



HSE
Occupational Health & Safety
and Environmental Protection unit

Electrical Safety Project Annual Meeting WP2 “HSE Branch” Report

C. Delamare, A. Henriques

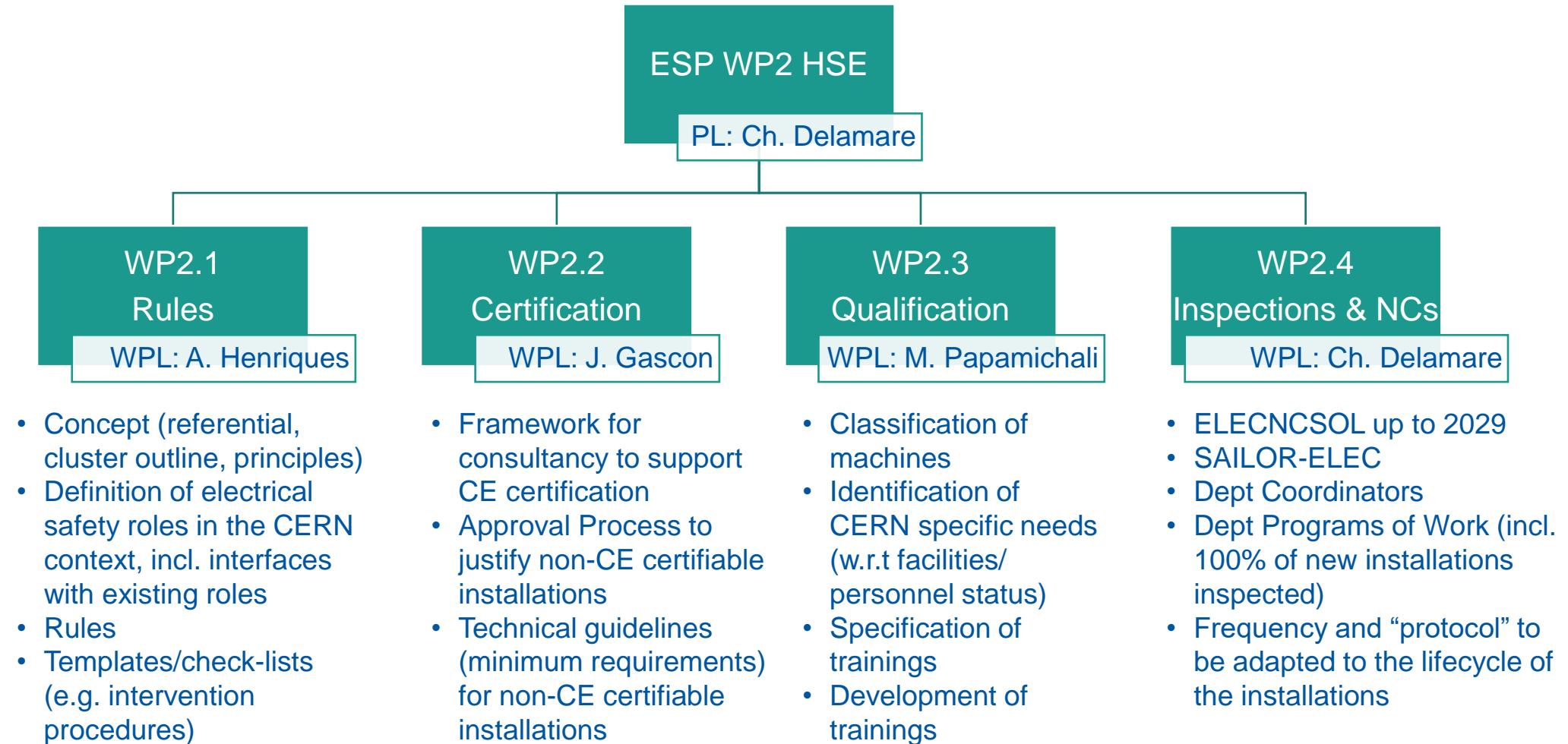
ESP Annual Meeting, *15 November 2024*

Acknowledgments to J. Gascon, I. Neuhold, O. Tison, J-P Julien, M. Papamichali, A. Goehring-Crinon, M. Ayass
and to all ESP contributors

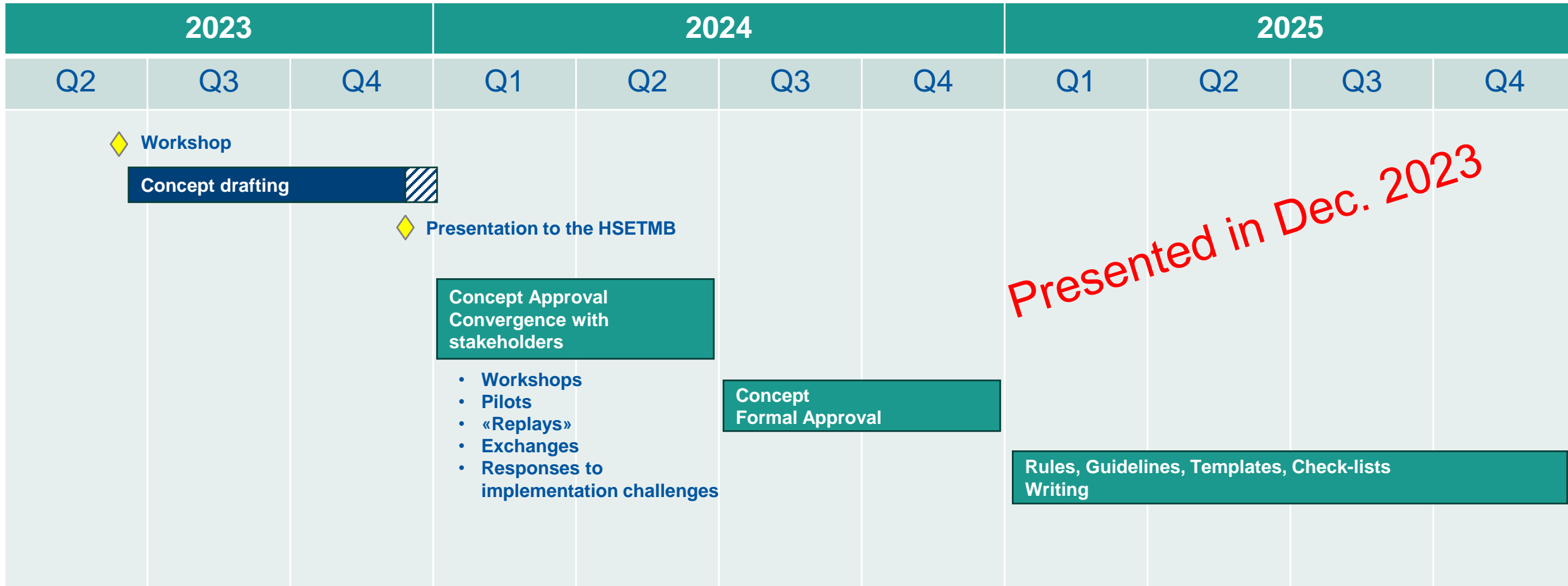
Outline

- WP2 “HSE Branch”
- Foreseen Schedule
- Preamble – CERN Safety Rules
- Electrical Safety Rules update in a nutshell
 - Objectives
 - Minimum requirements
 - Design and certification
- Convergence with stakeholders in 2024
- Inspections and Non-Conformities
- Revisited Schedule
- Conclusion

ESP – WP2 «HSE Branch» structure



Electrical Safety Rules Concept – Schedule



Preamble – CERN Safety Rules

CERN Safety Rules - Why ?

As an intergovernmental organization CERN establishes its own rules as necessary for its functioning.

- Need for consistent unique framework for the whole of the site (differences between CH-F)
- Need for comprehensive framework covering the different “categories of personnel” (staff, users, contractors...)
- Need to address CERN specific situations where no legal referential exists (accelerator equipment for example)
- Need to “transpose” administrative provisions of Host State regulations into the CERN context, i.e. define which CERN unit plays the role of national authorities or notified bodies)

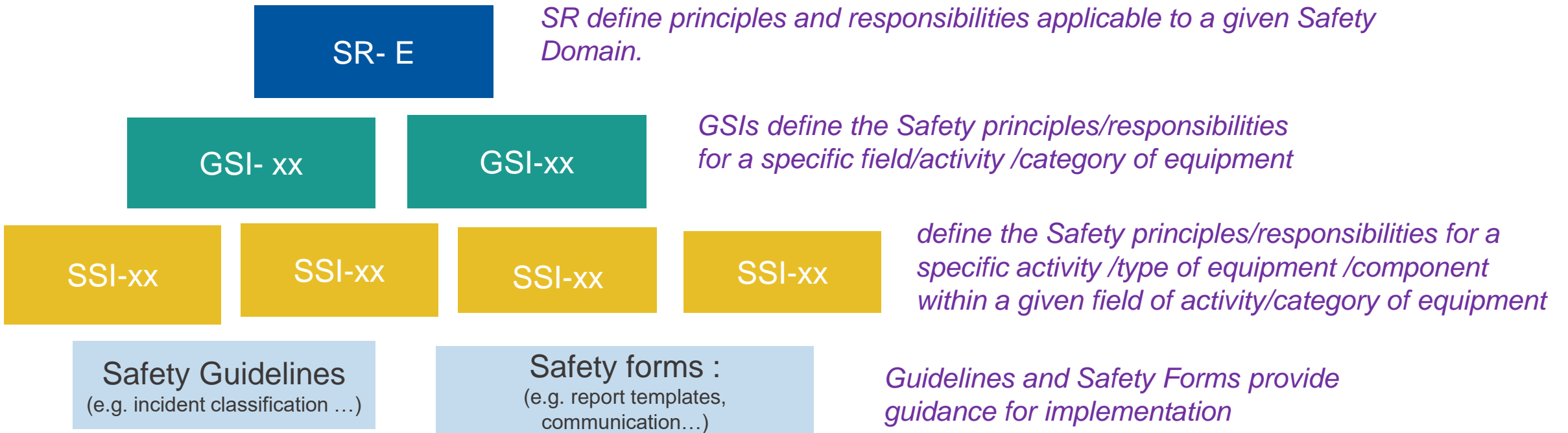
CERN Safety Rules – Principles

Basic Principle: follow Host States, EU, or international substantive regulations and standards as far as possible: facilitates compliance for contractors and understanding by collaborating institutions



CERN Safety Rules – System

- 2006 “new” Safety rules system introduced : replacement of Safety Codes and Safety Instructions by another system: Safety Regulations (SR), General Safety Instructions (GSI), Specific Safety Instructions (SSI). A set of Safety rules pertaining to the same Safety domain is called a cluster.
- The new Safety rules system closer to national systems. Consistency of terminology and principles across all post-2006 rules. These rules are continuously updated in the light of regulatory development and REX

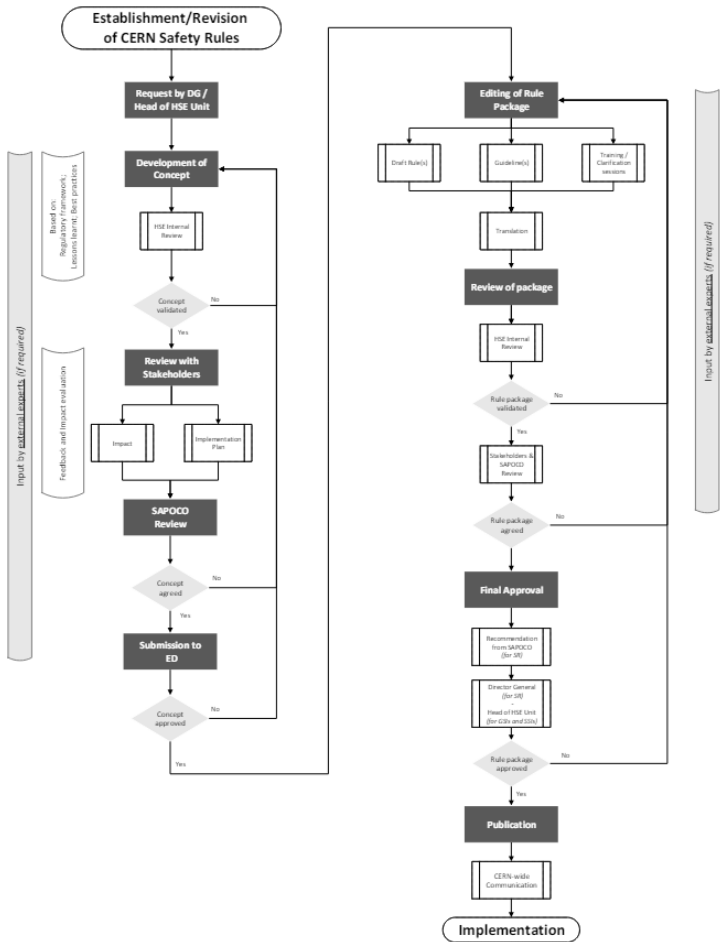


CERN Safety Rules – Approval procedure

GENERAL SAFETY INSTRUCTION GSI-SO-13

ESTABLISHMENT AND REVISION OF THE CERN SAFETY RULES

ANNEXE 1



1. Before drafting we prepare a 'concept'
2. Stakeholders approve the concept
 - General principles
 - Impact
 - Implementation
3. Start editing the rules
4. Text is circulated for approval
 - Once concept is approved only deviations from the concept can trigger a change in the text
 - Phrasing, language



Electrical Safety Rules update

Electrical Safety Rules Concept Proposal

New EL cluster

Key definitions

Electrical Safety objectives
By 2024, in accordance with IEC 60364

Ordinary Person

Equipment may contain
Locations in a different part of Safety Management

Stand Alone Equip.

Equip. from same OU contractor intervening

Several equip. involved from several OU. Workers from different OU/contractor

11/12/2023 New concept for SR-EL A. Harrognan et al

Roles and Responsibilities

Personnel Accreditation / Certification (Habilitation elec.)

Electrical Equipment (design / manufacture)

Works

- SR-EL
 - Outline the general principles for works in the presence of electrical hazards
- GSI-EL-3
 - Details, procedures, templates, etc.
 - Cover the most complex cases but not overload small routine interventions - Safety level shall be obtained regardless

Safety by design

11/12/2023 New concept for SR-EL A. Harrognan et al



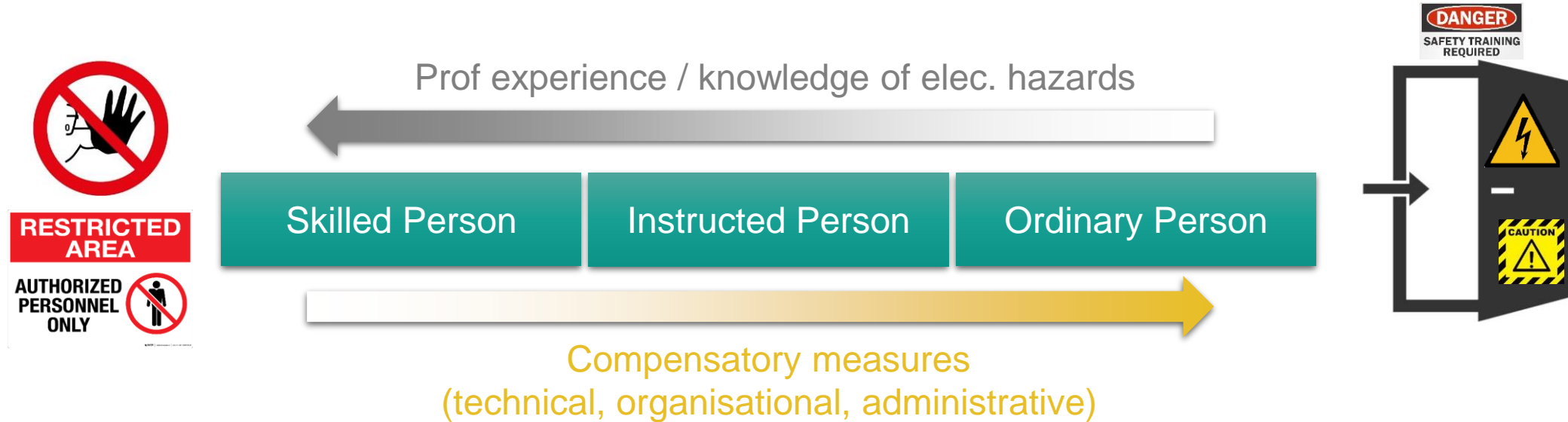
Electrical Safety Rules update - Objectives



Electrical Safety objectives (SR-EL)

In accordance with **CERN Safety Policy**

Guarantee the Health & Safety of all personnel, independently of their professional competencies or knowledge of the electrical risk. Different personnel categories*:



Elec works:

Yes

Yes**

No

* according to EN 50110 and NF C 18-510

** under supervision

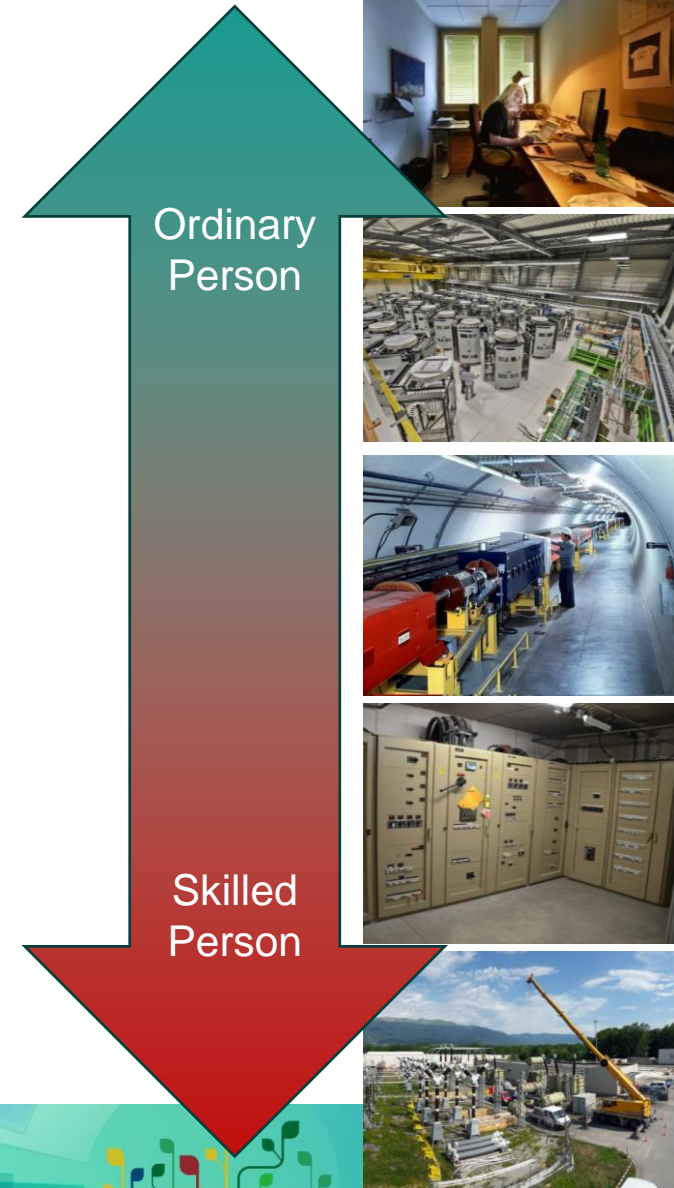
Electrical Safety objectives (SR-EL)

By default (anywhere at CERN):

Ordinary Person


Departments may classify certain installations to a different set of Safety measures :

Skilled Person



Electrical Safety Rules update – Minimum requirements

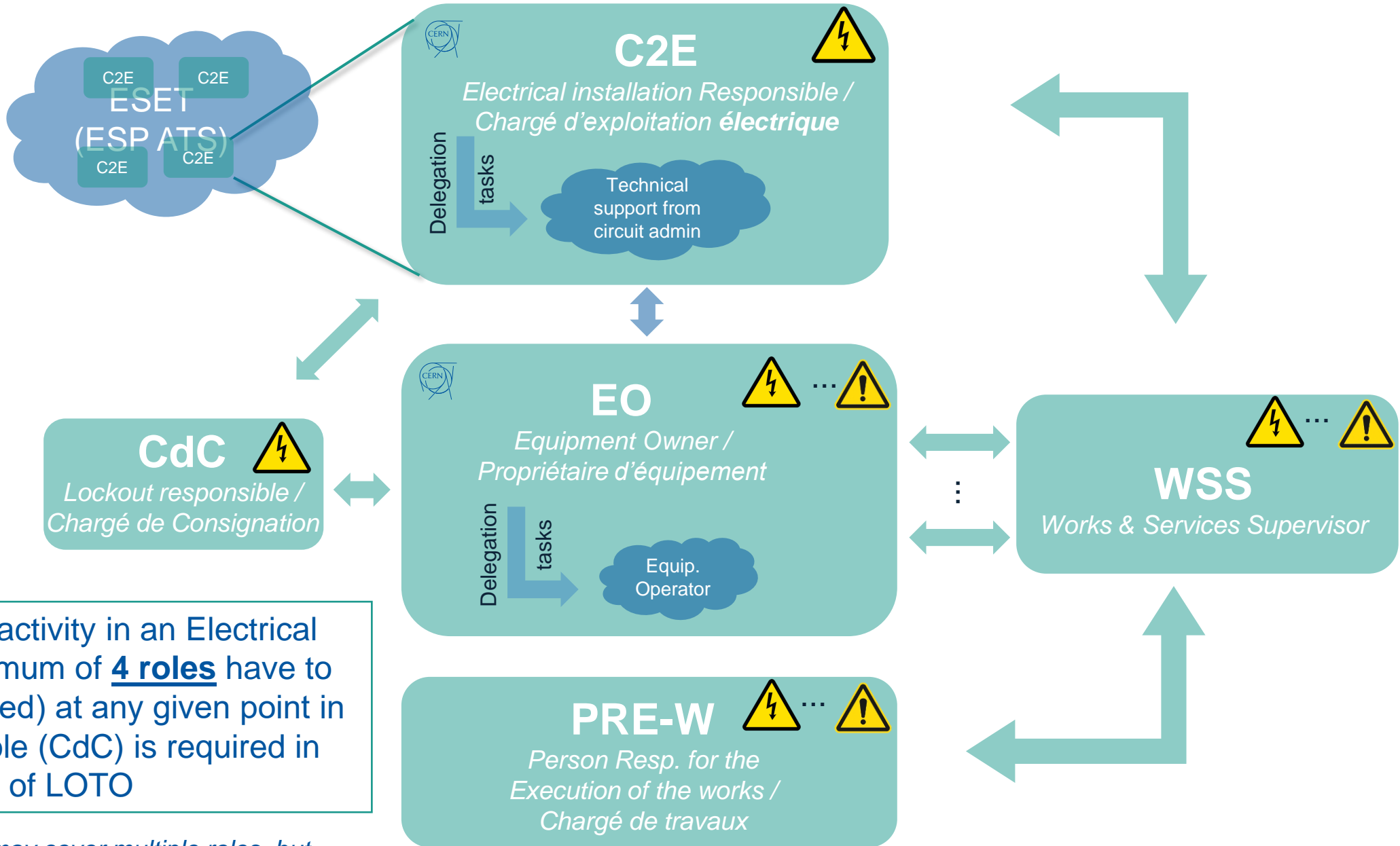
Main assumptions / boundaries



Cover / focus
(exclusively) on the
management of the
electrical risks

Concept outlines the general principles of
the rules – SR-EL will stay **as flexible as
possible** to accommodate the complexity
of CERN's installations and organisation

Titles and names can change,
focus on the principles



For a given work/activity in an Electrical Installation, a minimum of **4 roles** have to 'exist' (and nominated) at any given point in time. Additional role (CdC) is required in case of LOTO

Note: The same person may cover multiple roles, but 'auto-nomination' not possible.

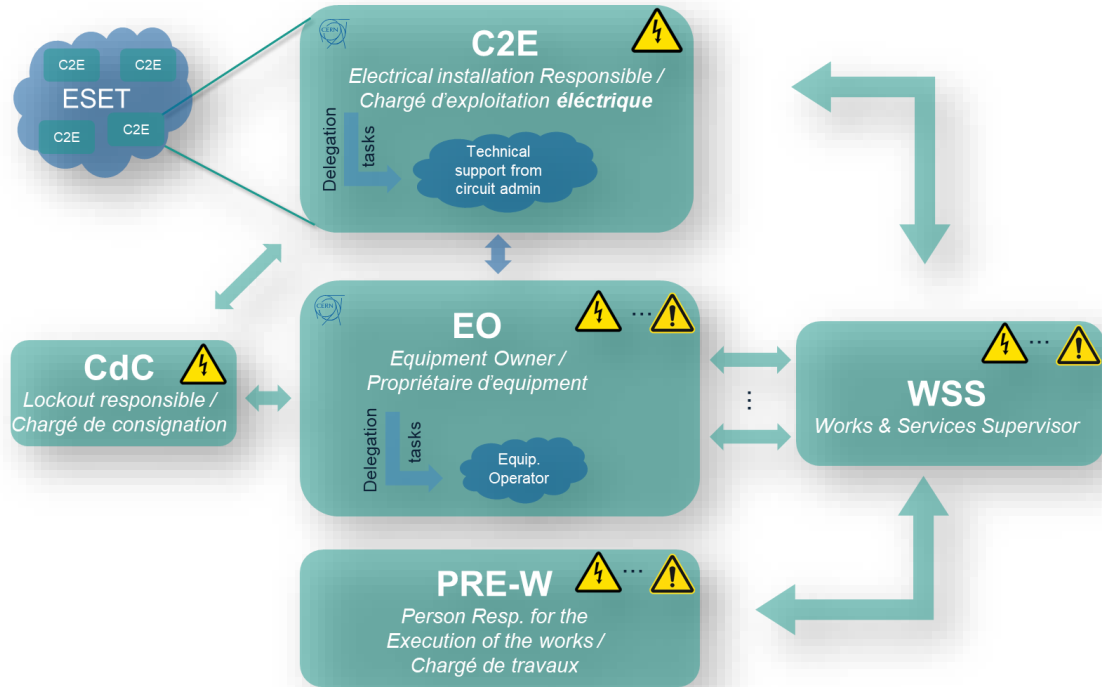
Rules & Implementation

ESP WP 2

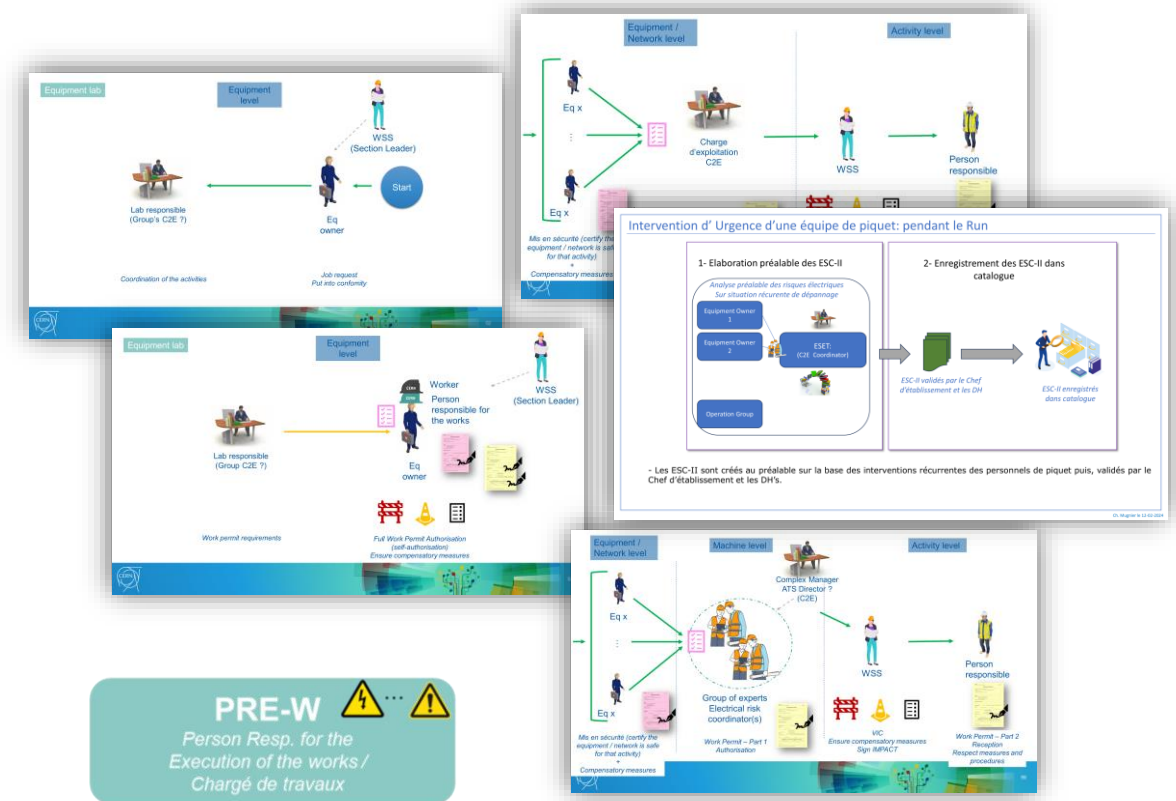
ESP WP 3...6 +
EP, SCE, ..., CERN

- Objective:
 - To keep the Rule ‘as flexible as possible’!
 - Outline the minimum requirements
 - Make sure the n implementation possibilities respect these minimum requirements

Rule (generic)



N implementation options



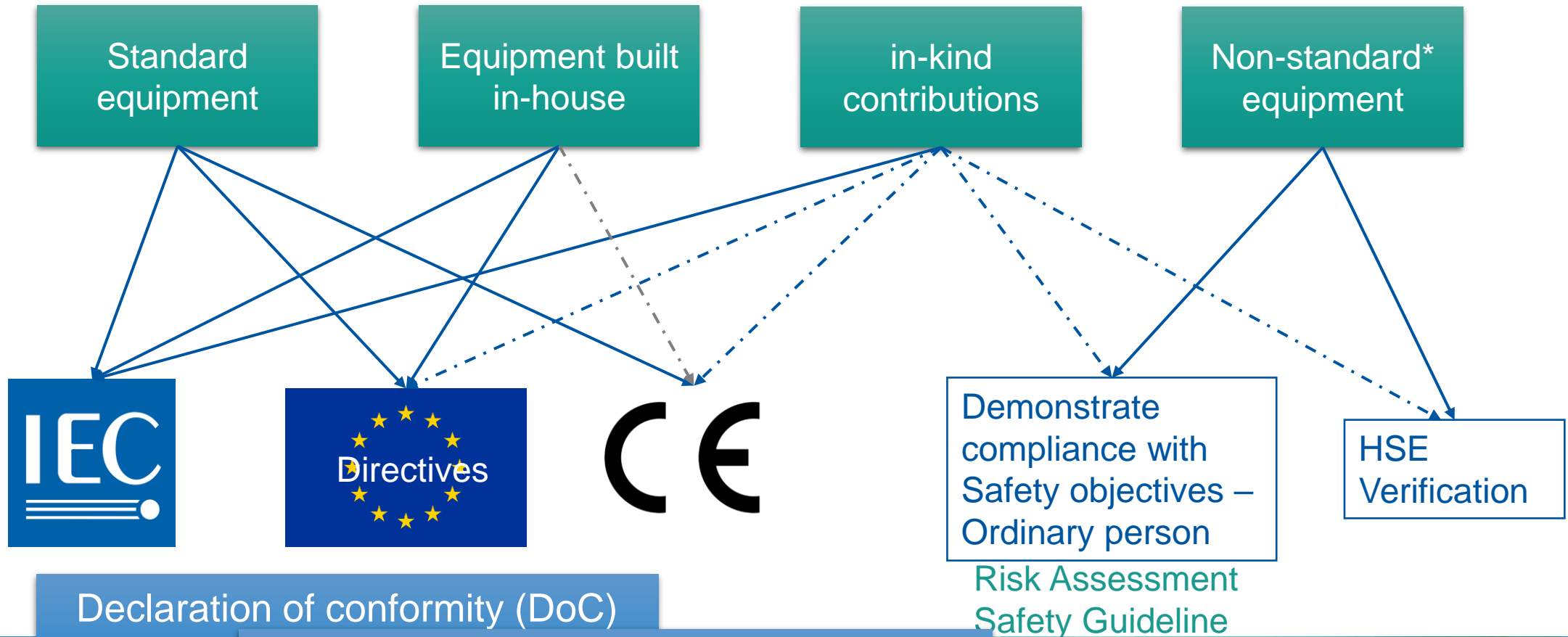
↳ Chargé de travaux (H1B1)
 Chargé de chantier (H0B0)
 Chargé d'opération

...

Design and “certification”

‘Safety by Design’

Electrical Equipment (design / manufacture)



Declaration of conformity (DoC)

signed
'Equ

IEC standards = Safety by Design

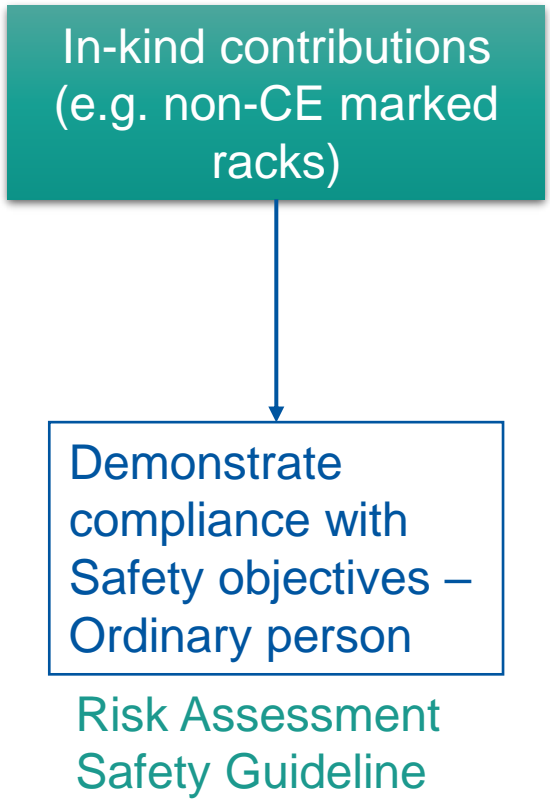
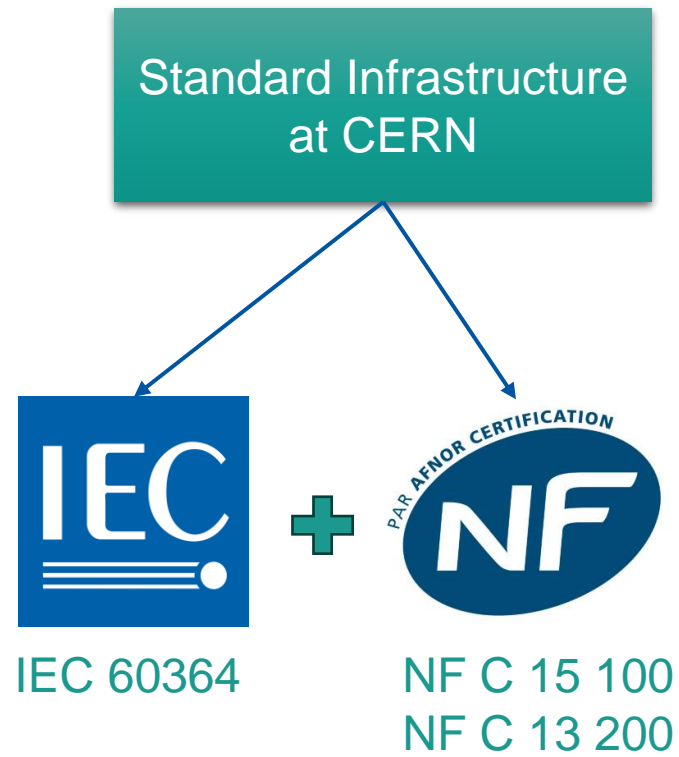
Demonstrate compliance with Safety objectives – Ordinary person

Risk Assessment
Safety Guideline

HSE
Verification

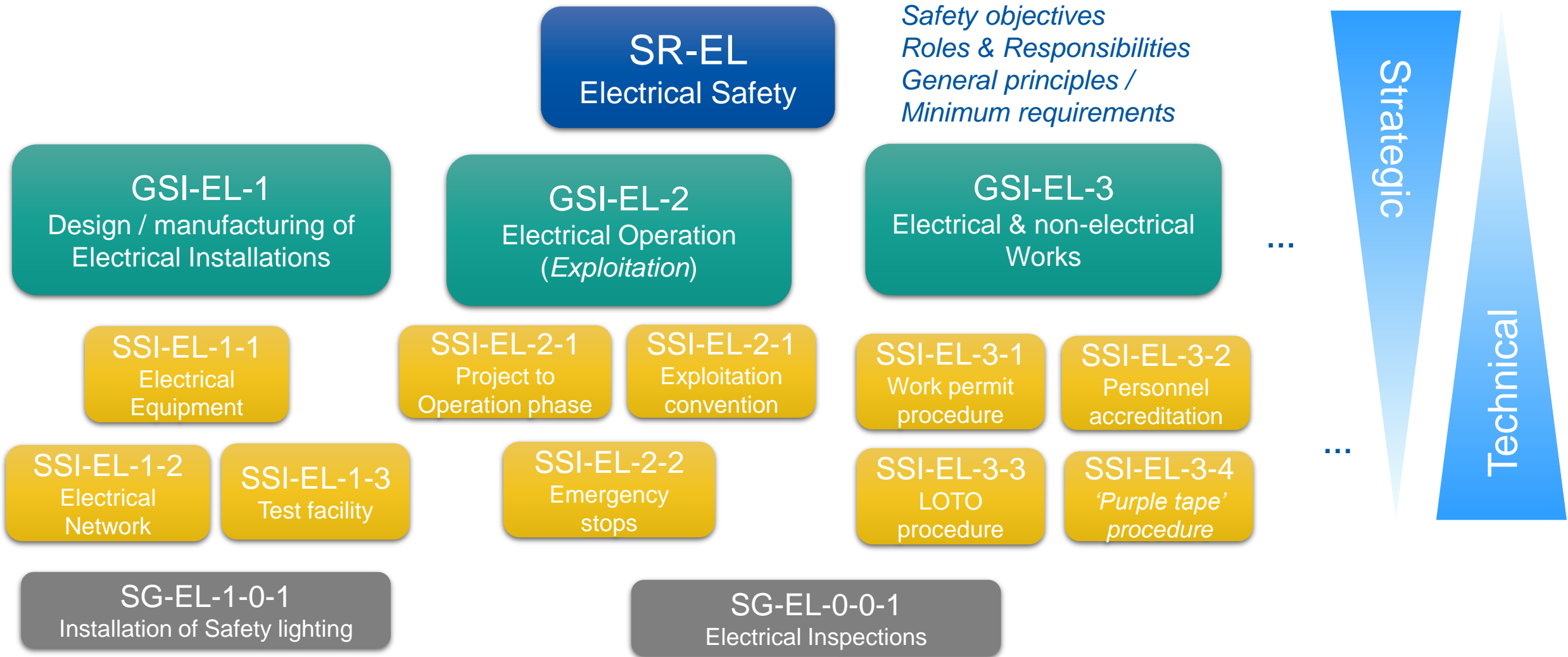
*existing standards not applicable
** in the case it is not signed by a third-party manufacturer.

Electrical Network (design / manufacture)



e.g. circuit breaker on the neutral as well, etc.

New EL Safety Rules cluster proposal



Convergence with stakeholders in 2024

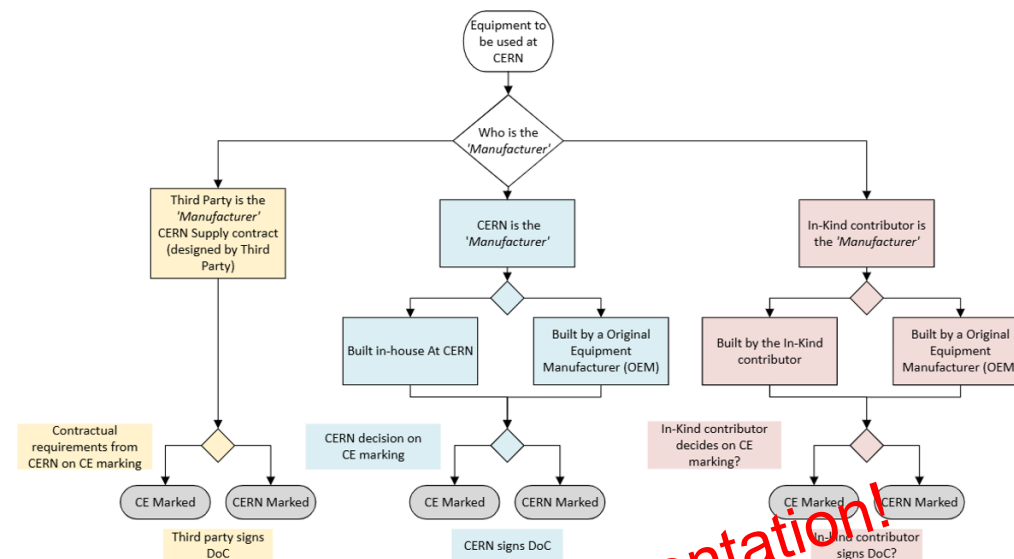
Key points

- 29th January and 6th March: Roles & responsibilities (w.r.t electrical safety) for interventions presented to WP4
- 25th March: 'Electrical safety rules concept' first presentation to WP3
- 24th and 26th June: ESP project team workshop
- Summer 2024: writing ESP document on 'Rôles et Responsabilités dans le cadre ESP WP2 & WP4' (EDMS# 3140941)
- 14th October: presentation about HSE inspections to WP3
- ESP meetings
 - Mutual understanding
 - Invaluable exchanges, particularly with regard to implementation

Convergence with WP3

- Equipment and Installation
- Equipment
 - More and more solid
 - Some key notions: 'Manufacturer', 'Declaration of Conformity', 'Equipment Owner'
- Installation
 - Framework of the HSE Inspections
 - Still discussions, esp. about responsibilities
 - Project Leadership, Installation Ownership (w.r.t C2E)

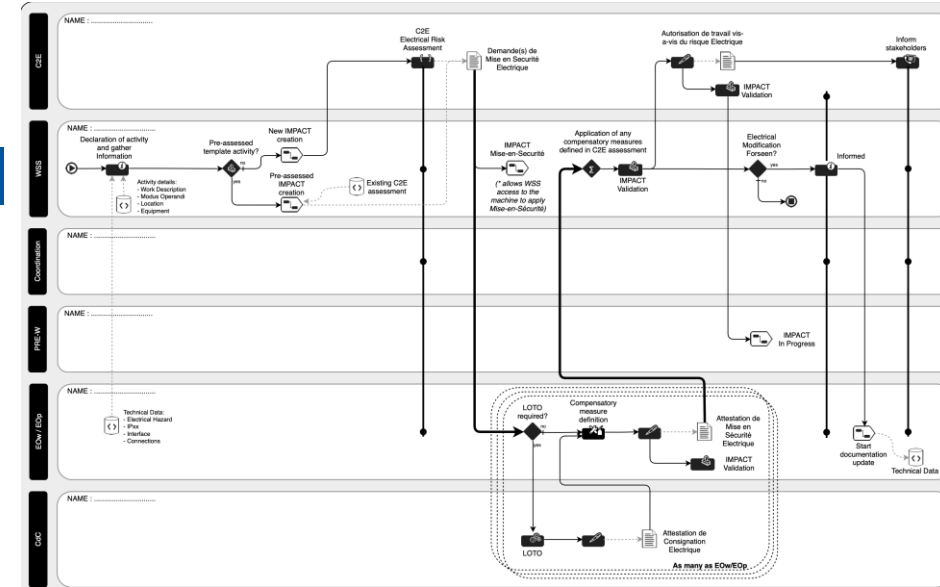
Determining the route to conformity for Equipment



See WP3 presentation!

Convergence with WP4

- The joint effort about roles is essential
- The level of details we collect is instrumental, particularly w.r.t implementation of the rule
 - This is especially the case for the C2E
 - Not a surprise



See WP4 presentation!

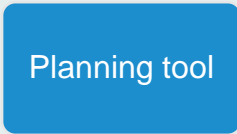

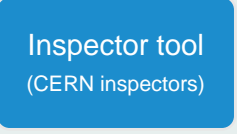
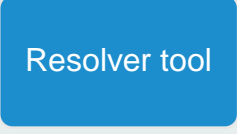
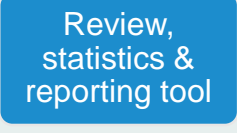
Inspections and Non-Conformities

Inspections and Non-Conformities

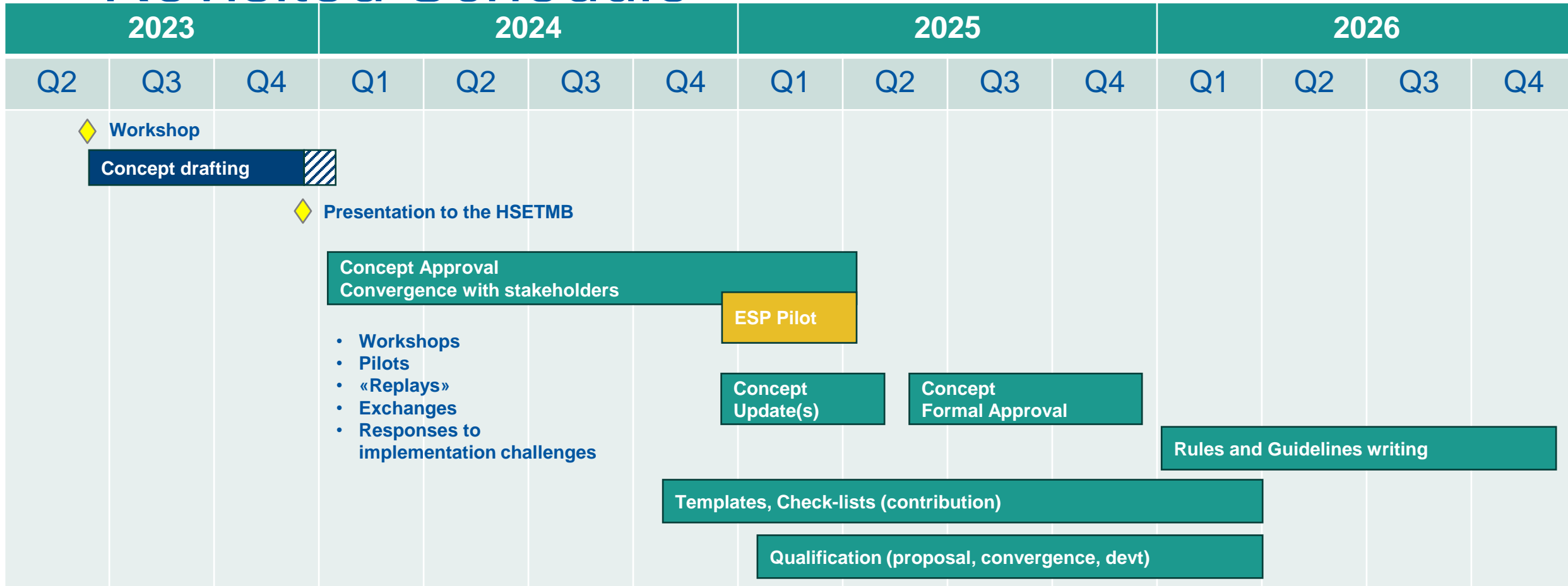
- Dedicated session with WP3 about HSE inspections
- Continuation of the ELECNC SOL project to resolve NCs
- Continuous exchanges with SCE & EN-EL about their “programs of work” (esp. during LS3)
 - **Competent manpower & technical supervision on the field is critical**
- “Backlog” of NCs should decrease dramatically by 2029
- Best approach: **accompanied inspections**
- SAILOR-ELEC
 - All modules in production (except planning tool); all data from periodic inspections will be stored and managed by SAILOR-ELEC by the end of 2024
 - Resolver module: on-going adaptations for EN-EL and SCE
 - Promising collaboration with SY concerning the management with SAILOR-ELEC of their own inspections+NCs on their own equipment

SAILOR-ELEC Safety Inspections Software

HSE Electrical Inspections tools status

SAILOR Tool	Users by role	Core functionality	State
 <p>Planning tool</p>	<ul style="list-style-type: none"> CERN Inspector manager, Project managers PM, Electrical installation owners Contractors 	<ul style="list-style-type: none"> Planning of inspections Agenda of inspections. Sending the invitations to participants. 	<p>Technical specification completed. To be developed</p>
 <p>Importing tool (for contractors)</p>	<ul style="list-style-type: none"> Contractors CERN inspectors 	<ul style="list-style-type: none"> Uploading inspection reports and non-conformities by contractors. Automatic verification of coherence (ex. buildings, installations, etc.) Review and validation of inspection reports by CERN inspectors 	<p>In production since Dec. 2023. Import of all periodic inspections performed since 1st Dec 2023:</p> <ul style="list-style-type: none"> 759 inspections registered 9365 NCs registered <p>Sept. 2024</p>
 <p>Inspector tool (CERN inspectors)</p>	<ul style="list-style-type: none"> CERN inspectors 	<ul style="list-style-type: none"> Writing of inspection reports Inspections and Non-conformities database Automatic upload of inspection reports to EDMS Notification to installation owners Launches non-conformities resolutions: SAILOR-Resolver, InforEAM or ServiceNow 	<p>In production since Dec. 2023</p>
 <p>Resolver tool</p>	<ul style="list-style-type: none"> Electrical installation owners Safety officers 	<ul style="list-style-type: none"> Follow-up and traceability of non-conformities resolution: <ul style="list-style-type: none"> SAILOR-Resolver: traceability of actions to remove the non-conformities. Monitoring the advancement of work-orders/non-conformities in InforEAM Monitoring the advancement of tickets/non-conformities in ServiceNow Alternative tool or complement to InforEAM 	<p>In production since Dec. 2023. 1st registrations of fixed NCs (still very little adoption)</p> <p>EN-EL: adaptations completed (hands-on with real data in Oct. 2024). SCE: adaptations under review. TE-CRG: discussions started</p>
 <p>Review, statistics & reporting tool</p>	<ul style="list-style-type: none"> HSE (involved personnel) Safety Officers (concerned) Installation owners 	<ul style="list-style-type: none"> Visualizes all electrical inspections and non-conformities Search and statistics by several criteria <i>Criteria ex.: time period, status, location, department, type NC, severity, etc.</i> 	<p>In production since 5th June 2024</p>

Electrical Safety Rules Concept Revisited Schedule

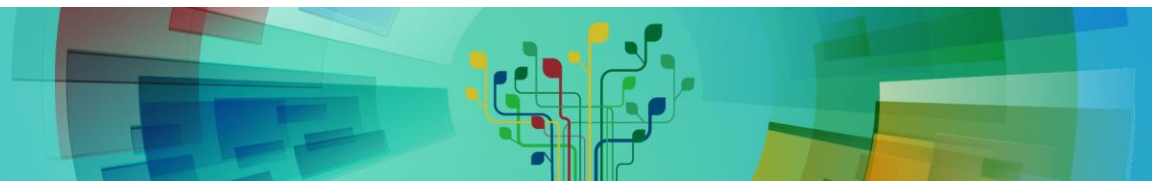


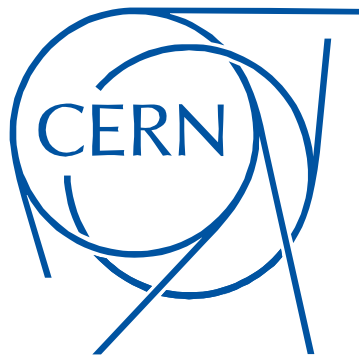
Conclusion

- WP2.1 Rules
 - Electrical Safety Rules Concept covers the main strategic points and general principles of the future SR-EL cluster
 - As expected, exchanges with stakeholders have been and still are instrumental
 - The general principles appear robust. The details collected (incl. pilot) will help to describe implementation challenges (and solutions), keeping in mind the formal concept approval
- WP 2.2 Certification
 - General principles proposed in the Concept above
 - Many progresses, in particular thanks to WP3
- WP 2.3 Qualification
 - General principles proposed in the Concept (not presented today)
 - Many detailed input and ideas collected in 2024, thanks to several ESP contributors
 - Time for proposals from HSE and exchanges with stakeholders
- WP 2.4 Electrical inspections and non-conformities
 - Good progress (ELECNC SOL project and SAILOR-ELEC)
 - Long-term effort with identified challenges (manpower) ahead
- RCS involved in ESP WP2 and this will continue; SCE kept informed
- This effort will be useful for the management of other risks

Many thanks to all contributors!

Questions?





Extra slides



Objective of the ‘Concept’

- Define the ‘General principles’ of the rule’s cluster
- Cover the strategic points and main technical considerations
- Shall cover the needs of all CERN sectors / Departments
- Foresee implementation challenges
- Basis for the writing of the rules



Safety Code C1

IS 24, IS 5 Issued in 1990



+30 years of lessons learnt

Revision of Electrical
Safety Rules.
Replaced by a ‘cluster’

Conclusion

- WP2.1 Rules
 - Electrical Safety Rules Concept covers the main strategic points and general principles of the future SR-EL cluster
 - Choices considered possible implementation challenges, lessons learnt and input from previous WGs
 - Time for detailed exchanges with stakeholders!
 - ESP contributors (esp. WP3 & WP4) will be instrumental
 - RCS already involved and this will continue
 - SCE will be informed (contribution welcome)
- WP 2.2 Certification & WP 2.3 Qualification
 - General principles proposed in the Concept above
 - Detailed input to be collected in the coming months
- WP 2.4 Electrical inspections and non-conformities
 - Good progress (ELECNC SOL project)
 - Long-term effort with identified challenges ahead

Presented in Dec. 2023

Classification of personnel vis-à-vis electrical domain

skilled person, <electricity> (*Personne qualifiée*)

person with relevant education, knowledge and experience to enable them to analyse risks and to avoid hazards which electricity can create

Source:

**EN 50110 and
NF C 18 510**

instructed person, <electricity> (*Personne avertie*)

person adequately advised by a skilled person to enable them to perceive risks as instructed and to avoid hazards which electricity can create

ordinary person, <electricity> (*Personne ordinaire*)

person who is neither a skilled person nor an instructed person

Electrical Equipment (design / manufacture)

• CE Marking

- CE mark is a label, what is important is the respect of the Essential Health & Safety Requirements (EHSR) from the Directives which point to the IEC standards
- CE marking mandatory for:
 - Standard products from suppliers or in-kind contributions
- For Equipment built in-house **for use in-house**, the Declaration of Conformity is issued by the DH
- In-kind contributions from associated members states outside EEA, the Declaration of Conformity (with the CERN rules) is issued by Institute
- Applicable directives: LV and EMC
 - Self-declaration: i.e. no need for a notified body

CE mark: Label on the product (visually) indicating that it has been assessed to meet the highest standards, when traded on the EU single market.

CE marking issued by 'manufacturer'. Manufacturer is the one '**placing on the market**' or '**putting into service**'.

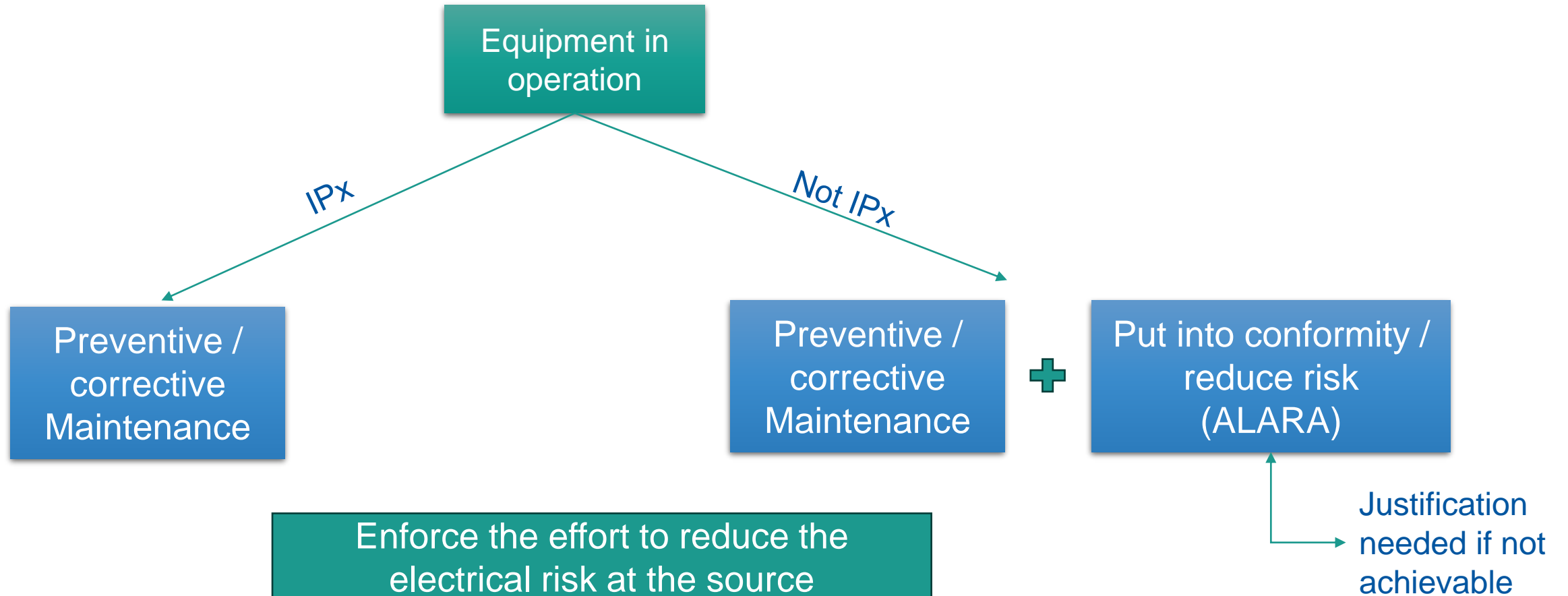
'Declaration of conformity': statement declaring that the product complies with the safety requirements (EU Directives or CERN-specific based on a risk assessment).

CERN rules:
Default requirements

+ flexibility for special cases (risk assessment, verification by HSE, etc)

Electrical Equipment (maintenance)

Courtesy A. Henriques





Roles & Responsabilités – WP4



C2E

Délivre l'Autorisation de Travail **elec**
Demande l'Attestation de mis en securité /
consignation

~~Délivre l'Attestation de consignation~~
~~Délivre l'Attestation de mise en securité~~



Circuit
admin

~~Délivre l'Autorisation de Travail elec~~
~~Délivre l'Attestation de mise en securité~~
Support au C2E (analyses des risques,
identification, procédures, protocoles, etc)



EOw

~~Délivre l'Autorisation de Travail elec~~
~~Délivre l'Attestation de consignation (via CdC)~~
~~Délivre l'Attestation de mise en securité~~



EOo

~~Délivre l'Autorisation de Travail elec~~
Délivre l'Attestation de consignation (via CdC)
Délivre l'Attestation de mise en securité
Support aux C2E (p.e. sur LOTO à quel niveau)



WSS

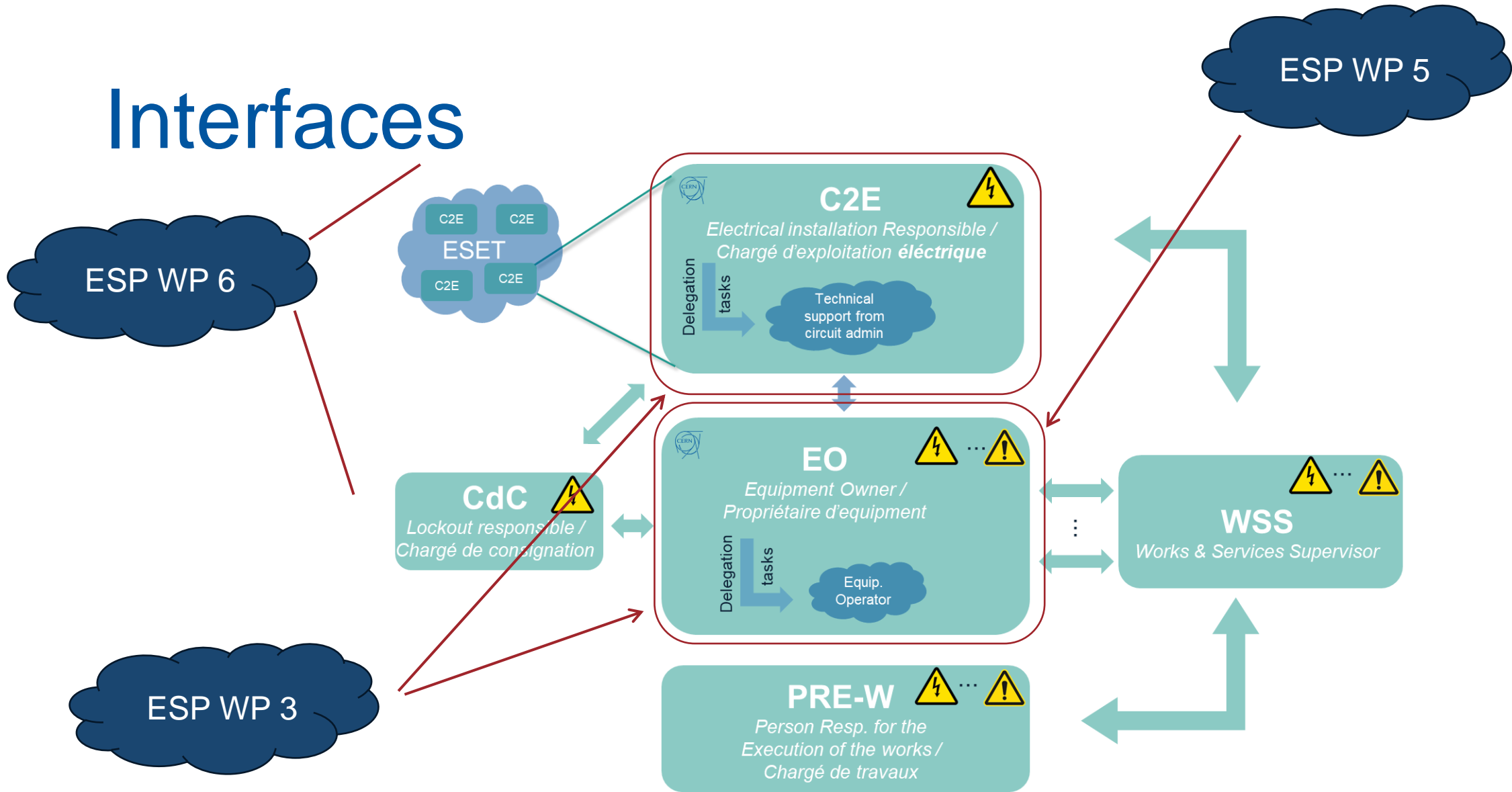
~~Délivre l'Autorisation de Travail elec~~
~~Délivre l'Attestation de mise en securité~~
Demande d'intervention au C2E (elec ou non-elec)
Organise les VIC
Lien entre l'Installation et les exécutants
(binôme avec PRE-W)



PRE-W

Accepte l'Autorisation de Travail **elec**
~~Délivre l'Attestation de mise en securité~~
~~Demande d'intervention au C2E~~
Déclare fin des travaux
Lien entre les exécutants et l'Installation
(binôme avec WSS)

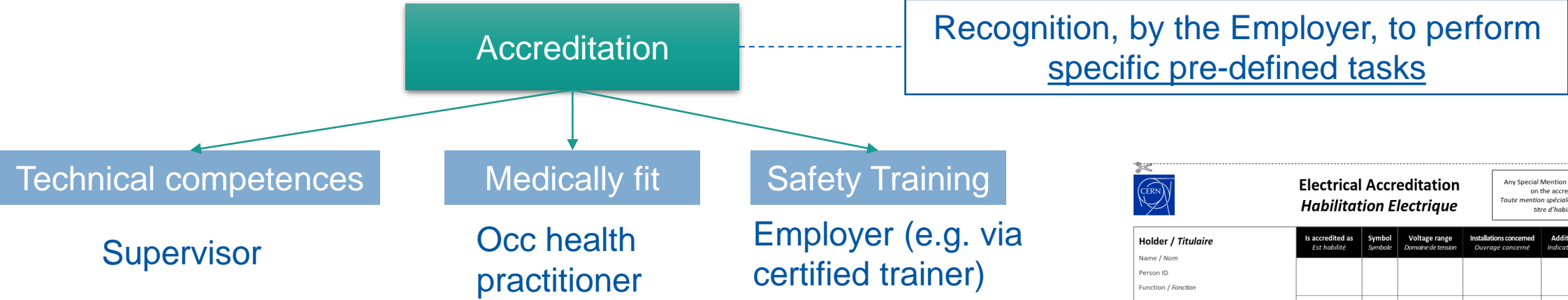
Interfaces



Personnel Accreditation / Certification (*Habilitation elec.*)

Personnel Accreditation / Certification (*Habilitation elec.*)

- Personnel should be certified to perform the specific works



Who signs as the employer? 'Supervisor'

MPE – Org. Unit (hierarchy – SL, GL, DH)
 MPA – Institute (Team Leader or Safety Correspondent)
 ENTC – Contractor (responsible person)

Electrical Accreditation
Habilitation Electrique

Any Special Mention must be included on the accreditation.
Toute mention spéciale doit figurer sur le titre d'habilitation.

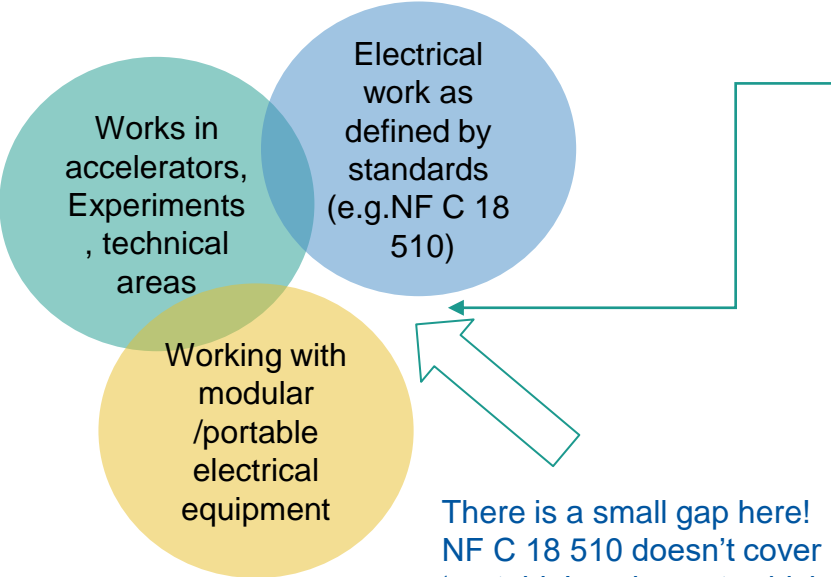
	Is accredited as <i>Est habilité</i>	Symbol <i>Symbole</i>	Voltage range <i>Domaine de tension</i>	Installations concerned <i>Ouvrage concerné</i>	Additional information <i>Indication supplémentaire</i>
Holder / Titulaire					
Name / Nom					
Person ID					
Function / Fonction					
Signature					
Group Leader / Chef de groupe					
Name / Nom					
Date					
Signature					
Validity / Validité <small>3 years recommended</small>					

LDM5 200845 v.2.2.0

Personnel Accreditation / Certification (*Habilitation elec.*)

Safety Training

- Awareness of the electrical risk
- Work organization ★



There is a small gap here! NF C 18 510 doesn't cover 'portable' equipment, which is most of what we have installed in racks (e.g. in Experimental areas) !

Referential for training?

- **CERN employees**, NF C 18 510 shall be followed, *with the addition of* ★ **CERN-specific content** for the training material.

Possibility for certain flexibility in well-identified cases:

- Equivalent accreditation for “activities in experiments” (EP approach: tailored training course)

* ~90% 'electrical works' in EP fall outside of the scope – covered by “Activities in experiments”

- **MPA – NF C 18 510, by default ***

- Additional requests:
 - CERN to provide the training 'service' -> **CERN content**
 - Flexibility allowed for 'short duration works' (< 5% of the remaining 10 %)
- Allow for accreditation from the home institute + risk assessment + compensatory measures...

- **ENTC – Applicable Laws (4P)**

- FR law (Code du Travail) + **CERN specific info**
- CH law (OIBT) + **CERN specific info** ★

★ **CERN-specific content / info is important ?**

Personnel Accreditation / Certification

- Accreditation / Certification is issued by the employer (via the Supervisor), delivered to a person certified to perform a specific task
- Safety Training is 1/3 !

- For MPE → NF C 18 510 (CERN-specific content embedded)
- For ENTC → Applicable Laws (4P) + CERN specific info
- For MPA → NF C 18 510 (CERN-specific content embedded) & flexibility for 'short duration works'
 - *If CERN can deliver training 'service' ?*

Personnel Accreditation / Certification (*Habilitation elec.*)

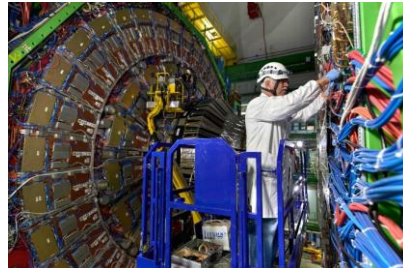
★ Why CERN-specific content / info is important ?

Infrastructure

Worksite

CERN Infrastructure / Organisation w.r.t elec risk

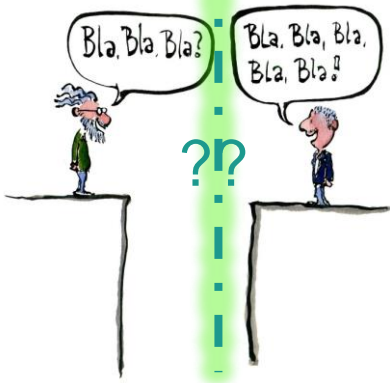
CERN / ENTC / ... : NF C 18 510 or EN 50110 or OIBT or ???



C2E



Eq owner



Person resp.



Worker

Needs:

- Workflow of the GSI-EL-2 in the contracts
- e-learning
- Recorded in DB
- ?



Timeline for SR-EL

