

overview of

“national inputs”

submitted to the 2020 ESPP

- disclaimer
- future collider projects and timelines
- summary of national priorities
- top priorities and further future projects
- selection of general policy statements
- summary

disclaimer (1)

- “national” inputs from 18 CERN MS and from 4 NMS (CDN, J, RUS, USA) (some nations submitted >1 ...)
- here: concentrate on analysing
 - inputs from particle physics commun.
 - priority future HEP (collider) projects
 - selection of general policy statements
- not include statements on running and on approved projects (LHC, hl-LHC, KEKb,...)

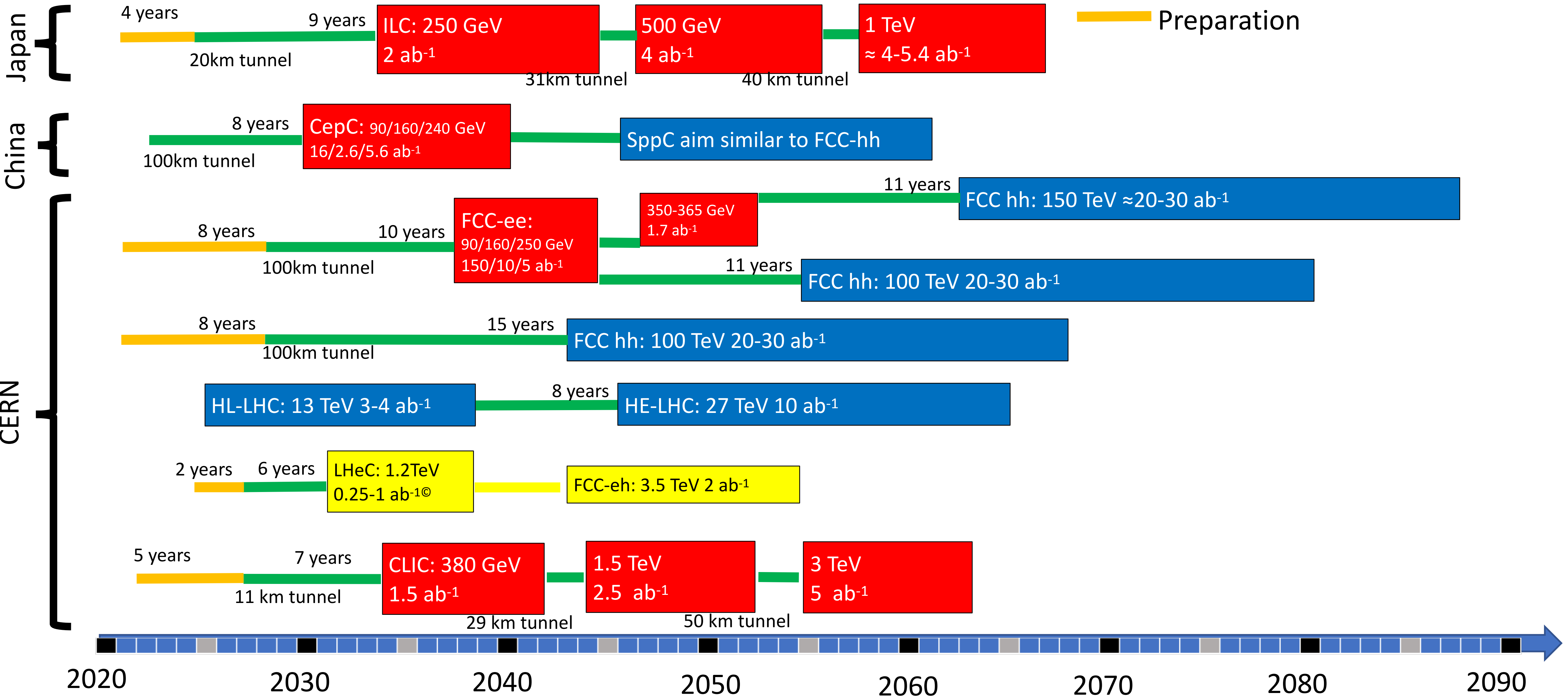
The table is a complex grid with approximately 10 columns and 30 rows. The columns are color-coded and contain text, likely representing different categories or data points. The rows are also color-coded, alternating between yellow, green, blue, orange, and grey. The text within the cells is small and difficult to read, but it appears to be a structured list or index of information.

disclaimer (2)

- sometimes difficult to separate priorities from possibly unsorted lists of topics (assign priority levels or check marks?)
 - interpretation of statements sometimes difficult
 - multiple inputs not always consistent
 - margin between priority levels sometimes feeble
- *there is a certain "degree of freedom" for interpretation, classification and assignment of priority levels*
- some "national inputs" not really based on community input; representation of number of scientists different by up to 1-2 orders of magnitude...

Possible scenarios of future colliders

- Proton collider
- Electron collider
- Electron-Proton collider
- Construction/Transformation
- Preparation



summary of national priorities and interests for large future HEP projects :

country	item #	e+e- e-w,H,.. (ILC, ...)	e+e- incl. ttbar (FCC-ee)	e+e- incl. HH (ILC+,CLIC)	hh beyond LHC	hh he-LHC	hh FCC	eh	accel. R&D	R&D magnets FCC,he-LHC	R&D novel PWA, $\mu+\mu-$	non- accelerator (DM,ndbd)	neutrino physics	intensity frontier	nuclear (FAIR,EIC...)	astro- particle
A	108	1			3				2			√			√	√
B	122	1														
CH	142	1	1		3		3		2	2	3		√	√	√	√
CZ	88	3		3	2	2	2		1	1	1		√		4	
D	33	1		1	3	3	3		2	2	2	4	√	√	√	√
DK	61	3	3		3		3		2	2	2	1	√	√	√	√
E	31	1	3	1	3	3	3		2	2	4		√		√	√
F	15,116,155	1	√	√	3		3	√	2	2	√	√	√	√	√	√
FIN	55	1		1									√		√	√
I	26,138	1	1		3		3		2	2	2	√	√	√		√
IL	34	√			√							√	√	√		
N	43	1		1					3		3	√			√	√
NL	166	1	3	2	3		3		2	2	3	√	√	√		√
PL	125	1	√	√					2							
RO	73												√	√		
S	127	1		1					2	2	√	√	√	3		√
SLO	78															
UK	134,144	1		1	2		2	2	3	3	√	√	√		√	
total score:		13,67	3	6,83	3,67	1,17	3,33	0,5	6,67	5,33	3,75					

1...4: priority 1 to priority 4;
 √: mentioned without (clear) assignment of priority
 total score: = $\sum(1/\text{priority})$ where given; √ not counted

Notes: – table reflects status of inputs submitted by Dec. 2018
 – intended for overview of physics or projects priorities
 – see disclaimers on previous and following pages!

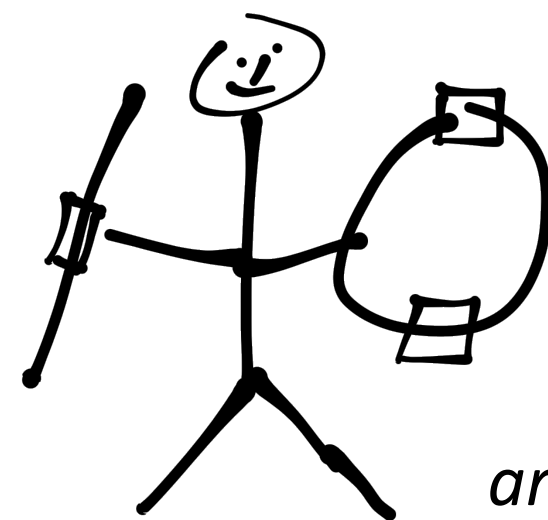
summary of NMS inputs:

country	item #	e+e- e-w,H,.. (ILC, ...)	e+e- incl. ttbar (FCC-ee)	e+e- incl. HH (ILC+,CLIC)	hh beyond LHC	hh he-LHC	hh FCC	eh	accel. R&D	R&D magnets FCC,he-LHC	R&D novel PWA, $\mu+\mu-$	non- accelerator (DM,ndbd)	neutrino physics	intensity frontier	nuclear (FAIR,EIC,...)	astro- particle
CDN	157	✓	✓	✓	✓	✓	✓					✓	✓			
J	63	1							4			3	2			
RUS	40								✓			✓	✓	✓	✓	✓
USA	149;150	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓
total score:																

- 18 MS and 4 NMS submitted national inputs on HEP
- 3 MS and 3 NMS provided no explicit prioritisation
- → "total scoring" based on 15 MS
- total score defined as $\Sigma(1/\text{priority})$

future HEP project priorities:

- highest priority for a (general) e^+e^- collider as next big project : total score of 13,67 out of 15 max.
 - score of 3,00 for upgradeability to include $t\bar{t}$ and/or explicitly for FCC-ee
 - score of 6,83 for upgradeability to include HH or $t\bar{t}H$ and/or explicitly for linear colliders (i.e. ILC+ or CLIC)



artwork by F. Simon

future HEP project priorities:

- **second priority** for (general) **accelerator R&D** : score of 6,67
 - score of 5,33 for R&D of high-field s.c. magnets (he-LHC, FCC)
 - score of 3,75 for R&D of novel accel. techniques (PWA, μ -coll.)
- **third priority** for a **hadron collider** beyond the LHC: score of 3,67
 - score of 1,17 for the he-LHC
 - score of 3,33 for the FCC-hh
 - score of 0,50 for e-h collider (LHeC or FCC-eh)
- *notable observation: similar priorities for FCC-hh and for R&D of novel accelerator techniques!*

further future projects

- neutrino physics (long baseline; ndbd; cosmic)
- physics beyond colliders
- dark matter searches
- intensity frontier
- nuclear physics
- gravitational waves
- astro-particle projects

selection of general policy statements

- maintain leading role of CERN (in Europe and the world)
- “a” future international collider at CERN!
- participation in outside-of-Europe collider project through CERN
- diversity and complementarity: CERN and national Labs
- (support for) astro-particle physics projects at CERN
- improvements for the CERN organization and laboratory (see e.g. input doc #166)
- importance of: theory; instrumentation; computing

summary:

- clear preference for an e^+e^- collider as the next h.e. collider:
 - as H-factory and for precision e.w. measurements (ILC, CEPC, FCC-ee, CLIC)
 - significant demands for upgradeability to access $t\bar{t}$ (ILC, CEPC, FCC-ee, CLIC) and also HH and $t\bar{t}H$ final states (ILC+; CLIC)
- second priority: R&D for future h.e. collider: h.f. s.c. magnets for hadron colliders, and also novel accelerator techniques (PWA, μ -collider)
- third priority: future hadron collider beyond LHC (FCC-hh; fewer demands for he -LHC and eh -collider)
- large diversity of other, “smaller” projects (PBC, neutrino, DM searches, precision/intensity frontier, astro-particle, ...)