

Regulatory-driven materials' obsolescence risks and their impact on European Space Sector

Presentation for ESA's Clean Space Industry Days, 10-13th October 2022

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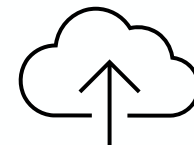
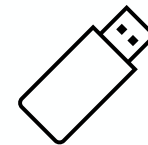
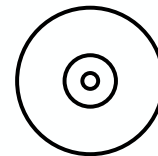
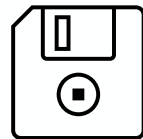
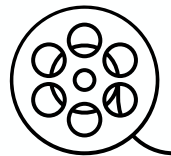
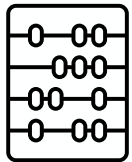
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Outline

- ☐ Obsolescence management of Materials and Processes in European Space Sector
- ☐ Examples of obsolescence in M&P and its impacts
- ☐ REACH and other regulatory drivers for obsolescence
- ☐ European Space Sector joint responses on REACH and related requirements
- ☐ Obsolescence risk assessment and management tools
- ☐ Conclusions & REACH Workshop announcement

(+references)

OBSOLESCENCE MANAGEMENT OF MATERIALS AND PROCESSES



New ECSS Requirements on Obsolescence Mgmt.

ECSS-Q-HB-70-23A
20 November 2017



Space product assurance

Materials, mechanical parts and processes obsolescence management handbook

ECSS Secretariat
ESA-ESTEC
Requirements and Standards Division
Noordwijk, The Netherlands

ECSS-Q-HB-70-23A (2017)

Definition: *...transition from availability to unavailability of a material, mechanical part or process from the manufacturer or supplier...*

- Recommendations to tackle obsolescence at a project level
- OM team: PM/TO + Procurement + M&P support + PA/QA + Design/Production + H&S + **REACH/Legal support**
- Obsolescence management to be covered within MPCBs
- Clear examples of OM plans, templates, and REACH regulation process flow

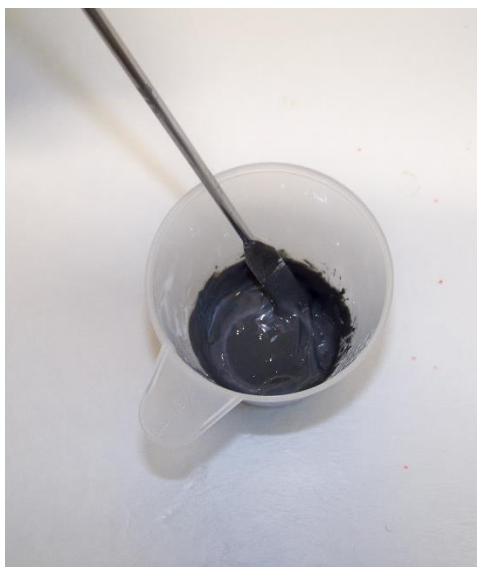
Updated **ECSS-Q-ST-70C rev2** (in 2019) has new requirement

4.1.3.i.6, ...Identify and mitigate the risks linked to obsolescence of materials, processes, or mechanical parts at all levels of the customer-supplier chain...

and refers to ECSS-Q-HB-70-23A (recommendations)

P. Janik et al. | Regulatory driven obsolescence risks... | CSID2022 | 10-13.10.2022 | ESA-TECQE-HO-2022-003148 | Slide 4

KNOW YOUR MATERIALS!



Sources of Obsolescence in M&P: Examples

Expansion to new plant capabilities, (triggered by Commercial/Market factors)

- **New plant** capabilities in Europe (variation in product quality between UK and US, delays in Europe, several issues with introduction of new technology → uncertainty in UK batch vs. US batch)

Modification of Products/Processes (REACH or H&S policy, Green Deal, company commitments, ...)

- Epoxy resins: Removal of **BPA** → Formulation change → Property change/name change
- Epoxy resins: **Toluene-free** hardener (same reactive content = same product/ID number)
- Silicone purification processes: **CMR solvents removal** to follow Directive 2004/37/EC carcinogens or mutagens at work (CMD) → Impact on the product's mechanical properties

Discontinuation of products (triggered by REACH/regulatory constraints, material unavailable):

- **SrCrO₄** containing primer – Absence of Application for Authorisation = “No use” → **Substitution unavoidable!**
No equivalent alternatives available.

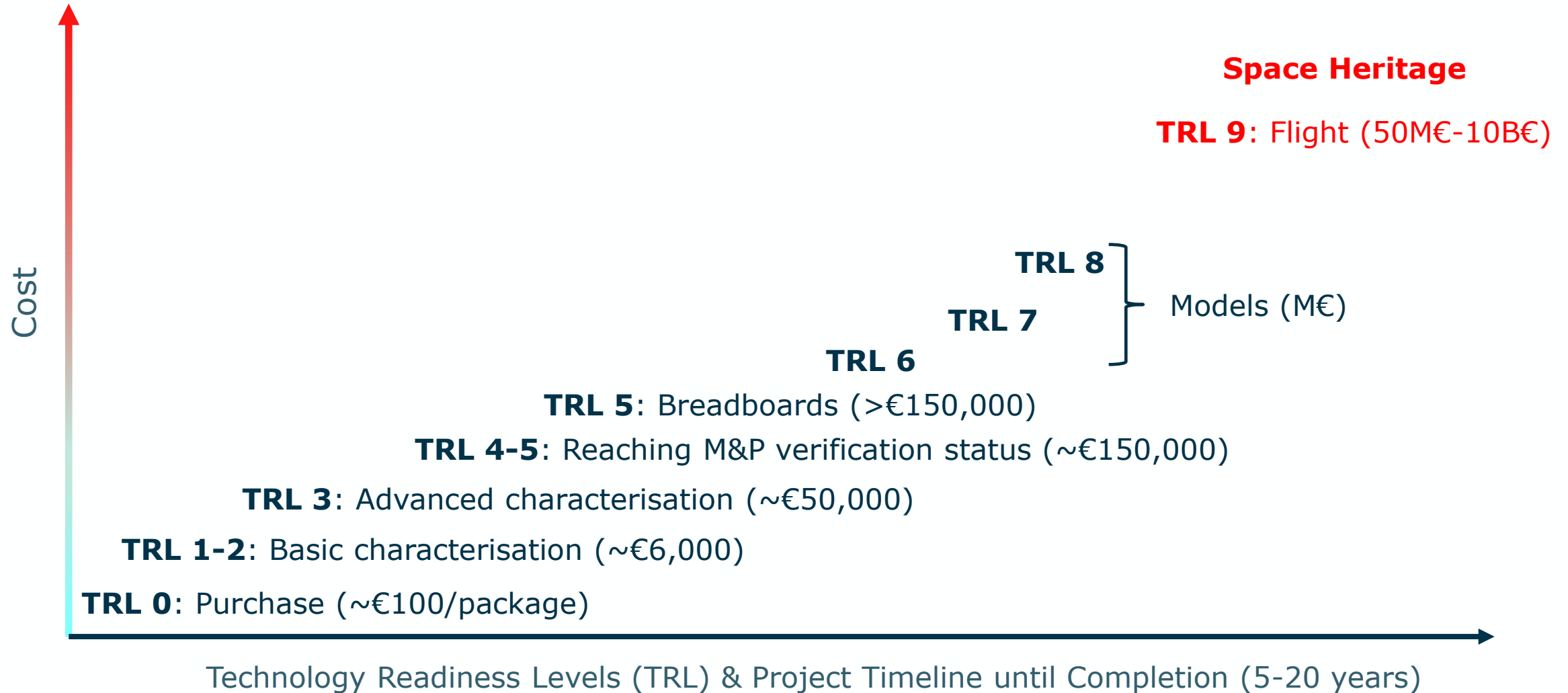
New/Other: Sanctions, Import/export limitation, Restriction in procurement policy, User tracking (delays) etc...

Obsolescence

Following slides consider REACH/Regulatory constraints as one of the main contributor to Obsolescence management risk metric

Obsolescence Impact Cost and Delay

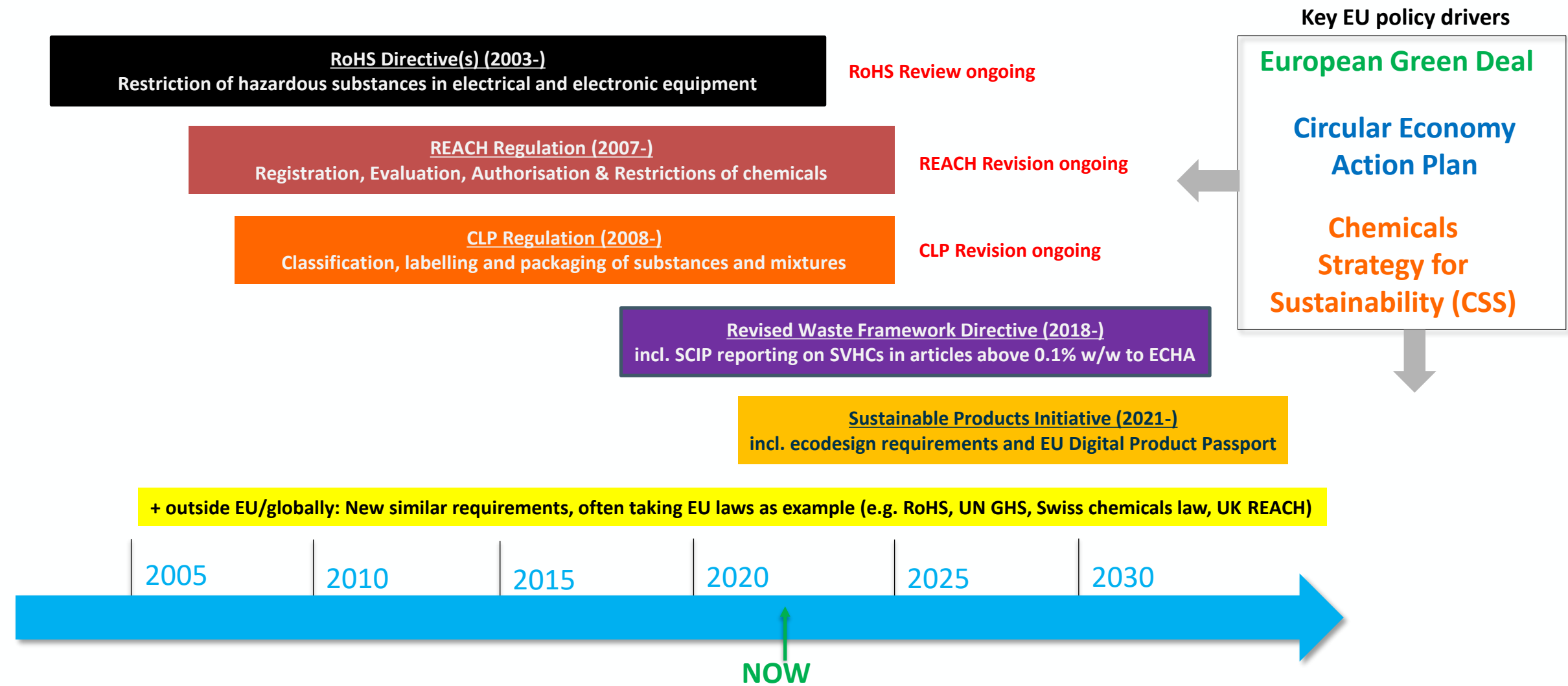
– Example of a new Adhesive in Optics





Evolution of Chemicals Regulatory Requirements*

*Important examples only, not exhaustive



INTRODUCTION TO EU REACH

Introduction to EU REACH

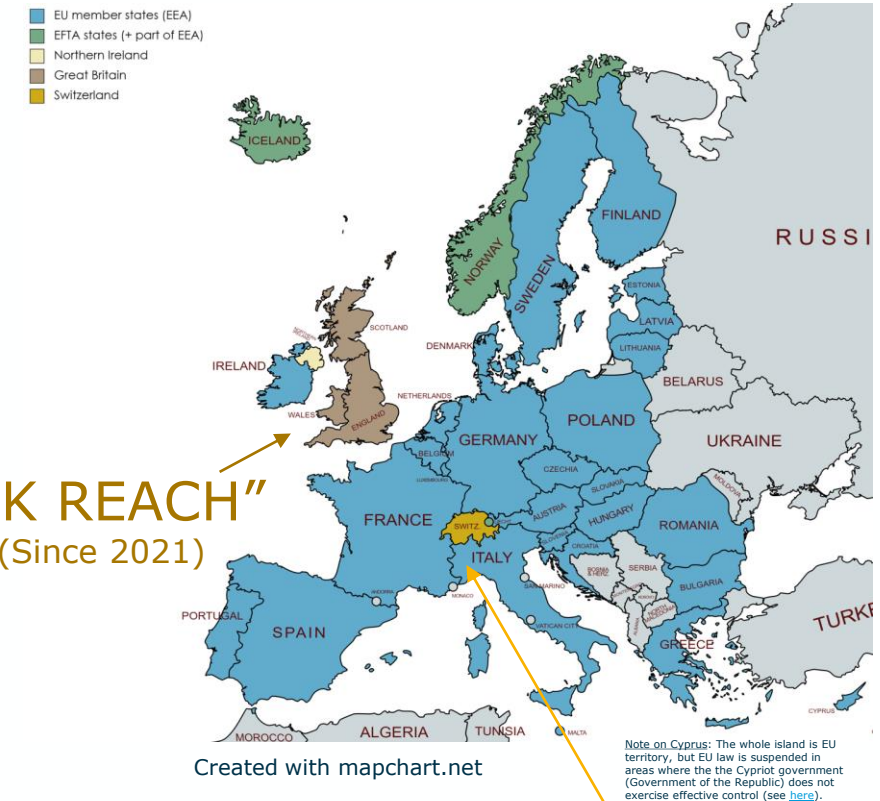
Registration, Evaluation, Authorisation and Restriction of Chemicals*

- Addresses potential impacts of chemicals to human health and on the environment, production & use of chemical substances.
- Strictest law to date regulating chemical substances.
- Managed by the European Chemicals Agency (ECHA) in Helsinki (FI)

- ❑ Very desirable and ambitious regulation to contribute to a safer and healthier environment but
- ❑ **Many chemical substances facing regulatory or commercial obsolescence, causing widespread impacts to downstream users.**
- ❑ Causes wide-reaching engineering and management challenges for the space sector which is by nature driven by performance and applications' heritage

"EU REACH" territories

EU-27 + Iceland, Norway and Lichtenstein
(= EEA) + Northern Ireland

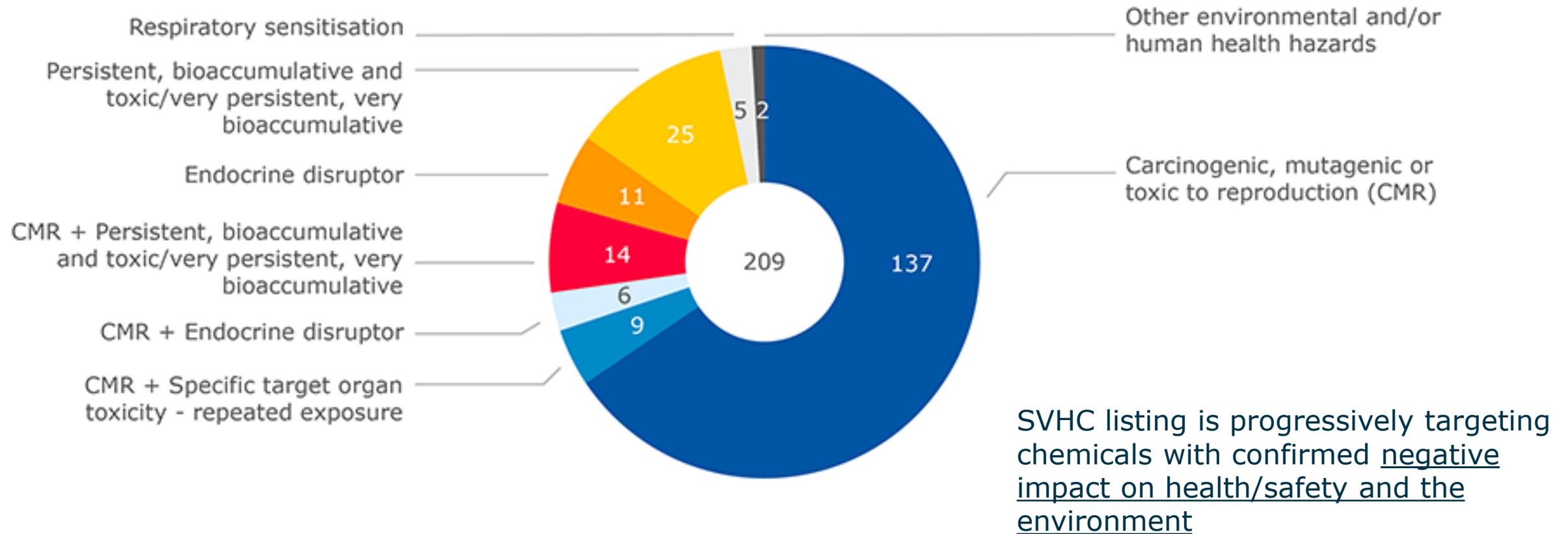


Created with mapchart.net

Swiss chemicals regulation

* Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

Candidate List Substances: Overview of Hazardous Properties

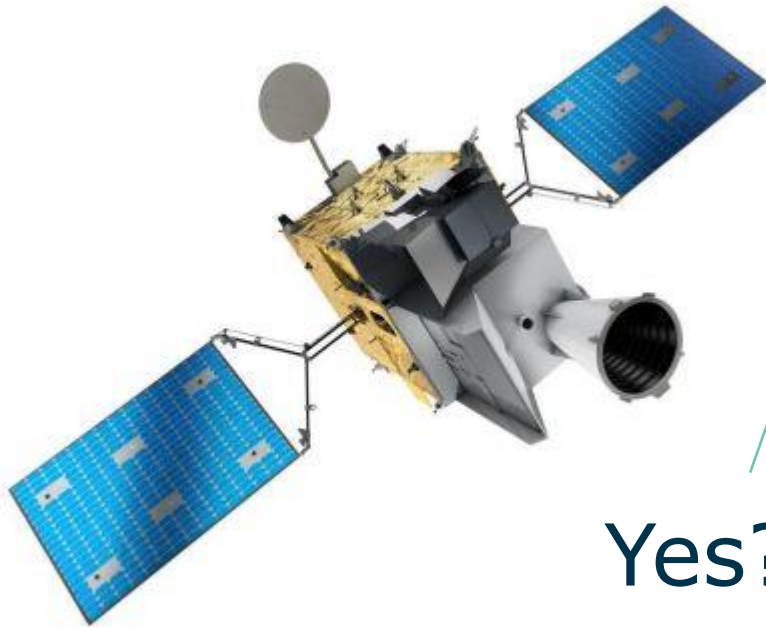


Source: <https://www.echa.europa.eu/-/candidate-list-update-four-new-hazardous-chemicals-to-be-phased-out>

Example of REACH-affected Manufacturing Processes

Are there any materials* with
Candidate List SVHCs $c > 0.1\%$ w/w?

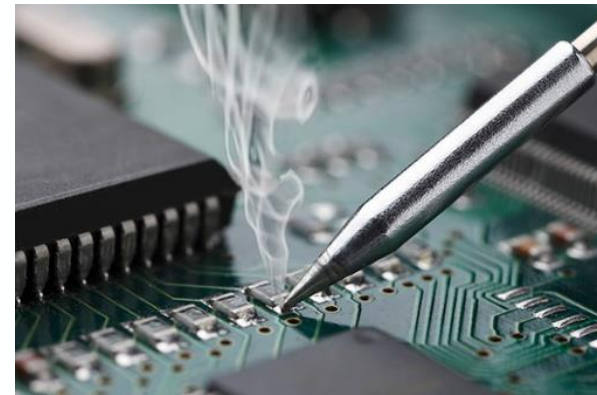
*"Articles" as defined in REACH Art. 3(3)



Yes?

Arbitrary examples (Art. 33 declaration &
WFD/SCIP reporting):

- Solar arrays – Cr^{6+} based primers
- Pyro valves – phthalates
- PCDUs – B_2O_3 contained in insulators
- ...
- Electronic units – lead in solders



EU REACH AND BEYOND

List of other regulations with impact (not exhaustive)

RoHS Directive(s), “RoHS 2” Directive 2011/65/EU: Restriction of hazardous substances in EEE

- Impacting space indirectly (COTS), as there is specific exemption for *equipment designed to be sent to space*

Carcinogens and Mutagens Directive “CMD” (2004/37/EC) and **Chemical Agents Directive “CAD”** (98/24/EC) on worker protection from risks related to exposure to substances found in the workplace

- Caused already significant obsolescence, especially in areas where organic solvents are used, including analytics! (Toluene, Xylene, Chloroform, etc... impacting adhesives, paints, coatings, surface treatments...)

Waste Framework Directive (WFD, revised Directive 2008/98/EC on waste), impacting space sector without any exemption so far, especially new obligation of **notification to SCIP database** (applies since 5 January 2021, cost effort, targets Candidate List SVHCs in articles → may result in obsolescence, companies may withdraw some articles), potentially conflict of laws (e.g. due to strict export restrictions/national differences on dual use goods)

UK REACH – consequence of Brexit (in force since January 2021)

- Impact for companies: Duplication of requirements, added burden for following another regime, possible source of obsolescence (divergence of EU REACH vs. UK REACH already happening)

Other relevant regulations (cont.)

Conflict minerals Regulation (EU) 2017/821, since January 2021(– tin, tantalum and tungsten, their ores, and gold), due diligence and reporting obligations for importers to EU, potential impact on effort → costs impacting final users (electronics)

Swiss chemicals regulation corresponding to EU REACH & CLP: **Chemicals Act, Chemicals Ordinance (ChemO)** and the **Chemical Risk Reduction Ordinance (ORRChem)**, similar scope as EU REACH.

New & future!

Ecodesign Directive 2009/125/EC, and its evolution to a Framework **Regulation on Ecodesign for Sustainable Products**: Space sector is mentioned in proposal text! New set of possible requirements e.g. on digital product passport (DPP), increasing number of requirements on additional data on materials and processes, establishes new term *Substance of Concern*, possible environmental footprint requirements etc.,... product-specific delegated acts are required – planned between 2024-2030

CSS REACH Revision (expected adoption and entry into force: 2025-2027): As response to EU's Green Deal and part of Chemicals Strategy for Sustainability (CSS): Significant impact on industry, introducing “Essential Use Concept”, possibly simplified authorisation process, new reporting obligations, etc. – Commission proposal currently expected in Q1/2023

EU sanctions imposed on Russia, (latest 7th package, (EU) 2022/1269 of 21 July 2022 amending Regulation (EU) No 833/2014), restricting **import of steel, coal, oil and newly gold**, and **restricting export of wide range of chemicals, energetic materials, additives, dual goods in general...** ([link](#))

“Space” in EU chemicals/product/safety legislation*

*Important examples tracked only, not exhaustive!

Exclusion from the scope	In scope – no exemption/exclusion	Product-specific requirements
<p>« <i>Shall not apply to ... equipment designed to be sent into space</i> »</p> <ul style="list-style-type: none"> ➤ Batteries Directive 2006/66/EC: <i>Batteries and accumulators</i> ➤ RoHS Directive 2011/65/EU & since 15 August 2018 Waste EEE Directive 2012/19/EU: <i>Electrical and Electronic Equipment (EEE)</i> ➤ Mercury Regulation (EU) 2017/852: <i>New mercury-added products</i> 	<ul style="list-style-type: none"> ➤ REACH Regulation (EC) No 1907/2006: <i>Chemicals</i> registration, evaluation, authorisation and restriction; Article 33 reporting for Candidate List substances above 0.1% w/w in <i>articles supplied in EU</i> ➤ Revised Waste Framework Directive (WFD) 2008/98/EC: Reporting to ECHA SCIP Database for Candidate List substances above 0.1% w/w in <i>articles supplied in EU</i> ➤ CLP, CMD, CAD, Conflict Minerals Regulation, etc. 	<ul style="list-style-type: none"> ➤ Proposal for a Regulation establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC (ESPR) (COM(2022) 142 final), recital (16): - [...] “<i>Similarly, the space industry is strategic for Europe and for its technological non-dependence. As space technologies operate in extreme conditions, any ecodesign requirements for space products should balance sustainability considerations with resilience and expected performance.</i>” [...]

Joint discussion is needed

Certain overlaps in scopes may be identified in various texts!

REACH (Regulation (EC) No 1907/2006) and other chemical regulations regulate substances on their own, in mixtures, in manufacturing processes and in final articles based on chemical's hazards, toxicity (human- and ecotoxicity)! Defines "SVHC". Typical LCA/Ecodesign parameters such as carbon footprint, water or energy consumption are not considered in substance prioritisation/regulatory process (subject to revision?). Note: REACH-compliant claims do not mean the product is by definition "green nor sustainable". "Sustainable" product claim does not always have to mean REACH/ROHS compliant (both need thorough check).

Ecodesign directive/ proposal for regulation (**ESPR proposal**), has broader scope, uses some definitions from REACH, and other chem. regulations. Mentions space applications specifically: *...any ecodesign requirements for space products should balance sustainability considerations with resilience and expected performance...*, proposal defines "SoC" *Substance of Concern*, broader than scopes of REACH & CLP together! Establishes set of Ecodesign requirements, some are not applicable for "space products". Requirements for product data (14+ parameters, including M&P) beyond state of the art, (e.g. require information including pre-processing, manufacturing...!)

Directive 2014/95/EU non-financial reporting, corporate social responsibility (CSR) reporting, broad scope.

ESA's additional requirements on suppliers, such as **ESA CSR Code of Conduct** (reflecting on on Procedure 2022/0051/COD Corporate Sustainability Due Diligence and amending Directive (EU) 2019/1937), drafting

EUROPEAN SPACE SECTOR JOINT RESPONSES ON REACH AND RELATED REQUIREMENTS

MPTB – Definition and Role



Materials and Processes Technology Board of the *European Space Components Coordination (ESCC MPTB)*. The ESCC MPTB is a partnership between the **European Space Agency (ESA)**, **national space agencies**, and the European space industry represented by **ASD-EUROSPACE**; it is chaired at present by ESA. The European Defence Agency (EDA) is an observer.

- ☐ **Exchange of information** on Materials and Processes.
- ☐ **Prepare roadmaps and work plans** for R&D activities aiming to secure the use of existing or new materials and processes in future space programs
- ☐ **Reduce dependence on non-European supplies** and promote the use of European technologies
- ☐ **Improve awareness** of the legislative processes (e.g. REACH) and of its consequences in order to coordinate preventive and corrective actions covering all space applications
- ☐ Monitor the **stability of supply chains** and mitigate obsolescence risks
- ☐ Promote **synergy** with other research or industrial groups
- ☐ Promote the **optimisation** of available resources, e.g. in the areas of standardisation, qualification and testing.

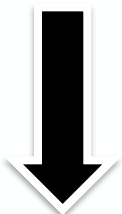
We organise regular plenary meetings in order to exchange the information. The objectives are further divided into individual working groups.

ESCC MPTB*

REACH obsolescence risk analysis, incl. ESA REACH Tool. Regulatory monitoring. General studies and sector positions

**Materials and Processes Technology Board of the European Space Components Coordination (ESCC MPTB). The ESCC MPTB is a partnership between the European Space Agency (ESA), national space agencies, and the European space industry represented by ASD-EUROSPACE; it is chaired at present by ESA. The European Defence Agency (EDA) is an observer.*

initiates



report



Space Task Forces and Working Groups

REACH dossier development. Substitution roadmaps. Obsolescence management. Technical actions

Hydrazine
Task Force
"HTF"

Materials
Space
Environmental
Survivability
WG

Energetic
Materials
"EMWG"

Chromates
Task Force
"STF"

Lead Metal
Task Force
"LTF"

Lead-free
Transition
"LFT"
WG

WFD / SCIP
Task Force

CSS
Space Focus
Group
"SFG"

Obsolescence
Splinter
Group
"OSG"

ESMDB
Steering
Board

Long Term
Storage
Splinter
Group

List of important contributions with references

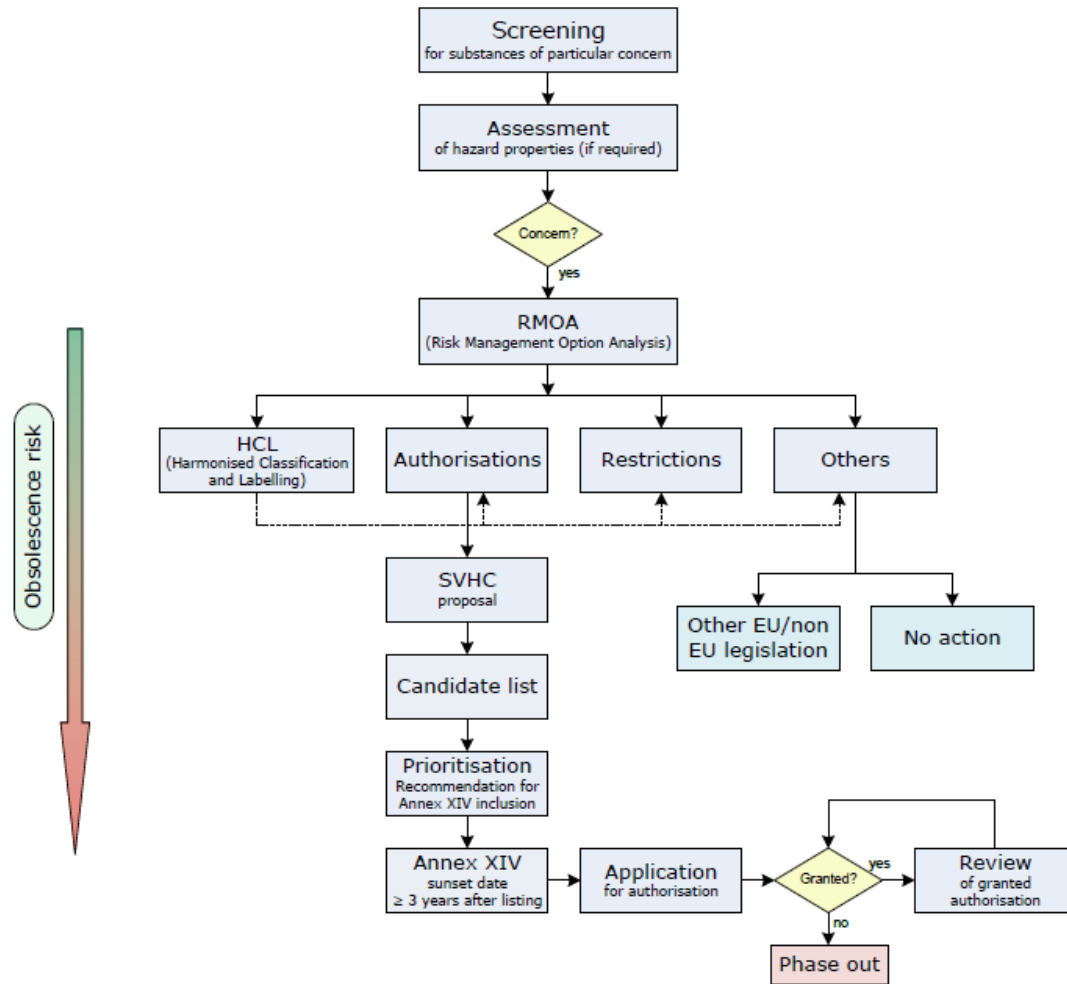
in reverse chronological order

- WFD/SCIP Best-Practice Guidance for European Space Sector (2nd update, 19 September 2022), available [here](#))
- Sustainable Products Initiative – European Space Sector feedback (20 June 2022), available [here](#)
- Lead Task Force comments on ECHA intention to recommend lead metal for Annex XIV (28 April 2022), available [here](#)
- CSS REACH Revision (incl. Essential Use Concept) – Position Paper (13 April 2022), available [here](#)
- REACH compliance guidelines for users of chromium trioxide in the European Space Sector to facilitate continued use under the REACH authorisation requirement (update, 18 November 2021), available [here](#)
- Energetic Materials Working Group comments on the Candidate List proposal for anti-oxidizer DBMC (18 October 2021), available [here](#)
- Heiskanen P. et al., Regulatory and Commercial Obsolescence Risks of Materials and Processes (International Chemical Regulatory and Law Review, Volume 3 (2020), Issue 1), available [here](#)
- Hydrazine Position Paper – Exemption from REACH authorisation (update, 8 April 2020), available [here](#)

A list of further contributions is available at <https://eurospace.org/task-forces/#reach>. In addition, a number of contributions have been submitted by ASD, with the support of MPTB/its task forces and working groups.

REACH/regulatory evolution used for OM

As per handbook ECSS-Q-HB-70-23A:



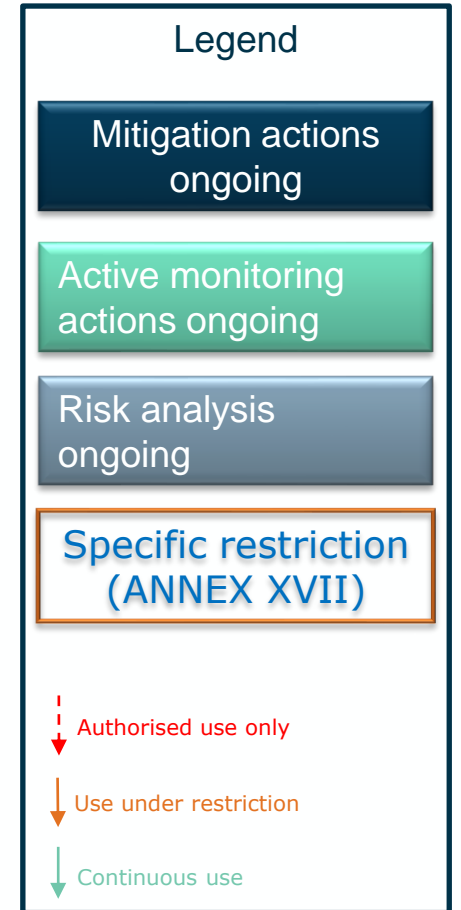
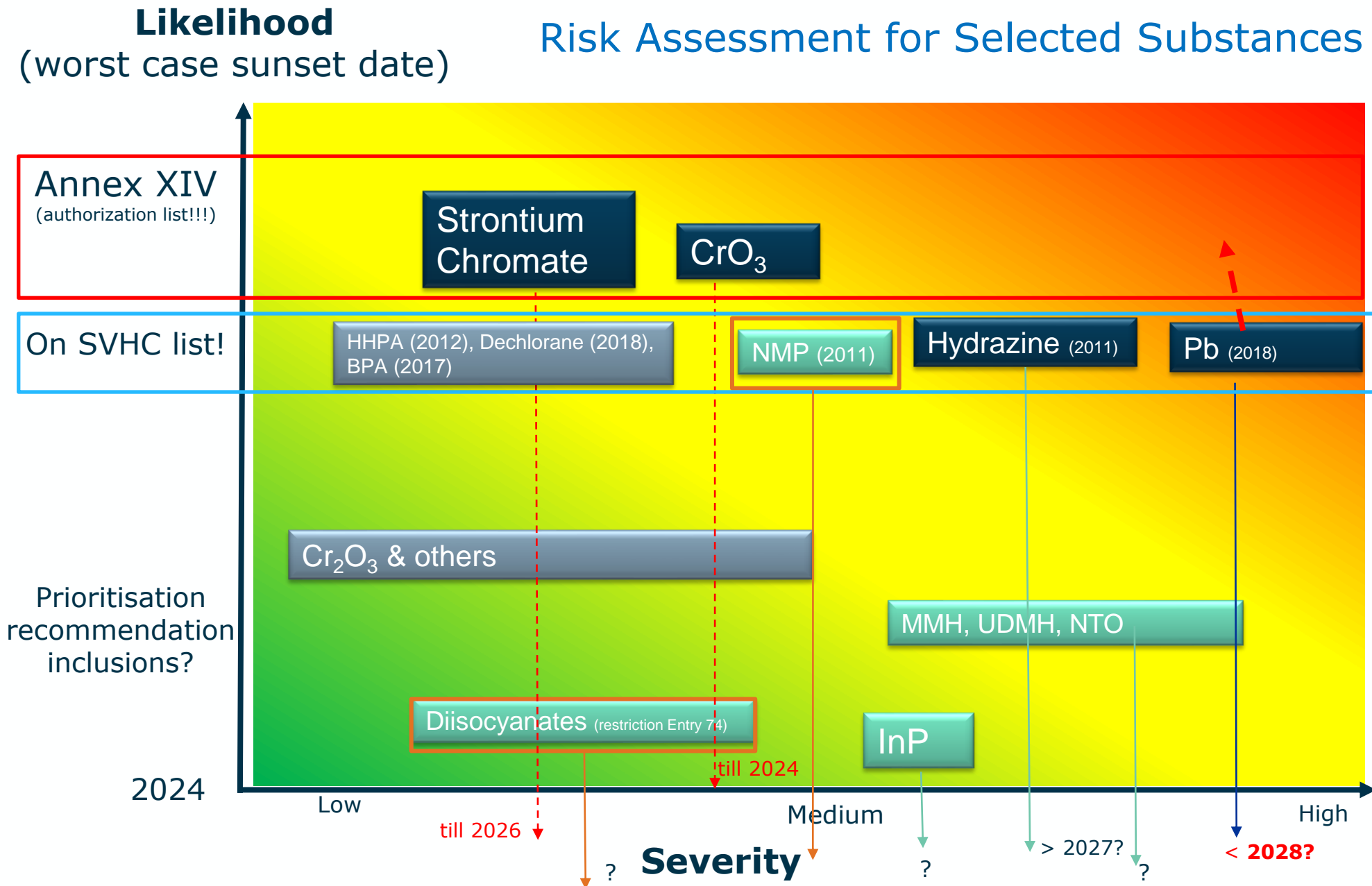
1. Identify materials (BoM) intended for the project, DML is good source of info but it is not enough,
2. Identify substances within materials/processes and crosscheck with regulatory lists (Figure D-2 in ECSS-Q-HB-70-23A),
3. How? analyse Safety datasheets (SDSs) of chemicals/mixtures or Article 33 declarations for articles and safe use instructions from suppliers, (SDS may be mandatory as per 1907/2006/EC, Article 31).

Risk ranking:

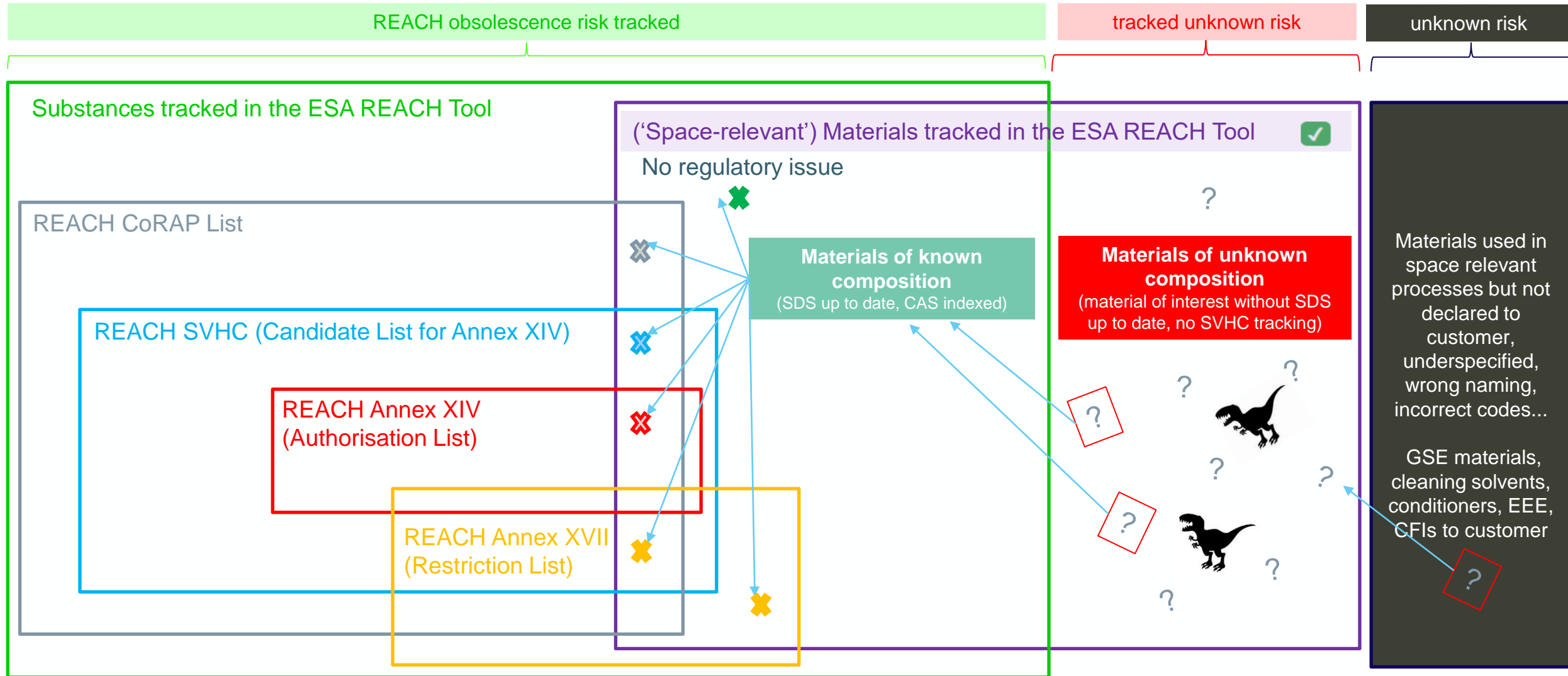
1. The highest obsolescence risk is associated with the use of material under **specific REACH Annex XVII restriction, which bans** specific type of use (e.g. Toluene in adhesives intended for general public market)
2. High risk of obsolescence is associated with chemicals with **Substance on Annex XIV** (only EC-authorized use is allowed!) + other obligations
3. Process-**unspecific REACH Annex XVII restrictions** affecting the material of interest but not necessarily the use of interest
4. **SVHC (candidate list) substance**: indicates potential of becoming Annex XIV chemical (**after ECHA Annex XIV recommendation**)

Figure D-2: Simplified REACH substances regulatory risk management process

2022 update



Substances vs. REACH lists – overview of “intersections”



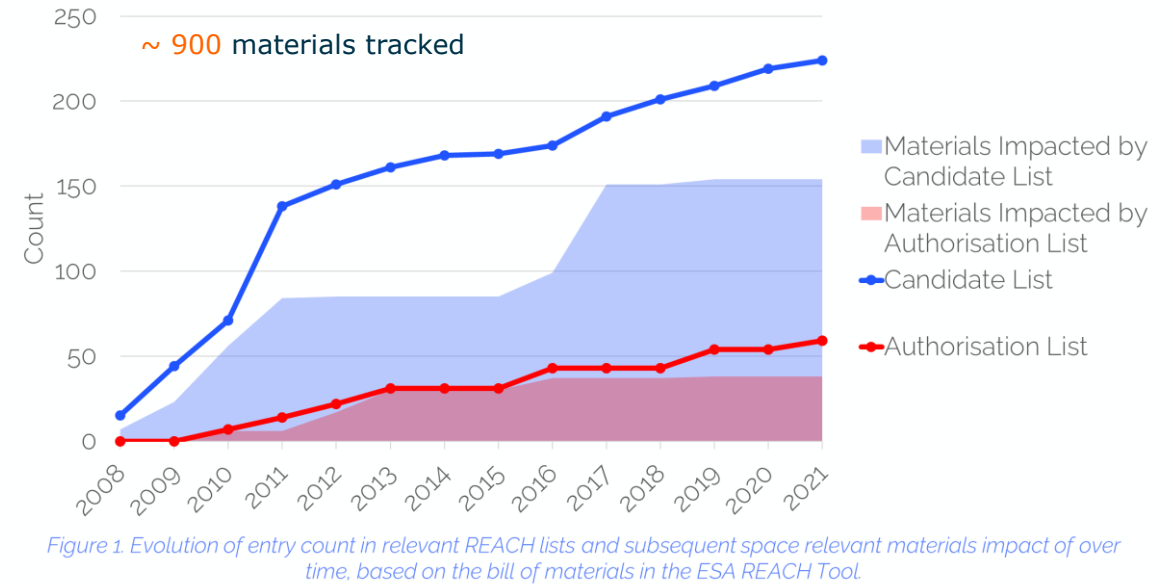
Note: It is impossible to perform any REACH cross-check/regulatory risk assessment if the substances present in materials & process are not traced/identified

REACH Status: General update Numbers in 2022

- ❑ EU REACH Registered substances: **23,050**
- ❑ EU REACH registrations: **103 015**
- ❑ ECHA's Cand. List – **460*** Substances of Very High Concern (SVHCs), grouped in **224** entries

*Number of reference substances for SCIP notifications

- ❑ **111** SVHC substances are recommended for Annex XIV
- ❑ REACH Annex XIV – Authorization list: **59** XIV – **248** applications for authorisation (AfAs) received
- ❑ REACH Annex XVII – Restriction entries: **71** ([multiple substance entries](#), analysis ongoing...)



>150 relevant materials affected

- ❑ OSG/REACH Tool analysis resp. points at
 - ❑ **14** REACH Annex XIV entries hit space-relevant materials,
 - ❑ **40** materials/mixtures with highest risk of obsolescence
 - ❑ **27%** of active materials impacted by Candidate List
- ❑ Analysis of impact of Annex XVII restrictions on space sector ongoing

CONCLUSIONS & REACH WORKSHOP ANNOUNCEMENT

Conclusions

- Increasing number of regulatory constraints in Europe lead to significant number of obsolescence cases in M&P domain impacting space industry (more to come),
- Proactive M&P obsolescence management is key element for successful businesses, regulatory monitoring is one of its essential elements,
- Collaboration & communication on regulatory issues within the Space Sector and beyond (aerospace & defence, automotive, electronics, etc.) is critical
- For obsolescence management in M&P follow ECSS! (Q-ST-70c & Q-HB-70-23A),
- More information about Space Sector activities on REACH and related:
<https://europspace.org/working-groups/#reach>

4th ESA REACH Workshop 18th October 2022 in Paris



ESA 4th REACH Workshop 18 October 2022 | ESA HQ | Hybrid Event



[Home](#) [Agenda](#) [Format & Registration](#) [Contact](#)

4th ESA REACH Workshop: Workshop on the EU REACH Regulation and its impact on the Space Sector

The European Space Agency (ESA) is pleased to organise the 4th edition of our "Workshop on the EU REACH Regulation and its impact on the Space Sector" on Tuesday, 18 October 2022 at ESA HQ in Paris.

At this interactive full-day event (ca. 9:30-16:00) we want to raise awareness and discuss the current state of play, challenges and risks with regards to EU chemicals regulations (mainly REACH/CLP) with experts from European agencies, regulators and industry. The ongoing revision activities under the European Commission's Chemicals Strategy for Sustainability, such as for the planned Reform of Authorisation and Restriction processes and the new Essential Use concept, shall be addressed as a special focus this time, as they could have significant impacts on space programmes, our sector at large and related value chains.

The event will be equally open to interested stakeholders from space agencies and industry, other sectors and representatives from the European Commission, ECHA, the European Parliament and Member States.

Preliminary Agenda

The following thematic sessions are foreseen:

- Keynote presentation on ESA Green Agenda
- State of play on REACH in agencies and industry
- Revision activities (REACH, CLP, others): Status, upcoming challenges & key messages
- Managing substitution and obsolescence: ESA REACH Tool, Lead-free Transition WG, etc.

In addition to our own experts, we have already confirmed contributors from the EDA, ASD and Eurometaux. Further speakers from authorities and industry will be agreed in the coming weeks.

Welcome	09:30 - 09:40 hrs.
Keynote Presentation	09:40 - 10:00 hrs.
Status of REACH Activities	10:05 - 11:25 hrs.
Coffee Break	11:25 - 11:45 hrs.
Revision activities - upcoming challenges & key messages	11:45 - 13:00 hrs.
Lunch Break	13:00 - 14:30 hrs.
Managing substitution and obsolescence	14:30 - 15:45 hrs.
Conclusions and closure	15:45 - 15:50 hrs.

You are welcome to register:

<https://atpi.eventsair.com/esa-4th-reach-workshop>

Workshop will be in hybrid format, targeted audience: space agencies, large space integrators, SMEs,



Acknowledgements



On behalf of author team I would like to thank to all members involved in ESCC/MPTB–related activities, in particular those following individual task forces and working groups associated with regulatory challenges for M&P domain!

Special thanks to team in REACHLaw for their excellent work in support on previous REACH/obsolescence related projects, currently on 4000112903 CCN1, *REACH & Obsolescence Management for Material and Processes*

Thank you for your attention!

Questions?

Contact: reach.officer@esa.int

Important references and links

EUROSPACE, trade association of the European Space Industry: <https://eurospace.org/>

MATREX, CNES space materials and regulatory risk tracking database: <https://matrex.cnes.fr>

MAPTIS, Materials And Processes Technical Information System of NASA: <https://maptis.nasa.gov/>

REACH-Related:

ECHA list of Annex XIV substances (authorisation list): <https://echa.europa.eu/authorisation-list>

ECHA list of Annex VXII restrictions (restriction list): <https://echa.europa.eu/substances-restricted-under-reach>

ECHA's SVHC list (Candidate list for Annex XIV): <https://echa.europa.eu/candidate-list-table>

ECHA SCIP database: <https://echa.europa.eu/scip-database>

REACH & Obsolescence management relevant ECSS (<https://ecss.nl/>)

ECSS-Q-ST-70C rev2 - Materials, mechanical parts and processes

ECSS-Q-HB-70-23A – Materials, mechanical parts and processes obsolescence management HB

Databases M&P & EEE component relevant info:

ESA REACH Tool: <https://reachtool.esa.int> (relevant for MPTB/OSG members)

MODESA, outgassing database: <https://modesa.esa.int/>

ESCIES: European Space Component Information Exchange System: <https://escies.org/>