



Network Development Plan

2022

Introduction & Purpose

Version Control

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Foreword

With the government's commitment to end the UK's contribution to carbon emissions by 2050, the role of electricity in helping to facilitate net zero is becoming increasingly important. To understand and enable us to meet the needs of a rapidly evolving energy landscape and continue to provide safe, secure and sustainable electricity across the Midlands, South West and South Wales, in-depth modelling of the distribution network is required.

Within our Network Development Plan, we have used forecasting data derived through our DFES process to quantify the likely growth across our region and identify areas of our network which may require intervention in the future. We use custom developed analysis tools and techniques to automate what have historically been laborious analysis processes. As a result of this automation, our teams have carried out comprehensive electrical analysis of the network over the next ten years. This analysis was carried out under various credible future energy scenarios, identifying areas requiring intervention far in advance of when they would have otherwise been detected using non-automated processes.

Ahead of the publication of the Network Development Plan (NDP), the DSO team has run 2,600 studies across our four licence areas, this covers over 11.6 billion individual load flow studies, with a 99.997% convergence success rate.

By identifying constraints across our network well in advance of need, we are able to effectively co-ordinate our load related investment strategies and ensure the optimal solution is taken forward. This helps guarantee we develop the network in an economic, coordinated and efficient manner to meet the needs our customers. The previously used firm capacity style analysis is no longer a suitable method to ensure network compliance and security of supply for our customers. As our network develops at a rate never seen before, robust analysis covering voltage, complex meshing and alternative topologies needs to be considered alongside simple traditional thermal loading assessments.

During RIIO-ED2, we will be considering where strategic investment may be required to unlock additional growth in the future and ensure stakeholders have confidence that network capacity will be made available to them when required. We would like to hear from you if this NDP has identified any areas where you expect development to exceed what we have identified within our analysis, please contact wpdnetworkstrategy@westernpower.co.uk with any feedback. Through 2022/23, we will be reviewing investment plans and considering options for flexibility or conventional reinforcement and will build any stakeholder supplied evidence into our next NDP submission in May 2024.



Ben Godfrey

Distribution System Operator Manager

Introduction

The [Clean Energy Package \(CEP\) \(EU Directive 2019/944\)](#) comprises European legislation for a unified energy strategy for delivering the Paris agreement. As part of the Clean Energy Package introduction into UK law, Standard Licence Condition SLC 25B has been introduced for electricity Distribution Network Operators (DNOs) to publish a Network Development Plan (NDP).

The NDP has three distinct purposes:

- To assess the future suitability of the distribution network for continuing to deliver for customers under credible future energy scenarios across the next 5 to 10 years;
- To identify sites that require intervention due to network constraints, assessing the options available to remedy the constraint to ensure the network complies with relevant design standards and technical limits of assets. Solutions could be provided through flexibility services, conventional reinforcement or operational mitigation; and
- To provide Ofgem and wider stakeholders with transparent plans to develop the distribution network and continue to enable the transition to net zero.

WPD has a variety of publications detailed that provide similar information to the NDP but are tailored for different audiences or published at a different frequency. If your requirements are not covered by the three points above, please see the [section in this report](#) where we provide further details about additional WPD publications.

Network Development Plan Structure

Through the Open Networks project; Western Power Distribution (WPD) and other electricity networks have developed a form of statement for the NDP. The objective is to define the common high-level end-to-end process for delivering the NDP licence requirements in the context of planning network investments and other reporting. The form of statement for the NDP is available [here](#). The form of statement describes three constituent parts for the NDP, as outlined in Figure 1 below.

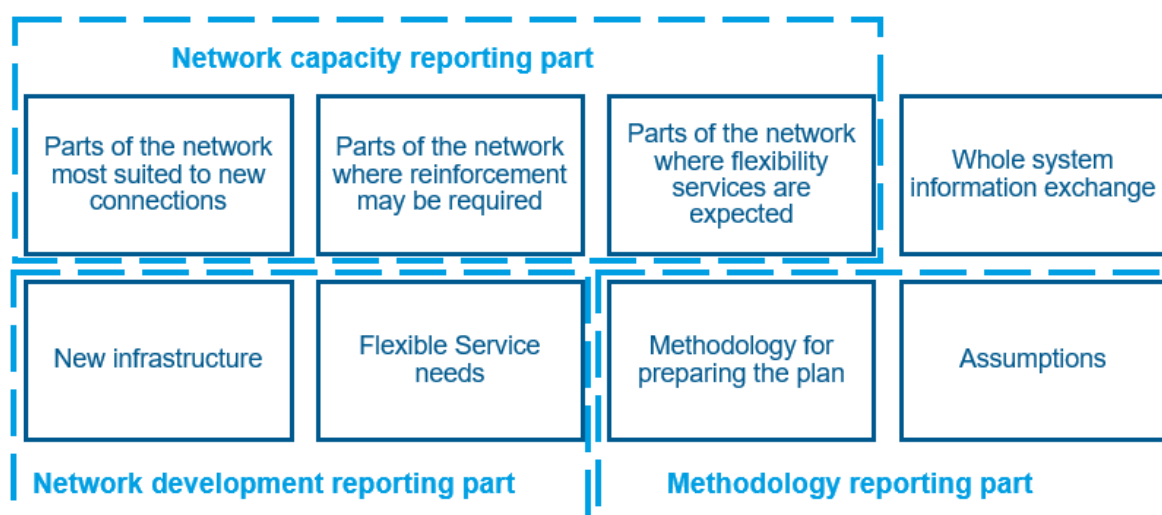


Figure 1: Outline of three parts of the Network Development Plan (taken from the [NDP form of statement](#))

The NDP comprises of this methodology document, the Network Headroom Report (NHR) and the Network Development Report (NDR). This report outlines the methodology used for each component of the NDP and how the process aligns to the WPD investment planning process.

Stakeholder Consultation

Standard Licence Condition SLC 25B.8 states as part of the NDP, the licensee must:

- a) consult interested parties on the proposed NDP for a period of at least 28 days before publishing as required by 25B.1; and
- b) publish the non-confidential consultation responses

To begin the 28-day consultation period we hosted a webinar to present our methods and NDP publication format and request feedback from interested parties. We also provided a survey on our website where people could answer the consultation questions on our draft Network Development Plan reports.

We received feedback from all seven of the stakeholder groups identified by the ENA Form of Statement of Network Development Plans, shown in Table 1.

Table 1: NDP stakeholders

Interconnected electrical network operators

- Other DNOs, IDNOs, TO, ESO

Community Energy

Local Authorities (LA) / Government organisations

Flexibility Service providers

Other network operators

- Transport
- Gas network
- Water network

Developers

- Property/ Building, Generation, Industrial customers, Generation customers

Universities

NDP Audience

As identified in the ENA Form of Statement of Network Development Plans, it is important to clearly identify the users of the NDP to prevent confusion and overlap with other WPD documents. WPD have provided a written explanation of this and related the NDP to other documents we published in the NDP methodology report. During the NDP webinar WPD consulted stakeholders to identify how effective this explanation was, and found that over 50% of consulted stakeholders felt they mostly or fully understood the intended audience for the NDP (Figure 2).

WPD would like to improve this understanding and so the final publication has provided additional clarification through creating a separate Introduction and Purpose document that includes a table summarising each of our published documents and their interaction with each other.

Extent to which the purpose of the NDP was understood by webinar attendees

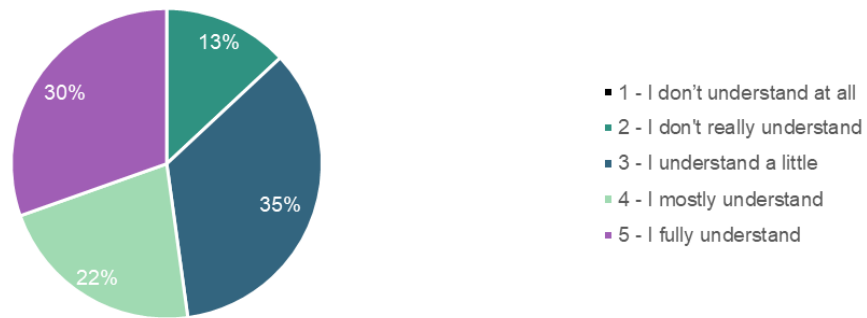


Figure 2: Extent to which NDP stakeholder consultation webinar attendees understood the purpose of the NDP

Analysis Approach

Having provided detailed explanation of the methodology used for both the Network Headroom Report and the Network Development Reports, WPD have asked the extent to which the stakeholders present at the webinar agreed with the methodology used. As seen in Figure 3, stakeholders largely agreed with the methodology used for both analysis publications of the Network Development Plan, with the Network Development Report methodology having the largest number of votes for strongly agree. As a result, WPD published the results with the methodology outlined in the NDP methodology report.

Following further analysis tool development, WPD (as a result of this feedback) implemented the comprehensive electrical analysis methodology used for the NDRs to produce the NHR table, ensuring we accurately identify network constraints for our stakeholders.

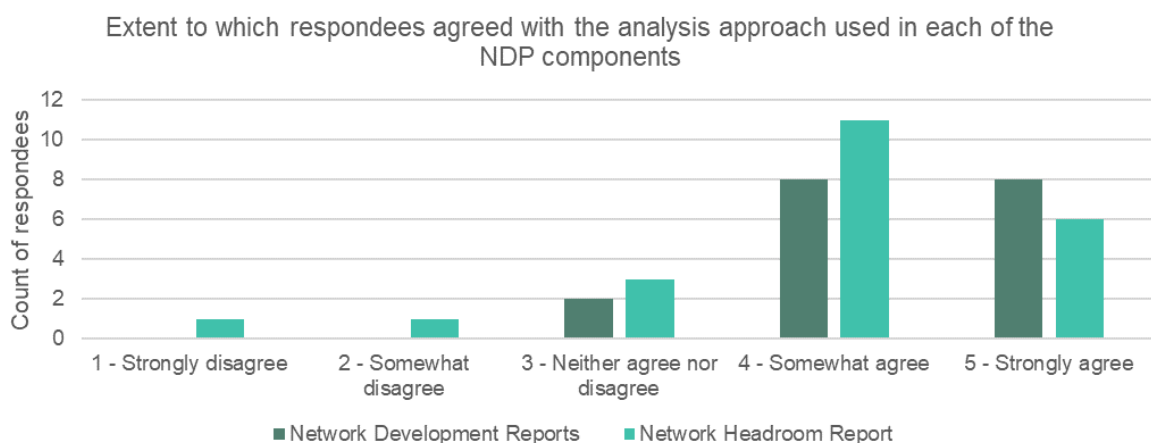


Figure 3: Extent to which stakeholders attending the NDP consultation webinar agreed with methodology used for the components of the NDP

Publication Format

WPD understand that the NDP stakeholder group contains a large range of technical abilities and the end use of the published data varies significantly across these groups. As a result, WPD wanted to gain further insight into the formats required by the NDP stakeholders and provided a multiple-choice poll within NDP's consultation webinar. By providing these formats, WPD hope to maximise accessibility of the data to all of our stakeholders. The results of the poll found that a variety of formats would best provide stakeholders with the insight that they need into the future network developments (Figure 4).

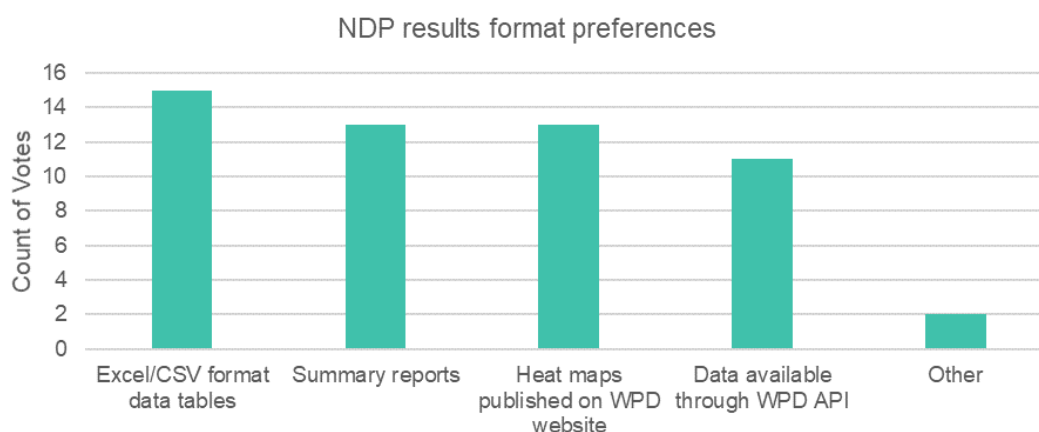


Figure 4: Poll results for preferred results provision format

The majority of the stakeholders consulted voted for two or more formats for the results to be provided in. The results format with the highest votes was Excel / CSV format data tables, followed by summary reports and heat maps published on the WPD website.

WPD will provide results in CSV/Excel format and in summary reports. WPD plan to publish future NDP reports on a heat map, as the less technical stakeholders in particular highlighted that this format would be beneficial for them. In the webinar, we also encouraged additional comments where “Other” was selected as a response. The format that was suggested through this mechanism was video reports for stakeholders to view through WPD's website. WPD intend to roll this out in due course as this method of dissemination was well received when trialled for previous Shaping Subtransmission reports.

Stakeholder Consultation Summary

Table 2 summarises the stakeholder consultation webinar responses and the actions WPD carried out to ensure that the NDP best serves the needs of the stakeholders. The survey provided on WPD's website and promoted through social media platforms did not have a sufficient number of responses to publish the results.

Table 2: Stakeholder consultation feedback and actions summary table

Consultation feedback	NDP 2022 amendments	Future NDP amendments
Over 50% of consulted stakeholders felt they mostly or fully understood the intended audience for the NDP, which WPD want to improve upon.	Inclusion of a more concise and clear summary of WPD's published documents for easy comparison of the purpose and intended use of the NDP.	In the future, WPD will continue to engage with stakeholders, ensuring we make clear the purpose of the NDP.
The majority of consulted stakeholders agreed with the analysis method used for the NDRs and NHR.	Results have been published using the analysis method explained in the consultation webinar.	In the future, WPD will use the comprehensive electrical analysis methods used for the Network Development Reports to produce the Network Headroom Report table, further improving the communication of future network constraints.
Consulted stakeholders felt a range of published formats would be beneficial, including Excel/CSV format data tables, summary reports, heat maps and making the data available through a WPD Application Programming Interface. Additional suggestions included publishing video reports.	This year's NDP findings have been published through: <ul style="list-style-type: none"> • NHR data in Excel data tables • NDR Summary reports • NHR data available through WPD Connected Data Portal 	In the future, we will provide heat maps and video reports of the results to increase data accessibility.

WPD Investment Planning Process

Throughout the RIIO-ED1 price control period, WPD has developed strategic planning capability and processes to investigate how growth projections will affect the design and operation of the distribution network. Providing transparency in each step of the investment planning process provides stakeholders with confidence as to how DNOs plan to develop distribution networks to enable the UK transition to net zero.

The NDP forms an important part of the WPD investment planning process, as outlined in Figure 5. The network impact assessment process aims to identify where and when network constraints could materialise as a result of forecast projections; and identify and model suitable mitigation options to any constraint. To demonstrate that any decision on load related investment is economic, coordinated and efficient, the network impact assessment must correctly detect network constraints.

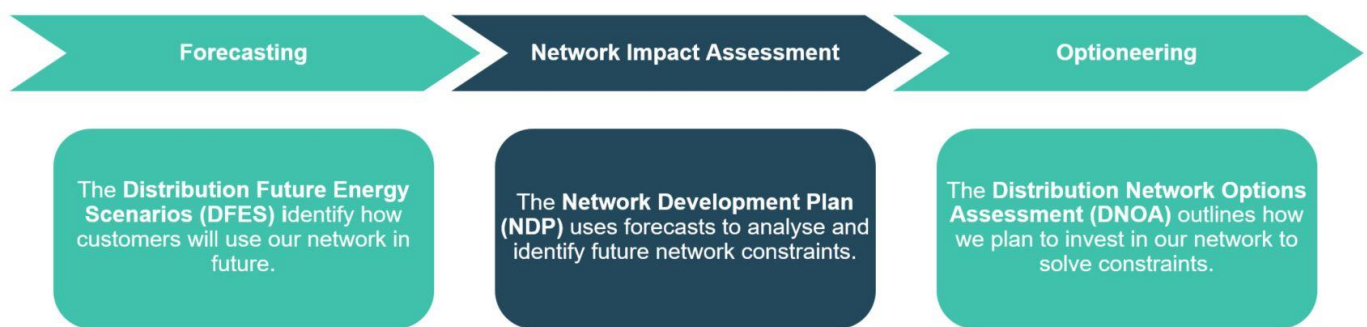


Figure 5: Diagram of end-to-end WPD investment planning process

A summary of the forecasting and optioneering stages are outlined below.

Forecasting: Distribution Future Energy Scenarios

The first step in WPD's load related planning methodology is establishing a forecast of future network loads across each of our four licence areas. Since 2015, WPD has been undertaking scenario planning work through Distribution Future Energy Scenarios (DFES) reports, updating these on a two-yearly cycle to provide a forward looking 10 year window of potential low carbon technology uptakes. From 2020, a full suite of DFES documents have been produced annually which consider a horizon out to 2050. The DFES projections are aligned to a common scenario framework, to allow for comparison between DFES publications from different DNOs and the Electricity System Operator Future Energy Scenarios (FES) publication.

In addition to the four scenarios used as part of the DFES, a WPD Best View scenario is also created. This outlines the expected growth pathway over a 0-10 year period, and is built on detailed stakeholder engagement.

A suite of documents related to the DFES are available on the [WPD website](#) and the data can be viewed on the [DFES map](#) on the WPD website, as shown in Figure 6.

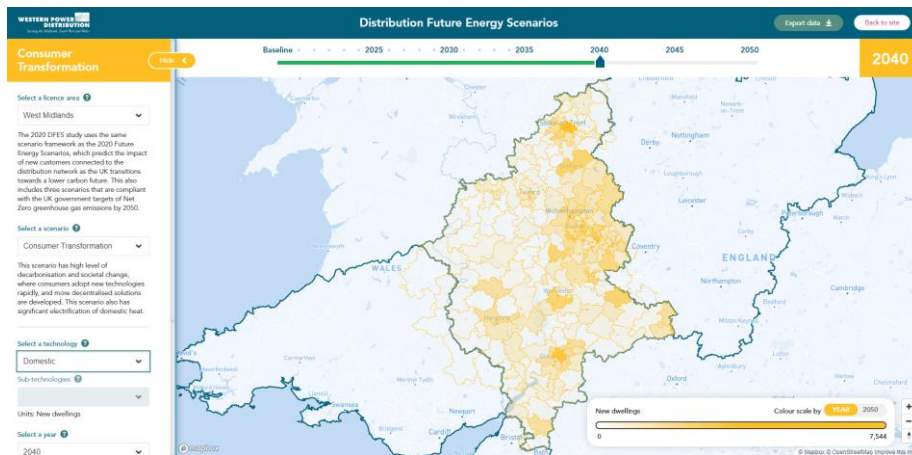


Figure 6: Screenshot from WPD DFES map interface, to allow stakeholders to explore forecast projections

Optioneering: Distribution Network Options Assessment

As part of WPD's extra high voltage (EHV) optioneering process, the Distribution Network Options Assessment (DNOA) is a document published twice a year providing transparency in the investment decision making process. The DNOA uses the [Common Evaluation Methodology \(CEM\)](#) developed under the Open Networks project to compare options and identify low regret pathways. Conventional reinforcement is always considered as a base case, with flexibility considered alongside. In some cases, alternative conventional solutions are also considered or additionally other innovation solutions that might be available, for example voltage management or compensation. The constraints identified in the NDP will be assessed as part of the DNOA process.

The DNOA report is refreshed twice annually and updated on the [WPD website](#).

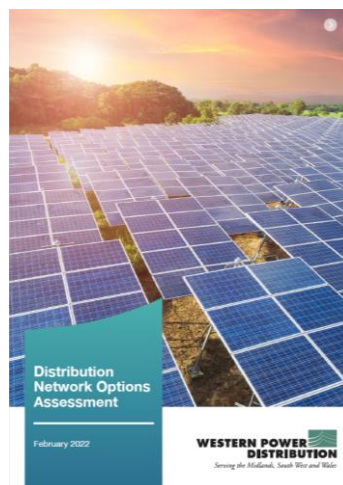


Figure 7: Distribution Network Options Assessment, published in February 2022

Interaction with other Western Power Distribution Documents

WPD regularly publish information that relates to available capacity and headroom on the distribution network. The interaction between these publications and the NDP is outlined below.

Table 3: Summary of NDP relationship with other WPD activities

Publication	Description	How does this differ to NDP?
Shaping Subtransmission Reports	Series of reports published in 2016-2020 outlining how forecast projections will affect 132 and 66 kV networks.	Reports superseded by NDP but following expanded analysis methodology.
Long Term Development Statement (LTDS)	Allows current and future users of Western Power Distribution's network to identify and assess opportunities available to them for making new or additional use of the distribution system.	Network model and starting load assumptions data used in NDP analysis. NDP undertakes analysis that is more detailed over a longer time horizon, with updated forecasts based on DFES 2021.
Network Capacity Map	Provides customers an up to date indication of existing available capacity to connect at substations across the extra high voltage WPD networks.	Capacity Map represents a daily update of 'committed' position of capacity reserved, not necessarily covered in NDP analysis.
RIIO-ED2 Business Plan	Business plan submission to Ofgem for period from 2023-2028 outlining how we expect to continue to meet customer needs.	Load related expenditure analysis over the same area of EHV networks, with updated starting load assumptions and forecasts based on DFES 2021.

Shaping Subtransmission Reports

In previous years, WPD published a series of [Shaping Subtransmission](#) reports. These overlaid the DFES projections onto a network model of the 132 kV and 66 kV networks and identified potential network constraints over the medium term outlook. As part of these studies, WPD developed analysis tools and techniques to enable automated analysis of distribution networks. The NDP has formalised this network impact assessment for all DNOs to undertake on a periodic basis. The NDP will supersede the Shaping Subtransmission series of reports from 2022, using an improved analysis methodology.

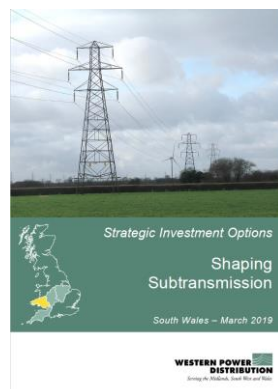


Figure 8: WPD Shaping Subtransmission South Wales document, published in 2019

Long Term Development Statement

The [Long Term Development Statement](#) (LTDS) is a publication compiled in accordance with Electricity Distribution Licence Condition 25, to assist existing and future users of WPD's network in identifying and assessing opportunities available to them for making new or additional use of our Distribution System.

As part of the statement, Table 3 presents forecasts of peak demand on our system in average cold spell conditions. This captures the annual peak demand for each node in the EHV power system model for each licence area, to allow users to apply load assumptions in network assessment. Table 3 also includes a forecast of peak demand for future years, which is based on the WPD Best View scenario. Due to the timing of the publication of the LTDS in November and the DFES in December, the forecast load information is based on the previous year's DFES forecasts and WPD Best View. As a result, the November 2021 publication of the LTDS growth rates is not expected to align with those used for the NDP.

A working group has been established across DNOs to reform the LTDS, which aims to update the LTDS by addressing the interoperability of network data to improve the sharing of planning data and so provide stakeholders with greater understanding of opportunities on the network.

Network Capacity Map

The [Network Capacity Map](#) provides an indication of the ability of the distribution network to connect large-scale developments to major substations. It can be viewed as a visual representation of some of the data contained in the Long Term Development Statement, with additional information provided for the generation headroom of WPD substations. Information of the National Grid Transmission Statement of Works (SoW) responses are also included, which can affect connection availability.

The Network Capacity Map is regularly updated with snapshots of connection information incorporating recently connected generation, accepted but not yet connected generation and quoted generation connections. These figures regularly change as quotations are issued and expire. As a result, the Network Capacity Map reflects a 'committed' network position, which does not directly correspond to a single scenario or year used as part of the DFES process. Customers with accepted connection offers do not always progress through to connection, so DFES publications take a view on connection likelihood. In addition, DFES forecasts include the growth of small-scale low carbon technologies, which would not typically be captured by a large-scale connection offer.

RIIO-ED2 Business Plan

As part of the submission of a Business Plan for the RIIO-ED2 price control period, WPD undertook strategic analysis of the distribution networks to identify areas of investment for the period from 2023-2028. The constraints identified in the NDP will be aligned to those identified in the RIIO-ED2 business planning process. However; due to updates with the starting load assumptions, forecast projections and network models there is expected to be some variation in constraints identified.

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