



cherenkov
telescope
array

SWISS CTA Day 2022

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STATUS of the Cherenkov Telescope Array Observatory

Second Report

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The future gamma-ray Observatory



- CTAO will be the **first ground-based gamma-ray observatory** and the largest and most sensitive instrument for the detection of gamma rays.
- CTAO's sensitivity to energies up to 300 TeV will push CTAO beyond the edge of the known electromagnetic spectrum, providing a **completely new view of the sky**.
- With **two sites**, CTAO will have access to the entire sky.
- CTAO will build on the advances pioneered by its predecessors to expand the catalogue of known gamma-ray emitting cosmic sources tenfold, **detecting more than 1,000 new objects**.
- CTAO will be the first ground-based gamma-ray observatory **open to the world-wide astronomical and particle physics communities** as a resource for data from unique, high-energy astronomical observations.

Status from the managerial point of view



- ✓ Hosting Agreements signed for all sites
- ✓ Structure of the CTAO organisation in place
- ✓ Cost Book of the project – in the actual Configuration
– approved
- ✓ Project Management Plan released
- ✓ Array layouts completed
- ✓ Construction Proposal very advanced
- ✓ Conceptual Design of North and South Sites
Infrastructures very advanced

Status from the managerial point of view



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- Construction can start only after CTAO-ERIC in place
 - But:
 - Pathfinder strategy: ACADA, LIDAR, FRAM, 5 MST on CTAO-N
 - Advancement of funds from a few Countries
 - ERIC process lead by Board of Governmental Representatives
 - Statutes
 - Construction Cost + S&T description
 - Rules and Regulations (Transition Working Group)
 - Operation costs sharing
 - Technical and project work moving ahead
 - LST, MST, SST
 - System engineering, ACADA, CTAO-N and CTAO-S infra, ...
 - Important reviews passed and upcoming (LST, MST Structure, NectarCAM, ...)

Toward CTAO-ERIC



Potential Members, Strategic Partners, Observers:

- *Australia*
 - *Austria*
 - *Czech Republic*
 - *European Southern Observatory*
 - *France*
 - *Germany*
 - *Italy*
 - *Japan*
 - *Netherlands*
 - *Poland*
 - *Slovenia*
 - *Spain*
 - *Switzerland*
 - *UK*
- Brazil*
South Africa
USA

Funding & Sustainable Configuration



- Approved Cost Book is allowing the construction of the Alpha configuration:

Telescope Design	Northern Site	Southern Site
Large-Sized Telescope	4	
Medium-Sized Telescope	9	14
Small-Sized Telescope		37
Total	13	51

- Total cost of the Alpha configuration is 331 M€
 - Not including VAT, contingency, inflation
 - Not including research, prototyping and design activities prior to the reference date (except LST-1 and CTAO-N infrastructure)
- Overall foreseen IKC contributions: 74%
- Overall cash contributions: 26%



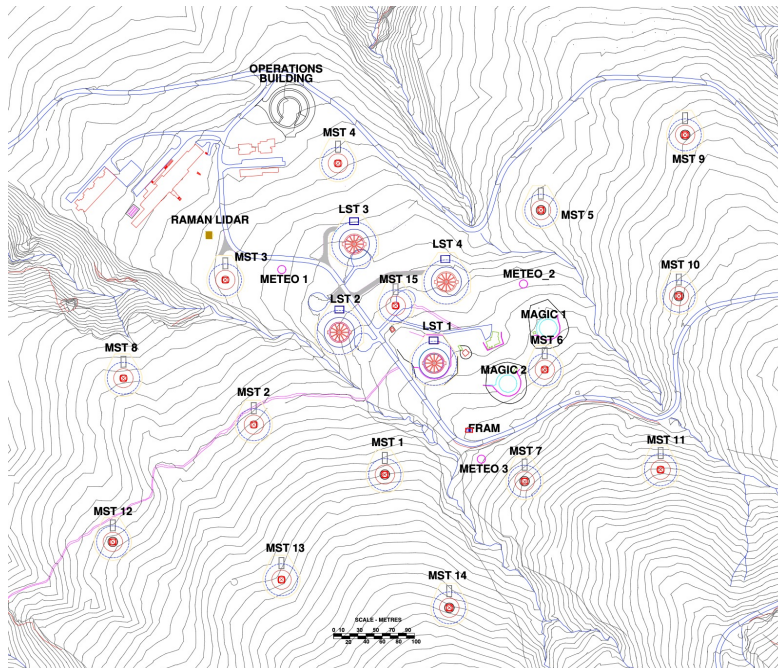
CTAO Construction Staffing

- CTAO construction needs ~320 FTE/yr for five years (Cost Book)
 - IKC staff ~202 FTE/yr (for all IKCs)
 - CTAO staff ~117 FTE/yr (for observatory design & construction tasks)
- To prepare and carry out construction, CTAO needs more staff
 - Either directly hired (needs budget) or seconded from institutes
- Given the expertise available in CTAC Institutes and the limited CTAO funding, secondments is encouraged.
 - CTAO specifies needs and announces it widely
 - Seconded staff remains employed and paid by home institution
 - Seconded staff is going to be part of the CTAO organization with a defined position
 - Co-location for a limited numbers of functions, no co-location for others
 - Recognition as IKC

Northern Array: from the original baseline configuration to the alpha configuration

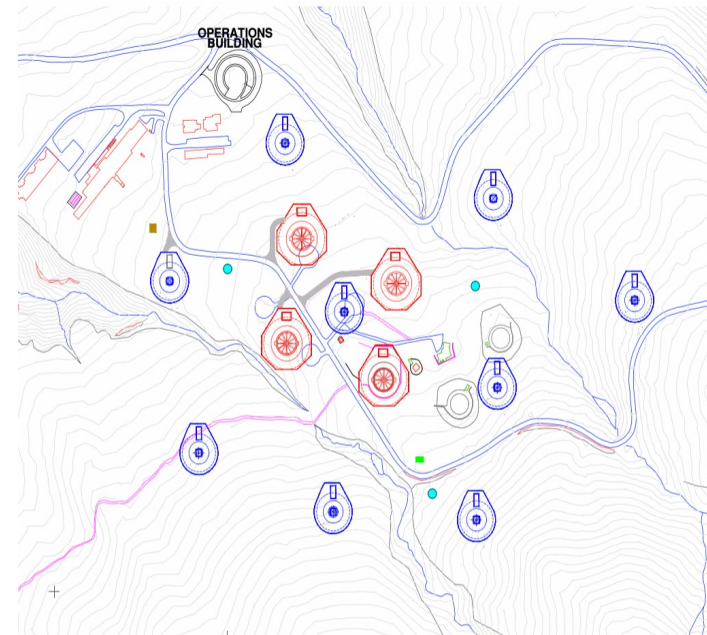


ORIGINAL BASELINE CONFIGURATION



4 LSTs
15 MSTs

ALPHA CONFIGURATION



4 LSTs
9 MSTs

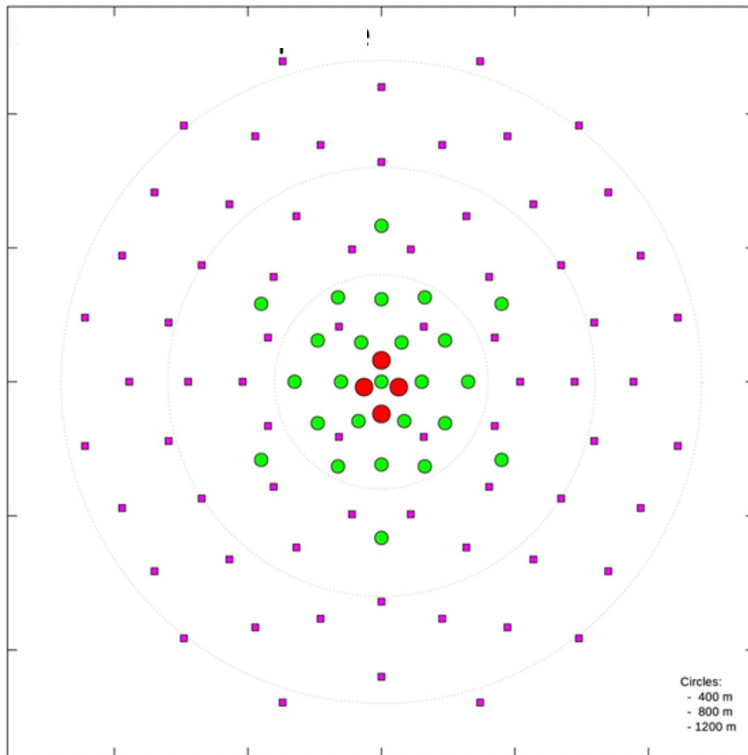
CTAO-North Status

- LST-1 being commissioned by LST collaboration
- Infrastructure construction initiated
 - Three more LST foundations, one MST foundation
 - Roads, data and power network
 - Tendered by *Instituto de Astrofísica de Canarias (IAC)* in collaboration with CTAO
 - Operation building
- CTAO building up its organization on La Palma
 - North Site Manager in place since 1 Jan 2019
 - Setting up CTAO Low Elevation Office (LEO)
- CTAO Systems Engineering very busy with detailed system design
 - Addressing all system level details

Southern Array: from the original baseline to the alpha configuration

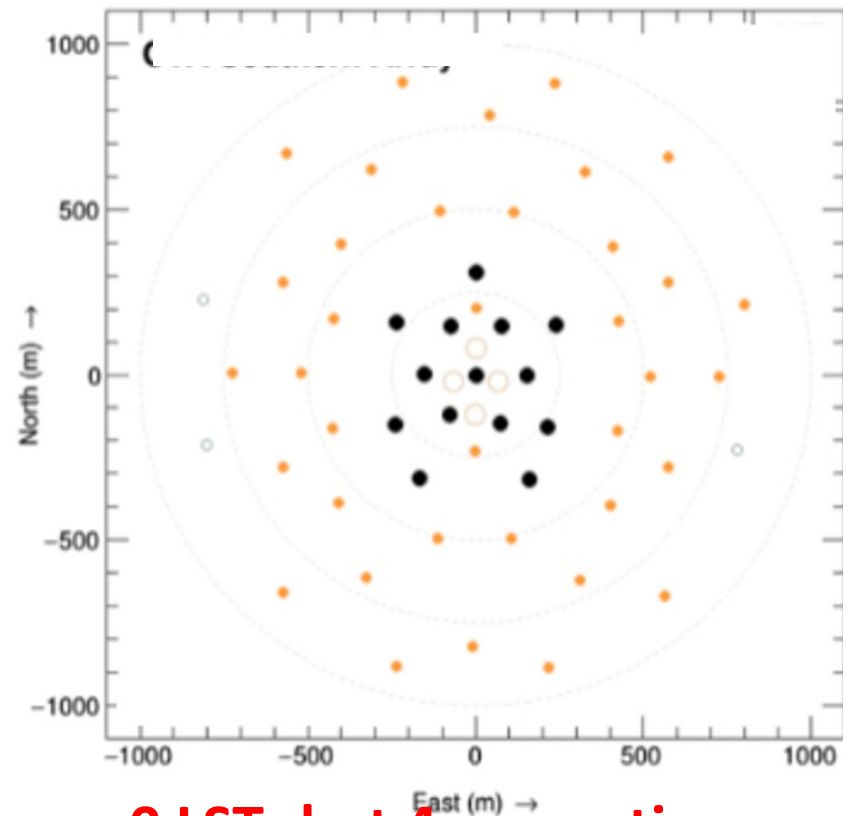


ORIGINAL BASELINE CONFIGURATION



4 LSTs
25 MSTs
70 SSTs

ALPHA CONFIGURATION

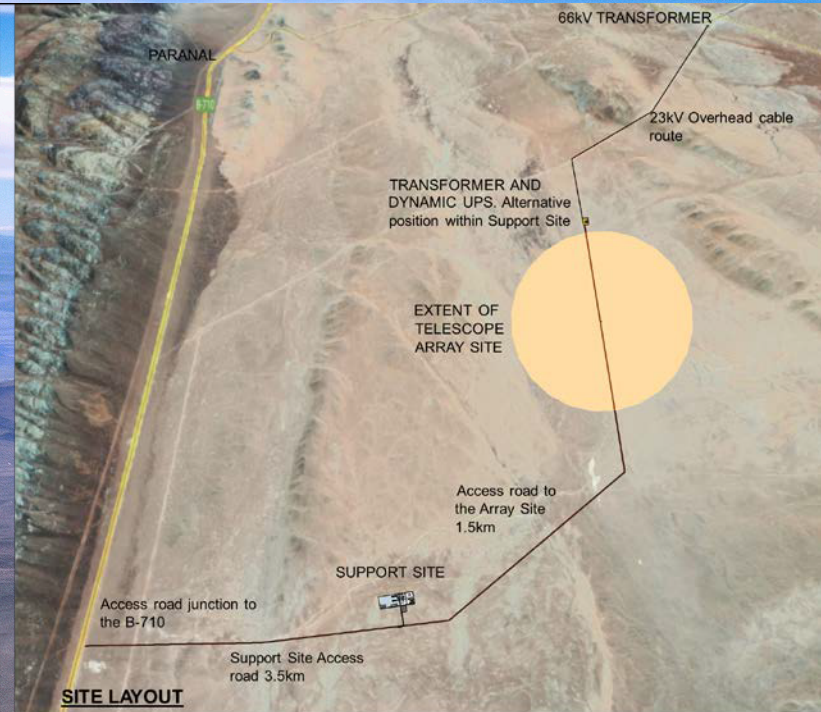


0 LSTs but 4 excavations
14 MSTs
37 SSTs + 3 foundations

CTAO-South Status

- Hosting agreements between Republic of Chile, ESO, CTAO and CONICYT were signed in Dec 2018
- CTAO-South Site Manager appointed (starting 1 July 2019)
- Seismic investigation for the specific site finalised
- CTAO ready to construct CTAO-South infrastructure
 - Access Road procurement is on track
 - Procurement carried out by ESO on behalf of CTAO
 - Scope: 4 km of access road incl. junction to the public road
 - Foundations, roads, power and data networks
 - Depend on ERIC status and available funding (cash flow)

CTAO-South Site – ESO (Chile)



Vulcano Lullillaco
6739 m, 190 km east

Cherenkov Telescope Array Site

Cerro Paranal
Very Large Telescope

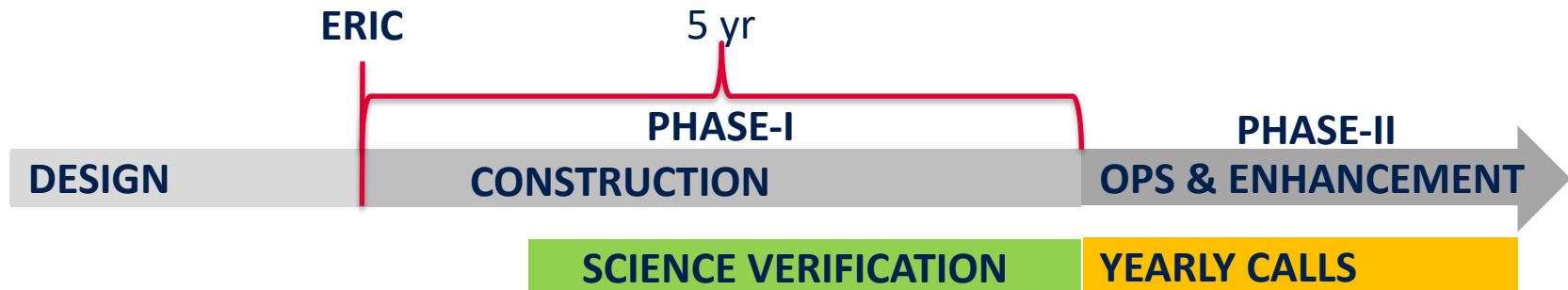
Science Data Management Centre (SDMC)



- The SDMC is responsible for CTAO scientific data management and make the science products available to the worldwide community
 - With an estimated 20 staff in a new building, now under construction



Project Status



- **Phase-I: construction of the Alpha configuration**
 - **a significant performance improvement wrt the currently running facilities**
 - high-impact science covering most of the science cases
 - a significant increase of the discovery space
- **Phase-II: regular operations of the Alpha configuration + construction towards the final full-scope one**



Tentative Schedule

No.	Level-1 Milestone	CTA-North	CTA-South
1	Hosting Agreement Signed	Q3 2016	Q4 2018
2	Begin Initial Infrastructure Works	Q1 2021	Q1 2022 (advanced funds only)
3	Start of ERIC Legal Entity	T0 = 01 Jan 2023 (assumed)	
4	Formal Start of CTAO Construction Project (incl. construction funding available)	T1 = T0 + 6 months = 01 Jul 2023	
5	Complete Initial Infrastructure Works	T1 + 30 Months = Q4-2025	T1 + 36 months = 01 Jul 2026
5a	First telescope construction starts on-site	LST underway MST Q2-2023	MST: Q1-2025 ??
6	Acceptance of First Telescope on Site	T1 + ?? months	T1 + 30 months
7	Begin System Commissioning & Science Verification (needs two telescopes)	T1 + 12 months	T1 + 31 months
8	Completion of Construction Project	T1 + 60 months	T1 + 60 months

Observation Modes and Data Access



CTAO will be a proposal-driven Observatory: users can request observing time through standard proposals in response to an Announcement of Opportunity call that will be issued once per year. Standard proposals will require between a few to hundreds of hours of observing time.



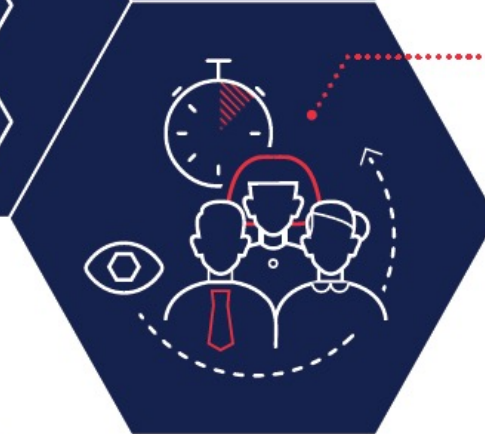
Archive Access to CTAO data will be made available worldwide after a proprietary period of about one year.



International Community Observing Time will represent a small fraction of the observing time that is available by meritorious proposals submitted in response to an Announcement of Opportunity call as a standard proposal by scientists not belonging to CTAO Member States.



The Key Science Projects are large programmes ensuring that the key science issues for CTAO are addressed in a coherent fashion, and providing legacy Science Data Products. A Key Science Project will require hundreds to thousands of hours of observing time.



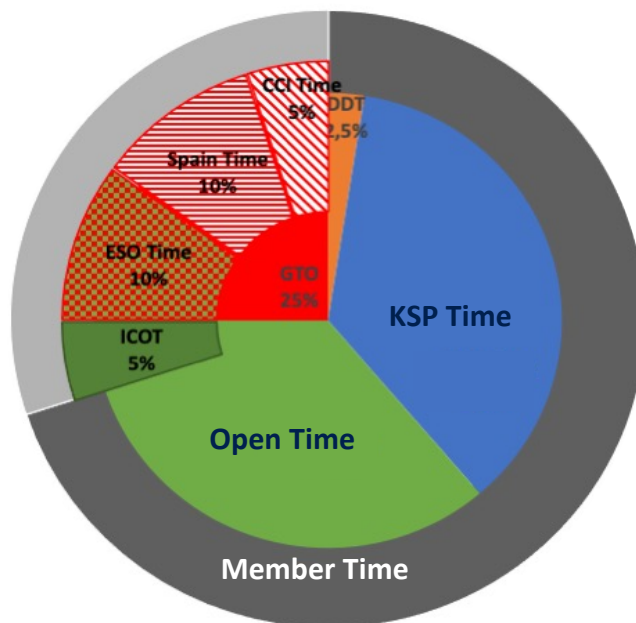
The Director's Discretionary Time will represent a small fraction of observing time that will be used for, e.g., unanticipated targets of opportunities.

CTAO Access Policy

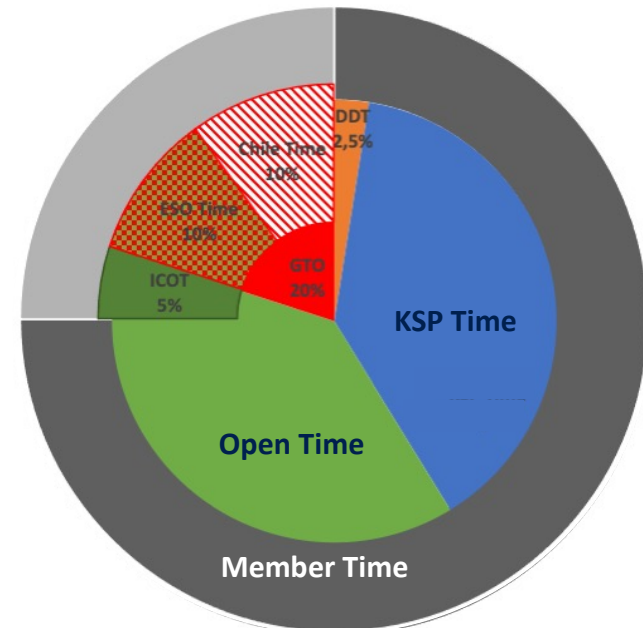


- 20-25% is GTOs
 - ESO Time: 10% for both arrays
- 5% (TBD) International Community Observing Time (ICOT)
- **Users' Time:** the remaining 70-75%, attributed exclusively to the contributors to construction and (probably) proportionally to the National contribution

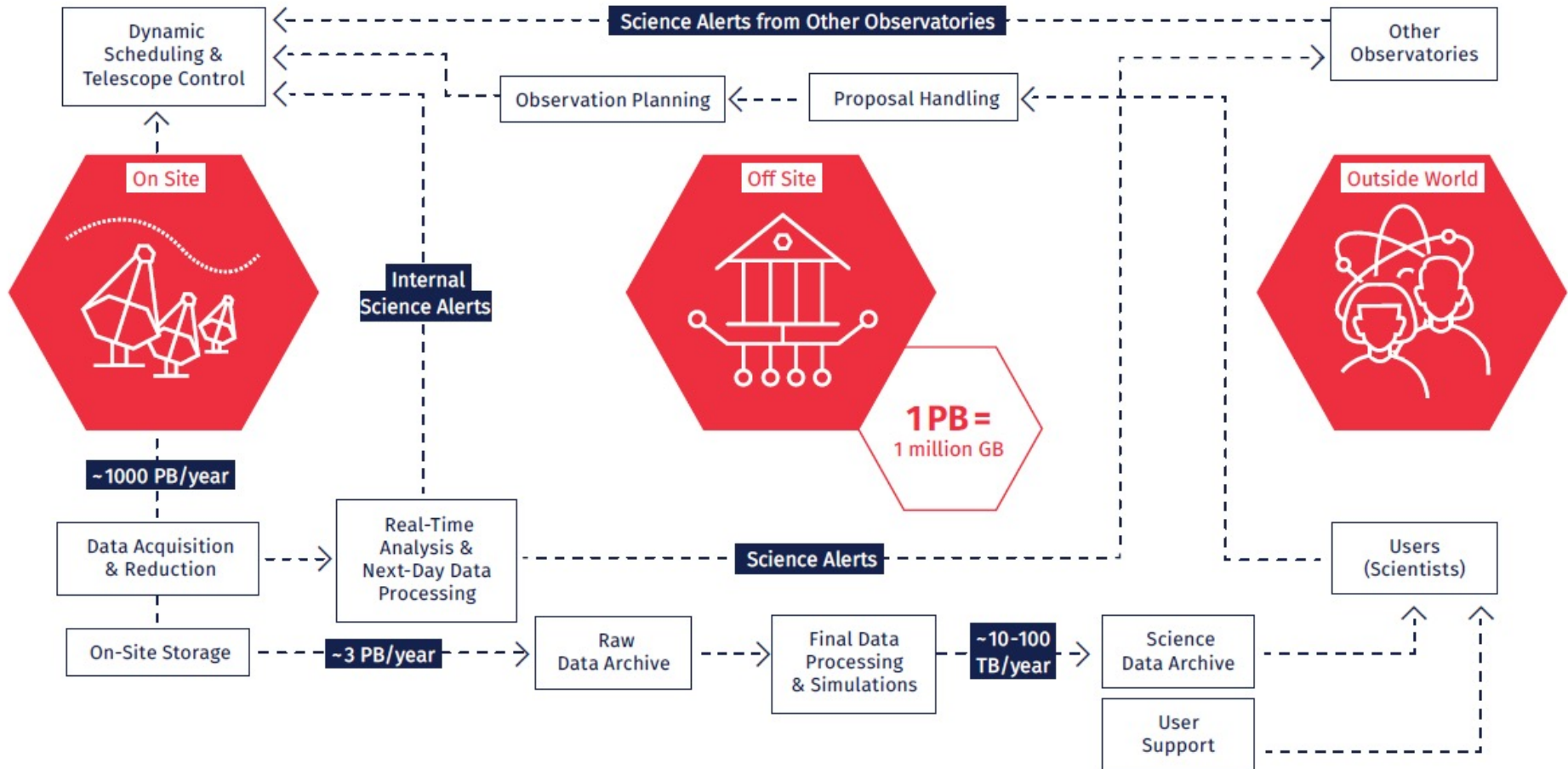
Northern Array



Southern Array



Data



Conclusions

- The Science case is outstanding
 - Politics: ERIC process arrived to the final steps
 - Finances: consolidated for Alpha Configuration
 - Governance/organisation: CTAO is well structured for the future
 - Project Management: Construction of sites prepared
 - Instrumentation: Telescopes Consortia in place and continuous connection with CTAO
 - Computing: complex organisation, need for strong participation of Institutes
 - Data and Access Policies almost fully defined
- **It is the right time to organise further support**

Communication - Stay tuned...



www.cta-observatory.org



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Thank you for your attention

