

## **Prevention of use of SVHC in power transmission equipment**

Answer to question 1.17. Greenhouse effect and Life Cycle impacts aren't the only grid concerns and other aspect should be taken into account under an SDG perspective. Can the authors discuss which strategies can be implemented to prevent the use or the dispersion of Substances of Very High Concerns?

### **Definitions:**



The SDGs were set up in 2015 by the [United Nations General Assembly](#) (UN-GA) and are intended to be achieved by 2030.

The 17 SDGs are: No poverty, zero hunger, good health and well-being, quality education, gender equality, clean water and sanitation, **affordable and clean energy**, decent work and economic growth, industry, innovation and infrastructure, Reduced Inequality, Sustainable Cities and Communities, Responsible Consumption and Production, Climate Action, Life Below Water, Life On Land, Peace, Justice, and Strong Institutions, Partnerships for the Goals.

Substance of Very High Concern are listed under: <https://echa.europa.eu/candidate-list-table>.

Environmental, Health and Safety aspects are a critical factor during the development and registration of new chemicals. Prior to introducing new chemicals into commerce, chemicals are subject to (local) regulation policies to address their potential impacts on both human health and the environment:

**REACH** – Registration, Evaluation, Authorisation and Restriction of Chemicals in the EU.

**K-REACH** – Act on the Registration and Evaluation of Chemicals in South Korea.

**TSCA** – Toxic Substances Control Act, Chemical Substance Inventory in the USA.

**ENCS** – Existing and New Chemical Substances in Japan.

**IECSC** – Inventory of Existing Chemical Substances in China.

### **Existing directives:**

The development of any new technology must be done in accordance with on force and local directives and RoHS and reach.

- The RoHS Directive aims to prevent the risks posed to human health and the environment related to the management of electronic and electrical waste. It does this by restricting the use of certain hazardous substances in EEE that can be substituted by safer alternatives. These restricted substances include heavy metals, flame retardants or plasticizers.
- REACH is a regulation of the European Union, adopted to improve the protection of human health and the environment from the risks that can be posed by chemicals, while enhancing the competitiveness of the EU chemicals industry. It also promotes alternative methods for the hazard assessment of substances in order to reduce the number of tests on animals.

**Example of REACH regulation:**

REACH requires all companies manufacturing or importing chemical substances into the European Union in quantities of one ton or more per year to register these substances with the European Chemicals Agency (ECHA). Specific test requirements can be dependent on production volume and results of previous tests. Authorities have ability to place restrictions on use of chemicals or even ban their use if it is deemed the risks cannot be adequately managed. The necessary content of the registration dossiers depends on so called volume bands, see Table 1. Annex VII deal with volume band from 1 to 10 tons per year and Annex VIII for 10 to 100 tons per year of product places on the EU market. It's a long and complex process to get chemicals registered and handling management under scrutiny at IEC and Cigre, see by instance Cigre B3.45 Application of non-SF6 gases or gas-mixtures in medium voltage and high voltage gas-insulated switchgear - Piet KNOL (NL) (Brochure no. 802)

Test end-point	Test protocol	EC 1907/2006	Annex VII	Annex VIII
Skin irritation or corrosion	In vitro OECD 431	8.1 (VII)	X	
Skin irritation or corrosion	In vivo OECD 404	8.1 (VIII)		X
Eye irritation	In vitro OECD 437 (BCOP)	8.2 (VII)	X	
Eye irritation	In vivo OECD 405	8.2 (VIII)		X
Skin sensitisation (LLNA)	In vivo OECD 429	8.3 (VII)	X	
Mutagenicity (Bacterial Reverse Mutation Assay)	In vitro OECD 471	8.4.1 (VII)	X	
Acute toxicity – oral	In vivo OECD 420 / 423 / 425	8.5.1 (VII)	X	
Acute toxicity – inhalation	In vivo OECD 403	8.5.2 (VIII)	X (exposure)	X
Acute toxicity – dermal	In vivo OECD 402	8.5.3 (VIII)		X (exposure)
Repeat dose toxicity (28 day)	In vivo OECD 412	8.6.1 (VIII)		X
Mammalian chromosome aberration test	In vitro OECD 473	8.4.2 (VIII)		X
Mammalian cell gene mutation test – Mouse lymphoma assay	In vitro OECD 476	8.4.3 (VIII)		X
Reproductive toxicity	In vivo OECD 421 / 422	8.7.1 (VIII)		X
Toxicokinetics	Assessment	8.8.1 (VIII)		X

**Table 1:** List of toxicity tests from reach

To go beyond, Waste electrical and electronic equipment (WEEE) Directive 2012/19/EU can also be mentioned. The objective of the Directive is to promote re-use, recycling and other forms of recovery of waste electrical and electronic equipment (WEEE) in order to reduce the quantity of such waste to be disposed and to improve the environmental performance of the economic operators involved in the treatment of WEEE. The WEEE Directive sets criteria for the collection, treatment and recovery of waste electrical and electronic equipment.

**Conclusion :** Regulations and directives are already in place to prevent the use or the dispersion of Substances of Very High Concerns (RoHS, WEEE, Reach, ...). The strategy to develop safe alternative to SF6 is to strictly complies with all theses directives.