



OPTIONS FOR EU WEB PORTAL SEARCH (DPP SYSTEM)

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ABBREVIATIONS

CPR	Construction Products Regulation
DPP	Digital Product Passport
DPPSP	Digital Product Passport Service Provider
EC	European Commission
ESPR	Eco-design for Sustainable Product Regulation
IAA	Identification, Authentication, Authorization
ID	Identifier
MSA	Market Surveillance Authorities
REO	Responsible Economic Operator
SME	Small-Medium Enterprise
UPI	Unique Product Identifier

1 OBJECTIVE OF THIS DOCUMENT

This document contains considerations and recommendations by the CIRPASS-2 consortium concerning the implementation of the EU Web Portal as defined in Article 14 and Recital 42 of the ESPR.

We start by introducing a discussion on the potential role of the DPP in pre-purchase decisions. Next, an attempt to clearly define the requirements and functionalities of the Web Portal is made, clearly distinguishing the main functionalities, and potential additional search capabilities. While the distinction between uses of the Web Portal by officials and by non-officials is not made in the ESPR, we make this distinction and derive associated implementation possibilities. Concerning these last, the document collects ideas on different implementation options and discusses the respective advantages and disadvantages of the different approaches.

Finally, recommendations for Web Portal implementation are made.

1.1 DISCLAIMER

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1.2 REGULATORY SOURCES FOR THE EU WEB PORTAL

Article 14 and Recital 42 of the ESPR define the '**Web Portal**' as a publicly accessible and user-friendly DPP web portal that is to be set up by the European Commission which guarantees stakeholders, such as customers, economic operators and other relevant actors, the ability to search for and compare data included in digital product passports in a manner consistent with their respective access rights.

*“(42) The Commission should set up and maintain a user-friendly and publicly available web portal where stakeholders, such as customers, economic operators and other relevant actors, have access to data included in the digital product passports and the possibility of searching for and comparing data included in those passports in line with their respective access rights specified in the delegated acts setting ecodesign requirements. The **web portal should provide links to data** already stored by the economic operator in its decentralised digital product passport.”*

(Emphasis added)

Article 14 - Web portal for data in the digital product passport

“The Commission shall set up and manage a publicly accessible web portal allowing stakeholders to search for and compare data included in digital product passports. The web portal shall be designed to guarantee that stakeholders can search for and compare the data in a manner that is consistent with their respective access rights specified in the delegated acts adopted pursuant to Article 4.”

1.3 MAIN FINDINGS OF THIS REPORT

This work has resulted in the following observations:

- The role of the DPP in pre-purchase decisions is unclear. Compared to the “label”, which will play a major role in orienting pre-purchase decisions, it is uncertain if the DPP itself will/can be used in the context of pre-purchase decisions.
- Products with batch or item-level mandatory granularity might be required to have two mandatory web links and possibly two mandatory data carriers.
- The exact functionality of the Web Portal cannot be extracted from the ESPR, which only provides a general description.
- We list a number of potential capabilities for the EU Web Portal, which may or may not include ‘searching’.
- Depending on the implementation option selected, the implementation of the Web Portal might cause commercially sensitive information to be revealed.
- Depending on the implementation option selected, the implementation of the Web Portal may or may not require additional standardization effort and implementation effort by operators of distributed DPP data repositories (Economic Operators or their appointed DPP service provider).

2 INVESTIGATION ON THE ROLE OF THE DPP IN PRE-PURCHASE DECISIONS

In this chapter, we discuss the potential role that the DPP may have in orienting pre-purchase decisions. Of particular importance to this discussion are the complementarities that will be offered by the “label” and the “DPP”.

2.1 PRE-PURCHASE DECISIONS – ESPR CONTEXT

Pre-purchase decisions are typically made by consumers or professional buyers by matching their needs with the set of **model**-level characteristics of products. Online, this is often done using marketplaces which offer extensive search functionalities, the most important of which is searching on price.

With the ESPR, the intention of the Regulator is to facilitate access to comparable product information to influence pre-purchase decisions towards more sustainable products.

2.2 LABELS FOR PRE-PURCHASE DECISIONS (ESPR ARTICLE 16)

To influence purchases towards more sustainable products, the ESPR introduces the concept of **labels**, to be used both offline and online:

*(46) “To drive consumers towards sustainable choices, labels should, when required by the delegated acts adopted pursuant to this Regulation, provide clear and easily understandable information allowing for the effective comparison of products, for instance by indicating classes of performance. Specifically for consumers, physical labels can be an additional source of information at the place of sale. They should **provide a quick visual basis for consumers to distinguish between products based on their performance** in relation to a specific product parameter or a set of product parameters. They should, where appropriate, also make it possible to access additional information by bearing specific references such as website addresses, dynamic QR codes, links to online labels or any appropriate consumer-oriented means. The Commission should set out in the relevant delegated act the most effective way of **displaying such labels, including in the case of online distance selling**, taking into account the implications for customers and economic operators and the characteristics of the products concerned. The Commission should be able to also require the label to be printed on the packaging of the product.”*

*(68) “To facilitate the choice of more sustainable products, **labels**, where required, **should be displayed** in a clearly visible and identifiable way. ... To ensure that the labels are accessible to customers when considering a purchase, both the dealer and the responsible economic operator should display them whenever advertising the product, **also in cases of distance selling, including online.**”*

(Emphasis added)

It is understood from the above that labels should be **accessible without any action** on the potential purchaser’s part.

Even if the DPP may contain more detailed information than the label, it is likely that the label, as will be defined in each Delegated Act, will display the key information needed for sustainable purchase decisions.

It is likely that the information content of the label will be defined at the product model level (and not at the batch or item level).

It is likely that labels under ESPR will resemble the label defined by the Energy Labelling Regulation¹ that support pre-purchase decisions for energy related products (see examples below). We observe that the EPREL label includes a data carrier (here a QR code) which **contains a web link to the model-level information stored on the centralized EPREL database.**

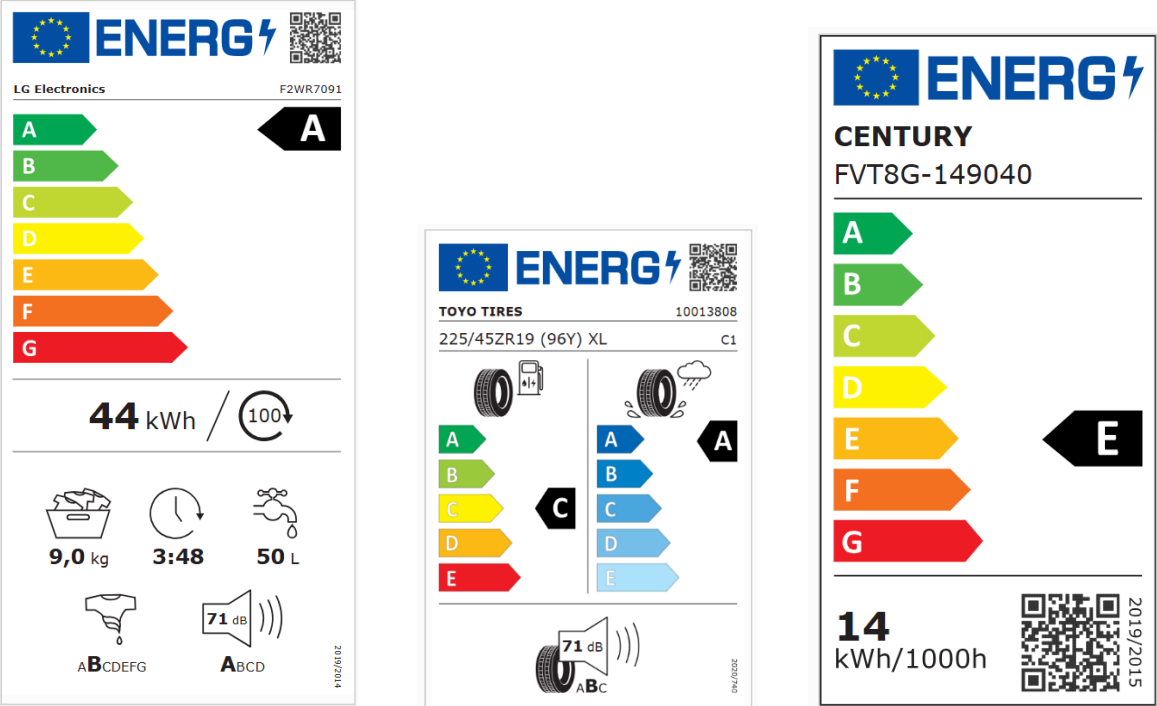


FIG. 1 EXAMPLES OF PRODUCT MODEL-LEVEL LABELS DEFINED BY THE ENERGY LABELLING REGULATION: LEFT: WASHER/DRYERS, MIDDLE: TYRE, RIGHT: ENERGY SOURCE



FIG. 2 EXAMPLES OF PRODUCT MODEL-LEVEL LABELS DEFINED BY THE ENERGY LABELLING REGULATION AND PLACED ON PRODUCT PACKAGE

¹ Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017 setting a framework for energy labelling and repealing Directive 2010/30/EU

Differently from the DPP, it is likely that an ESPR label, if available on the product packaging, will be discarded after purchase.

Differently from the EPREL label, the ESPR label could indicate that the product has been provided with a DPP with the aim of supporting consumers in adopting more sustainable post-purchase behaviors. A consistent indication of the DPP being present could provide useful influence as DPPs become a known and understood concept by the market and consumers. For products without mandatory DPPs, this might become a differentiation argument.

2.3 THE DPP IN PRE-PURCHASE CONTEXTS

Differently from the label, the role of the DPP in pre-purchase decisions is less clear for the following reasons:

- The label will display the key information needed for sustainable purchase decisions, as will be defined in each Delegated Act.
- Accessing the possibly more detailed information in the DPP requires action from the potential pre-purchaser (e.g. scanning a QR code). (We note that there is nevertheless a strong business value case associated with this situation.)
- Differently from the label, whose information content will likely be defined at the model-level, the mandatory information content of the DPP will be defined at the granularity level required by the delegated act: model, batch or item. Of course, batch and item-level DPPs may also contain model-level information.
- Furthermore, an ESPR label (under Article 16) may be defined on which a model-level QR code may be mandatory. More clarity on the requirements of the label is required. However, should this be the case, this would mean that products with batch or item-level mandatory granularity **would have two mandatory data carriers**.
- The need for online access to model-level product information before purchase may lead to the need for **two mandatory web links, as discussed below**.

2.3.1 ONLINE PURCHASE OF A NEW PRODUCT

The ESPR does not define “*the manner in which the DPP is to be made accessible to customers before they are bound by a contract for sale, hire or hire purchase, including in the event of distance selling*”, leaving this to upcoming delegated acts (Article 9, 2e). Article 10, 3b does specify that “[*The economic operator placing the product on the market shall:] provide dealers and providers of online marketplaces with a digital copy of the data carrier or the unique product identifier, as relevant, to allow them to make the data carrier or the unique product identifier accessible to potential customers where they cannot physically access the product.*”

However, in an online purchase situation, before purchase, the consumer does not know which specific item will be purchased or to which production batch this specific item will belong. Because the web link to the DPP is related to the unique product identifier (which is defined at the granularity defined by the delegated act), any DPP defined at batch or item level cannot be accessed at that moment unless the specific web link for the specific item or batch is known.

There are two ways to access model-level DPP data on online marketplaces for products with batch or item mandatory granularity:

- The REO provides to the marketplace the web link (or data carrier) of a **randomly chosen** item or batch. The marketplace settings are adapted to display only the model-level attributes of the retrieved DPP.² Alternatively, if a model-level web link can be extracted from the more granular web link, and if a model-level DPP data repository can be accessed using the model-level web link, the model-level DPP information can be retrieved directly.
- The REO creates a model-level web link and provides this web link to the marketplace. This implies that **the REO must create two mandatory data carriers** (and/or web links) for these products.

This is confirmed by the text of the Standardisation Request, chapter 1.4 “*The unique product identifier shall always allow the possibility to include the three different granularity levels, i.e. model, batch, or item. This is needed because product passports of products sold online will only be available at model level, while product passports may need to be available at batch level with the possibility for economic operators to serialise their product passports having a product passport at item level.*”³ (Emphasis added)

In case the second approach is preferred by the European Commission, it should be made clear to REOs that this model-level data carrier **should not be physically placed on products as this would mean there are two data carriers on the product, creating confusion. If a model-level QR code is placed on an EPREL-like label, this label should be made available only on the product packaging, on in-store displays, or on online marketplaces.** Also, it should be made clear that this additional data carrier (and/or web link) **is also mandatory.**

2.3.2 IN-STORE PURCHASE OF A NEW PRODUCT OR PURCHASE OF A SPECIFIC SECOND-HAND PRODUCT

In these situations, because a specific physical good is referred to, either because the physical good is displayed in-store or is referred to specifically on a second-hand market online platform, the full DPP of the specific item can be retrieved, whatever the granularity of the DPP (model, batch or item).

² This approach might come with some risks, e.g. if the randomly chosen batch/item happens to be recalled and taken off the market.

³ Standardisation request to CEN, CENELEC and ETSI as regards digital product passports in support of Union policy on ecodesign requirements for sustainable products and on batteries and waste batteries. [https://ec.europa.eu/transparency/documents-register/detail?ref=C\(2024\)5423&lang=en](https://ec.europa.eu/transparency/documents-register/detail?ref=C(2024)5423&lang=en)

3 EU WEB PORTAL

3.1 HYPOTHESES CONCERNING THE WEB PORTAL

- **Marketplaces:** The EU Web Portal is not meant to replace modern online marketplaces commonly used by consumers in their pre-purchase decisions.
- **Scope of search:** As the scope of the search is not defined in the ESPR, this may be interpreted to mean either that the full contents of the DPP must be searchable or that only the most relevant features of a product must be searchable (similarly to the EPREL search functionality).
- **Pre-purchase:** Sustainability-driven purchase decisions will be made on model-level product information provided on **labels** displayed “whenever advertising the product, also in cases of distance selling, including online.” (ESPR recital 68)
- **Label content vs. DPP:** The DPP will **at least** contain all information that will also be present on the label. (ESPR Article 7, 7c)
- **Frequency of access:** Access to the EU Web Portal will not be necessary in the huge majority of DPP data requests, as the majority of requests will be made based on (the scanning of) the data carrier which links directly to the decentralized DPP data repository.
- **Sensitive market intelligence:** EU Web Portal functionalities should not make it possible to gather (using common Web scraping techniques) sensitive market intelligence, for example by retrieving information on production volumes (e.g. number of batches or items produced) for products manufactured by a given economic operator. For this reason, the data **MUST NOT** be index-able by search engines and the web repository that holds the data **MUST NOT** expose lists of stored files.⁴
- **Mandatory information:** While a DPP may contain additional non-mandatory information, any DPP data requests made using the Web Portal will return at least (or possibly only) the mandatory information.
- **Comparability:** It is assumed that semantically interoperable vocabularies, built using common and/or standardized dictionaries, will enable comparability of search results.
- **Public authorities:** The EU Web Portal functionalities for users with credentials associated to their role as public authorities (customs, market surveillance authorities, other Commission services) will **differ** from the functionalities for non-officials (general public and stakeholders with access rights to specific restricted data according to the delegated act).

3.2 MINIMUM CAPABILITIES FOR THE WEB PORTAL

The following minimum functionalities should be provided by the Web Portal to **all stakeholders** (authorities and non-authorities). Additional search capabilities will be described in section 3.4:

⁴ For the same reason, this requirement is identical for the DPP defined by UN Transparency Protocol (UNTP) <https://uncefact.github.io/spec-untp/docs/specification/DecentralisedAccessControl>

- Retrieval of the active web link in case the UPI is known but the web link is unknown (e.g. the data carrier has been destroyed, the data carrier does not contain a web link and the expected industry-specific means to retrieve the web link is no longer available);
- Retrieval of the backup web link in case the active web link, e.g., the one in the data carrier, is not functional and the backup copy needs to be accessed (e.g. the REO has gone out of business or is no longer operating on the EU market);
- Comparison of DPP information for at least two products identified either using their unique product identifiers, active or backup web link and retrieved using the active or backup web links;
- Support for understanding (e.g. links to resources for understanding the meaning of a durability rating) and trusting (e.g. data tamper-proof seals, verifiable credential verification tools, etc.) the DPP information.

3.3 MINIMUM REQUIREMENTS FOR THE EU WEB PORTAL

The uses mentioned above imply the following requirements for using the Web Portal.

- Retrieving a specific DPP, based on the UPI or web link, requires the system to be **exhaustive**, i.e., containing all product IDs and associated web link, including the web link to the backup if the original DPP is no longer available. It is therefore assumed that the Web Portal has (internal) access to the information from the EU Registry.
- Comparing data between DPP's requires **completeness**, providing all the mandatory data from a DPP. It is therefore assumed that retrieving the mandatory content of the DPP using the Web Portal provides the same information as retrieving the mandatory content of the DPP using other means.
- Comparing data between DPP's requires **reliability** and the trust that the retrieved data are correct. Should any mandatory data correctness mechanism be implemented for the mandatory DPP data, the Web Portal should enable the performance of the associated data correctness checks.
- Providing a Web Portal (as defined in Article 14 and Recital 42 of the ESPR) requires **responsiveness**, as users have grown to expect quick responses from online digital services.
- The **impact of the Web Portal implementation, both financial and technical, on the REO** must be carefully considered, as the DPP system must be suitable for implementation by small companies with limited means. For this reason, implementation options that do not require the implementation of search APIs by REOs and DPPSPs should be preferred (Options 1, 2, 3, 5 below).
- Queries made on the Web Portal should not just be manual, but **machine-to-machine** queries must be supported. (Where QR-codes containing a complete web link will be the most likely access to the DPP for consumers, these often will not be usable in industrial operations, e.g. sorting of waste. Using RFID is a logical solution in these cases. As storage on RFID may be limited and may not contain a web link, the option of automated retrieval of DPP data using the Web Portal would be needed in case the default industrial application for building the DPP web link from a UPI is no longer available).
- Web portal implementation requires high **availability** as requests can be made either by humans or machines at any hour, any day.
- The portal should conform to **accessibility** requirements for users with disabilities.
- For **user friendliness**, the search capability of the web portal should anticipate supporting LLM search capability, as these tools are coming into wide use today.

Finally, it is important to consider user expectations of the Web Portal's search engine capabilities in today's and future context. Average users have grown accustomed to "intelligent" search engines, which is likely to increase the costs, complexity and risks of building and maintaining the portal.

3.4 ADDITIONAL SEARCH CAPABILITIES

Because the search capability mentioned in Article 14 is not clearly defined, we assume it may mean either of the following two capabilities:

3.4.1 AN EPREL-LIKE MODEL-LEVEL SEARCH

The European Product Registry for Energy Labelling (EPREL)⁵ *"is a comprehensive database set up and operated by the European Commission. Its primary purpose is to make information about the energy and environmental performance of all **models** of products bearing the "energy label" readily available"*.

The EPREL search engine assumes that all product models are assigned to specific "product groups". Next, for every product group users can:

- *"search for a specific model (by brand and model name or by registration number)*
- *filter for all models fitting to a set of criteria (specific for every different product group)*
- *sort the search results up to 3 simultaneous keys*
- *analyse the "class population" for the selected models (i.e. how many models are in each class)"*

⁵ https://energy-efficient-products.ec.europa.eu/eprel_en

EPREL - European Product Registry for Energy Labelling

Home > Washing machines

Search

Model identifier

Brand or trademark

Energy Efficiency Class

Any ▼

Include models not placed on the market anymore⁶

+ Advanced

Reset Search

Washing machines (18 487)

[REGULATION \(EU\) 2019/2014](#)

Showing result 1 to 25 Items per page 25 ▼

Sort by ▼ + ▼ + ▼

+ Models distribution by performance class

Electrolux		A A+ G	Details >
EW8F4414SUE 914495605			
Overall dimensions	85 (Height) x 60 (Width) x 64 (Depth)	cm	
Rated capacity	10	Kg	
Weighted energy consumption [per 100 cycles, eco 40-60]	26	kWh	
More			

Electrolux		A A+ G	Details >
EW8F710Y5 914475105			
Overall dimensions	85 (Height) x 60 (Width) x 64 (Depth)	cm	
Rated capacity	10	Kg	

FIG. 2 EPREL SEARCH ENGINE INTERFACE FOR WASHING MACHINES⁶

The examination of a specific model (via the details button) retrieves additional information compared to the label. “For some product groups, whose legislation has been recently reviewed, you may find weblinks to complementary information such as list of spare parts, their indicative cost, repair instructions, or even dismantling information for recyclers.” Also available is the Product Information Sheet (available for download in several languages), product availability, supplier contact, and the possibility to report a model to market surveillance authorities.

An EPREL-like search capability is therefore of the type:

- Retrieve all the **model-level** information for all products of **type X** with **parameter = Y**. (E.g. Retrieve the model-level information for all refrigerators with energy performance class > A+).

3.4.2 FULL DPP-DATA OR DPP WEB LINK RETRIEVAL SEARCH CAPABILITY

Warning! Such capabilities enable web scraping and should be provided to authorities only.

- Retrieve all UPIs and associated DPP web links for all products of **type X** and **model number = Y**.

⁶ <https://eprel.ec.europa.eu/screen/product/washingmachines2019>

- Retrieve all UPIs and associated DPP web links for all products of **type X** and with associated **performance class Y**.
- Retrieve all UPIs and associated DPP web links for all products manufactured by **economic operator named X**.
- Retrieve all UPIs and associated DPP web links for all products registered in the EU Registry by economic operator with **unique operator identifier X**.
- Retrieve all UPIs and associated DPP web links for all products manufactured at the location identified using the **unique location identifier X**.

The last two examples above exploit centralized data uploaded to the EU Registry. Thus, the execution of such searches by officials would be trivial thanks to the use of centralized data base tools exploiting the data stored in the EU Registry.

The EPREL-like search and the other examples above are less trivial as the **search-keys** (e.g. product type, model number, commercial name of manufacturer, performance class) are not expected to be stored in the EU Registry.

3.5 OPTIONS FOR IMPLEMENTATION OF ADDITIONAL SEARCH CAPABILITIES

Assuming additional capabilities are required for the EU Web Portal (beyond those already listed above in section 3.2), in this section, we propose 5 implementation options for an EU Web Portal search functionality.

3.5.1 OPTION 1 – CREATE A CENTRALIZED SEARCH INDEX INCLUDING ALL MANDATORY MODEL-LEVEL DATA

In this option, a copy of the mandatory model-level content of all DPPs is automatically retrieved and cached by EU services upon or after DPP registration in the EU Registry. (Note that if the registration process performs an automatic DPP validation check, this retrieval process for mandatory DPP data has already been performed.) This cached data is used to create a centralized search index which is then used as the Web Portal search engine. Liability and responsibility for the availability of DPP data remains with REOs or their appointed DPPSP and remains stored in decentralized DPP data repositories. Web Portal search results present only model-level product information.

Pros: The Web Portal search engine can offer search capabilities for the entire mandatory model-level DPP content, not limiting the search to a limited number of selected search-keys. This option does not require the implementation of any decentralized search APIs by REOs and DPPSPs. This approach has the advantage of making it easy to limit the search results to model-level product information only, limiting the risk of leakage of sensitive business information that might be captured by retrieving batch-level (e.g. variations in product carbon footprint per batch) or item-level DPP information (e.g. production volumes). The implementation of the Web Portal search engine would be trivial using modern database tools.

Cons: Duplication of the complete model-level mandatory contents of all original DPPs from REOs or their DPPSPs would however have a relevant effect on the amount of centralized data and hence also the needed bandwidth at the storage location.

However, while this might appear to represent large amounts of information, this is much less information than is normally handled by modern databases. (For example, the Internet Archive non-profit association makes regular snapshots of important sections of the Web and a single copy of the Internet Archive library collection occupies 145+ Petabytes of server space). A shortcoming of this approach is that some search index data may become out of sync in case errors are corrected in the DPP, requiring either that these

modifications be declared or that other reliable and verifiable update mechanisms be implemented (even for products from REOs that are no longer active).

This option gives the impression that the DPP system is slightly more centralized, in appearance making a small concession to the distributed nature of the DPP system. However, the EC, like any other DPP user, is authorized by law to cache retrieved DPP data. Furthermore, this option would allow for an extremely low-cost implementation of Web Portal functionality by all stakeholders (by the European Commission and by all DPP data repository operators, both REOs and DPPSPs).

3.5.2 OPTION 2 – CREATE A CENTRALIZED SEARCH INDEX INCLUDING ALL MANDATORY SEARCH-KEY DATA (MANUAL)

In this option, a copy of all mandatory (and non-sensitive) model-level search-key data (e.g. brand, type of product) for every DPP is uploaded by REOs when registering their DPPs. This data is used by the EU to create a centralized search index which is then used as the Web Portal search engine. The set of mandatory search-key information should correspond to the most desired or useful search criteria, e.g. product type, brand, energy efficiency class. This set should be defined in the Delegated acts (possibly after a public survey by the European Commission or based on insights from common product web searches within Ecolabels, Green Public Procurement). Provisions to update the search-key dataset (e.g. new search-key requirements) may be necessary. Liability and responsibility for the availability of DPP data remains with REOs or their appointed DPPSP and remains stored in decentralized DPP data repositories. Web Portal search results present only model-level product information.

Optionally, thanks to the limited set of centralized product information, more complex searches could trigger a real-time query to retrieve additional relevant model-level data from the decentralized DPP data repositories that are known to store the relevant information.

While it would require updates to pre-existing delegated acts, the contents of the repository could be extended to facilitate faster search functionality if the use of search terms not already present in the search-key dataset is common, by requesting some additional data from REO's.

Pros: This option does not require the implementation of any decentralized search APIs by REOs and DPPSPs. This option does not require the storage of the complete model-level DPP data, minimizing the size of the search index. This approach has the advantage of making it easy to limit the search results to model-level product information only, limiting the risk of leakage of sensitive business information that might be captured by retrieving batch-level (e.g. variations in product carbon footprint per batch) or item-level DPP information (e.g. production volumes). Because the search index is a centralized database, the implementation of the Web Portal search engine would be trivial using modern database tools.

Cons: This option gives the impression that the DPP system is slightly more centralized, in appearance making a small concession to the distributed nature of the DPP system. However, the EC, like any other DPP user, is authorized by law to cache retrieved DPP data. Furthermore, this option would require much less cached centralized DPP data than the previous option. This option would allow for an extremely low-cost implementation of Web Portal functionality by all stakeholders (by the European Commission and by all DPP data repository operators, both REOs and DPPSPs).

3.5.3 OPTION 3 - CREATE A CENTRALIZED SEARCH INDEX INCLUDING ALL MANDATORY SEARCH-KEY DATA (AUTOMATIC)

In this option, a search index would be progressively built-up by EC services using an automatic retrieval and indexing functionality. This platform would periodically perform batch retrievals of model-level search-key data (e.g., product type, brand, energy efficiency class) using the DPP web links available in the EU Registry. (Note that if the DPP registration process performs an automatic validation check, a first iteration of this retrieval process has already been performed.) This data is used by the EU to create a centralized search index which is then used as the Web Portal search engine. The search-key dataset does not need

to be defined in Delegated Acts and can be updated ad hoc. Liability and responsibility for the availability of DPP data remains with REOs or their appointed DPPSP and remains stored in decentralized DPP data repositories. Web Portal search results present only model-level product information.

Optionally, in case of complex search criteria not already stored in the index, the system might conduct targeted, real-time queries (model-level DPP data retrievals) to the relevant subset of decentralized DPP repositories.

Rather than batch queries at regular intervals, the search index creation function could also periodically query all known decentralized DPP repositories to check if updates to the search-key dataset are required (e.g. corrections). However, this would require implementation of a dedicated API by all.

Pros: This option does not require the implementation of any decentralized search APIs by REOs and DPPSPs. It does not require the storage of the complete model-level DPP data, minimizing the size of the search index. Furthermore, this approach avoids the possibility of search-key data becoming out of sync. Also, the search index is automatically built by the EC without economic operators being required to upload the mandatory search-key data. This therefore requires slightly more effort from the EC but would be a more politically acceptable solution, as the EC would only be pulling and storing a subset of public DPP data like any other DPP user. This approach has the advantage of making it easy to limit the search results to model-level product information only, limiting the risk of leakage of sensitive business information that might be captured by retrieving batch-level (e.g. variations in product carbon footprint per batch) or item-level DPP information (e.g. production volumes). Because the search index is a centralized database, the implementation of the Web Portal search engine would be trivial using modern database tools.

Cons: This option gives the impression that the DPP system is slightly more centralized, in appearance making a small concession to the distributed nature of the DPP system. However, the EC, like any other DPP user, is authorized by law to cache retrieved DPP data. Furthermore, this option would allow for an extremely low-cost implementation of Web Portal functionality by all stakeholders (by the European Commission and by all DPP data repository operators, both REOs and DPPSPs).

3.5.4 OPTION 4 - REQUEST THAT ALL OPERATORS OF DECENTRALIZED DPP DATA REPOSITORIES IMPLEMENT A SEARCH INDEX FOR MODEL-LEVEL DATA FOR ALL DPPS STORED ON THEIR REPOSITORY

Definitions:

A **search index catalog** is a database associating keywords to relevant results. For example, for the DPP system, the search index catalog might consist of the following set of information {product type, model, brand name, performance class}, for the model-level information of all DPPs stored in the associated repository.

A **search index service** is a publicly accessible web query service which finds relevant results (e.g. a list of relevant models) based on the search-key conditions entered by users. (e.g. product type = refrigerator and energy efficiency class > B). The search indexing service relies on the use of a database, i.e. the search index catalog. One of the ways to automatically access the search index service is through an API.

In this option, all decentralized DPP data repository operators (DPPSPs or REOs) must implement a local search index catalog and search index service. Small extracts of each of these search index catalogs, e.g. at least the product_type and the address of the decentralized DPP data repository search index service API, are aggregated and stored centrally by the EU. Each search made on the Web Portal is sent to the relevant search index services (e.g. all decentralized DPP data repositories containing DPPs for product_type = refrigerator). The model-level search results are concatenated and filtered according to the search-key settings before being presented to the user.

Warning: Search results must be limited to model-level information only. This means that if the DPP granularity is not 'model', then the complete batch or item-level DPP and the associated web link must not

be retrieved. The danger associated with the retrieval of batch or item-level DPP data and/or their web links is as follows: Existing search engines will progressively find the decentralized DPP data repositories (using normal Web crawling procedures), will use the available search indexing service API to retrieve all DPP data (a process known as Web scraping) and will create centralized (by them) copies of all EU DPPs (limited to the publicly available data). Because they are not DPPSPs, they will not be bound by legal restrictions on DPP data handling. They will therefore be able to exploit the full EU DPP data content to build market intelligence (e.g. number of batches or items produced by each economic operator, average numbers of product life-cycle events, etc.)

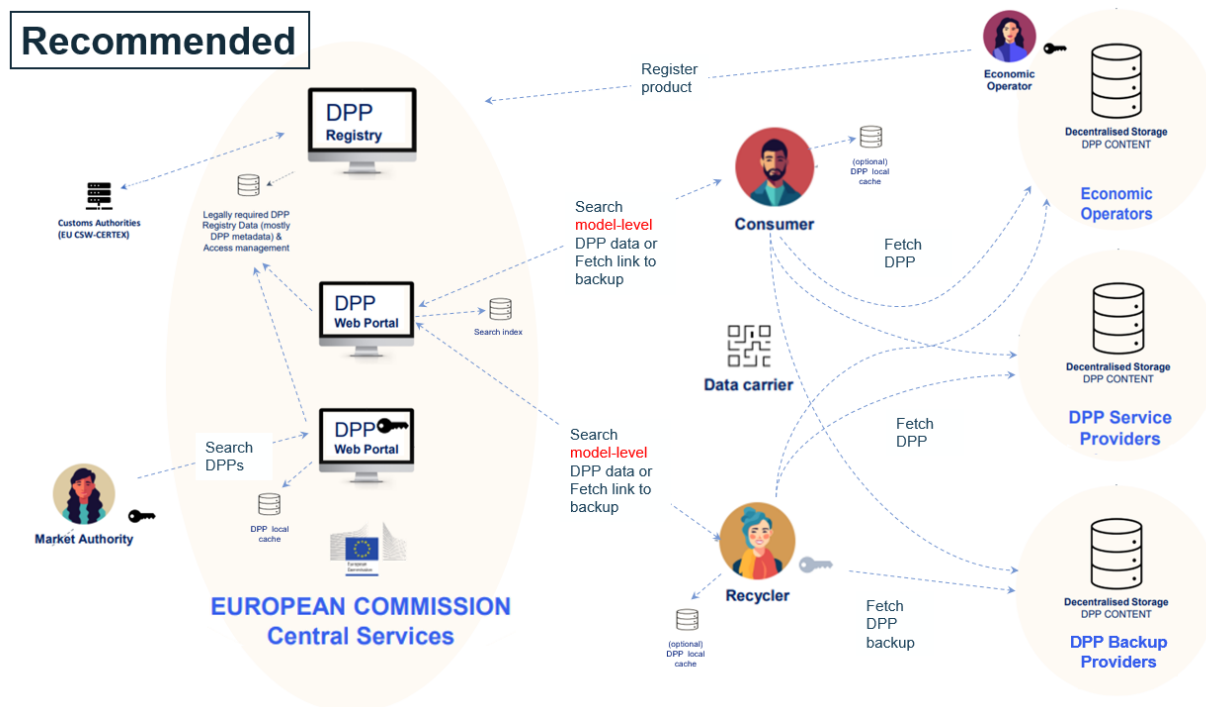
Considerations: Because each API call to each DPP data repository will take ~100ms, if there is no mechanism to filter for specific repositories, assuming there were only 10,000 decentralized data repositories (REOs + DPPSPs), a simple query to all repositories would probably take more than 15 minutes. Parallelization techniques could possibly reduce this delay a bit. Most federated systems adopt some level of index aggregation or caching to avoid fan-out queries to thousands (or tens of thousands) of endpoints for every user search. For this reason, here we propose that this be performed by the EU. Further filtering may be needed as there may be a large number of decentralized DPP data repositories containing DPP data for a given product type (product_type = refrigerator in the above example.)

Pro: This solution requires the least amount of centralized DPP data. It however still requires some.

Cons: This option gives the impression that the DPP system is slightly more centralized, in appearance making a small concession to the distributed nature of the DPP system. Additionally, the definition of the search index database and search indexing service will likely require dedicated standardization efforts, possibility including standardisation updates every time the mandatory content of a DPP or the mandatory search keys are modified. All operators of decentralized DPP data repositories will have to implement these changes and ensure regular synching with the EU aggregated index. Implementing and maintaining a local search index is not trivial; it requires infrastructure, skilled personnel, and ongoing maintenance. Small or medium-sized REOs may find this especially challenging compared to larger companies. The implementation and maintenance of search index catalogs and search indexing services by all DPPSPs and REOs will likely increase the cost of DPP implementation.

3.6 RECOMMENDED SYSTEM ARCHITECTURE

The proposed architecture below represents the combination of Option 5 with any of Option 1, 2 or 3. Because it does not require the implementation of decentralized searching algorithms and associated APIs by all operators of decentralized DPP data repositories, it offers the lowest implementation complexity, lowest cost and best performance and user experience.



4 EXAMPLES OF SUCCESSFUL IMPLEMENTATIONS OF WEB PORTALS FOR PRODUCT DATA

The following examples are provided for architectural comparison and consideration:

US SmartLabel

US SmartLabel can in many ways be seen as a voluntary Digital Label / DPP for product categories including food, beverage, household cleaning, pet care, personal care, dietary supplements, and over-the-counter medications. Its purpose is to provide detailed information on ingredients, nutrition, and allergens and goes beyond the package label to include things like how to use or prepare the product, how to recycle the packaging, safety and handling instructions and even recipes.

SmartLabel offers a consistent display across participating brands to facilitate consumer understanding of the data.

The SmartLabel system can handle product variants, meaning products with the same GTIN/EAN/UPC, but with and without e.g. Palm Oil. A scan of the QR-code on products would show the right variant. Online search would show the latest variant.

In the US SmartLabel system, QR-codes on products embed URLs such as e.g.:

<https://smartlabel.unileverusa.com/048001705920-0001-en-US/index.html>

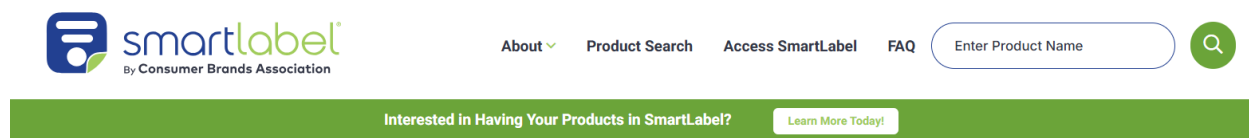
<https://smartlabel.hersheys.com/034000288007-0012-en-US/index.html>

<https://smartlabel.syndigo.com/id/8ca76eff-dcf0-46c5-8c04-07ea1dfc9019#nutrition>

All SmartLabels landing pages are hosted by economic operators and refer to economic operator's domains with link to these in the URL of the QR-code. However, the rendering of data follows a strict and unified user

interface for mandatory and voluntary and attributes. The consumer can tell no different in the look and feel and where and how to find information from different brands.

A centralized web portal for public search across the decentralized systems of all economic operators is available (similarly to the EU Web Portal concept): <https://smartlabel.org/product-search/>



SmartLabel Product Search Results:

Search

Filters:

Search Products: Brand/Retailer Brands: Sub Brand: Items per page [50](#) | [100](#) | [250](#) | [500](#)

[Find Detailed Product Information](#)

Simply search by Brand and/or Product using the search field and filters. Remember to clear the filter between searches.

COMPARISON SITES, SUCH AS PRICEWISE

Many online price comparison tools fulfill part of the functionality that would be required for the EU DPP Web portal. One such example is the Dutch Price wise (Pricewise | Vergelijk op grootste onafhankelijke vergelijkingssite), which allows consumers to pick the energy provider, car insurance, or internet provider, among other services, that best meets their needs. Or the German idealo.de that is about products (physical goods). These platforms make use of available product information to stay relevant and connect consumers to the product or service they are actually interested in. Moreover, they enable comparison between similar products, e.g. the price of two car insurances, or two office chairs (from same provider, or different ones filtered along common characteristics). Many online marketplaces offer similar functionalities.

However, these platforms only allow searching and comparison of products in relatively narrow product categories. Moreover, the number of attributes to filter upon is also limited and pre-defined. Because the search attributes are stored and indexed locally, consumer searches can be answered quickly.

In the context of the EU DPP Web Portal however, the number of products that can be searched over is far higher. Moreover, these comparison sites don't actually work over a decentralized system. They only give this impression to the consumer by fetching some data (such as price) when it's needed. All other data is cached locally.