ESCCON 2019 REACH update – Impact on availability of components for Space in Europe

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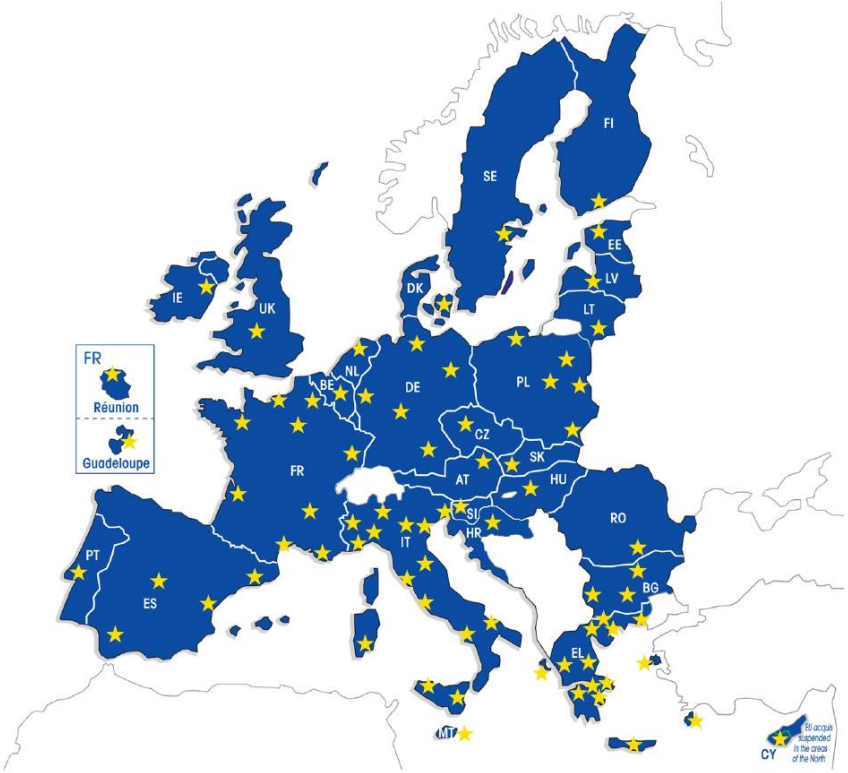
INTRODUCTION TO REACH

Introduction – REACH 1/3

Main purpose is to

ensure a high level of protection of human health and the environment

in relation to the use of chemical substances. *



* EU Regulation 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the registration, evaluation, authorization and restriction of chemicals (REACH)

Introduction – REACH 2/3

Registration, **E**valuation, **A**uthorisation and Restriction of **Ch**emicals

- Addresses potential impacts of chemicals to human health and on the environment
- And production & use of chemical substances.

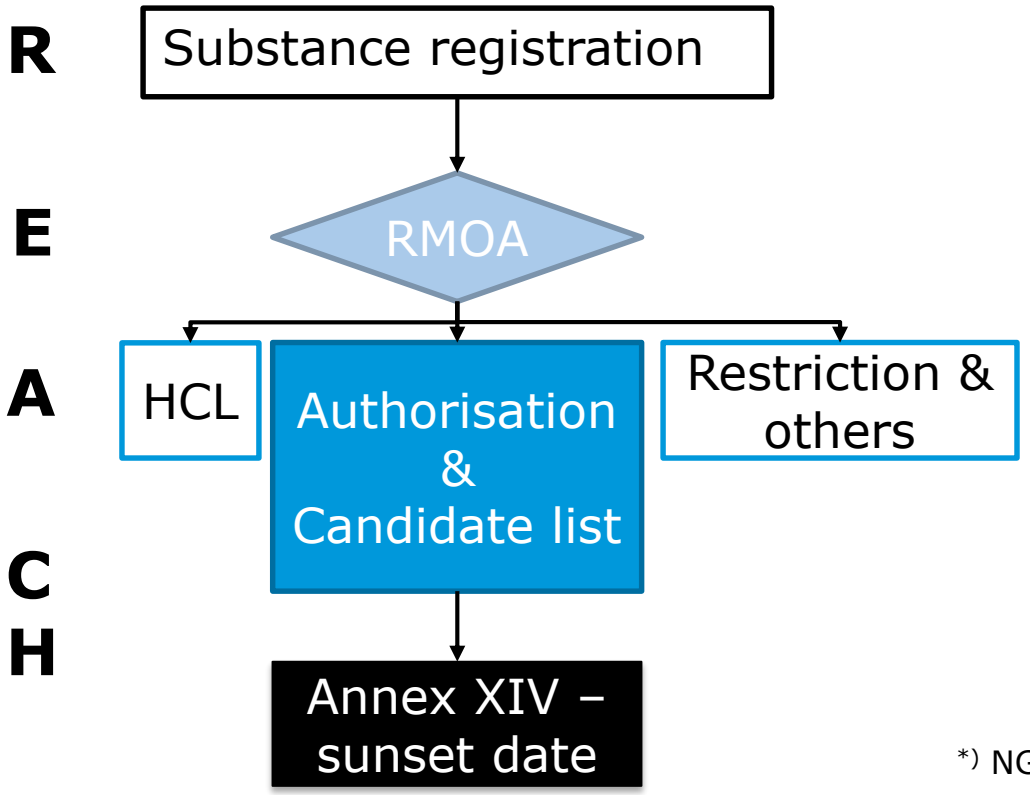
Strictest law to date regulating chemical substances.

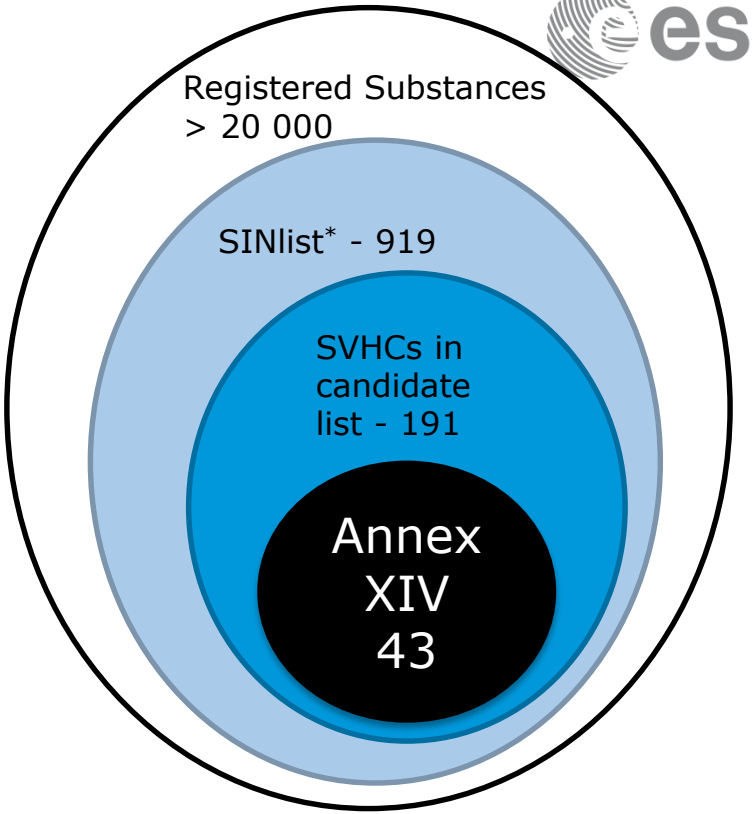
- many chemical substances will face ***regulatory*** ***or*** ***commercial*** ***obsolescence***, causing widespread impacts to downstream users.

Very desirable and ambitious regulation to contribute to a safer and healthier environment

but causes wide-reaching engineering and management challenges for the space sector which is by nature driven by performance and heritage design.

Introduction – REACH 3/3





*) NGO driven, using criteria from REACH to identify Substances of Very High Concern (SVHC).

PRACTICAL OBSOLESCENCE RISK MANAGEMENT

Impacts of REACH on a Space Supply chain

1. Directly affects the entire industrial sector through obsolescence of materials, processes, and technologies at unprecedented scale
2. REACH needs to be taken into consideration already in the design phase (Obsolescence risk management and planning)
3. REACH will affect the project even after manufacturing (fueling, pyrotechnics, repairs, recurrent models, …)
4. Project duration also increases uncertainty and risk (one-off satellite payload versus multi-decade launcher program)
5. Not only a compliance matter, but risk management in a niche market.

Cross-sectorial management within space community required

European-wide coordination through MPTB

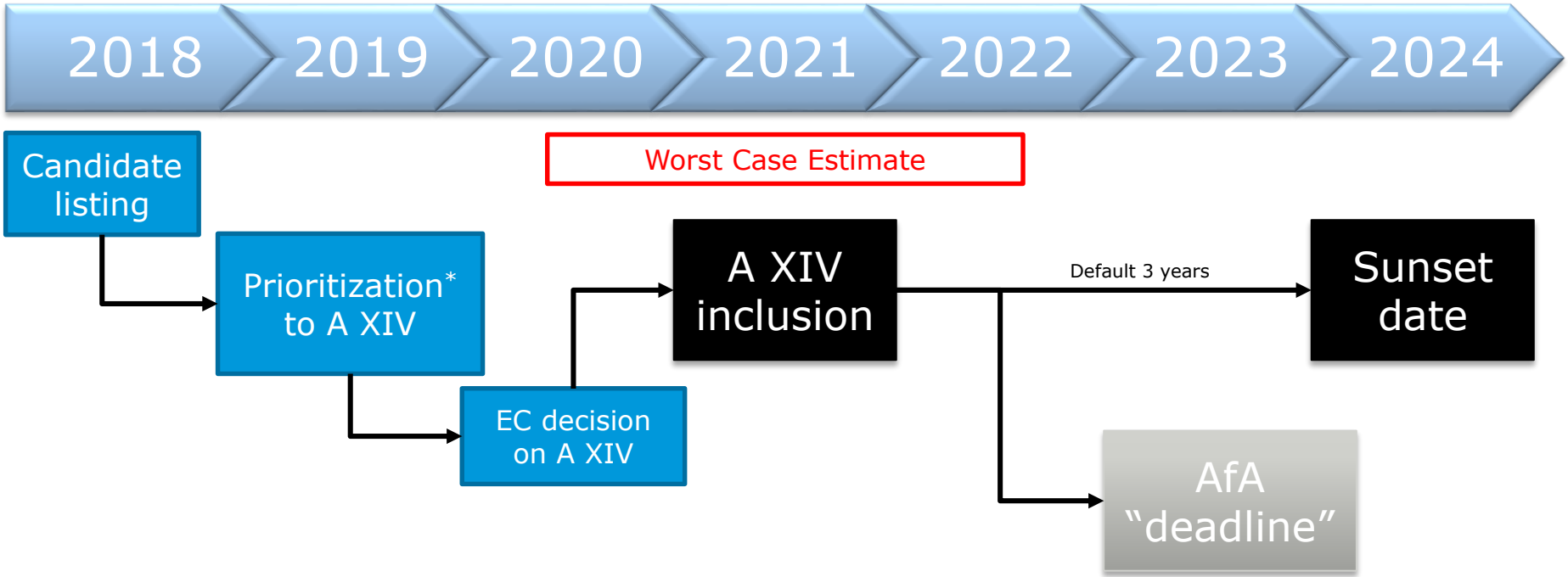
REACH is affecting European space industry as a whole. Coordination and information exchange of risk analysis and mitigation is to the benefit of the entire community.

The **Materials & Process Technology Board** is a European platform that includes the major industrial partners and space agencies. Tasks include:

- Legislation: Intelligence of legislative processes (e.g. REACH, RoHS) and coordination of actions.
- Obsolescence risk management: Identify in advance critical materials and processes.
  Propose action plans to mitigate obsolescence risk of Materials & Processes.
  Reduce programmatic risks and costs by early replacement.
- Data exchange: Share materials test data and avoid test duplication.
- R&D activities: Coordination of R&D activities, monitoring of alerts, analysis of in-orbit anomalies, *etc.*
- Communication & information exchange: Coordination of information via symposia, WGs, training. Development of synergies with other industrial sectors.
- Splinter activities: Chromate space task force, hydrazine task force, European Space Materials Database (ESMDB) steering board
- Standardisation: Provide inputs to European Space Standards (ECSS) – for example new obsolescence management handbook (ECSS-Q-HB-70-23A)

CASE STUDY: LEAD (PB) METAL)

Example timeline of REACH authorisation (Pb)



*) Swift prioritization likely due to large volume / mass of use

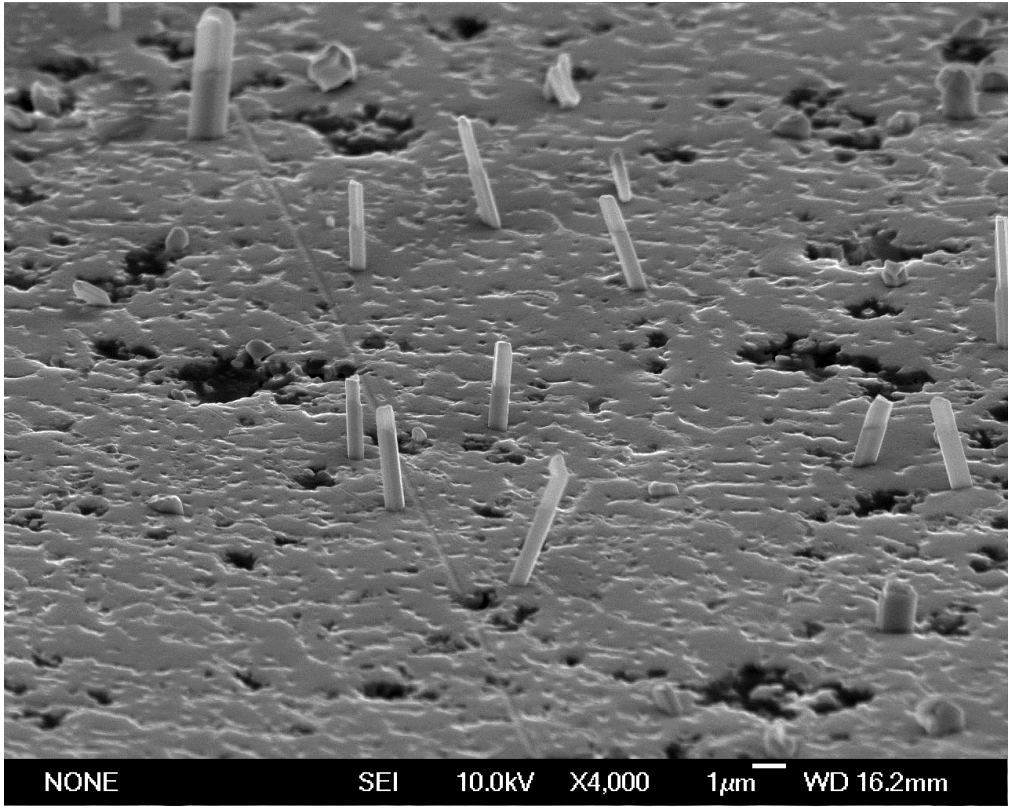
Authorisation normally granted for 4-12 years.

Tin Whiskers 1/2

- Tin whiskers are electrically conductive, crystalline structures of tin that sometimes grow from surfaces where tin (especially electroplated tin) is used as a final finish. Tin whiskers have been observed to grow to lengths of several millimeters (mm) and in rare instances to lengths in excess of 10 mm.[1]
- Numerous electronic system failures have been attributed to short circuits caused by tin whiskers that bridge closely-spaced circuit elements maintained at different electrical potentials.
- Mechanisms causing tin whisker growth are not fully understood even though the phenomenon has been known for 70 years.
- Lead (Pb) metal inhibits the growth of Tin Whiskers for reasons that are not fully understood.

[1] https://nepp.nasa.gov/whisker/background/index.htm

Tin Whiskers 2/2



Images: Dr. Henry Begg, TWI.

Joint Working Group for Pb-free transition

During 2019, ESCC CTB and MPTB have formed a **joint working group** that has the following goal:

- In the domain of EEE components, electronic assembly technologies and PCBs, ensure a successful industry-wide transition to a Pb-free technology while preserving or improving current level of quality and reliability, including but not limited to:
  - Tin-whisker mitigation and risk assessment
  - Lead-free solders and assembly processes
  - Accelerated tests for verification of Pb-free materials and processes and qualification of components, and
  - Acceptance criteria for Pb-free materials, processes and components
- Objectives: Identify the necessary activities and objectives to fulfill the before mentioned strategic goals, with
  - measurable outcomes indicating successful completion (e.g. TRL),
  - including schedules and budgets,
  - and their interconnections and dependencies.
- A lead-free transition plan composing of:
  - Materials and EEE parts selection
  - Supplier compliance and guidelines for procurement
  - Changes in assembly processes
  - Reliability assessment and key reliability risks in lead-free electronics

OTHER TOPICS OF HIGH IMPORTANCE

RoHS2 – inclusion of Indium Phosphide

- Indium Phosphide is currently assessed to be included to the RoHS2 directive for use in commercial electronics.

- This would cause a significant commercial obsolescence risk in areas of photonics and photovoltaics.

- Microwave devices have already started mitigation activities when InP was included to the **Annex VI** of the REACH regulation together with Gallium Arsenide (GaAs).

- Situation is being monitored in the ESCC MPTB.

Conflict minerals (Regulation (EU) 2017/821)

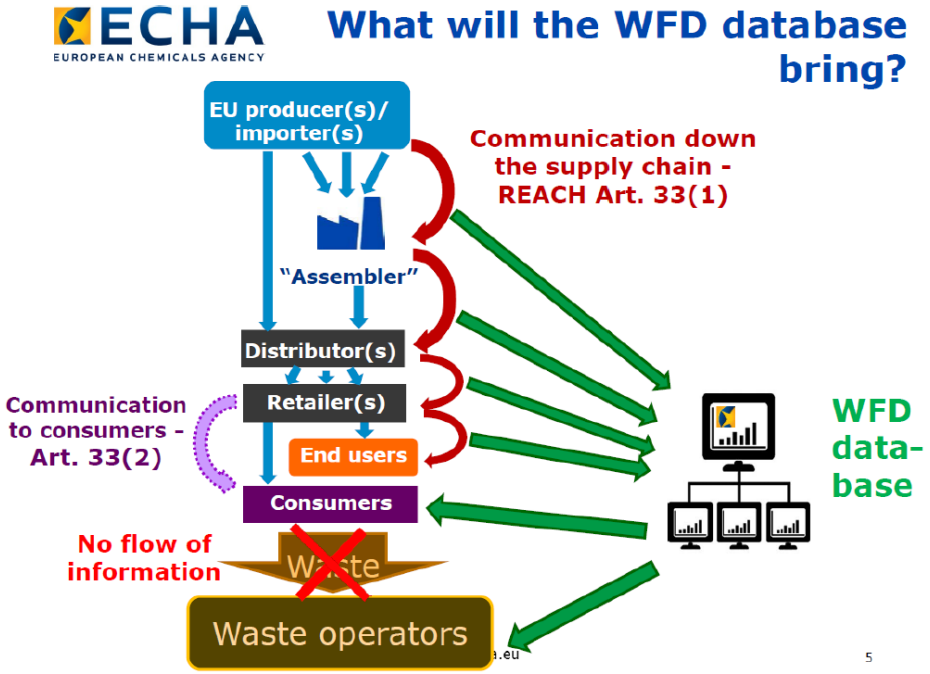
- Regulation lays down supply chain due diligence obligations for Union importers of tin, tantalum and tungsten, their ores, and gold originating from conflict-affected and high-risk areas.
- Most obligations will apply only from 1 January 2021.
- **End users are out of scope**
- Importers' supply chain due diligence obligations
    - EU Importers' compliance and record keeping (Inspired by the five-step framework of the OECD Due Diligence Guidance):
        1. Management system
        2. Risk management
        3. Third-part audit
        4. Disclosure obligations

Communication in the supply chain – Article 33 declarations

- Safety information for **substances** is communicated via the Safety Data Sheet, containing information of the SVHC's.
- Suppliers are to provide sufficient information to allow safe use of **articles** to customers (**article 33**), if an article contains a SVHC > 0.1%.
- *"Once an Article, Always an Article"*, European Court of Justice decision (2015) means that the SVHC mass can no longer be "diluted" to the whole **complex object**, but rather if an article is created (such as a solder joint) it remains such.
- Discussion ongoing between ECHA and Industry on how to practically implement the decision.
- Currently ESA & the MPTB follow ASD Sectoral guideline, meaning that the SVHC information can be consolidated on a complex object level, not identifying every single article.

Waste Framework Directive (Directive (EU) 2018/851)

- As from 5 January 2021 EU/EEA Article Suppliers have to notify Article 33-information to ECHA, for its database to be established by 5 January 2020.
- The WFD revision is part of the EU's waste legislation package, contributing to the EU's circular economy policy.
- Several consultations have been participated by the MPTB, arguing both the scope and feasibility of implementation of WFD for the space sector.



Picture: ECHA, 22 October 2018

CONCLUSIONS AND FUTURE CHALLENGES

Conclusions

- **In mid-term ~8% materials may be affected, in long-term possibly 20%.** Impairment of quality and reliability or even loss of critical technologies through obsolescence of qualified M&P must be avoided.
- **Active European-wide obsolescence risk management necessary** through the Materials and Processes Technology Board (MPTB) as observatory and technical focal point.
- Space related uses of hazardous substances may have high potential for successful REACH authorisation, however, there remains a significant **commercial obsolescence risk** due to the small market share.
- **Project management** needs to take current legislation into account, and realize that even future legislation can affect current projects.
- **Significant future investments are needed** by industry and agencies for product replacements and maintenance of production capabilities.
- Early replacement of materials/processes containing SVHCs may position European space industry on the **forefront of green technologies**, and provide it with a commercial advantage after successful qualification.
- Stakeholder **communication** (supply chain, authorities, associations, etc.) is pivotal for success of sustainable supply. SMEs are innovation drivers but often have limited resources to engage in deep long-term risk assessment. **Coordination of obsolescence issues with all stakeholders very challenging** but necessary for pro-active obsolescence risk management.

Future events and reference material

Materials and Processes Technology Board Stakeholder Day

11 June 2019, ESTEC, The Netherlands - https://indico.esa.int/event/264/

- ECHA Annex XIV authorisation list
- ECHA Candidate list for authorisation
- ECSS-Q-HB-70-23A – Materials, mechanical parts and processes obsolescence management handbook (20 November 2017)

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Thank you for your attention!

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