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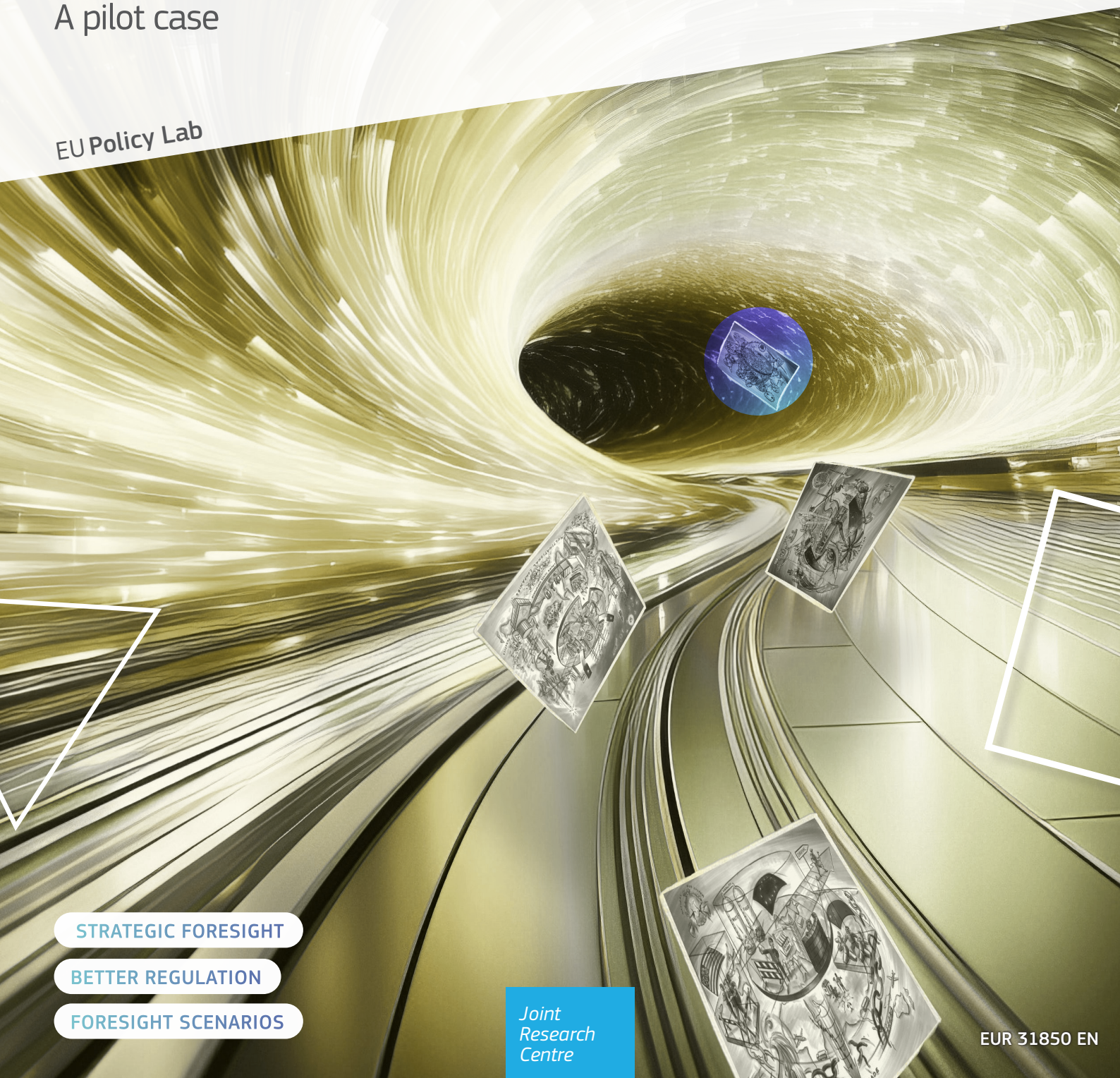
STRESS-TESTING OF POLICY OPTIONS USING FORESIGHT SCENARIOS:

A pilot case

EU Policy Lab



STRATEGIC FORESIGHT

BETTER REGULATION

FORESIGHT SCENARIOS

Joint Research Centre

EUR 31850 EN

Contact information

EU Policy Lab
Unit S.1 EU Policy Lab: Foresight, Design and Behavioural Insights
Joint Research Centre, European Commission, Brussels, Belgium
JRC-FORESIGHT@ec.europa.eu

EU Science Hub

https://joint-research-centre.ec.europa.eu

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STRESS-TESTING OF POLICY OPTIONS USING FORESIGHT SCENARIOS:

A pilot case

Authors:

Lucia Vesnic-Alujevic

Eckhard Störmer

EU **Policy Lab**

The EU Policy Lab is a space for cross-disciplinary exploration and innovation in policymaking. We apply collaborative, systemic and forward-looking approaches to help bringing the scientific knowledge of the Joint Research Centre into EU policy making.

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Abstract

This report summarises a pilot process of stress-testing policy options against a set of reference foresight scenarios. The process was led by the European Commission's Joint Research Centre (JRC) and applied to a specific EU policy proposal on Standard Essential Patents. The goal of this report is to provide an example and serve as a guide for any future process of stress-testing policy options against foresight scenarios.

A set of reference foresight scenarios on the global standing of the EU in 2040 was used to stress-test five policy options and the baseline option, in relation to the EU policy initiative on Standard Essential Patents. The process ran during the initial stage of the impact assessment process, but it was not an official part of it.

The results of this pilot helped to understand which policy options are more or less robust and how they can be made more future-proof. The process also provided rich insights into what the challenges and opportunities of this approach are, and into how stress-testing can be further incorporated into EU policymaking.

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We would like to thank current and former colleagues from the European Commission, Department for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) who helped us in this pilot project to stress-test policy options against reference foresight scenarios.

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Finally, we would like to thank the workshop participants, without whom this report would not have been possible.

Glossary

FRAND:	fair, reasonable and non-discriminatory terms and conditions (as criteria to commit to license the technology protected by the relevant SEPs to implementers)
IoT:	internet of things
MNCs:	multinational companies
OEMs:	original equipment manufacturers
R&I:	research and innovation
SEP:	standard essential patent
SMEs:	small and medium-sized enterprises
Stress-testing:	A foresight method used to assess the robustness of specific policy or strategic options against a set of scenarios, reflect on how to improve them, and contribute to making these options future-ready.

1. Introduction

In 2002, the European Commission launched a new regulatory approach with the aim to reduce regulatory burden (European Commission, 2002). This proposal resulted in the 'better regulation' agenda, which tries to make EU laws 'simpler, more targeted and easier to comply with'. The 'better regulation' agenda encourages an approach to design and evaluate policies in a more transparent way, based on evidence, and informed by the input of stakeholders and the public (European Commission, 2015). 'Better regulation' guidelines provide a set of procedures and practices that the European Commission uses when preparing new policy initiatives and proposals, as well as when managing existing policies and legislation.

Impact assessment is the logical process of steps carried out during the preparation phase of a Commission proposal for a new law. It examines whether there is a need for EU action and it analyses the possible impacts of different solutions. This assessment seeks to identify and develop EU policies and laws so that they achieve their objectives in the most efficient and effective way. According to the 'better regulation' agenda, 'evaluation' is an assessment of the performance of already implemented laws, policies, and spending activities against the criteria of effectiveness, efficiency, relevance, coherence and EU added value. To make sure that policies are future-proof, since 2021, the updated 'better regulation' toolbox includes tool #20: 'Strategic foresight for impact assessments and evaluations' (European Commission, 2021). The inclusion of foresight in the 'better regulation' toolbox is one of the major novelties, contributing to bringing anticipation into EU policymaking. This follows the mandate on strategic foresight that was given to the Commission Executive Vice President Šefčovič in 2019.

Strategic foresight is the discipline of exploring and anticipating the future. In the context of the EU, it can be used to inform policymaking. In order to increase its preparedness and resilience, the EU needs to develop policies that are robust and future-ready. Policymakers and political institutions must also anticipate changes in order to proactively shape the future according to the EU's political priorities. The systematic use of foresight analysis for preparing impact assessments helps European Commission services to better deal with uncertainty and to ensure that Commission initiatives benefit from:

- a clearer understanding of the drivers of change that may impact the policy problem and its future development;
- having policy objectives that take into account the key challenges resulting from the policy problem and its future development;
- future-proofing policy options that are designed to address the key challenges resulting from the policy problem and its possible future development.

The Competence Centre on Foresight (CC-FOR) is a part of the EU Policy Lab at the European Commission's Joint Research Centre (JRC). Its role is to support the Commission's policy departments with the integration of strategic foresight in policymaking processes and with strengthening their strategic foresight capacities[1]. The CC-FOR has developed, tested and adapted numerous foresight methods for their use in the specific context of EU policymaking.

[1] For more information, please see https://knowledge4policy.ec.europa.eu/foresight/about_en

This report describes a pilot process to stress-test policy options against a set of reference foresight scenarios. The process[2] was led by the CC-FOR and applied to a specific EU policy proposal on Standard Essential Patents (SEPs). This report aims at providing guidance for any future stress-testing of policy options against foresight scenarios, as a part of an impact assessment or conducted separately.

A set of reference foresight scenarios, developed by the JRC (Vesnic-Alujevic, Münch and Störmer, 2023), were used to stress-test five policy options and a baseline option in relation to SEPs. The exercise was carried out during the initial stage of the impact assessment process, although not as an official part of it.

The results of the pilot process contributed to the understanding of possible alternative trajectories of context conditions such as: (i) geopolitical and economic developments; (ii) innovation processes; (iii) the business environment; (iv) governance. Looking at a spectrum of alternative ways in which the world could have developed by 2040 helps to integrate uncertainty into the development of policy measures and thus to make EU policies more future-ready.

[2] The process of stress-testing is explained in more detail in the next section.

2. Use of reference foresight scenarios for stress-testing policy options

In general, foresight scenarios are used to better understand how a problem or an area of interest can develop over time and change in unexpected ways. This type of analysis can generate awareness of the influencing factors that shape the policy area, including factors that might not be considered in more traditional analyses. It can also facilitate an understanding of uncertainties and ambiguities relevant for the area that are often not included in more narrow, topic-centred analyses.

The development of the reference foresight scenarios on the global standing of the European Union in 2040 (Vesnic-Alujevic, Münch and Störmer, 2023) was based on a participatory process, generating four plausible scenarios that depict the EU's global position and standing in 2040. The four scenarios, Storms, Endgame, Struggling Synergies, Opposing Views, explore key uncertainties in five areas: i) social values; ii) source of geopolitical power; iii) reaction to environmental degradation; iv) food, water, health, and energy nexus; and v) technological developments.

Figure 1 gives an overview of the scenario set. In the scenario Storms, societies became more self-centred and retreated inwards, strengthening the role of nations and regional blocs. in the scenario Endgame, economic growth and competitiveness trump well-being and social equality. In the scenario Struggling Synergies, there is a strong multilateral determination to fight climate change while side-lining other aspects of sustainability. In the scenario Opposing views, society is divided into a regenerative and an exploitative alliance and both try to impose their paradigm.

These reference foresight scenarios were created for use by the EU institutions and policy departments, but also other stakeholders, be it from the government or any other sector. They are intentionally broad so that they can be adapted to a variety of specific policy fields. The scenarios describe plausible and consistent ways in which the world could develop in the next 20 years. They do not predict the future. Instead, they can be used to increase the EU's resilience and preparedness for possible future developments.

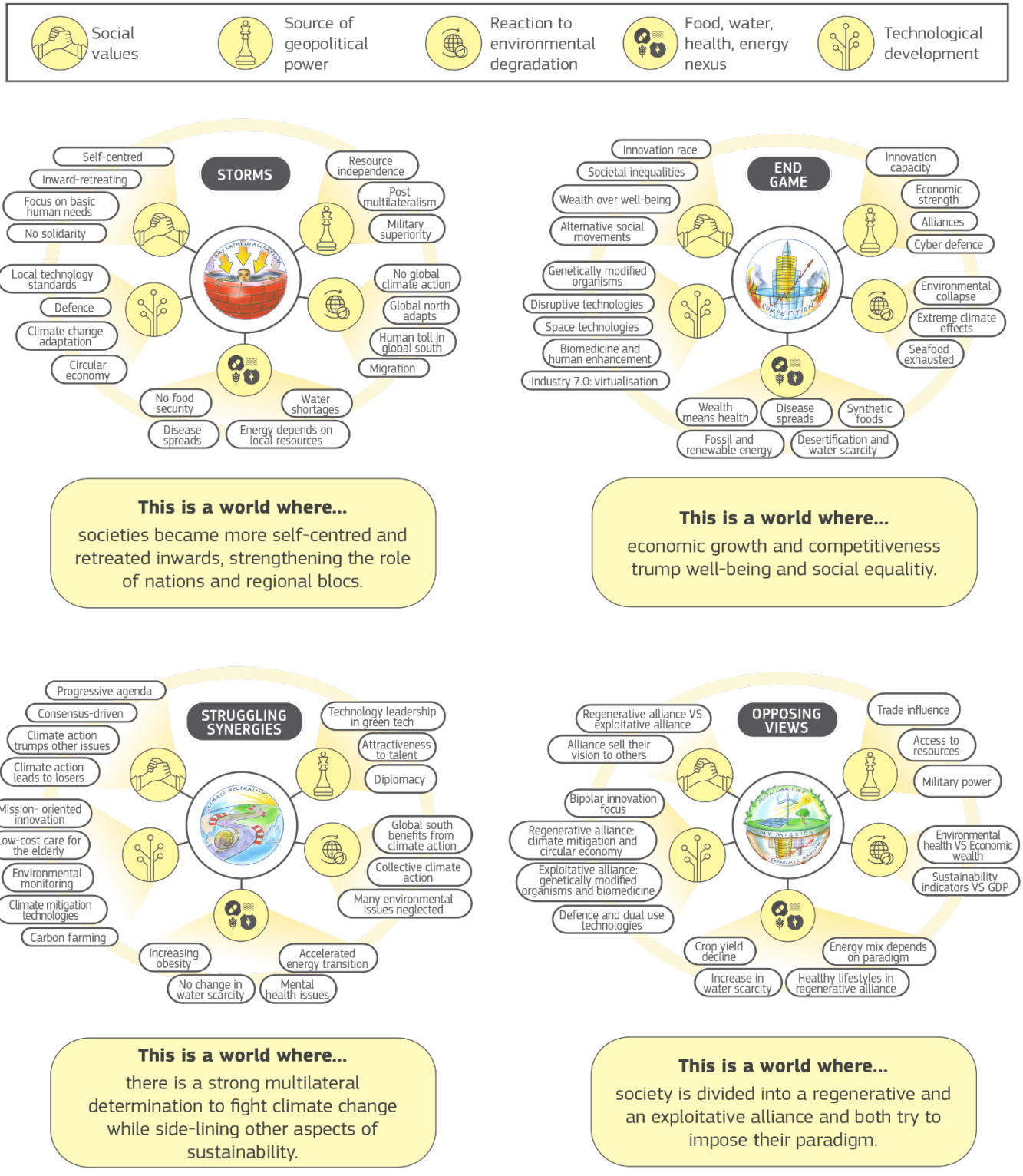
Built on trends, uncertainties and weak signals, the scenarios can be used as simulations of plausible futures. They raise 'what if' questions to stress-test a strategy or a policy against performance in these different futures and point towards the potential weaknesses of a specific proposal. In this way, they can help to understand the choices available today and their consequences for the future.

If the reference foresight scenarios are perceived as too generic for a specific policy area of interest that should be stress-tested, they can be used as a starting point for further adaptation. This starting-point approach was followed for using reference foresight scenarios to assess SEPs. Topic-specific drivers can be added to the scenarios to meet the particularities of a specific policy area or sector. Factors that could affect the future development of different drivers of change may need to be supplemented; and if they are supplemented they must be consistent and plausible with the more generic pre-existing factors. The added value of this adaptive approach is that it can be used for comparisons across different policy areas or sectors while saving time in the setup phase of scenario building.

Reference foresight scenarios can be used to stress-test a set of policy options, programmes, or strategies. In the process described in this report, and in other similar exercises, alternative future worlds are used as framework conditions under which policy options can be 'wind-tunnelled' (or stress-tested) to assess their robustness, considering different uncertain futures (Van der Heijden et

al, 2002; Strelkovskii et al, 2020). 'Wind tunnelling' as a term referring to scenario planning was introduced by Pierre Wack, an executive at the Shell company in the 1970s (Van der Heijden, 1996/2005). It uses an analogy from the world of aerospace and airplane manufacturing: strategies can be tested under different conditions in the same way that an airplane prototype is put in a wind tunnel before it is considered as safe to fly. Thus, a 'wind tunnelling' process can also serve to test policies for their robustness, future-readiness, and flexibility, 'to be changed or reversed if new insights emerge' (van Asselt, 2000). Those policies that are robust would perform well across most future scenarios (van Asselt et al, 2014). By assessing different possible scenarios for the future, policymakers can be better prepared and increase their capacity to deal with uncertainty.

Figure 1. An overview of the reference foresight scenarios



Foresight scenarios support three key elements of stress-testing policy proposals and making them more future-ready. These three elements can all be used in the impact assessment:

- **Understanding the evolution and possible futures of the policy problem.** This helps policymakers to future-proof their definition of the problem. Scenarios make it possible to grasp uncertainties in the long term and consider plausible challenges and opportunities that differ from scenarios that were developed based on baseline assumptions only.
- **Reflecting on – and adapting – the objectives of a policy initiative.** This makes it possible to assess whether policy objectives cover future challenges and opportunities in a variety of different scenarios.
- **Stress-test or wind-tunnel policy options.** A policy initiative can be stress-tested against a set of alternative future scenarios to understand whether an option is robust across different future framework conditions and, if it is not robust, how it can be made more resilient.

Stress-testing should be done in a participatory process, consisting of several workshops or a combination of workshops and smaller dedicated sessions with the 'core' team working on a specific policy file. We propose a four-step process for using reference foresight scenarios for stress-testing (a more detailed guide on how the process could be conducted can be found in Annex 1).

1. Linking the reference foresight scenarios to the policy problem

The first step of analysis is linking the reference foresight scenario set to the policy problem. This kind of analysis is done for each scenario separately to answer questions such as: What do specific context conditions in each of the future scenarios mean for the policy issue at stake? Do these conditions change either the types and numbers of actors involved or the type of activities that are relevant for the issue? By asking these questions, opportunities and challenges can be identified and plausible shifts in the policy problem can be identified.

Because the reference foresight scenarios are rather broad, they might speak mainly to broad policy areas and questions. For narrower policy problems, the reference foresight scenarios might need to be further developed, and more relevant aspects might need to be added to provide the relevant context. This can be done by specifying existing drivers of change to better address relevant issues and/or by adding topic-specific drivers of change and consistent descriptions of the future.

2. Review of the policy objectives against the possible future developments of the policy problem

In the second step, the policy objectives are reviewed to see: (i) how comprehensively the objectives encompass the future possible states of the policy problem; (ii) whether the objectives are relevant to these possible future states of the policy problem; and (iii) whether the objectives cover the key challenges in the possible future states of the policy problem.

3. 'Wind tunnelling' policy options

In the third step, each policy option is assessed against all four scenarios. The assessments use a scale (for example from 1 to 5 or from – – to ++), answering the question of how well a single policy option would perform in each scenario (from very negative to very positive). The assessments also collect arguments that support the evaluation made in the 'quantitative' assessment, as well as ideas to adapt and change the policy option so that it performs better.

4. Validation and reporting

Based on the results obtained through Steps 1-3, a validation workshop can be organised and a report can be drafted. The report could provide input for three sections of the impact assessment report. It can inform the 'problem definition' section by helping to describe the development of the policy problem and related uncertainties. The second section of the impact assessment report for which it can provide input is the 'objectives' section, by making a proposal to adapt policy objectives if necessary. The input is particularly valuable for the 'impacts' section of the impact assessment report, by showing how policy options are likely to perform in different future conditions and the different impacts that these policy options might achieve.

If applied to the impact assessment process, these four steps should be carried out by a core team that works on the respective policy file. This core team should also organise a series of half-day workshops with some members of the impact assessment inter-service group[3] to look at the policy initiative from the perspectives of different related and affected policy areas. If external experts support the inter-service group as members of an expert group, they should also be invited to these workshops to provide an additional perspective outside of the realm of EU policy making. The preparation and – if needed – the adaptation of the scenario set should be in the hands of the core team, as should be the preparation and post-processing of the workshop results. Steps 1 and 2, linking the reference foresight scenarios to the policy problem and reviewing the policy objectives can be done in one half-day workshop. The 'wind-tunnelling' of policy options can be carried out in one to three half-day workshops, depending on the complexity of the policy options and their number. The draft report can be validated and supplemented in a final session.

The experience of 'wind tunnelling' or stress-testing of policy options against alternative future worlds shows that future context conditions matter. A scenario-based foresight analysis can bring quite a differentiated picture of the performance of different policy options. An exercise of this type can also reveal which policy options are robust across different context conditions and which policy options might need adaptations to perform well under certain future conditions.

[3] An inter-service group consists of members from different European Commission departments that have a stake in a specific policy file.

3. The pilot case: Standard Essential Patents

Standard Essential Patents (SEPs) are patents that are essential for some standards and as such, ensuring smooth licensing and clear rules is necessary for the success of a standard and diffusion of innovation. Their use is based on fair access for all users of a given standard at reasonable costs (European Commission, 2023a). The number of SEPs is constantly increasing, driven by the Internet of Things and 5G where SEPs play a key role. Because of that, the Intellectual Property action plan acknowledged that "there is a need for a much clearer and more predictable framework, incentivising good faith negotiations rather than recourse to litigations" (European Commission, 2020; for full context and background of the policy problem, see for example Thumm, N. (ed) (2017) and Thumm, N. (ed.) (2020)).

Taking this into account as well as the "continued friction in the uptake of SEP-protected standards" (European Commission, 2023a) and the complex landscape of new players and challenges, a policy package on SEPs was announced in the 2023 Commission Work Programme (European Commission, 2022b). The CC-FOR was contacted by the European Commission's Department for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) to develop this pilot foresight process together.

The foresight process was conducted in a participatory way, through four workshops and several smaller engagement sessions. The workshops were conducted with experts from DG GROW and other European Commission departments (as members of an inter-service group) and academia. These workshops were moderated by the CC-FOR. Smaller sessions were conducted with the 'core' team, consisting of five colleagues from DG GROW working on this policy file and with expertise in the field.

In the first step of this foresight process (corresponding to Step 1 in Chapter 2), the reference foresight scenarios had to be adapted to be fit for purpose for the area of SEPs. Scenario-specific contexts were developed and validated in an expert workshop (Workshop 1, half-day). These scenario-specific contexts made it easier to understand the spectrum of future challenges of the policy problem.

Step 2, review of policy objectives, was done internally with the 'core' team and was used for further reflection and as input for workshops 2 and 3.

In two workshops (Workshops 2 and 3, half-day, equivalent to Step 3 of the process as described in Chapter 2), the scenario-specific conditions were used to assess the performance of five alternative policy options and a baseline option (no policy change) to identify which policy options were future-ready and which needed to be revised to be made more robust regarding possible future developments.

Workshop 4 served for the validation of results (Step 4). As this was a pilot process, this additional workshop was also used to discuss and evaluate the overall process and to draw conclusions for future applications.

Five specific policy options and the baseline option were taken into account in this pilot process. However, it is important to stress that these options were not the final ones used for the impact assessment of the SEPs, although some might seem similar or overlapping. Because the workshops were conducted at the same time of the initial phase of the impact assessment and were not a part of the official impact assessment, they used some of the proposed options available at that stage. The workshops provided further reflections on which options should be changed, improved or removed for greater overall robustness and future-readiness.

Adapted reference foresight scenarios: SEPs context

The reference foresight scenarios were adapted to the area of SEPs to provide a better understanding of the possible long-term developments of the context conditions of SEPs that could lead to shifts in the policy problem.

We started with the policy problem, described in the call for evidence launched by the European Commission in 2022 (European Commission, 2022a):

The main problem is inefficient licensing, including hold-up[4], hold-out[5] and forum shopping[6]. Potential implementers, including start-ups and SMEs, may opt-out from using the standards altogether, or they may use the relevant standards without a licence, assuming any risks related to SEP infringement. These problems may slow the pace of innovation, hamper development in critical technologies, and delay the scaling up of start-ups and SMEs in the EU.

These problems stem mainly from (i) insufficient transparency and predictability, (ii) uncertainty about FRAND (fair, reasonable and non-discriminatory) terms and conditions, and (iii) high enforcement costs and inefficient enforcement.

The scenarios were adapted by adding relevant additional aspects, expressed through the following three questions.

- What is the EU (and world) regulatory environment?
- How are the patent system, standardisation and competition aspects configured?
- What is the pace and locus of innovation?

These aspects were conceived within the DG GROW team working on the SEP file and then developed across all four scenarios with participants in Workshop 1 (see Table 1). The scenarios were subsequently further refined ahead of Workshops 2 and 3 to allow for their use in stress-testing the policy options.

An additional reflection on the implications of possible alternative futures for the policy problem of SEPs was also developed with workshop participants. This reflection is described in the last row of Table 1 'What does this mean for SEPs?'.

Summary of the set of adapted reference foresight scenarios

The set of reference foresight scenarios, described in Chapter 2, had to be further adapted for the stress-testing of SEP policy options, according to the aspects mentioned above. This was particularly important for the success of this exercise, taking into account that the field of SEPs is quite narrow compared to the broadness of the scenarios. The summary of the adapted set of scenarios is presented below:

[4] Hold-up refers to a difference between the patent-holders' pricing incentives ex ante, namely before the standard is set, and their pricing incentives ex post, i.e. after the standard is set.

[5] Hold-out refers to a situation where an implementer of a standard refuses to pay royalties to SEP owners until forced to do so by a court. In practice, hold-out is rarely as 'naked' as a blanket refusal but rather involves various delaying tactics.

[6] Forum shopping refers to the practice of choosing the court or jurisdiction that has the most favourable rules or laws for the position being advocated.

Storms

This is a world where there is a decrease in global trade, and one where multilateralism has been undermined by the emergence of regional blocs. Different technology approaches lead to the creation of parallel systems of standards in different regions of the world, and therefore global interoperability does not exist. The 'splinternet'[7] has replaced the internet, creating a division between Chinese, US, European, and Russian-led internets. The diversity of standards and limitations on export opportunities limit the pace of innovation. China is the biggest producer of internet-of-things (IoT) devices. Patent systems are regional, and owners of intellectual property (IP) encounter difficulties enforcing their rights in other regions of the world. The licensing of SEPs is regional or local, which significantly increases transaction costs, and thus reduces the profitability of the licensing business.

End game

This is a world where economic growth is prioritised over environmental and social issues. Opportunistic global alliances emerge, maximising global trade. China, under economic and military pressure, loses power. Innovation is concentrated in the EU and US, and their companies lead in setting standards. EU governments take a 'soft' regulatory approach to competition, which attracts large multinational corporations (MNCs). Given their power, these MNCs strongly influence and shape both policy and court decisions. New disruptive technology is stimulated, boosting innovation, and keeping ICT markets open and competitive. IoT devices are well integrated with a high degree of interoperability. Proprietary solutions are dominant and the patent system loses its importance. There is also a niche open-source market but it does not have any major impact.

Struggling synergies

In this world of multilateralism, the EU strives to remain influential between the US and China, while undergoing relative decline. There are geopolitical tensions here and there, but no real conflict breaks out. More standards are created globally, mostly by the US and China, which are both also innovation loci. Increasing proportions of the population and businesses in the EU feel alienated by the opaqueness of the cumbersome compliance regimes, full of rules and tensions. Foreign private companies try to game this slow-paced system. The EU's joint and publicly-led innovation is mission-oriented to further stimulate innovation-led growth. The patent system is harmonised globally, with the possibility of being turned into a global system, although some well-known challenges remain. The registration and enforcement of patents remain complex.

Opposing views

This is a world where the EU and other like-minded countries prioritise environmental policies and the health of natural ecosystems. The 'regenerative alliance' standards are constantly raised to further stimulate green innovation and applications. Green technologies are enabled by digital solutions, and green IoT devices are ubiquitous. Different platforms with different standards are used to fulfil specific requirements. Investments in interoperability are key. Patent systems are divided between the 'regenerative' and 'exploitative' alliance. There is a unified patent system with strong intellectual

[7] The 'splinternet' means a splintering/division of the internet. This can be due to various factors, such as technology, politics, and divergent national interests.

property protection in the 'regenerative alliance'. To promote market diffusion, green-tech patents are made available royalty-free within the 'regenerative alliance'. Standards, patent licences, and access to cutting-edge green/clean tech are used as a geopolitical carrot-and-stick to encourage countries to join this alliance.

Overview of the SEP context in 2040 in four distinct scenarios and implications for SEPs

Table 1 outlines the additional SEO-specific aspects developed within each scenario (regulatory environment, patent system, standardisation and competition aspects, pace and locus of innovation), and a reflection on implications of different scenarios for SEPs. These aspects were mainly developed in Workshop 1.

Table 1. Overview of the SEP context in 2040 across the scenarios and implications

(IP – Intellectual property; MNC – Multi-national companies; FRAND – Fair, reasonable and non-discriminatory)

Question/ Driver	**Scenario:** **Storms**	**Scenario:** **End game**	**Scenario:** **Struggling synergies**	**Scenario:** **Opposing views**
What is the EU (and world) regulatory environment?	Globalisation fails. Increased tension between regional blocs and blocs of shared interest. The EU focuses on economic issues of common interest to Member States. Low degree of harmonisation on rules, practices, and principles between blocs. Court decisions have national effect and can diverge between blocs.	Free market dominates. Government is strongly influenced by MNCs. Political institutions have been weakened. Courts are put under pressure from MNCs, and they either submit to these MNCs or defend social values.	Globalisation and multilateral efforts continue at a slower pace. All nations try to work on common high-level principles. Opaque and cumbersome regimes for implementation and compliance due to local specificities. Collaboration among courts is necessary, but slow.	In the regenerative alliance, green standards are constantly raised to drive further innovation. The exploitative alliance focuses on economic growth only. Courts in regenerative alliance may be required to make decisions beyond their jurisdictions to enforce green targets on companies in exploitative alliance. There is potential for conflicts among jurisdictions.
How are the patent system, standardisation and competition aspects configured?	More powerful geopolitical blocs dominate the rule-making process. Standards and patents are used as a tool of industrial policy and protectionism. For example, national governments strengthen and adapt their intellectual	Large corporations influence different geographies to protect rents or revenues, and economic growth is the ultimate goal. Regional patent systems are created (e.g. EU-US harmonised system), but the patent system in general has been weakened	Filing patents in every jurisdiction and getting licence rights are cumbersome processes with huge compliance requirements, because of various local requirements. Standardisation processes and agreements are complex and consensus building is slow. That	The regenerative alliance has a single unified patent system. There is strong intellectual property protection. Two paradigms compete: investing in patents on green technologies vs. promoting open-source technology if

Question/ Driver	Scenario: Storms	Scenario: End game	Scenario: Struggling synergies	Scenario: Opposing views
	property systems to support public policy objectives, such as the inclusion of their national technologies in international standardisation. Large markets such as China start developing their own standardisation solutions with their own policies on intellectual property rights.	and the focus is on proprietary solutions. Large companies dominate international standardisation. Global trade and interoperability are perceived as most important. Competition rules are applied selectively, in support of the interests of large companies.	is why European companies try to bypass this process with either proprietary or open source solutions. Competition rules strongly protect consumers' choices within their jurisdictions.	applied for green/clean objectives. Aiming at international green standards cannot be too ambitious in order to keep the exploitative alliance unified. Competition policy likely to be supportive for green industries.
What is the pace and locus of innovation?	Innovation in the EU and the US slows in pace, while it increases in pace in Asian countries such as China, Japan and South Korea. The diversity of national standards – and therefore the reduced export opportunities between blocs – impedes innovation. The IoT enables the emergence of many small scale 'local' solutions, which address local needs. This	Very high exponential rate of innovation is driven by technological convergence in connectivity, computing, biotechnology, and health. The US and EU lead in innovation, with China lagging behind due to its internal problems. SMEs lose out to large MNCs.	Innovation thrives but at a slower pace because of cumbersome compliance systems. Complex innovative products enter the market, and there is a lot of innovation outside of standards. Greater pressure for joint governance brings benefits in terms of redistribution and the green transition.	The direction of innovation differs between the 'regenerative alliance', focused on green and clean tech and with advanced levels of energy transition, and the 'exploitative alliance', focused on efficiency, profitability and dealing with resource scarcity. Carbon border tax protects the industry of the 'regenerative alliance'. The 'explorative alliance' still heavily relies on fossil fuels.

Question/ Driver	Scenario: Storms	Scenario: End game	Scenario: Struggling synergies	Scenario: Opposing views
	decreases the need for global solutions. SMEs are the backbone of innovation.		SMEs are supported by governments but may struggle for resources to handle all the complexities imposed by the state.	The pace of innovation is medium to high depending on the sector and region. Green SMEs thrive, as they are responsible for breakthroughs and increasingly low-cost innovation.
What does this mean for SEPs?	There is no global technology market, but rather parallel systems of standards and a 'splinternet'. There is increased tension between foreign-based MNCs and national governments. Regional and national champions are supported to patent their technologies and contribute those technologies to international standards. National governments are confronted with the needs of their implementers to access standards. Global SEP holders are sometimes invited to	Royalty-bearing standards have attracted many contributors and patenting has increased. However, the number of products implementing such standards has increased even more. Given the inherent opaqueness of SEP licensing, a number of courts are involved in setting royalties but their adjudication doesn't always seem fair. A gap in innovation emerges between countries that are 'haves' (i.e. that innovate) and blocs/countries that are 'have nots' (i.e. that do not innovate). This gap increases further	There are tensions between compliance with regulation on the one hand and the needs of businesses on the other. International standards are put under pressure because of the lengthy processes. IP owners feel under pressure, especially those that do not implement the standards. IP implementers cannot predict whether they will be given a licence, its cost and if their competitors will be in a similar situation. Loose international coordination on SEP rules does not solve all problems. Small EU companies still cannot fully enforce	For green technologies, the global market is split between the two alliances, with both possibly having different standards. Governments may require royalty-free green standards, if applicable, to promote faster uptake of the technology. Specifically low-FRAND royalties are set for communication standards (for IoT devices and beyond) used in green technologies. In Europe, civil society organisations and NGOs participate in developing standards and discussing SEPs

Question/ Driver	Scenario: Storms	Scenario: End game	Scenario: Struggling synergies	Scenario: Opposing views
	contribute to national standards on unfavourable terms. IP owners face limitations in various legal systems on enforcing their rights. Enforcement is complicated and costly. In jurisdictions friendly to the IP owners, implementers may not get a fair deal. Forum shopping and anti-(anti-) suit injunctions become the norm.	fuelled by proprietary solutions and trade secrets.	(licence) their patents and take a licence on competitive terms.	to ensure the inclusion of values in the tech standards.

4. Stress-testing of policy options – Assessment of policy options across the scenario set

In Workshops 2 and 3, the set of policy options was assessed under the context conditions of the four alternative future worlds (see Chapter 3). The objective was to understand how well a policy option might perform under different possible framework conditions and how this policy option could be made more robust to a number of different futures that might unfold.

Accordingly, workshop participants were asked to evaluate how well each SEP policy option would have performed in each of the four scenarios. The term *'performance'* was understood as ensuring an efficient and sustainable SEP licensing ecosystem, innovation, and the diffusion of technologies.

The seven point evaluation scale consisted of the following:

++	This decision would be seen as very positive with almost no downsides
+	On balance, this decision would be seen as positive
0	On balance, this decision would be irrelevant OR have neither a net positive or a net negative impact
-	On balance, this decision would be seen as negative
--	This decision would be seen as very negative with almost no upside

Each workshop participant had to rate the performance of each policy option within the four alternative futures. Detailed results of the ratings are provided below and in Annex II.

Policy options[8]

0. Baseline option

In Europe, there is no system in place for assessing whether SEPs declared to Standard developing organisations (SDOs) are truly essential, and the number of SEPs continues to increase. Publicly available information on FRAND terms and conditions and on royalty rates continues to be patchy, disaggregated, and of inconsistent quality. All negotiations continue to be conducted under non-disclosure agreements. Courts deal with FRAND issues on a case-by-case basis, but certain (divergent) practices are taking shape in different countries.

1 Increased transparency

Focus on transparency only: There is an up-to-date register of all SEPs at the adoption of any new standard and essentiality checks are carried out to ensure that only true SEPs are registered. Standard FRAND terms and conditions are published and a competence centre providing more information on FRAND practice and jurisprudence is set up.

[8] As stated in the Introduction (Chapter 1), these are not the final policy options that were used in the Impact assessment report. For the final options, please see: European Commission (2023b)

2 FRAND solution

In addition to increased transparency, **guidance on FRAND is adopted**, including on price differentiation based on objective criteria and on levels of licensing plus **ex ante aggregate royalty announcements.**

3 Industry-led clearing house, differentiated prices

There is increased transparency and guidance on FRAND. Aggregate royalties are determined by the industry ex-post following adoption of the standard on the basis of the principle of price differentiation based on objective criteria. Every implementer has the possibility of paying the aggregate royalty into an escrow account and not being subject to infringement cases.

4 Clearing house led by an independent authority, uniform prices

Increased transparency. FRAND is the same irrespective of the use. Aggregate royalties are determined by a public authority following the adoption of the standard. Every implementer has the possibility of paying the aggregate royalty into an escrow account and not being subject to infringement cases.

5 SEPs are licensed royalty-free or the EU resorts to open standards

All future standards are licensed royalty-free. There is therefore no need for FRAND negotiations.

Overall assessment of the policy options across four scenarios from a 2040 perspective

Stress-testing the five SEP policy options and the baseline option against alternative future scenarios shows that the conditions of each future scenario matter significantly (Table 2).

Table 2. Summary of the stress-testing of policy options across future scenarios

World in 2040	Option 0 Baseline	Option 1 Increased transparency	Option 2 FRAND solution	Option 3 Industry-led clearing house	Option 4 Clearing house led by an independent authority	Option 5 Royalty-free SEPs
Storms	neutral / slightly **positive**	neutral / slightly positive	slightly positive	positive	positive	negative
End game	rather negative	positive	neutral / **positive**	negative & positive	very negative	very negative
Struggling synergies	neutral / slightly negative	positive	positive	neutral / slightly **positive**	**negative /** but diverse	rather negative
Opposing views	neutral	positive	positive	neutral / slightly **positive**	negative	negative

The scenario-based foresight exercise produced a differentiated picture of which policy options are robust across different context conditions and which policy options might need adaptations to work well under certain possible future conditions. The results of assessing the policy options against possible future scenarios can be summarised as:

- The baseline policy option (Option 0) is considered as neutral or rather negative in 3 out of 4 scenarios.
- Policy options 1 and 2 are robust and perform relatively well in most of the scenarios.
- Policy option 3 is considered as only slightly positive across three scenarios, while the results for Option 3 in the *End game* scenario are varied.
- Policy options 4 and 5 are perceived as relatively negative in most of the four scenarios (although Option 4 is perceived as positive in the *Storms* scenario).

Considering that SEPs as a policy instrument mainly play a role in a world where there is effectively a global technology market, the performance of policy options in the two scenarios *Endgame* and *Struggling synergies* are the most important. In the *Storms* scenario, characterised by splintered technologies across blocs, there is no need for SEPs. In the *Opposing views* scenario, characterised by diversity in the area of green technology in Europe and its partner countries (but no such diversity in the area of green technology in the rest of the world), SEPs might also not play an important role.

Policy options 1 and 2 perform best and are clearly better than the baseline option. The guidance on the level of licensing in Option 2 might need to be carefully considered, as this level of licensing was the sole element to create a clearly positive result for Option 2 in the *End game* scenario.

It is important to note that this exercise is based on a qualitative participatory process. As in many similar participatory exercises, the results depend on the group of people involved in the workshops and their subjective, yet expert, assessment.

More explanations on the performance of the policy options across the future scenarios are provided below.

Option 0: Baseline option

- *Storms*: neutral / slightly **positive**
- *End game*: rather **negative**
- *Struggling synergies*: neutral / slightly negative
- Opposing views: **neutral**

Overall assessment

This is not a robust option, and its performance is strongly dependent on context conditions. This option is only slightly positive in *Storms*, where technology distribution is relatively limited to regional blocs. To a certain extent, it could be an option in *Struggling synergies* with more synergies across society.

Option 1: Increased transparency

- *Storms*: neutral / slightly **positive**
- *End game*: **positive**
- Struggling synergies: **positive**
- Opposing views: **positive**

Overall assessment

Option 1 is perceived as a relatively robust and positive option across all four scenarios; although its performance is slightly less good in *Storms*. This policy option seems to perform relatively well in a range of different context conditions.

Option 2: FRAND solution

- *Storms*: slightly **positive**
- *End game*: neutral / **positive**
- Struggling synergies: **positive**
- Opposing views: **positive**

Overall assessment

Option 2 is a relatively robust and positive option. Its performance is slightly less good in the *Endgame* and *Storms* scenarios. The level of licensing involved could either change the negotiation dynamics (for example, if a licence-to-all principle is adopted) or deprive the system of the flexibility to adjust based on economic considerations (for example, if the Commission itself determines the level of licensing). As long as the guidance related to the level of licensing remains sufficiently general and flexible, this option will work well. More detailed and inflexible guidance may hurt the industry and thus this option might be less effective.

Option 3: Industry-led clearing house – differentiated prices

- *Storms*: **positive**
- *End game*: negative & **positive**
- *Struggling synergies*: neutral / slightly **positive**
- *Opposing views*: neutral / slightly **positive**

Overall assessment

The performance of Option 3 depends on the context conditions, especially related to the public-private sector relations and configurations. This option has a clearly positive result only in the *Storms* scenario. It has varied results (some good, some bad) in the *End game* scenario.

Option 4: Clearing house led by an independent authority – uniform prices

- *Storms*: **positive**
- *End game*: very negative

- *Struggling synergies*: **negative / but diverse**
- Opposing views: **negative**

Overall assessment

The performance of Option 4 depends on the context conditions. This policy option performs overall not well, except for the *Storms* scenario.

Option 5: SEPs are licensed royalty-free or the EU resorts to open standards

- *Storms*: **negative**
- *End game*: very negative
- Struggling synergies: **rather negative**
- Opposing views: **negative**

Overall assessment

Option 5 is perceived as negative in all four scenarios – while performing slightly better in *Struggling synergies* than in other scenarios. The lack of monetary incentives for innovation is prevalent in this policy option, regardless of the context conditions described in the scenarios, so other incentives for innovation would be required. The *Opposing views* scenario calls for royalty-free green technology to accelerate dissemination, but it may impact incentives to invest without government support.

A more detailed scenario-specific assessment in provided in Annex II, along with detailed comments on the options in the scenarios and ways to improve them, as noted by participants in the workshops where these options were discussed.

5. Conclusions

In times of TUNA (Turbulent-Uncertain-Novel-Ambiguous) conditions, political institutions must be prepared to anticipate possible changes and disruptions and understand uncertainties in order to create more resilient and future-ready policies. For this reason, the European Commission has introduced foresight in its Better Regulation Toolbox. The case of Standard Essential Patents was used as a pilot to explore the potential of reference foresight scenarios to be used in impact assessment exercises for policy stress-testing or wind-tunnelling purposes.

This report offers practical guidance, showing which steps need to be taken and how the process could be conducted. Most important, stress-testing is a participatory exercise that should not be done individually but needs to include different viewpoints and if possible a range of stakeholders. Also, a facilitation from an experienced foresight practitioner remains key for obtaining robust results.

The results show how different policy options are assessed in a range of ways depending on different future context conditions. They show that some options work better than others within different future contexts and how these options could be adapted to make them more fit for purpose and adapted for a range of futures. They also show how some options lack robustness across multiple futures.

Looking at the policy options through a foresight lens remains key in order to develop more resilient and future-ready EU policies. Foresight can thus enhance the anticipatory culture in EU institutions and bring future-oriented policy relevant insights across different policy fields.

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Annex I: Detailed description of Workshops 1 to 3

Based on the reference foresight scenarios and the existing literature on the method of wind-tunnelling and stress-testing, workshops to stress-test policies have been developed to help make EU policies more robust and future-proof. The workshops are designed to be as interactive as possible. Each workshop has a duration of not more than 3 hours. In addition, preparatory time is needed.

OBJECTIVES

- To test policy options against different future conditions
- To explore how different conditions might impact the expectations of stakeholders
- To determine whether policy options are robust enough or should be changed to ensure that they are able to perform under different conditions

PREPARATION FOR THE WORKSHOPS

When preparing the workshops, it is important to: (i) clarify the underlying policy issue of the initiative; (ii) clarify the policy options to be analysed; and (iii) for core team members to get a gist of the scenario set.

- Using the created set of policy options, decide on clear choices to be tested (i.e. testing the policy assumptions);
- Go through scenarios and make sure they are clear to the core team; discuss and determine the most important additional aspects that will serve as a basis for discussion during the workshop;
- All participants should prepare by reading the set of scenarios and the policy options before the workshops;
- Templates and canvases should be prepared in advance, either physical ones or virtual ones using online collaborative platforms and virtual white boards.

PARTICIPANTS

Participants in the exercise could be an inter-service group or study group that works on the policy initiative. There should be (at least) 10-15 participants.

In addition to participants from the responsible department, inter-service group members should participate in this workshop to add different perspectives on the policy. External experts could be involved as well.

FACILITATION

Because strategic foresight and foresight scenarios are relatively new to policy departments, it is strongly recommended that an experienced foresight facilitator collaborates with the lead policy officer on the specific policy initiative. In any case, the workshops' leader needs to be familiarised with both the policy area and the scenarios (both in methodological terms and content-wise). The facilitator needs to adopt a participatory approach and be able to moderate discussions. If the workshops take place online, a team member needs to be in charge of technical support.

WORKSHOP 1

The following describes the sequence of steps for Workshop 1 (linking the reference foresight scenarios to the policy problem).

1 Introduction

1.1 Introduce what foresight is and what the aim of the exercise is.

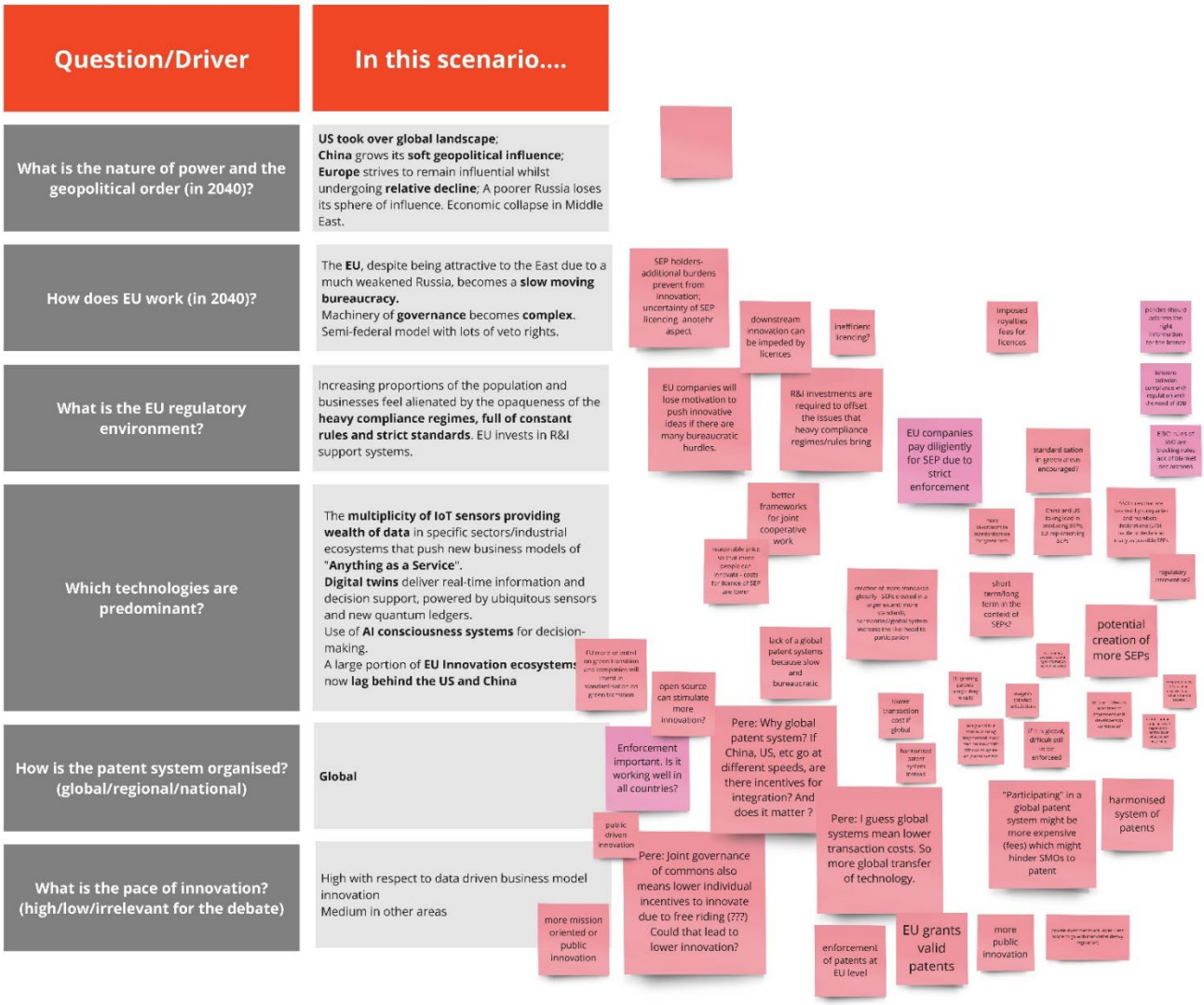
1.2 Present briefly the scenarios, the policy issue to be discussed, the policy objectives, and policy options.

1.3 Start the workshop with an 'icebreaker', to make sure everyone understands the scenarios and policy areas to be discussed. For example, the task could be for participants to write on a p*ost-it* note their expectations for this workshop; or to ask participants what the fundamental issue is (or will be in the future) that this policy needs to address.

In the case of SEPs, a week before the first workshop, the organisers sent out a summary of the scenario set. They asked every participant to write a 2040 newspaper headline about SEPs in a given scenario.

1.4 Group the participants into breakout teams (not less than 5 persons per team, especially online) and hand out the templates for the teams to fill in (if online, invite participants to join breakout groups). An example of a template is shown in Figure 2. There should be either two or four teams. If four teams, each team will work on one scenario, if two teams, each team will work on two scenarios agreed upon in advance.

Figure 2. Print screen from the SEPs workshop showing the development of additional aspects and the input from participants



2 Customising the scenario set

2.1 This is done by using summaries of the reference foresight scenarios, which are then adapted by adding or removing some of the aspects connected to the respective policy area. Several new aspects should be developed in advance, so that they can be validated in the workshop.

2.2 Ask participants to identify the main aspects from the contextual environment that could have an impact on a specific policy area. A series of prompts and 'what if' questions should be used to stimulate the discussion among the participants. Through this exercise, participants add missing elements and strengthen the existing ones that they consider as important contextual factors for a given policy area.

2.3 Optionally, participants could also be asked to identify different stakeholders within their scenario.

In the case of SEPs, participants were asked to look at the scenario, check the additional aspects that were created in advance and validate them. They were also asked to reflect on additional factors that could have a big impact on SEPs. For example, to think about what could happen with the patent system, global economy (global/regional), innovation loci, the future of IP. They were also asked to identify winners, losers, key actors and new actors.

WORKSHOPS 2 and 3 (assessing the performance of policy options across the different scenarios)

Depending on the number of policy options, two or more workshops might be needed to discuss all policy options. Optimally each workshop should not have more than 3 options discussed at once, especially if there are only two breakout groups and each group needs to go through two scenarios.

1 Introduction

1.1 Introduce the workshop and its goals.

1.2 Present briefly the adapted versions of the reference foresight scenarios, the policy issue to be discussed, the policy objectives, and the policy options.

1.3 Group people into 2 or 4 breakout teams.

2 Policy stress-testing

2.1 Give a template with policy options and one scenario to participants to fill it in (as an example, see Table 3). Participants familiarise themselves with the template and their scenario.

2.2 Ask participants to analyse how different policy options perform in the scenario. For this task, they use post-its to assess individually each policy option within the scenarios. The task is to evaluate how well each SEP policy option would have performed in that scenario (Table 3).

Alternatively, if there is more time and the need for such an exercise, the same assessment could be done by including a time perspective for the performance- short, mid and long-term, as shown in Table 4.

Table 3. SEPs policy stress-test template for each scenario with the first 3 options to be tested.

SEP POLICY OPTIONS	PERFORMANCE ++/+/0/-/--	What would work well (+), when? What would not work well (-), when?	How could this policy option be improved?
1 – Increased transparency			
2 - FRAND solution			
3 - Industry-led clearing house, differentiated prices			

Assessment scale:

++	This decision would be seen as very positive with almost no downsides
+	On balance, this decision would be seen as positive
0	On balance, this decision would be irrelevant OR have neither a net positive or a net negative impact
-	On balance, this decision would be seen as negative
--	This decision would be seen as very negative with almost no upside

Table 4. Assessment of policy options' performance over short (S), medium (M) and long (L)-term futures for each scenario with the first 3 options to be tested.

SEP POLICY OPTIONS	PERFORMANCE ++/+/0/-/--			What would work well (+), when (S/M/L)? What would not work well (-), when (S/M/L)?	How could this policy option be improved and when (S/M/L)?
	SHORT +5 years	MID +10 years	LONG +20 years		
1 – Increased transparency					
2 - FRAND solution					
3 - Industry-led clearing house, differentiated prices					

Assessment scale:

++	This decision would be seen as very positive with almost no downsides
+	On balance, this decision would be seen as positive
0	On balance, this decision would be irrelevant OR have neither a net positive or a net negative impact
-	On balance, this decision would be seen as negative
--	This decision would be seen as very negative with almost no upside

2.3 All participants come together in plenary. Each group presents their assessment of policy options within their scenario. There is a joint discussion on strengths and weaknesses of the policy options to reach agreement among participants.

In this part, participants use a synthesis template (see Table 5) with scenarios on one side and policy options on the other, plus another column for consolidated results. At the end of the discussion, the group evaluates policy options overall using a 'robustness' scale with three options: (i) robust; (ii) to be redesigned, (iii) obsolete/not needed anymore.

Some of the guiding questions for this part of the discussion are:

- How might policy options be affected in these scenarios?
- What policy options are robust enough across (almost) all scenarios?
- What policy options are not robust?
- How can these policy options be made more resilient? Do they need to be reassessed or revisited?
- Is a specific policy option still desirable?
-

Table 5. A synthesis template for stress-testing

SEP POLICY OPTIONS	STORMS Performance ++/+/0/-/--	ENDGAME Performance ++/+/0/-/--	STRUGGLING SYNERGIES Performance ++/+/0/-/--	OPPOSING VIEWS Performance ++/+/0/-/--	OVERALL OPTION ROBUSTNESS
1 – Increased transparency					
2 - FRAND solution					
3 - Industry-led clearing house, differentiated prices					

3 After the workshops

The results should be used to review the policy options. Therefore, such workshops should be conducted at initial stages of the impact assessment to be able to feed into the further assessment and development of the policy options.

Annex II: Detailed scenario-specific assessment of the policy options

Annex II provides more details regarding the performance assessment of the policy options, as discussed in the participatory Workshops 2 and 3.

Storms scenario

General comment on the scenario: In this world, standards and SEPs are likely to be a lot less relevant, and their existence might be questionable (small markets would have difficulty justifying the investments). If the costs of licensing are very high and markets for technology are not efficient, companies will go back to vertical integration, in a way similar to how some big companies operated in the mid-20th century (Bell Labs, etc.). Standards are produced in-house within companies.

(0) Baseline option

This option has been assessed as **neutral / slightly positive** (but also with a balanced and negative perspective) within this scenario (negative (-): 1 participant; neutral (0): 1 participant; positive (+): 3 participants[9]).

Some comments on this option in the *Storms* scenario are set out below:

- Market players would be free to develop practical solutions. A mix of models would continue to exist. There would be a prevalence of OSS/RF[10] models for the internet. The FRAND regime would be increasingly limited to certain technologies.
- It is possible that there would be more than one global standard. This would support the diversity of approaches to technology by different countries/blocs. Splintering of technologies across blocs could make the baseline the most appropriate option.
- However, because there would be no coordination between blocs, every bloc would do its best to maximise revenues. For example, Chinese SEP holders would likely make their money from EU implementers.
- This option might not work if large players on opposite sides do not agree. Conflict resolution across blocs might be weak.
- Revenues of SEP holders are low for this option in the *Storms* scenario. There would be few incentives for them to invest in innovation.

[9] These results are based on the number of participants in each subgroup and the assessment scale they used during the workshop.

++	This decision would be seen as very positive with almost no downsides
+	On balance, this decision would be seen as positive
0	On balance, this decision would be irrelevant OR have neither a net positive nor a net negative impact
-	On balance, this decision would be seen as negative
--	This decision would be seen as very negative with almost no upside

While all participants in each subgroup were invited to vote, some of them occasionally decided not to vote.

[10] OSS: Operational Support Systems / RF radio frequency.

(1) Increased transparency

This option has been assessed as **neutral / slightly positive** (but with one negative perspective) within this scenario (negative (-): 1 participant; neutral (0): 2 participants; positive (+): 3 participants).

This option has been assessed as **neutral / slightly positive** (but with one negative perspective) within this scenario (negative (-): 1 participant; neutral (0): 2 participants; positive (+): 3 participants).

Some comments on this option in the *Storms* scenarios are set out below:

- Transparency would be good. There would be more knowledge about FRAND conditions and jurisprudence, and better market players would be able to survive.
- Transparency might also reduce litigation on essentiality and FRAND terms, and enable SEP licences to be enforced in the EU.
- Transparency is a public good. However, it might impose costs on SEP holders who would need to invest in such transparency. Therefore, this policy option might need to include incentives to encourage innovators to contribute to transparency.
- Too much transparency might also be perceived as more negative, creating disadvantages compared with other regional blocs that do not have the same transparency requirements. Therefore, a careful approach to the issue of transparency – and how much transparency to insist on – would be necessary.

<u>Suggestions to improve the policy option</u>

- Consider how to subsidise, share, and limit the costs of ensuring transparency to enable a balanced approach in relation to other measures and obligations.
- Ensure that transparency does not go beyond what the market needs to protect the interests of SEP holders.

(2) FRAND solution

This option has been assessed as **slightly positive** within this scenario (neutral (0): 2 participants; positive (+): 3 participants).

Some comments on this option in the *Storms* scenario are set out below:

- In such a hostile environment, there would not be any global standards in place that are comparable to today.
- The SEP holders would carry the main burden of providing the data required for transparency, announcing the aggregate royalty rate, etc. while the regulation would only apply in the EU. So, SEP holders might not benefit from better enforcement/protection in other regional blocs. It is unclear how other blocs would react.
- FRAND guidance is more likely to be followed in the EU regional bloc. Under this scenario, it is unclear whether other regional blocs would follow this guidance or adopt their own guidance.
- This option might have positive effects in the EU, but it is unclear whether those positive effects would spill over to other regional blocs, because of the different policies the different regional blocs might adopt.

(3) Industry-led clearing house – differentiated prices

This option has been assessed as **positive** within this scenario (positive (+): 3 participants; very positive (++) 1 participant).

Some comments on this option in the *Storms* scenario are set out below:

- The industry setting of an aggregate royalty for the regional bloc or worldwide would be helpful to ensure: (i) fair and reasonable revenue for the SEP holders; and (ii) predictability for the implementers.
- Collecting revenues via an escrow account would be effective. It is likely that the Asian regional bloc would become more implementer-friendly, thus eroding the revenues of SEP holders. An aggregate royalty would at the same time ensure that implementers remain competitive. There would be a need to protect EU interests in a more effective manner.
- Setting royalties at industry level could be more efficient compared to involving public authorities, as industry players would better understand the interests at stake and be directly involved and affected.
- The challenge for policymakers would be to set the rules for 98% of the SMEs in the EU and guarantee a return on investment for EU SEP holders.

(4) Clearing house led by an independent authority – uniform prices

This option has been assessed as **positive** within this scenario (neutral (0): 1 participant; positive (+): 3 participants; very positive (++): 2 participants).

Some comments on this option in the *Storms* scenario are set out below:

- Having a public authority set aggregate royalty rates could be a solution under this particular scenario if other mechanisms failed due to coordination failures (e.g. if companies could not coordinate in the market). However, involving a public authority in this way might be disproportionate given the costs of the policy intervention (i.e. the costs of running a clearing house led by a public authority).
- The non-cooperative equilibrium of industrial policies might lead to heavy government pressure to reduce royalties.
- The strong role of a clearing house led by a public authority could balance interventions from other blocs, in particular if countries from the Asian bloc undermined the investment efforts of EU companies. If international standardisation were to be influenced by contributors from the Asian bloc, this method of creating a clearing house led by a public authority would be particularly beneficial for EU implementers.
- The framework conditions in the *Storms* scenario would encourage concentration and regional cartelisation, so there might be no need to manage royalty rates through a clearing house. If standards are produced through individual efforts and owned by individual companies (because it is so costly to coordinate among themselves, companies would not produce standards in a cooperative manner anymore), then there would be no need to set aggregate royalty rates. There would be just a single royalty rate.

(5) SEPs are licensed royalty-free or the EU resorts to open standards

This option has been assessed as **negative** within this scenario (negative (-): 5 participants; neutral (0): 1 participant).

Some comments on this option in the *Storms* scenario are set out below:

- Standards would rest heavily on public support as the standards have to be provided royalty-free or as open standards. Innovators would be unable to get a return on investment unless they were able to integrate downstream. To promote innovation, public R&D incentive

schemes would be required. The research landscape would be different compared to today, and there would be little international cooperation.

- Non-cooperative strategies by the blocs would weaken intellectual property rights, but increase competition between market actors. Intellectual property rights might be eroded. Most/all business models based on SEP licensing would vanish, and research institutes would be chased out of standardisation. In this world of regional technologies, SEPs' royalty model would no longer work, as market reach would be limited to the bloc.
- The 'open standards' system might be destroyed across regional blocs in a scenario that is characterised by the 'splinternet' and diverging technologies.

Suggestions to improve the policy option

- Allow innovators to licence their technology on a FRAND basis as this would keep the innovation process open.

Endgame scenario

General comment on the scenario: In this world, the patent system is weak despite the relative increase of the number of patents and SEP-based products. Companies that lead in setting standards are based in the EU and US, where the innovation is concentrated and markets are open and competitive. There is an increase of trade secrets and proprietary solutions are dominant. With weakened political institutions and the leading role of MNCs, start-ups would be endangered. Also a bigger gap in innovation emerges between countries that innovate and those that do not.

(0) Baseline option

This option has been assessed as **rather negative** in this scenario (very negative: 2 participants; negative (-): 2 participants; neutral (0): 1; positive (+): 1 participant).

Some comments on this option in the *Endgame* scenario are set out below:

- Much of the action would be left to the market. The responsibility for resolving conflicts would be left to the interested parties. This could work if the courts' decisions are fair and if the legal system works well. However, court proceedings might often be too slow to solve the disputes.
- This option could also lead to the over-declaration of SEPs, and there could therefore be uncertainty regarding essentiality. This could increase the problems caused by slow court proceedings and possible immediate injunctions from MNCs. It could also damage the position of SMEs.
- Small companies would not be able to assess the risk of SEP exposure (ex post tax on innovation). New entrants, such as start-ups, might not have sufficient access to SEP licences (however, start-ups might not play a key role in this scenario).
- If there are more SEP holders that are not implementers, immediate injunctions from MNCs could lead to higher costs of collecting a unit of royalty.
- There would be limited incentives to set up patent pools.

Suggestions to improve the policy option

- Draw up guidelines for industry on how it can organise itself, e.g. on how to set up essentiality checks;
- Request that standard-setting organisations limit declarations to valid and granted patents.

(1) Increased transparency

This option has been assessed as **positive** within this scenario (positive (+): 6 participants).

Some comments on this option in the *End game* scenario are set out below:

- This option would perform in a similar way as the baseline, with slight improvement.
- In general, transparency improves trust among different actors and fosters good-faith licensing. However, in this scenario, certain MNCs experienced in SEP licensing would dominate the market, and these dominant MNCs might put pressure on governments to decrease transparency. The lack of transparency can be beneficial to experienced players in the market, both SEP holders and implementers. This lack of transparency would be detrimental for SMEs and inexperienced end-product manufacturers from new sectors.
- This policy option would lead to more challenges on patent validity between SEP holders. But it would also lead to greater certainty for both implementers and SEP holders. It would increase the capacity of SMEs to litigate against MNCs.

Suggestions to improve the policy option

- Ease as much as possible the burden for start-ups and SMEs

(2) FRAND solution

This option has been assessed as **neutral to positive** within this scenario (negative (-): 1 participant; neutral (0): 2 participants; positive (+): 5 participants).

Some comments on this option in the *End game* scenario are set out in the bullet points below.

- The FRAND guidance is likely to be ignored in a world of very influential MNCs.
- Guidance on the level of licensing, if detailed and inflexible, could be abused by the MNCs depending on their interests.
- Strong implementers could withstand pressure from SEP holders (there would be powerful MNCs on both sides: implementers and SEP holders). Governments would not be able to influence MNCs.
- This option would support SMEs as it would deal with the asymmetry of information and increase business predictability. However, SMEs under this scenario would not have sufficient leverage in negotiations.

Suggestions to improve the policy option

- FRAND guidance should be complemented by strong incentives.
- This policy option would only work in combination with mandatory essentiality checks that give an indication of the portfolio shares of the different SEP holders. Otherwise, companies' self-declared 'reasonable' aggregate royalty rates would be meaningless, as there would be no clear indication of companies' share in that aggregate rate.

(3) Industry-led clearing house – differentiated prices

This option has been assessed as both **negative and positive** within this scenario (negative (-): 2 participants; neutral (0): 1 participant; positive (+): 2 participants; very positive (++): 1 participant).

Some comments on this option in the *End game* scenario are set out below:

- The industry might not be able to agree on aggregate royalties, as key industry players could be in a heavily competitive environment. Negotiations on industry platforms would be complex.
- This option provides for a mechanism to determine aggregate royalties ex post. However, systems already exist, such as pools and other mechanisms, that would make similar determinations possible. If properly incentivised, those mechanisms could be more appropriate as industry knows the market best and therefore knows best how to set FRAND terms and conditions.
- It would be difficult to decide on an aggregate FRAND ex post or to decide on apportionment rules that correctly reflect each SEP holder's contribution. Pricing through market interactions and negotiations would both be limited (ordinarily, these are a valuable source of information on value creation in industry).

<u>Suggestions to improve the policy option</u>

- Whether this policy option would work or not would largely depend on the design of the system. There must be clear timelines and a system in place to ensure that the different parties agree. This would not be easy given the power of some big players. This policy option should be designed in such a way that gaming the system – for example by delaying the process – would not be possible.
- In some cases (complex standards with potential multiple implementations), it might be difficult to set up an aggregate royalty. Some flexibility to adapt to market evolution might be needed.

(4) Clearing house led by an independent authority – uniform prices

This option has been assessed as **very negative and unlikely** within this scenario (very negative (--): 6 participants; negative (-): 1 participant).

General remark: Governments in the *End game* scenario would not be interventionist in nature. It is not likely that governments in this scenario would set up such a central system led by a public authority. Governments in this scenario would rather leave it to the market to develop solutions.

Some comments on this option in the *End game* scenario are set out below:

- The non-market, public price setting included in Option 4 would be in contrast with free-market principles. Price formation through market interaction would be restricted in this policy option. This could make it difficult to set the right incentives for SEP holders.
- The public authority running the clearing house would need to obtain specific knowledge on products and markets. This might reduce the risk of errors, ambiguities, and unnecessary disputes.
- Uniform price setting could eliminate the implementation of many standards, in particular from SMEs. This would mean that certain implementers could be priced out.

- Undercompensating intellectual property rights would mainly be of benefit to large foreign MNCs.
- Because MNCs and large companies have the most power in this scenario and could influence governments, there would be no trust in the public authority's clearing house.

(5) SEPs are licensed royalty-free or the EU resorts to open standards

This option has been assessed as **very negative** in this scenario (very negative (--): 4 participants, negative (-): 2 participants).

Some comments on this option in the *End game* scenario are set out below.

- There would be no uncertainty about prices for implementers.
- However, the absence of incentives to invest in the development of standards would lead to fewer – and suboptimal – standards, and therefore lead to less technology diffusion (only SEP owners who are also implementers would stay).
- There would be no return on investment and no incentive to participate in standardisation. Only companies that could invest in standardisation and that are big enough to produce and implement a standard would do so (production of an entire standard would be difficult).
- Therefore, big implementers would have standards that favour their business models and there would be no incentives to integrate standards, leading to a possible duplication of costly technologies. This would discourage SMEs and there would be no markets for technology. Companies would not specialise.

Struggling synergies **scenario**

General comment on the scenario: In this world, more standards are created globally, mostly by the US and China. Both IP owners and implementers are put under pressure. The patent system is harmonised globally, with the possibility of being turned into a global system, but the patent registration and enforcement are complex. If a loose international coordination on SEP rules was strengthened, small EU companies could licence their patents or take licence on more competitive terms.

(0) Baseline option

This option has been assessed as **neutral / slightly negative** within this scenario (negative (-): 2 participants; neutral (0): 2 participants).

Some comments on this option in the *Struggling synergies* scenario are set out below:

- The baseline option could work to some extent, as global solutions would be found via multilateral negotiations. However, this could cause long delays. It would pose the risk that European companies might become mainly payers, and that innovation could be disrupted by litigation.
- If this scenario is already characterised by many regulations, and the pace of innovation is slower, it might be a good idea to leave SEP transfer to markets so that bureaucracy would not hamper this aspect of innovation. This could be a desirable option in this scenario.
- On the other hand, SEP problems are unlikely to be resolved in this option as there would be no coordinated action at international level and it is likely that many regional guidelines would

emerge. This would increase complexity. In the baseline scenario, the EU would not take a leadership position to influence decisions at international level.

Suggestions to improve the policy option

- Increase transparency

(1) Increased transparency

This option has been assessed as **positive** within this scenario (positive (+): 3 participants; very positive (++): 1 participant).

Some comments on this option in the *Struggling synergies* scenario are set out below:

- More transparency would not create more rules, but would make it possible to better apply the rules. Therefore, this option would be beneficial (if the scenario is not super-bureaucratic).

(2) FRAND solution

This option has been assessed as **positive** within this scenario (neutral (0): 1 participant; positive (+): 6 participants).

Some comments on this option in the *Struggling synergies* scenario are set out below:

- If governments agreed on a single set of guidance globally, this option could work well. The EU could take the lead in this case.
- FRAND guidance might be helpful. Any guidance on the level of licensing, if it is too detailed and inflexible, might not receive support internationally and might risk regional divergences. This would make SEP licensing less efficient.
- In this scenario, SEP policies around the world could converge on basic principles but there would be a danger of discrepancies in their implementation.
- In this scenario, Europe would be likely to contribute to SEPs via mission-driven R&D efforts (supported by taxpayers' money). SEP holders who developed new standards or who developed new SEPs based on public funding might be more likely to share information and be transparent. This research and innovation system might be more conducive to transparency.

(3) Industry-led clearing house – differentiated prices

This option has been assessed as **neutral** / slightly **positive** within this scenario (neutral (0): 3 participants; positive (+): 2 participants).

Some comments on this option in the *Struggling synergies* scenario are set out below.

- SEP licensing is global so the aggregate royalty-setting mechanism must aim at a global aggregate royalty, and not an EU-specific aggregate royalty.
- The focus in this option should be on facilitating the adoption of solutions. Transparent pricing would be key.
- SMEs would be better off with this option, because they would have predictability of cost and due diligence protected by an escrow-account procedure.

(4) Clearing house led by an independent authority – uniform prices

This option has been assessed as **negative, but diverse** within this scenario (very negative (--): 1 participant; negative (-): 2 participants; neutral (0): 1 participant; positive (+): 1 participant).

Some comments on this option in the *Struggling synergies* scenario are set out below.

- It is likely that the royalties set by the EU for foreign-held SEPs could be resisted. It would be difficult to agree on principles for FRAND calculations, and authorities in third countries might not accept the methodology (as it would impact the competitive advantage of their stakeholders).
- If there was to be a focus on open-source with burdensome compliance regimes, the option for a clearing house led by a public authority would be appropriate. This system would favour implementers that are in favour of the open-source idea.

(5) SEPs are licensed royalty-free or the EU resorts to open standards

This option has been assessed as **rather negative** within this scenario (negative (-): 3 participants; neutral (0): 1 participant).

Some comments on this option in the *Struggling synergies* scenario are set out below.

- Standards would be 'captured' by US and Chinese firms, since these countries are home to the main upstream innovators (under the assumption that other jurisdictions would allow companies to charge royalties).
- The mission-driven innovation system in the EU would also need to devote efforts to developing standards.

Suggestions to improve the policy option

- Other incentives should be created for companies and other entities to participate in standardisation together with non-implementers such as universities, etc.

Opposing views **scenario**

General comment on the innovation logic in the scenario: SEPs could affect the uptake of green technologies in two ways:

- Firstly, standardised technologies based on SEPs might enable the use of green technologies. For example, smart metres could measure the humidity and temperatures in agricultural fields enabling the optimal use of water. Such smart metres could use 5G technology to send the data to the cloud for aggregation and predictions. In this case, SEPs would be a cost to the development of green technologies.
- Secondly, standardised green technologies might be based on SEPs and a FRAND royalty policy. Government support for the update of such standards could reduce the reliance on SEPs as a means to support innovation. The level of investment in technologies focused on such future green standards would depend on a balanced SEP licensing policy.

The 'exploitative alliance' would not sponsor green standards and those countries would be more interested to see reduced FRAND royalty rates to cover uses of standardised technologies that enabled the use of green technologies. Therefore, in this scenario the EU should be interested in striking a balance with a fair and reasonable reward for SEP holders and a fair and reasonable cost for implementers to ensure that the latter remain competitive.

Because there is no global technology market, the role of SEPs for green technologies in this scenario could be much reduced. Instead, a more regional market could emerge, partly due to the royalty-free dissemination of green-tech within the EU and partner countries. Underlying standards would continue to be relevant for SEPs (as they would apply to both green and non-green technologies).

(0) Baseline option

This option has been assessed as **neutral** /neither positive nor negative within this scenario (negative (-): 1 participant; neutral (0): 3 participants; positive (+): 1 participant).

Some comments on this option in the *Opposing views* scenario are set out below:

- SEPs are included in all digital green solutions that would be needed to achieve the green transition. The market for technologies that cover SEPs in the IoT would be expected to grow.
- Developing green standards and forcing their use would stimulate innovation. It would inevitably provide a competitive advantage compared with non-green technology applications, and this would be a policy choice in the scenario. The large-scale roll-out and commercialisation of green technologies would require large subsidies for green R&I or for other forms of compensation to help market players to overcome the financing gap from royalty-free green-tech licences.
- The baseline option would leave it to market actors to organise the world of SEPs. The development of green technologies might not be hampered in this option and scenario, but it might also not support the EU's ambition to be a leader in green technology.

(1) Increased transparency

This option has been assessed as **positive** within this scenario (positive (+): 5 participants; very positive (++): 1 participant).

Some comments on this option in the *Opposing views* scenario are set out below.

- Transparency can promote cooperation within a bloc of like-minded countries. Transparency would promote the diffusion of green technologies, and the development of these kinds of technologies would be a political priority.
- SEPs would apply mainly for green-enabling digital technologies, and thus promote the green transition. Royalties and funding would go hand in hand and encourage further innovation.

(2) FRAND solution

This option has been assessed as **positive** within this scenario (positive (+): 5 participants).

Some comments on this option in the *Opposing views* scenario are set out below.

- Guidance could be used to incentivise companies to develop or implement green technologies.
- There could be special pricing for green SEPs: differentiated pricing would be required for technology that is used for green applications (which would have a lower price) and non-green applications (which could have a higher price).

(3) Industry-led clearing house – differentiated prices

This option has been assessed as **neutral / slightly positive** within this scenario (neutral (0): 3 participants; positive (+): 2 participants).

Some comments on this option in the *Opposing views* scenario are set out below:

- The reduced need for global coordination makes this policy option viable.
- Dependence on royalty payments or compensation from the EU would act as incentives for companies to invest in developing these technologies.
- The escrow simple access to licences would be beneficial for SMEs who want to use licences for IoT functions in their green technologies.

Suggestions to improve the policy option

- This option could apply to green technologies only. It might then be easier for stakeholders to agree, as there would not be that many players involved.

(4) Clearing house led by an independent authority – uniform prices

This option has been assessed as **negative** within this scenario (negative (-): 6 participants).

Some comments on this option in the *Opposing views* scenario are set out below:

- Uniform pricing would be favourable for mass consumer products, but it could also be to the detriment of green applications.
- With green technologies, incentives to SEP holders seem particularly important. The EU would want green technologies to be produced swiftly to foster the transition to sustainability. This might be attained through higher aggregate royalties (as a premium to green innovation). But this might delay or reduce the diffusion and implementation of green-tech solutions.
- Government-based price setting would likely result in low rates for the compensation of royalty loss, and this could undermine incentives to invent green-tech. Bilateral negotiations might be needed to resolve such trade-offs and develop a system for efficient pricing.

(5) SEPs are licensed royalty-free or the EU resorts to open standards

This option has been assessed as **negative** within this scenario (very negative (--): 1 participant; negative (-): 4 participants; neutral (0): 1 participant).

Some comments on this option in the *Opposing views* scenario are set out below:

- Royalty-free licences, such as open-source/open-hardware standards would reduce incentives for market players to innovate. A balance would be required to compensate for the loss of royalties by means of subsidies.
- Standards are highly varied. This policy option could lead to less investment but not zero investment. This option risks removing the technologies protected by SEPs.
- If no subsidies or other forms of compensation are provided, there could be a risk that many green technologies would not be developed, because the return on investment for developing own products would be too little or non-existent. This could be an issue in this scenario, as green technology development would predominantly depend on Europe and its partners. The inability to charge licence fees for the use of technologies would mean that other forms of compensation would be needed, and technologies might only be developed by original

equipment manufacturers (OEMs). Only powerful players able to develop products by themselves (downstream integration) would remain successful in this scenario ecosystem. This would lead to a disruption of the dominant strategy of upstream integration.

- If only the EU and its partners pushed for green technologies, most of the share of revenues from innovation would need to be earned in Europe alone.
- The divergence of royalty regulation for applications between the bloc of EU-and-partners and countries outside this bloc, for both green and non-green application cases, might require complex arrangements for this policy option.

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