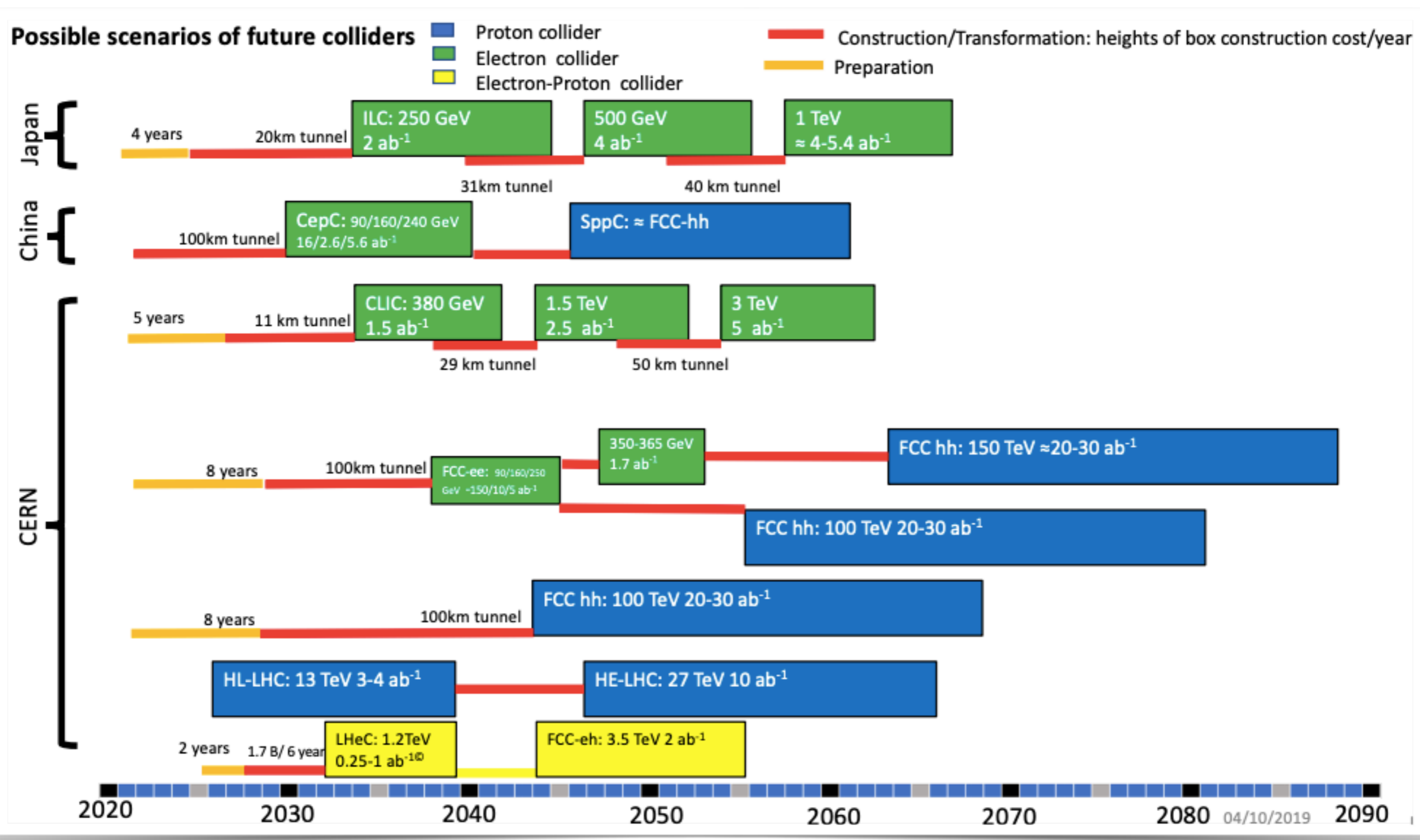
Europe = CERN + ... Strong driver of the worldwide program
 -> EPPSU is influential on the entire worldwide HEP program

(CERN/ESG/05 29 September 2019

SUPPORTING NOTE FOR BRIEFING BOOK 2020

Towards an update of the European Strategy for Particle Physics)

With related timetable of proposed machines:



Europe's View of the Future

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LE-to-HE-FCC-h/e/A	HL-LHC	LE-FCC-h/e/A (low-field magnets)	FCC-h/e/A (Adv HF magnets) / other tech
LHeC-FCC-h/e/A	HL-LHC + LHeC	LHeC	FCC-h/e/A (Adv HF magnets) / other tech

Europe = CERN + ... : Strong driver of the worldwide program

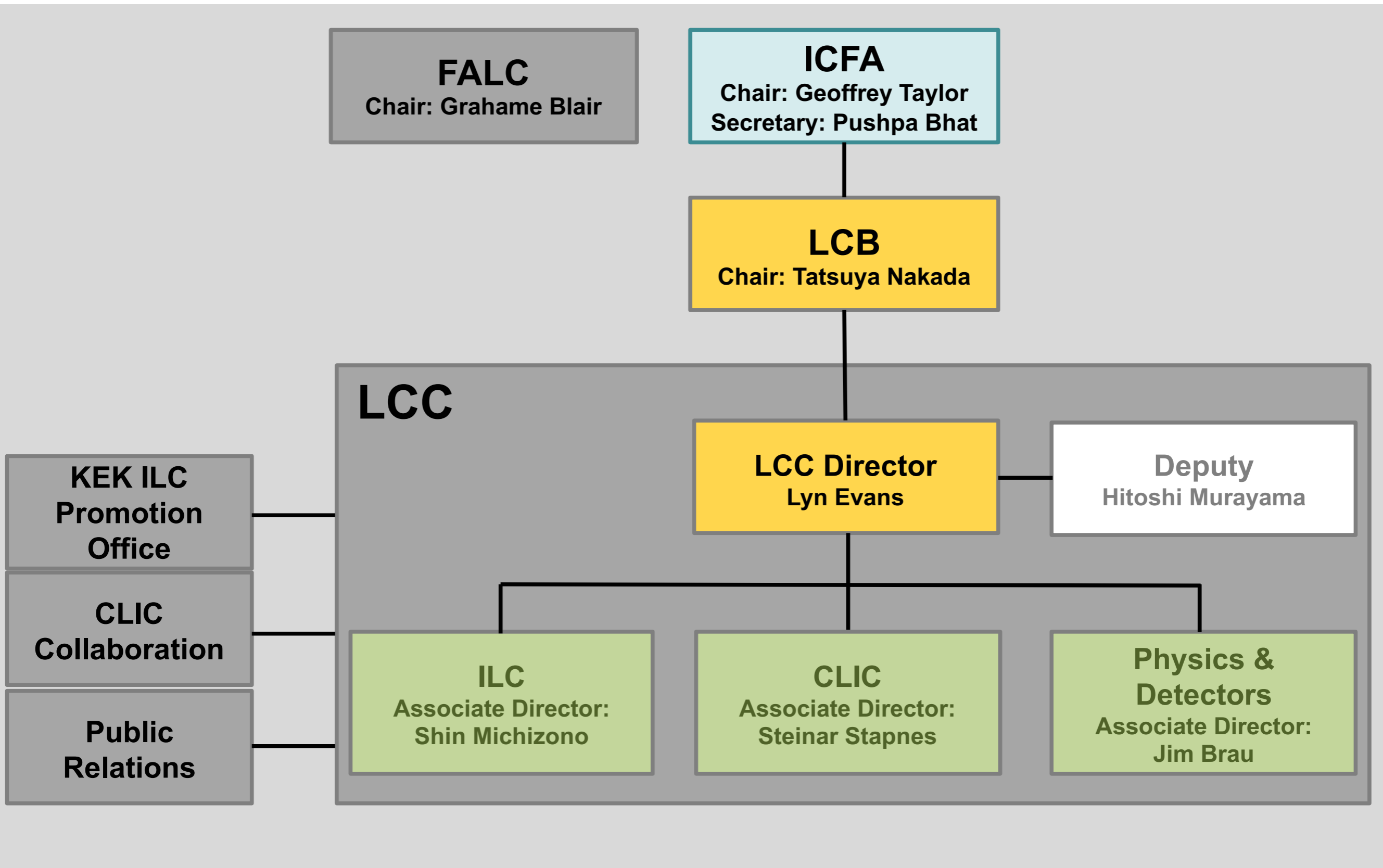
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Should there be a stronger recognition of potential facilities elsewhere?

Are we being too conservative in our aims?

Can we not optimise development, construction, and operation phases to keep all groups (accelerator physics, instrumentation, analysis, theory) busy and innovative, especially student and early career physics

ICFA -> LCB -> ILC & CLIC



Summary

- *Most of the ILC accelerator parameters **have been demonstrated at the various facilities.***
- *SRF **Technology matured** based on the success of **European XFEL** (10% scale of ILC Main linac).*
- *ILC preparation:*
 - *ILC **cost reduction R&Ds** are ongoing under US-Japan cooperation and ILC improvement adopting these results are considered at US.*
 - *KEK issued ILC action plan.*
 - *European ILC preparation plan as “E-JADE” report was summarized.*
- *KEK published “**Summary of Recommendations on ILC Project**” based on the discussion at the international WG.*
- *The technical preparation plan **in response to reports by ILC Advisory Panel** organized by MEXT and the Science Council of **Japan** is presented.*
- *The plan identifies **technical tasks to be carried out through international collaboration.***

Steinar Stapnes CLIC Update:

- CLIC is now a mature project, ready to move towards next phase preparing for a 380 GeV stage
- There is an consistent way forward with initial LC at “SM energies”, keeping the options open for future upgrades and/or circular accelerators further on
- The cost and implementation time for CLIC 380 are similar to LHC
- The physics case is broad and profound, and being further developed
- The detector concept and detector technologies R&D are advanced
- The full project status has been presented in a series of Yellow Reports and other publications: <http://clic.cern/european-strategy>

The Linear Collider

This group more than any other needs no encouragement.

The field wants:

- A Linear Collider : initially Higgs Factory, and
- Upgradeable in Energy

But

Can't justify two Linear electron-positron colliders.

Japan *can* host the ILC

If Japan *does* host the ILC, CERN would not need to build CLIC.

To its benefit CERN could thus remove two scenarios from its decision process.

- This series of workshops has clearly defined the physics need for the LC.
- eg. Michael Peskin's talk this meeting (and others): Understanding symmetry breaking needs experimental data. We need the ILC
- Hirotaka Sugawara "ILC Should be call "Nambu-Higgs Factory"

ILC Progress in Japan

- Masa Yamauchi's Summary:

Summary and Outlook

- MEXT gave a statement on ILC at the LCB meeting in March, 2019, and some actions are taking place following the statement:
 - MEXT and three members of the Japanese National Diet visited Berlin and Paris to talk with BMBF and MESRI. They agreed to begin bilateral discussion groups.
 - A working group was formed at KEK to discuss ILC implementation. The report from the WG has been sent to MEXT as a recommendation from KEK. Hope this is used as an input to the international discussions.
 - SCJ is now working on "the master plan". We are doing our best to obtain the priority in the master plan.
 - The new MEXT minister visited SFT/KEK as soon as he took his office together with the Director of the Research Promotion Bureau, MEXT.
- MEXT will come to the next LCB meeting in February at SLAC, and update the statement there.

A. Yamamoto, Granada

Timeline	~ 5	~ 10	~ 15	~ 20	~ 25	~ 30	~ 35
Lepton Colliders							
SRF-LC/CC	Proto/pre-series	Construction		Operation		Upgrade	
NRF-LC	Proto/pre-series	Construction		Operation		Upgrade	
Hadron Collider (CC)							
8~(11)T <u>NbTi</u> / (Nb ₃ Sn)	Proto/pre-series	Construction		Operation		Upgrade	
12~14T Nb ₃ Sn	Short-model R&D	Proto/Pre-series		Construction		Operation	
14~16T Nb ₃ Sn	Short-model R&D			Prototype/Pre-series		Construction	

Note: LHC experience: NbTi (10 T) R&D started in 1980's --> (8.3 T) Production started in late 1990's, in ~ 15 years

B(dipole) ~ +2T per decade!
Challenge: Can this be increased?
... Stretch Goal!

CERN's Future = HEP Future

- Can the ILC in Japan give strategic relief to CERN?
- Does CERN really need an FCC(ee) as stepping stone to FCC(pp) (and FCC(hh), FCC(ep)) ?
- Can we improve on 2T B-field increase per decade?
- If CERN does not pursue the next generation energy frontier, who will?

Personal Plea

- I can only urge our worldwide particle physics community to consider the entire field and encourage a strategy that optimises our international base.
- We must build upon this base to continue to provide the broad range of challenging facilities that has been the signature and strength of our field.
- We should make clear to all our colleagues that the ILC can provide relief for the EPPSU deliberations.