**Outline ESPP position on CRMs v1**

For Public Consultation and proposed Amendments
to draft EU Critical Raw Materials Act

*Summary of proposed Act and background documents:* [*ESPP eNews n°74*](http://www.phosphorusplatform.eu/eNews074)

*Draft Act and other documents - European Commission Critical Raw Materials web page:* [*https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials\_en*](https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials_en)

***Public consultation open to 16th May 2023***[*https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13597-European-Critical-Raw-Materials-Act\_en*](https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13597-European-Critical-Raw-Materials-Act_en)

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# The supporting documents are confused and misleading on phosphorus

The JRC Foresight Report cites “Phosphorus” (P4) as essential for all five technology sectors considered as “strategic”, and as one of the highest supply-critical materials. However, it also misses identifying a number of essential uses of P4 relevant for many of the technologies considered. The report does not identify or address the supply-chain criticality of acid purification for “Phosphate Rock”.

This report contains significant errors suggesting confusion between the two CRMs “Phosphorus” (P4) and “Phosphate Rock” (phosphorus – P – in any form). For example, the need for P4 in batteries seems to be based on the error that P4 is needed to produce lithium iron phosphate for LFP battery cathodes. This is incorrect: battery grade LiFePO4 can be and is already today produced via purified merchant-grade phosphoric acid (see [SCOPE Newsletter n°136](http://www.phosphorusplatform.eu/Scope136), 2020, which was co-produced with and validated by nearly all relevant industry actors, and by JRC and DG GROW). The report further suggests that LFP batteries will compete with fertiliser production for phosphate rock (this is referenced to only one P-rock mine project company’s commercial press release, [Epstein 2022](https://www.streetwisereports.com/article/2022/03/07/ev-demand-drives-phosphate-rock-market.html)). Not only is this largely wrong (LFP is expected to only represent a few percent of mined phosphate rock use), it also suggests the report is confusing “Phosphate Rock” with “P4”.

The Report also notes (p.90) that P4 is increasingly essential for fire safety, but only for data storage and servers, stating “*increasing move to green materials and chemicals … Phosphorus flame retardants (PFRs) are often proposed as alternatives to brominated flame retardants (BFRs)”.* However, the report seems to ignore the essential need for phosphorus in fire safety for computers, wind turbines, photovoltaics, heat pumps, space-satellites, 3D-printing, which all depend heavily on flammable polymers and composites in e.g. printed circuit boards, wires and cables, casings and components (ensuring electrical insulation) …

Other essential uses of P4 in the considered technology sectors are not cited, in particular thermal phosphoric acid for micro-chip etching, phosphine for semi-conductor doping (partial modification of Si to P in semiconductors), production of gallium indium phosphide and indium phosphide which cannot be produced without P4 (despite these materials being cited).

Phosphate rock is indicated as needed for data transmission networks, but for none of the other technologies (p84), with no explanation (p.81). This is probably again confusion between “Phosphorus” (P4) (cited for fire safety for this application) and “Phosphate Rock”. To our knowledge, there is no particular need for “Phosphate Rock” (or purified wet-route phosphoric acid) in data centres.

Overall, the designations of which technologies require “Phosphorus” (meaning P4/derivatives) and which require “Phosphate Rock”, and why, are largely unexplained, often incoherent, have important omissions, and in some cases seem to be based on erroneous information, in appropriate references and confusion between these two CRMs.

The SCRREEN2 input to the CRM Act also confuses the two CRMs ‘Phosphorus’ (P4) and ‘Phosphate Rock’ and contains relevant errors. ESPP had understood that the EU-funded [SCRREEN2](https://scrreen.eu/) project (3 million € [EU money](https://cordis.europa.eu/project/id/958211), led by the French Atomic Energy Commission CEA), was supposed to deliver input information to support the update of the CRM List, in the form of SCRREEN2 CRM “Factsheets”. The project has apparently failed to do this in time for Phosphate Rock and P4, in that the draft Factsheet (not dated, version [online](https://scrreen.eu/wp-content/uploads/2023/03/SCRREEN2_factsheets_PHOSPHATE.pdf) 19th March 2023) contains errors suggesting a complete lack of relevant understanding. For example, sodium is cited as one of the three main plant nutrients p.16. The SCRREEN2 authors do not seem to understand the chemical difference between “phosphate” and “phosphorus”, in that on p.26 phosphate is calculated to have the molar weight of the element phosphorus.

Importantly, this SCRREEN2 Factsheet confuses the CRM “Phosphate Rock” with “Phosphorus” (P4) by treating both in the same Factsheet. The separation into two Factsheets of the two CRMs Phosphate Rock and P4 was requested by ESPP six months ago, but is apparently not done in time to input to the CRM Act.

ESPP pointed to these problems of confusion and understanding already at SCRREEN2 workshops and in letters in July and September 2022 (see [HERE](http://www.phosphorusplatform.eu/regulatory)). Many comments are not taken into account in this draft Factsheet. This failure of SCRREEN may explain the apparently confused treatment of P4 in the JRC Foresight Report.

ESPP suggests that future reassessments of Critical and Raw Materials should engage experts with understanding of phosphorus, its chemistry, its uses and its cycle.

# We regret that food security is not considered “Strategic”

A subset of around half of the materials on the “Critical” Raw Materials (CRM) List are identified as “Strategic”, and for these materials only (not for other CRMs) EU supply resilience targets are specified and actions are proposed. This “Strategic” list targets technological uses only: energy, IT, aerospace – but not food security.

ESPP suggests that food security must also be recognised as “Strategic” for the EU. Food products and crops themselves are not covered by the draft Act, but raw materials critical for food production should be identified as “Strategic” and supply and recycling targets and resilience actions should be defined in the same way as for technological materials.

ESPP proposes that supply and recycling targets and resilience actions should be defined for the key plant nutrients (phosphorus, nitrogen, potassium), comparable to those for technological materials. We suggest to add this principle into the draft Regulation with a timetable for defining targets and actions for phosphorus, nitrogen and potassium.

This will ensure coherence with EU policies on nutrients, in particular: Green Deal (Farm-to-Fork and Biodiversity Strategies) nutrient loss reduction targets, Circular Economy, Integrated Nutrient Management Action Plan, Soil Health, Common Agricultural Policy, energy policy (for nitrogen fertiliser production).

In the case of nitrogen, fertiliser supply is linked to natural gas supply and price, and to the development of Green Ammonia (using renewable energy) and White Ammonia (nitrogen recycling).

Proposed amendments:

Add to preamble $1: *“There is a set of non-energy, non-agricultural raw materials that due to their high economic importance and their exposure to high supply risk … are considered critical.* ***Some raw materials with high supply risk are critical for agricultural production and so food security.*** *….”*

Add to preamble $4: *“The list of strategic raw materials should contain raw materials that are of high strategic importance, taking into account their use in strategic technologies underpinning the green and digital transitions or for defence or space applications …* ***This list of strategic raw materials should be later completed with a list of raw materials which are strategic for food supply****. In order to ensure that efforts to increase the Union capacities along the value chain, reinforce the Union’s capacity to monitor and mitigate supply risks and increase diversification of supply are focused on the materials for which they are most needed, the relevant measures should only apply to the list of strategic raw materials.*

Art. 3 Add a point (4):” ***The Commission shall assess and if appropriate propose an update of Annex I to add to the list of strategic raw materials, raw materials and agricultural input supply chains identified as of the highest importance for EU food security,*** *by [OP please insert: four years after the date of entry into force of this Regulation] and every 4 four years thereafter*”.

# The CRM “Phosphorus” (P4) should be a “Strategic” Raw Material

P4 (white phosphorus) is a specific form of phosphorus, produced in dedicated P4-furnaces, and which is essential (non-replaceable) in the production of many organophosphorus chemicals necessary for electronics, semiconductors, batteries, fire safety, pharmaceuticals, agrochemicals, catalysts, metal alloys … This is detailed in [SCOPE Newsletter n°136](http://www.phosphorusplatform.eu/Scope136) (2020, co-produced with nearly all relevant industry actors, JRC and DG GROW).

The EU has very high supply risk. There is today no P4 furnace in Europe (the last one closed in 2012). The EU is completely dependent on imports, almost entirely from only three countries: China, Vietnam (largely dependent on electricity from China) and Kazakhstan.

P4 is essential, in the identified “strategic” technology sectors, for: microchip production (pure thermal acid etching), semiconductor doping, the electrolyte of lithium ion batteries (LiPF6). If halogenated flame retardants are progressively limited, then P4 will become increasingly non-replaceable to produce flame retardants necessary to ensure fire safety across all technology sectors: printed circuit boards, computer and electronics housings and components, electrical installation components, battery materials, wires and cables, polymeric and composite parts of renewable energy installations …

The JRC and CEA background documents show considerable confusion and misunderstandings concerning P4 (called “Phosphorus” in the CRM list). Despite this, they identify P4 as having very high supply risk (it is identified as the raw material with the highest supply risk for batteries, and amongst the highest 15 for supply risk for several other technologies). They also identify some (but not all) of the essential uses of P4 in the strategic technologies considered. They identify P4 as essential for fire safety for “data storage and servers”, but inexplicably do not consider fire safety for batteries, computers, photovoltaics, aerospace …

A project is being developed with EU Horizon 2020 funding ([Flashphos](https://flashphos-project.eu/)) to produce P4 in Europe from secondary materials with innovative electrochemical technology. Recognition as a “Strategic” project could enable full-scale implementation through cooperation between the EU companies who are potential customers.

ESPP suggests that the CRM “Phosphorus” should be included in the list of “Strategic” Raw Materials

Proposed amendment:

Modify Annex I Section 1 to add: “**(x) Phosphorus (P4 and derivatives)”**

# The CRM “Phosphate Rock” should be a “Strategic” Raw Material

Although use of phosphate rock in batteries and fuel cells is expected to remain a small proportion of total mined rock (c. 90% is used in food production: fertilisers and animal feeds), the EU faces high supply risk for the highly purified phosphoric acid (produced from the rock) needed for “strategic” technology applications.

The CRM “Phosphate Rock”, via highly purified wet-route phosphoric acid (not via the specific P4 = CRM “Phosphorus”) is used for in lithium iron phosphate batteries (LFP cathodes), for which the market is expected to grow rapidly (see JRC Foresight Report). The same is true for Phosphoric Acid Fuel Cells (PAFCs), for which the market is also expected to grow rapidly (see e.g. [here](https://www.marketdataforecast.com/market-reports/phosphoric-acid-fuel-cell-market)). Purified phosphoric acid is also essential for anticorrosion treatment of steel, including for applications in renewable energy, aerospace, etc. Any further references on PAFCs welcome. Are there other applications of purified acid in renewable energy, batteries, electronics, aerospace ? Metal treatment ?

Growth of LFP batteries and PAFC fuel cells may require 4 - 5 million tonnes/year of phosphate rock in coming decades (that is 0.3 – 0.9 MtP/y), see CRU Phosphates Conference 2023 [here](http://www.phosphorusplatform.eu/eNews074), other references and numbers ???? but this will remain a small part of the c. 200 million tonnes/year of world phosphate rock mined (15 – 40 MtP/y, see [ESPP FactSheet](http://www.phosphorusplatform.eu/factsheet) – comments and input welcome) and of the wet-acid route phosphoric acid derived from this rock. However, this “green” acid must be intensively purified, using specific technologies, to achieve the high level of purity required in batteries or fuel cells. This will be competing with use of purification capacity for e.g. food and beverage applications, as production of these is moved from energy-intensive thermal acid (from P4) to wet-acid, as P4 will be increasingly used only in applications where it is essential (and which are growing, such as electronics, battery electrolytes, fire safety).

ESPP estimates that world phosphoric acid purification capacity, able to achieve the purity needed in battery and fuel cell applications, is currently c. 0.9 MtP/y ????, with around 30% of this capacity currently in the EU. A ??? growth in global high-quality purification capacity is thus needed, corresponding to a global investment of around ??? bn€ (c. 150 M€ for 100 000 tP2O5/y) - if you send me estimates, I will keep these confidential and we will publish an ‘average’ of estimates received. Please do NOT send business confidential data on your company’s current production or projects. If this phosphoric acid purification capacity is not built in the EU, then Europe will be dependent on imported purified acid for LFP batteries and PAFC fuel cells, as well as for other applications.

The JRC Foresight Report wrongly suggests that production of LFP battery cathodes requires P4. This is incorrect (see our [SCOPE Newsletter n°136](http://www.phosphorusplatform.eu/Scope136), 2020, co-produced with nearly all relevant industry actors, JRC and DG GROW). However LFP cathode production does require highly purified wet-route phosphoric acid. This confusion may explain why phosphoric acid purification is not considered in the JRC Foresight Report, nor in the SCRREEN Factsheet background documents, leading to not include “Phosphate Rock” in the list of Strategic Raw Materials.

ESPP suggests that, because of major supply chain risks for purification, Phosphate Rock should be listed as a Strategic Raw Material.

Proposed amendment:

Modify Annex I Section 1 to add: “**(x) Phosphate Rock (highly purified phosphoric acid)”**

# Clarification of definitions of CRMs Phosphorus and Phosphate Rock

The JRC and CEA background documents show considerable confusion and misunderstandings concerning the two CRMs “Phosphorus” and “Phosphate Rock”.

“Phosphorus” effectively means only the specific form of phosphorus P4 (also known as White or Yellow Phosphorus) and its derivatives or vector chemicals.

“Phosphate Rock” is defined in the current version of the [SCRREEN Factsheet](https://scrreen.eu/crms-2023/) as “an indicator of phosphorus in different forms (mineral, organic) used in agriculture and industry (fertilizer chemicals or phosphoric acid, but also organic fertilizers, manures, crop products used as animal feed).”

The current CRM terminology also leads to confusion of stakeholders.

Proposed amendment:

Modify Annex II Section 1 to add:

*“(y) ~~Phosphate Rock~~* ***Phosphorus in any form****”
“(z) ~~Phosphorus~~* ***P4 and derivatives”***