Securing the innovation through voluntary certification

Case : Batteries for electric vehicles

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Absence of regulations for new technologies

Absence of detailed regulations for new technologies (hydrogen, nanomaterials, batteries for EV, biogaz, CCS, shales gaz,…)

A need of demonstators to validate concepts

⇒ How to assess the security of demonstrators in the absence of regulations ?

⇒ How to share the knowledge about risks due to new technologies ?

⇒ How to have an independent assessment of risks ?

Voluntary certification

Aim of voluntary certification :

- To have an independent and external assessment of risks according to clear guidelines

Voluntary certification can rely on :

- standards (for instance INERIS voluntary certification on functional safety rely on IEC standards….)

- Guidelines written by the certification body

Voluntary certification

INERIS guidelines are set up by a committee gathering all stakeholders:

- Manufacturers
- Users
- Administration
- Experts
- NGO : consumer organizations,…

Guidelines can be a set of tests, a training scheme, a method to evaluate the performance of a security system,…

Standardization

Standardization and volontary certification are closely linked :

- Knowledge developped in voluntary certification is a relevant input in standardization committee
- Voluntary certification can rely on standards

CEN's STAIR initiative *: An Integrated Approach for Standardization, Innovation and Research :*

- standardization does not come as an afterthought
- standardization is built into a project proposal right at the start.

To sum up :

Controlling risks due to new technologies :

Case of batteries for Electric Vehicle (EV and PHEV)

Current situation :

- No international standards for testing batteries for Electric Vehicle
- Discussions on test procedures for vehicle homologation still on going
- Each car manufacturer has its own test requirements

INERIS's response :

- INERIS initiated the development of guidance for a safer innovation regarding batteries for EVs and PHEVs
- The **ELLICERT Certification Scheme** has been elaborated by a group of stakeholders led by INERIS. It is a voluntary type certification concerning Lithium based cells and packs for EVs and PHEVs
- The ELLICERT Certification Scheme was formally approved by the Certification Committee on October 2010

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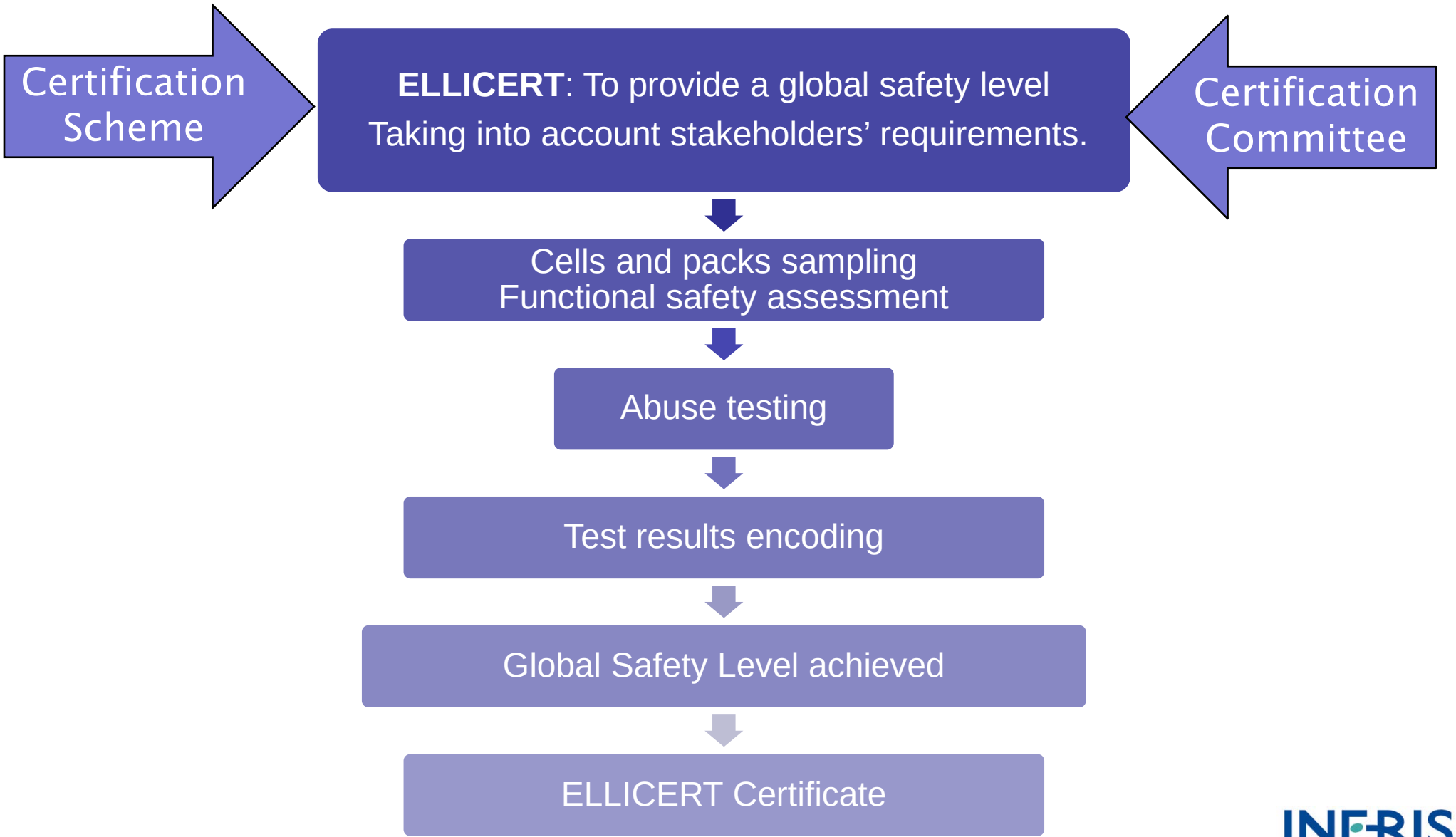
ELLICERT Certification Scheme



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ELLICERT Certification Scheme

The ELLICERT Certification Committee

- Proposes any modifications to the certification scheme,
- Approves the certification scheme,
- Ensures INERIS' expertise in the fields covered by this certification scheme,
- Handles complaints from applicants who disagree with INERIS as regards the decisions reached.

ELLICERT Certification Scheme

The ELLICERT Certification Committee

- College **Manufacturer** (of cells or packs)
- College **Users** (of cells or packs)
  - Automotive manufacturers (and other types of vehicles)
  - OEMs
  - Fleet Managers ...
- College **Administration**
  - French Ministry of Industry
  - French Ministry of Environment
- College **Experts**
  - Technical Union for the Automobile, Motorcycle and Cycle Industries
  - EDF, Non Governmental Organisations ...
- College **Certification Body** (INERIS)

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ELLICERT Certification Scheme

Cells and packs sampling - Functional safety assessment

- For cells
  - 33 pieces to be tested
  - No specific SOC required, but may be adjusted prior testing
  - No specific ageing required

- For packs
  - Preliminary testing on cells may be required
  - BMS safety integrity level will condition the testing configuration
    - *reliable independent assessment according to IEC 61508 or ISO 26262 is required*
  - Number of samples to be tested depends of BMS safety integrity level

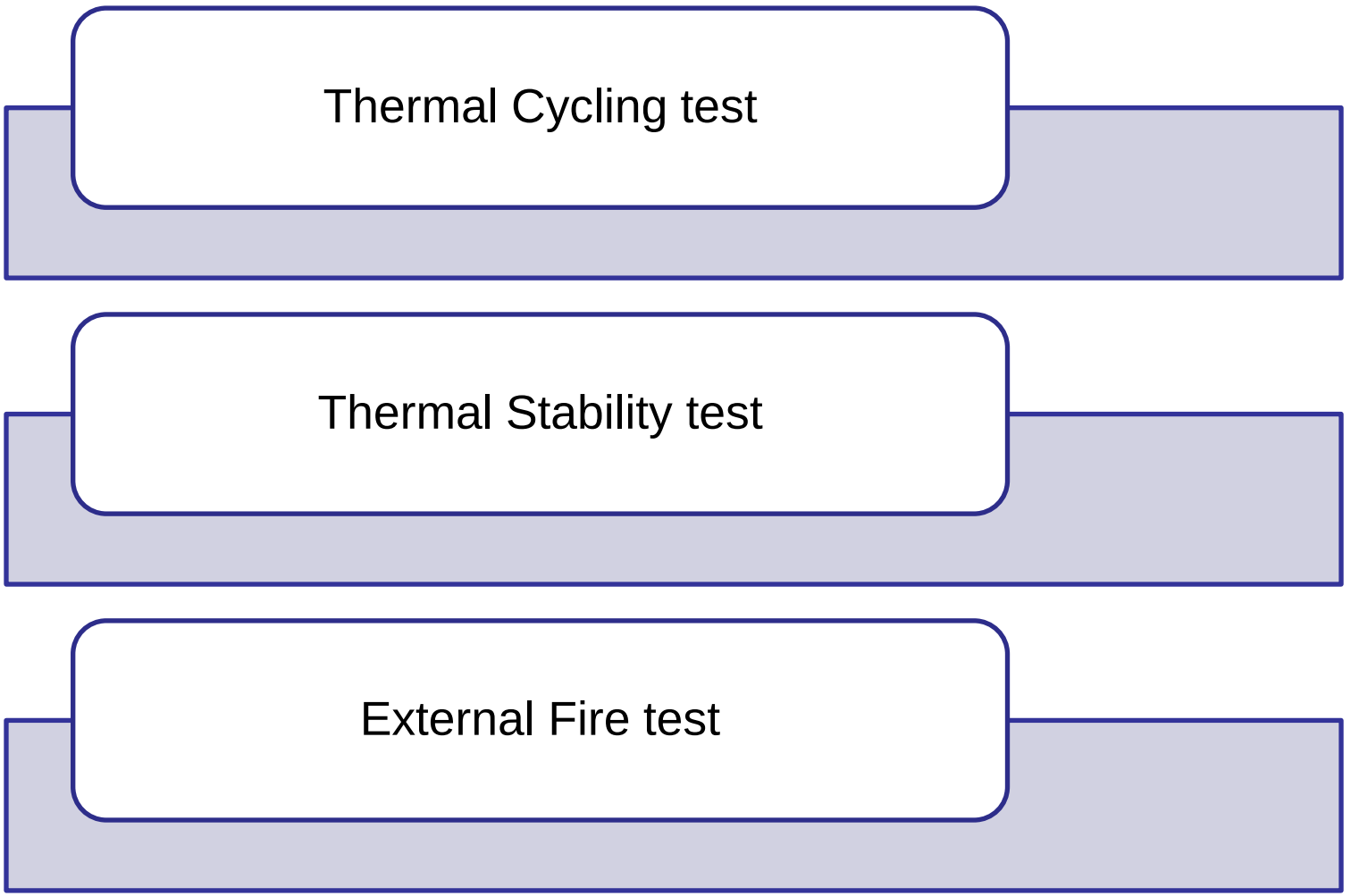
Mechanical Abuse Tests

- Crush test
- Penetration test
- Immersion test
- Drop test
- Vibration test
- Shock (Jolt) test
- Low pressure test

Electrical Abuse Tests

- Forced Charge test
- Forced Discharge test
- External Short-Circuit test

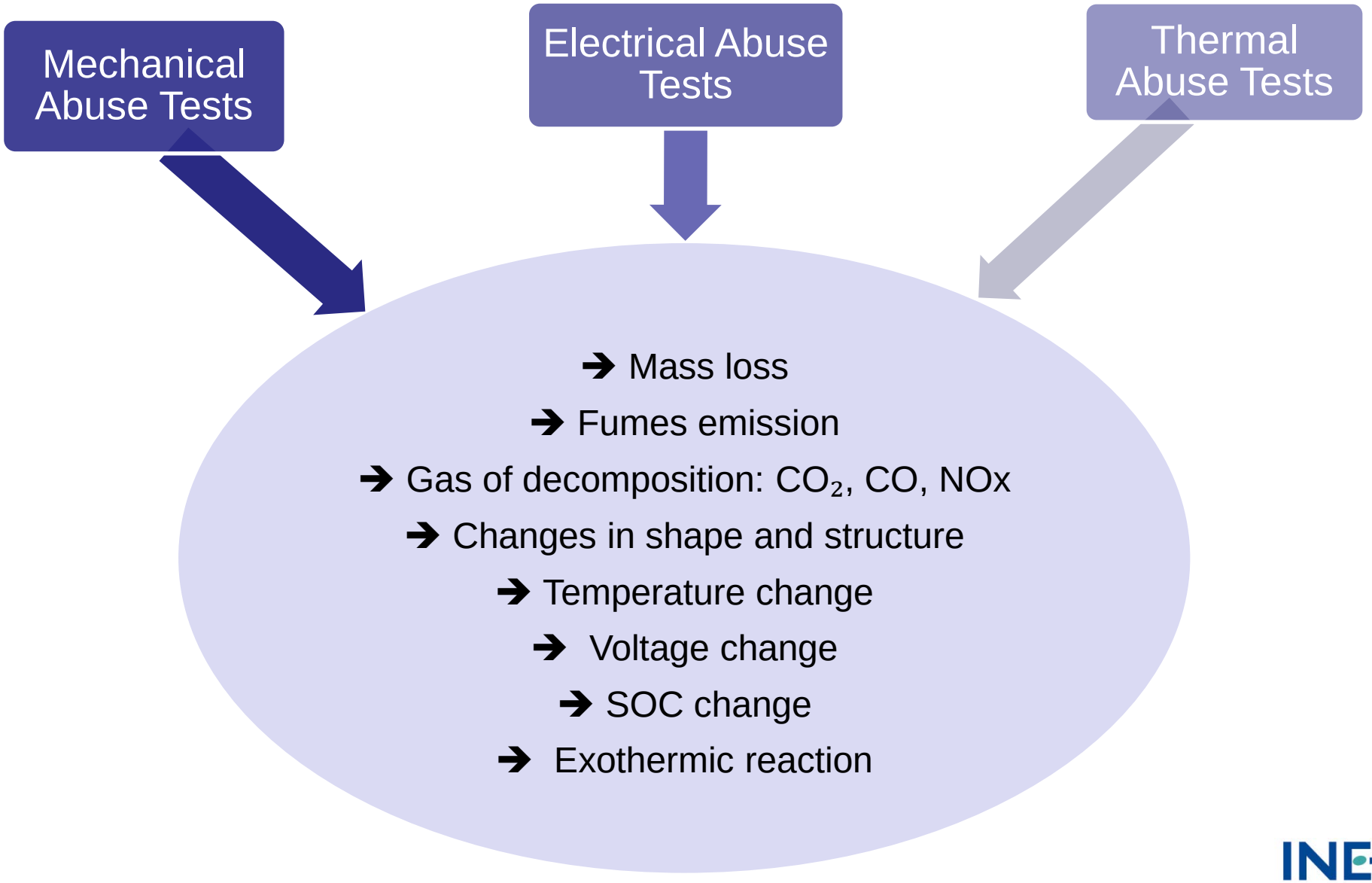
Thermal Abuse Tests



Main sources and References for the tests

- SAE Standard SAEJ2464 Nov 2009
  EV and HEV Rechargeable Energy Storage System (RESS) Safety Abuse Testing
- Manual of Tests and Criteria (transport of dangerous goods)
  Document ONU ST/SG/AC. 10/11/REV.5 (2009)
- United States Advanced Battery Consortium Electrochemical Storage System:
  Abuse Test Procedure Manual. USABC/SNL CRADA N° SC961447 and other USABC documents
- European Standard EN 62281:2004
  Safety of primary and secondary lithium cells and batteries during transport
- International Standard IEC 61982
  Secondary batteries for the propulsion of electric road vehicles
- ISO/CD 12405
  Electrically propelled road vehicles - Test specification for lithium-ion traction battery systems

Parameters monitored for the assessment



Effects encoding

Test results are classified according to the following levels

Level	Description	Classification criteria
0	No effect	No effect, no loss of function.
1	Passive protection enabled	No danger, no damage, reversible function loss. Replacing or refurbishing the protection mechanism is enough to return to normal operation.
2	Defects, irreversible damage	No danger, but damage and an irreversible function loss. Replacement or repairs are required.
3	Minor leak / Gas release	Slight leaks, without fire or flame or explosion. Weight loss < 50% of electrolyte weight.
4	Major leak / Gas release	Major leaks, without fire or flame or explosion. Weight loss ≥ 50% of electrolyte weight.
5	Bursting	Bursting without violent projections or explosion.
6	Fire presence	Continuing inflammation and combustion.
7	Explosion	Complete object breakdown, violent projections.

Safety Classes

Three global safety classes are defined A, B et C

- For each class levels of acceptable effects are defined,
- Class A is the best class: levels of acceptable effects are the lowest
  - Example for forced charge test and crush test

	Acceptable level for cells and packs of class A	**Acceptable level for cells and packs of class B**	**Acceptable level for cells and packs of class C**
Forced Charge	**2**	**2**	**3**
Crush	**2**	**3**	**4**

ELLICERT Certification Scheme

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