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**OPINION OF THE AGENCY FOR THE COOPERATION OF ENERGY
REGULATORS No 11/2013**

of 28 May 2013

**ON THE ENTSO-E RESEARCH AND DEVELOPMENT ROADMAP 2013-
2022 AND THE IMPLEMENTATION PLAN 2014-2016 OF THE
RESEARCH AND DEVELOPMENT ROADMAP 2013-2022**

THE AGENCY FOR THE COOPERATION OF ENERGY REGULATORS,

HAVING REGARD to Regulation (EC) No 713/2009 of the European Parliament and of the Council of 13 July 2009 establishing an Agency for the Cooperation of Energy Regulators (hereinafter referred to as the ‘Agency’)¹, and, in particular, Article 6(3)(b) and 17(3) thereof;

HAVING REGARD to Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003², and, in particular, Article 9(2) thereof;

HAVING REGARD to the favourable opinion of the Board of Regulators of 14 May 2013, delivered pursuant to Article 15(1) of Regulation (EC) No 713/2009,

WHEREAS:

- (1) On 17 December 2012, the European Network of Transmission System Operators for Electricity (‘ENTSO-E’), pursuant to Article 8(3)(a) of Regulation (EC) No 714/2009, released the Research and Development Roadmap 2013-2022³ (the ‘R&D Roadmap 2013-2022’) and the Implementation Plan 2014-2016 of the Research and Development Roadmap 2013-2022⁴ (the ‘R&D Implementation Plan 2014-2016’). ENTSO-E submitted these documents to the Agency on 24 April 2013.
- (2) Pursuant to Article 6(3)(b) of Regulation (EC) No 713/2009 the Agency has to provide an opinion to ENTSO-E in accordance with the first subparagraph of Article 9(2) of Regulation (EC) No 714/2009 on relevant documents referred to in Article 8(3) of Regulation (EC) No 714/2009. Point (a) of Article 8(3) of Regulation (EC) No 714/2009 refers to ‘research plans’ to be adopted by ENTSO-E. Regulation (EC) No 714/2009 does not require a specific content or scope for such research plans. In view of the general meaning of ‘research plans’ and the content of the R&D Roadmap 2013-

¹ OJ L 211, 14.8.2009, p.1

² OJ L 211, 14.8.2009, p.15

³ <https://www.entsoe.eu/about-entso-e/working-committees/research-and-development/entso-e-rd-roadmap/>

⁴ <https://www.entsoe.eu/about-entso-e/working-committees/research-and-development/implementation-plan/>

2022, as well as of the R&D Implementation Plan 2014-2016⁵, the Agency considers that both the roadmap and the implementation plan are relevant research plans under point (a) of Article 8(3) of Regulation (EC) No 714/2009. Since the R&D Roadmap 2013-2022 and the R&D Implementation Plan 2014-2016 are intrinsically linked, it is appropriate to comment on them ('R&D Plan') together, and not in separate opinions.

- (3) ENTSO-E included in its submission to the Agency the Appendix 3⁶ to the R&D Implementation Plan 2014-2016, dated 16 January 2013. Relevant research and development ('R&D') activities of ENTSO-E are also outlined in the ENTSO-E Annual Work Programme 2012 through 2013 ('ENTSO-E Work Programme 2013'), for which the Agency provided its Opinion⁷ on 28 January 2013, as well as in the ENTSO-E Monitoring R&D Roadmap report⁸. For the present opinion the Agency took due account of these documents,

HAS ADOPTED THIS OPINION:

1. General remarks

The ENTSO-E R&D Roadmap 2013-2022 and the R&D Implementation Plan 2014-2016 exhibit both a long-term approach, addressing research needs for the horizon 2013-2022, and a medium-term approach, defining priorities for the period 2014-2016. According to ENTSO-E, the R&D Roadmap serves as a basis for the transmission section of the European Electricity Grid Initiative (EEGI) Roadmap, while the Implementation Plan serves as a background for developing future calls for R&D project proposals through the European Energy Research and Innovation programme⁹.

The scope of the aforementioned documents involves an extensive area of activities, including research, development and demonstration in fields¹⁰ related to electricity transmission planning, transmission technologies, system operation and control, design of electricity markets, asset management, as well as interactions with the electricity distribution system.

ENTSO-E highlights the role of the R&D Roadmap 2013-2022 in achieving the European climate and energy objectives as defined through the "20-20-20" targets and the EU Energy

⁵The set of the two documents is herewith referred jointly as 'the R&D Plan'.

⁶ ENTSO-E, "Appendix 3: Description of Topics for R&D Implementation Plan 2014-2016", 16 January 2013. Although the document is not published by ENTSO-E, a version of it is available in the documents of the meeting of the European Electricity Grid Initiative which took place on 30 January 2013. Link:

<http://www.smartgrids.eu/node/108>

⁷http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Opinions/Opinions/ACER%20Opinion%2002-2013.pdf

⁸<https://www.entsoe.eu/about-entso-e/working-committees/research-and-development/monitoring-of-the-rd-achievement/>

⁹<https://www.entsoe.eu/about-entso-e/working-committees/research-and-development/implementation-plan/>

¹⁰Referred to as (innovation) clusters in the R&D Roadmap.

Roadmap 2050, as well as in meeting the new requirements of the Internal Electricity Market by 2014¹¹.

The Agency considers that the overall R&D Plan of ENTSO-E constitutes an appropriate approach for structuring R&D-related deliverables, which integrates all aspects of the spectrum of the R&D process cycle (assessment of R&D needs, prioritisation and implementation planning, expected outcomes, budgets, monitoring and evaluation, dissemination) and signifies a commendable effort potentially resulting in long-term benefits to the EU. The Agency would like to emphasise the already essential role of R&D activities in the short term, in the face of the current challenges in the areas of network codes and network development (see Section 2.5 for remarks on specific R&D Functional Objectives).

The Agency deems that the ENTSO-E R&D Roadmap 2013-2022 and the R&D Implementation Plan 2014-2016 meet the objectives of non-discrimination, effective competition and the efficient and secure functioning of the internal market in electricity (Article 6(3)(b) of Regulation (EC) No. 713/2009). More specifically, the non-discrimination objective is covered adequately by the open consultation procedure used for forming the R&D Roadmap; by the assignment of a significant part of R&D activity to the research community through open calls for R&D project proposals and, finally, by the publicity and dissemination of results of R&D projects¹². The objectives of effective competition and efficient and secure functioning of the internal market are covered through the inclusion of research areas (clusters) for electricity markets design as well as for power technologies, network operation and network planning¹³ in the R&D Roadmap 2013-2022.

2. Specific remarks

2.1 On the involvement of research parties and stakeholders in the R&D Plan

The approach adopted in the R&D Plan is that Transmission System Operators (TSOs) will work together and collaborate with universities, research institutes, Distribution System Operators (DSOs), generation companies, consumers and industrial manufacturers¹⁴. A significant part of the R&D activity is supported through open calls for R&D project proposals at European or national level. The Agency suggests that when R&D activities are not supported by calls for proposals, ENTSO-E and TSOs should pursue that the R&D they deem essential is directly undertaken by TSOs themselves.

The Agency acknowledges very positively the involvement of stakeholders in the R&D Plan through consultations¹⁵ and workshops¹⁶. The Agency positively notes that ENTSO-E

¹¹ R&D Roadmap 2013-2022 report, Conclusion, p.33.

¹² See also section on *Monitoring and Evaluation of R&D fulfillment* of the present Opinion.

¹³ R&D Roadmap 2013-2022 report, Appendix A, pp.38-71.

¹⁴ R&D Roadmap 2013-2022 report, p.31.

¹⁵ Consultations were held by ENTSO-E on 11 January - 22 February 2010 and on 17 September - 15 October 2012. Furthermore, when publishing the Research and Development Plan, Update December 2011, ENTSO-E noted that the updated version took into account stakeholders' comments which were addressed to the transmission part of the EEGI Roadmap consultation process which was carried out at the beginning of 2011.

published a summary of remarks collected from stakeholders¹⁷ (as already done after the January 2010 consultation¹⁸ and after the public consultation on Study Roadmap towards MoDPEHS 2050¹⁹) and an explanation of how they have been reflected in the R&D Plan.

According to ENTSO-E, the R&D Roadmap is issued every 5 years. No external consultation is foreseen for the ENTSO-E R&D Implementation Plan, since this document is fully derived from the R&D Roadmap and instead places emphasis on TSO priorities and their available resources²⁰. However, according to ENTSO-E, external stakeholders are consulted to retrieve feedback and additional input on the ENTSO-E update proposals. Therefore, the Agency suggests that ENTSO-E, on a yearly basis, presents in the R&D Implementation Plan results from stakeholder informal consultations (e.g. discussions taking place in the EEGI), which contribute to the preparation of the R&D Implementation Plan. Links to relevant consultations should be provided in conjunction with the links to the relevant R&D plan documents of ENTSO-E.

2.2 On the methodology for the development of the R&D Plan

The methodology for defining and updating the R&D Plan is provided in the R&D Roadmap 2013-2022²¹. This methodology is based on (a) an analysis of strengths, weaknesses, opportunities and threats and (b) a set of iterative processes in which the relevant players (ENTSO-E, TSOs and stakeholders, e.g. authorities, industry, R&D community) are engaged, in order to define R&D needs, monitor R&D projects, determine potential gaps between needs and existing capabilities and disseminate knowledge.

In its Opinion on the ENTSO-E Work Programme 2013, the Agency invited ENTSO-E to develop a “grand design paper”, in view of the future European power system, clarifying the

Finally, on a research-related topic, ENTSO-E prepared in 2011 the Study Roadmap towards a Modular Development Plan on pan-European Electricity Highways System which was consulted on 2 May – 3 Jun 2011.

¹⁶ The workshops included:

-Workshop, 16 June 2010

https://www.entsoe.eu/index.php?id=42&tx_ttnews%5Btt_news%5D=58&tx_ttnews%5BbackPid%5D=28&cHash=fe911ba931fe7553b427e7ab1da74a9d

-Workshop, 14 June 2011. [https://www.entsoe.eu/news-](https://www.entsoe.eu/news-events/announcements/newssingleview/article/conclusions-on-the-rd-workshop-held-on-14th-june/?tx_ttnews%25255Bps%25255D=1309471200&tx_ttnews%25255BpL%25255D=2678399&tx_ttnews%25255Barc%25255D=1&tx_ttnews%25255BbackPid%25255D=214&cHash=098a9fec17c89afb07ebf253e67db564)

[events/announcements/newssingleview/article/conclusions-on-the-rd-workshop-held-on-14th-june/?tx_ttnews%25255Bps%25255D=1309471200&tx_ttnews%25255BpL%25255D=2678399&tx_ttnews%25255Barc%25255D=1&tx_ttnews%25255BbackPid%25255D=214&cHash=098a9fec17c89afb07ebf253e67db564](https://www.entsoe.eu/news-events/announcements/newssingleview/article/conclusions-on-the-rd-workshop-held-on-14th-june/?tx_ttnews%25255Bps%25255D=1309471200&tx_ttnews%25255BpL%25255D=2678399&tx_ttnews%25255Barc%25255D=1&tx_ttnews%25255BbackPid%25255D=214&cHash=098a9fec17c89afb07ebf253e67db564)

- Innogrid2020+ 1st workshop, 23-24 Feb 2012. <https://www.entsoe.eu/news-events/events/rd-seminar-2012/>

- Innogrid2020+, 2nd workshop, 20-21 Feb 2013.

<http://www.gridplus.eu/Documents/events/Programme%20Innogrid2013.pdf>

¹⁷ [https://www.entsoe.eu/fileadmin/user_upload/library/news/R_D_release/121217_ENTSO-](https://www.entsoe.eu/fileadmin/user_upload/library/news/R_D_release/121217_ENTSO-E_Summary_R_D_consultation_Final.pdf)

[E_Summary_R_D_consultation_Final.pdf](https://www.entsoe.eu/fileadmin/user_upload/library/news/R_D_release/121217_ENTSO-E_Summary_R_D_consultation_Final.pdf)

¹⁸

https://www.entsoe.eu/fileadmin/user_upload/library/consultations/Closed_Consultations/RandD_Plan/ENTSO-E_Summary_R_D_consultation.pdf

¹⁹ https://www.entsoe.eu/fileadmin/user_upload/library/consultations/Study_Roadmap_MoDPEHS/110620_MoDPEHS_Public_Consultation_Comments.pdf

²⁰ R&D Roadmap 2013-2022 report, p.74.

²¹ R&D Roadmap 2013-2022 report, Appendix B, p.72-76.

interrelations between the technical Network Codes. Such a paper could also identify factual needs, in terms of technology²², and could become a main source of justification for projects and new applications to be developed under the R&D plan.

Although the R&D Implementation Plan 2014-2016 mentions that the task of defining the Plan's priorities lies in an analysis of the results from monitoring the R&D achievements of the last years and the expected needs for the coming years²³, it should be noted that the justification for the selection of priorities made in the R&D Implementation Plan 2014-2016 is not immediately identifiable. Effort should be put into providing such information in the future R&D Implementation Plans.

Once more, the Agency would like to stress the need for strong involvement of TSOs in identifying the needs and prioritisation phases of the R&D Roadmap and Implementation Plan documents.

In addition, the Agency would like to stress the role of ENTSO-E and TSOs as the 'ultimate evaluators' of the results of R&D efforts. This role is complementary to the role of validating R&D needs as identified in the ENTSO-E methodology for defining the R&D Roadmap (Figure 13 in Annex B of the R&D Roadmap 2013-2022). The inclusion of a short chapter on concrete applications of recent R&D results in the key publications of ENTSO-E could contribute to stronger synergies.

The Agency stresses that homogenisation and clarity is of paramount importance in describing the Functional Objectives²⁴ (and their specific tasks) of the R&D Roadmap, as this helps to avoid overlapping of R&D work and facilitates the R&D community in identifying potential areas for research and suggest concrete R&D project proposals. The Agency emphasises the need to provide more specific description of the desired results of each Functional Objective in the R&D Roadmap; also with quantitative targets, where possible. Further, it is necessary to ensure that the respective Functional Objective for each proposed R&D topic is identified (as precisely as possible) in the R&D Implementation Plan. This would facilitate the accurate monitoring of the completion of such projects, as also mentioned in the Monitoring R&D Roadmap report²⁵.

2.3 On R&D resources, budget & financing strategies for the R&D Plan

According to the R&D Implementation Plan 2014-2016²⁶, the currently available R&D resources of TSOs are insufficient to reach the R&D objectives within a reasonable timeframe; TSO and regulatory commitment must be arranged to provide timely cost-effective and innovative solutions for future grids. As the R&D activities are realised at

²² The term "technology" refers to all results of research and technological development. It does not relate to power transmission technologies.

²³ R&D Implementation Plan 2014-2016, p.7.

²⁴ The 6 innovation Clusters of the R&D Roadmap 2013-2022 report contain 21 Functional Objectives.

²⁵ Monitoring R&D Roadmap report, p.22.

²⁶ R&D Implementation Plan report, p.8.

different levels, R&D funding comes from different institutions: EU, national or own (TSO) funding²⁷.

The total budget for the accomplishment of the R&D Roadmap 2013-2022 is estimated to be in the order of 1,000 million Euro, which amounts to approximately 100 million Euro/year. The R&D Roadmap report provides a budget estimate for each Functional Objective²⁸. According to this report, the estimated expenses are based on the cluster analysis and the appraisal of completion (of R&D projects)²⁹.

Furthermore, ENTSO-E previously noted³⁰ that the R&D Implementation Plan report shall include precise (20%) estimate of costs and funding proposals.

Finally, ENTSO-E suggests financing R&D activities through tariffs³¹.

In this regard, the Agency notes the following:

- The provision of (at least) the main assumptions leading to the abovementioned budget estimates will not only increase the overall transparency already characterising the R&D Roadmap, but might also provide better guidance to the research community in understanding R&D needs and in planning their R&D activities.
- R&D expenses incurred by TSOs should be indicated separately in the TSOs accounts submitted to NRAs and made publicly available. ENTSO-E and its TSO-members are invited to highlight situations or regulatory regimes where, in their experience, R&D costs are not sufficiently covered by tariffs. This would complement the current identification of good examples of regulatory frameworks³².
- ENTSO-E should provide cost estimates (or funding proposals) in the future R&D Implementation Plans, which are expected to include detailed R&D topics, in line with Appendix 3 to the R&D Implementation Plan 2014-2016.

2.4 On monitoring and evaluation of R&D fulfillment, Key Performance Indicators (KPI) of the R&D Plan, dissemination of R&D results

The Monitoring and Evaluation (M&E) of R&D fulfillment mainly aims at influencing the R&D process at two levels: (a) prioritisation of clusters and (b) prioritisation of Functional Objectives, by performing a gap analysis. Monitoring by ENTSO-E refers to the R&D performed in Europe, as well as monitoring projects performed within the ENTSO-E R&D Plan. M&E of the R&D projects is performed on a yearly basis through³³:

²⁷ Monitoring R&D Roadmap report, p.5.

²⁸ R&D Roadmap 2013-2022 report, Appendix A, pp. 38-71.

²⁹ R&D Roadmap 2013-2022 report, p.28.

³⁰ V. J. González, "ENTSO-E R&D Plan – Update 2011", presentation at InnoGrid2020+ Workshop, 23.2.2012.

³¹ R&D Roadmap 2013-2022 report, p.29.

³² R&D Roadmap 2013-2022 report, p.29.

³³ Monitoring R&D Roadmap report, p.7.

- a qualitative approach highlighting how a project is performing against key indicators such as contribution to the R&D Plan, budget and timing.
- a quantitative approach dealing with the degree to which each R&D project contributes to the completion of the functional projects in the clusters of the R&D Plan (a functional project may be complete, on-going, under proposal or not started).

The Agency acknowledges very positively that the M&E procedures, as set up by ENTSO-E (also including a knowledge sharing database), intend to overview (on-going or finished) TSO-relevant projects in Europe and their contribution to the R&D Plan, and disseminate their results. Although the 17 national (or regional³⁴) projects in the Monitoring R&D Roadmap report³⁵ have been collected only by 8 countries (Belgium, Denmark, Finland, Norway, Poland, Slovenia, Spain and Sweden), this is clearly the way forward in order to provide a comprehensive mapping of transmission and markets related R&D results and to reduce the duplication of activities.

However, despite the extensive M&E procedures already set up, and in view of time limitations (in the sense of the urgent need for results), an assessment of the quality of R&D results³⁶ and the impact on transmission activities of ENTSO-E and its TSO members should be initiated as early as possible. This could refer to the already completed projects (EWIS, REALISEGRID, ANEMOS Plus, SUSPLAN, Safewind, ICOEUR, PEGASE, OPTIMATE³⁷).

Also, the Agency positively acknowledges the work-in-progress³⁸ for a detailed description and guideline for the calculation methodologies of expected KPI values and for developing a knowledge sharing tool³⁹.

Finally, the Agency recommends ensuring dissemination of the results and lessons learned from the demonstration projects to all interested parties, including other network operators and market participants, in case these projects are (co-)financed by additional grid tariffs or from public funds.

2.5 On the specific Functional Objectives of the R&D Roadmap 2013-2022 and R&D Implementation Plan 2014-2016

³⁴ Projects funded by one country, involving TSOs also from other countries.

³⁵ Annex of the Monitoring R&D Roadmap report, pp. 23-82.

³⁶ The need for an assessment is also acknowledged by ENTSO-E in the Monitoring R&D Roadmap report, p.7: 'the real success of the R&D activities will be decided after the evaluation of the deliverables by technical experts'.

³⁷ European-level projects completed by the end of 2012, according to combined information from Appendix 1 of the R&D Implementation Plan report and from the Monitoring R&D Roadmap Report.

³⁸ GRID+, "Methodological Guide on EEGI KPIs, D 3.4, Define EEGI Project and Programme KPIs", Draft version 30 January 2013.

http://www.smartgrids.eu/documents/EEGI%209/EEGI_KPI_GRID+_D3%204_v1%200.pdf

³⁹ S. Galant, "Development of a knowledge sharing tool within GRID+ (WP9)", presentation at EEGI meeting on 30 January 2013.

<http://www.smartgrids.eu/documents/EEGI%209/41%20EEGI%20Knowledge%20Sharing.pdf>

In this section, some specific suggestions are provided to ENTSO-E in order to adjust the list of proposed R&D tasks with R&D topics stemming from needs identified during the recent work.

2.5.1 On Functional Objective 'T1 - Definition of scenarios for pan-European network expansion'

The scope of Functional Objective T1 and its specific tasks need to be described more clearly, in order to avoid potential overlapping with Functional Objectives T2 and T12.

Clarification seems necessary especially on the expected outcome; whether scenarios are actually expected as an outcome (as the title and the first specific task suggest) and how they will interact with ENTSO-E activities on medium and long term adequacy (System Outlook and Adequacy Forecast).

2.5.2 On Functional Objective 'T2 - Planning methodology for future pan-European transmission system'

Cost-benefit analysis and related software tools should investigate concrete network development projects and not only expansion options. The Agency proposes that methods for quantifying and monetising benefits in terms of i) optimisation of regulating and ancillary services, ii) technical resilience, iii) social and environmental sensibility and iv) effects on competition and market power⁴⁰, are further developed by ENTSO-E to support future developments of the ENTSO-E methodology for cost benefit analysis⁴¹; especially in the context of Work Package 6 of E-Highway 2050 project⁴².

Taking into account the ENTSO-E position on TEN-E Regulation⁴³ “assessing electricity storage projects requires a fundamentally different approach than transmission infrastructure that could resemble in many aspects the assessment of other generation plants that are not part of any regulated portfolio of investments”, the Agency proposes that ENTSO-E promptly develops further methodologies in the context of the R&D Plan.

Different models are used by the different ENTSO-E system development Regional Groups for network planning (Ten Year Network Development Plan). The Agency deems it as important that ENTSO-E, when investigating the state-of-the-art planning software, will map

⁴⁰ Benefits from Agency position on the ENTSO-E Guideline to Cost Benefit Analysis of Grid Development Projects,

http://www.acer.europa.eu/Official_documents/Board_of_Regulators/Board%20of%20Regulators%20Decisions/Position%20on%20ENTSO-E%20CBA.pdf

⁴¹ ENTSO-E, “Guideline to Cost Benefit Analysis of Grid Development Projects”, Draft December 2012, https://www.entsoe.eu/fileadmin/user_upload/library/events/Workshops/CBA/121204_ENTSO-E_Draft_CBA_methodology-V0.4.zip.

⁴² Work Package 6: Socio-Economic Profitability of an Electricity Highways System in the ENTSO-E Study Roadmap towards MoDPEHS 2050.

⁴³ ENTSO-E, “ENTSO-E Position on the draft Regulation on guidelines for trans-European energy infrastructure”, 25 September 2012. https://www.entsoe.eu/fileadmin/user_upload/library/news/ENTSO-E_Regulation_4_trans-European_energy_infrastructure/120925_EIP_position_ENTSO-E_final.pdf

the on-going developments in market and network simulation models and software tools, in view of the required consistency across regions.

The last specific task, ‘Proposal for network investment mechanisms at EU level’, should be double-checked in order to avoid overlapping with the second specific task in Functional Objectives T12 (which aims at designing investment incentives regime also for new transmission capacity).

2.5.3 On Functional Objective ‘T3 – Demonstration of Power Technologies to increase network flexibility and operation means’

More detailed information is expected about the need to demonstrate Phase Shifting Transformers, wide-area monitoring systems, High Voltage Direct Current – Voltage Source Converter, as these technologies are already widely deployed in EU transmission networks.

2.5.4 On Functional Objective ‘T12 – Tools and market mechanisms for ensuring system adequacy and efficiency in electric systems integrating very large amounts of RES generation’

Taking into account the expected growth of power injections and electricity generation from wind and solar power plants, it is important that ENTSO-E promotes new methodological approaches to estimate an expected reliable capacity of wind and solar power plants. It is also important that ENTSO-E elaborates on issues regarding expected energy generation from such plants taking into account (among others) the Pan-EU Climate Database⁴⁴. The focus should be both on the short term (weeks-months, as is the case of the Summer/Winter Outlooks) and on long term (several years, as is the case of the Adequacy Reports).

Done at Ljubljana on 28 May 2013.

For the Agency:


Alberto Pototschnig
Director

⁴⁴ ENTSO-E, “ENTSO-E Response to the ACER Opinion on Summer Outlook 2012 and Winter Review 2011-2012 Report”, November 2012, p. 4.



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