

Statutes of the Extreme Light Infrastructure ERIC

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MAIN BODY OF THE STATUTES

PREAMBLE

The Czech Republic,

Hungary,

The Republic of Italy,

The Republic of Lithuania,

Hereinafter referred to as 'the Founding Members', and:

The Republic of Bulgaria

The Federal Republic of Germany,

Hereinafter referred to as 'the Founding Observers',

WHEREAS there is a desire to strengthen the position of Europe and the Member States in the world relative to laser technology development and to intensify scientific research cooperation across disciplinary and national borders by establishing the Extreme Light Infrastructure (ELI) ERIC;

WHEREAS the Extreme Light Infrastructure (ELI) has been recognized in 2006 by the European Strategy Forum on Research Infrastructures (ESFRI) as a strategic priority for Europe as the first and world leading international laser research infrastructure dedicated to science and research applications of ultra-intense and ultra-short laser pulses, providing high-quality access to the international research community for prospective applications in medicine, radiography, fusion energy, environment, materials sciences, nanotechnologies, and biochemistry;

WHEREAS the scale and ambition of operating ELI ERIC demands a global effort with long-term sustainable investment;

WHEREAS the Founding Members and Founding Observers, as well as future Members and Observers, are dedicated to realising that vision of ELI ERIC;

WHEREAS ELI ERIC is the first international research infrastructure hosted in Central and Eastern Europe of which the construction of laser research facilities was co-financed by the European Structural and Investment Funds;

ACKNOWLEDGING the preparatory work done by the Founding Members, Founding Observers and other States supporting ELI ERIC in the Preparatory and Implementation Phases;

WHEREAS the Founding Members and Founding Observers undertake to increase the research opportunities of their research facilities through partnerships and collaborations with ELI ERIC;

WHEREAS the Founding Members and Founding Observers invite and expect other countries to participate in the activities undertaken together under the following Statutes;

HAVE agreed as follows.

CHAPTER 1 - ESSENTIAL ELEMENTS

Article 1 - NAME

There shall be a single-sited European research infrastructure with operational facilities in multiple ELI ERIC member countries, set up as a European Research Infrastructure Consortium (ERIC) under Council Regulation (EC) No 723/2009 ⁽¹⁾ and named 'The Extreme Light Infrastructure ERIC' and commonly referred to as 'ELI ERIC'.

Article 2 - TASKS AND ACTIVITIES

1. ELI ERIC shall operate the high-power laser facilities described in the Technical and Scientific Description (Annex I) (the 'ELI FACILITIES') as a single integrated organisation, with a unified governance and single management structure. The ELI ERIC General Assembly (hereinafter referred to as 'GA') may recognise and include additional ELI FACILITIES according to item (d) of Article 25(9).

2. ELI ERIC shall manage access to the ELI FACILITIES for users through an international peer-review system. In order to achieve its objectives, ELI ERIC shall in particular:

a) Exploit the full scientific potential of the ELI FACILITIES, by collaborating closely with user communities, developing and making available a set of complementary sources and instruments, providing efficient services and optimum conditions for users, and by undertaking outreach activities to new potential users;

b) Sustain excellence and improve the value, quality and effectiveness of the Members' research communities through international peer-reviewed access;

c) Provide a unique platform for the development of know-how to the Members by coordinating research and development of relevant technologies, coordinating the joint training of scientific and technical personnel, and by promoting collaboration between leading research centres and with industry;

d) Develop and implement a policy and strategy for innovation, including intellectual property, technological exploitation, and support to industrial development;

e) Ensure an efficient internal and external communication, promoting the ELI ERIC activities and disseminating the scientific and technical results;

f) Carry out any other activity in support of ELI ERIC's objectives.

3. ELI ERIC shall operate on a non-economic basis. ELI ERIC may carry out limited economic activities, provided that they are closely related to its principal tasks, and do not jeopardise the achievement of these tasks. Details shall be specified in the FINANCIAL RULES.

¹ Council Regulation (EC) No 723/2009 of 25 June 2009 on the Community legal framework for a European Research Infrastructure Consortium (ERIC) (OJ L 206, 8.8.2009, p. 1).

Article 3 - STATUTORY SEAT

The Statutory Seat of ELI ERIC shall be in Dolní Břežany, Czech Republic.

Article 4 - DURATION AND WINDING-UP

1. ELI ERIC shall be established for an initial period of 20 years and may be prolonged, subject to a decision of the GA in accordance with item (f) of Article 25(9).

2. The winding-up of ELI ERIC shall require a decision of the GA in accordance with item (k) of Article 25(10) and be notified to the European Commission according to Article 16 of Regulation (EC) No 723/2009. Such a decision shall include at least:

- a) The number of liquidators and rules of functioning of the board of liquidators in case of plurality of liquidators;
- b) Appointment of the liquidators and indication of the liquidator who shall be legal representative of the winding-up of ELI ERIC;
- c) The criteria for the winding-up, including the possible transfer of activities to another legal entity, and the powers of the liquidators.

3. Without undue delay after the closure of the winding-up procedure, and in any event within 10 days after such closure, the ELI ERIC shall notify the Commission thereof.

4. In case of dissolution, ELI ERIC shall remain bound in respect of all pending obligations and undertakings towards third parties. The decommissioning and/or re-use of each ELI FACILITY shall be taken over by the respective HOST MEMBER.

Article 5 - LIABILITY REGIME

1. ELI ERIC shall be liable for its debts.

2. The financial liability of the MEMBERS for the obligations of ELI ERIC shall be limited to their respective contributions to ELI ERIC in respect of the last full year of operations.

3. ELI ERIC shall take appropriate insurance to cover the risks specific to its operations.

Article 6 - ACCESS POLICY FOR USERS

1. ELI ERIC shall offer USERS access to the ELI FACILITIES through a transparent selection process based on an international peer-review procedure of proposals managed through an electronic common entry point. The selection criteria shall be based on scientific quality and feasibility of the experiment. Ethical aspects involved in the evaluation of proposals or performance of access should be dealt with the support of the Ethical Advisory Committee referred to in Article 29.

2. USERS requiring and accessing technical and/or scientific services outside of the peer-review selection-based access shall pay the appropriate price of the services received, in accordance with the limits as referred to in Article 2(3).

3. The principles of the ACCESS POLICY FOR USERS are outlined in Annex I to these Statutes and shall be defined and detailed in a specific policy. That policy shall take into account the European Data Protection legal framework related to the sharing of personal data of USERS among the MEMBERS.

Article 7 - SCIENTIFIC EVALUATION POLICY

1. ELI ERIC shall regularly evaluate and benchmark the quality of its scientific activities by international peer review, including a periodic assessment of its impact on the European Research Area, the regions hosting its activities and at international level.

2. ELI ERIC shall ensure that research carried out by its USERS meets the highest standards of quality and excellence and shall promote training and exchanges of best practices. Ethical aspects should be assessed by the Ethical Advisory Committee referred to in Article 29. ELI ERIC shall assess the impact and effectiveness of its research policy and programme design, as well as the resources required to support these standards.

Article 8 - DISSEMINATION POLICY

1. ELI ERIC's tasks and activities aim to strengthen research, technology development, and innovation in Europe and worldwide. ELI ERIC will, in particular, conduct communication and dissemination activities to support that aim, using a variety of platforms to reach all relevant stakeholders and the general public.

2. ELI ERIC shall promote the dissemination to the research community, industry, and the general public of the scientific activities, results, publications, and the scientific-technical knowledge resulting from its activities. Consistent with Article 6 whereby access is open, and granted on the basis of scientific excellence, ELI ERIC shall also pursue a policy of open access to FAIR data sets and metadata, as referred to in Article 13, as well as to scientific publications derived from publicly-funded research conducted at ELI ERIC.

Article 9 - INTELLECTUAL PROPERTY RIGHTS POLICY

1. The term 'Intellectual Property' shall be understood in accordance with Article 2 of the Convention Establishing the World Intellectual Property Organisation signed on 14 July 1967.

2. Subject to the term of any contract between ELI ERIC and users, intellectual property rights created, obtained or developed by users shall be owned by those users.

3. ELI ERIC shall adopt an Intellectual Property Rights Policy and specific processes and procedures in accordance with item (e) of Article 25(10).

Article 10 - EMPLOYMENT POLICY

1. ELI ERIC shall ensure equal treatment and opportunities for its personnel and shall support mobility with a view to foster professional training and development of personnel.

2. The policy of hiring and managing the staff shall be defined by the ELI ERIC Director-General (hereinafter referred to as 'DG') and approved by the GA. The employment policy shall apply international-level selection and evaluation procedures, as well as remuneration principles aiming to competitively attract and retain highly qualified staff. The selection procedures for ELI ERIC staff

positions shall be transparent, non-discriminatory and respect equal opportunities. Recruitment and employment shall not be discriminatory.

3. ELI ERIC shall have a single employment policy defined in accordance with the laws of the countries in which staff is employed.

Article 11 - PROCUREMENT POLICY

The ELI ERIC DG shall define a procurement policy to be approved by the GA. This procurement policy shall respect the principles of transparency, proportionality, mutual recognition, equal treatment, competition and non-discrimination.

CHAPTER 2 - DEFINITIONS AND OTHER STATUTORY POLICIES

Article 12 - DEFINITIONS

For the purposes of ELI ERIC and these Statutes, the following definitions shall apply:

- a) ACCESS FOR USERS means the legitimate and authorised physical or remote use of ELI ERIC's offered scientific facilities and services to individuals, teams and institutions from academia, industry and public services according to ELI ERIC's User Access policy (Article 6).
- b) ACCESSION means the act of joining ELI ERIC as a Member after entry into force of the European Commission Implementing Decision on setting up ELI ERIC.
- c) ELI FACILITY means the high-power laser facilities that are operated by ELI ERIC. A detailed Technical and Scientific Description is provided in Annex I.
- d) FINANCIAL RULES means the internal regulations adopted by the General Assembly relating to ELI ERIC's budget, accounting standards, cash and in-kind contributions and resources, and rules regarding preparation, filing, auditing, and publication of accounts.
- e) FOUNDING OBSERVER means a country with Observer status participating in ELI ERIC at the establishment of ELI ERIC, which shall have the rights set out in Article 17(3) of the Statutes.
- f) IMPLEMENTING RULES means the internal regulations detailing the conditions of implementation of the ELI ERIC Policies approved by the General Assembly.
- g) HOST MEMBER means a Member country where an ELI FACILITY is located, having the rights and obligations set forth in Article 20.
- h) MEMBER means a country or intergovernmental organisation who, following approving of their application for ACCESSION by the General Assembly, shall have the rights and obligations set forth in Article 20.
- i) OBSERVER means a country or intergovernmental organisation who shall have the rights and obligations set forth in Article 21.
- j) RULES OF PROCEDURE means the regulations detailing the mode of functioning and organisation of the ELI ERIC statutory and advisory bodies.
- k) A STRATEGIC PARTNER is a third party, such as national agencies and/or institutions, which will contribute to the mission of ELI ERIC and support the involvement of their user communities and the operation of the ELI FACILITIES on a long-term perspective through a partnership agreement, consistent with Article 19 of the Statutes.
- l) USER means individuals, teams and institutions from academia, industry and public services that will access the ELI FACILITIES according to ELI ERIC's User Access policy (Article 6).

Article 13 - DATA POLICY

1. 'Data' refers to all information collected by USERS and the staff while performing scientific experiments under the ACCESS FOR USERS Policy and performing operations of the ELI FACILITIES.
2. Open Access to FAIR data sets and metadata stored in Open Access repositories shall be favoured for data collected as a result of the use of the ELI FACILITIES and, to the extent possible in case of software and computer programmes created by the ELI ERIC and the ELI FACILITIES; open source principles shall be considered.

Article 14 - INNOVATION AND INDUSTRY POLICY

1. ELI ERIC shall as a part of its mission be a reference for European industry, leading research and technology development through outreach and collaboration opportunities with industry. It will enhance the economic effect of ELI ERIC on the European Research Area, and MEMBERS, by serving as a platform to build synergies and enhance knowledge and technology transfer, especially, but not limited to, the fields of laser and photonics technology.
2. The ELI ERIC vision and approach for innovation and industry shall be defined in a specific policy, approved by the GA.

CHAPTER 3 – MEMBERSHIP

Article 15 - MEMBERS AND ENTITIES REPRESENTING THE MEMBERS

1. The following entities may become MEMBERS or OBSERVERS:
 - a) Member States of the European Union (EU);
 - b) Associated countries;
 - c) Third countries, other than associated countries;
 - d) Intergovernmental organisations.
2. Each MEMBER may appoint one or more 'Representing Entity' (hereinafter referred to as 'RE') to carry out activities on its behalf in direct connection with the scope and activities of ELI ERIC. Each MEMBER shall specify in the appointment the exercise of specific rights and the discharge of obligations as a MEMBER that have been delegated to the RE. The RE may be a public entity, including regions, or private entities with a public service mission.
3. Each MEMBER shall inform the Chair of the GA of any change of its RE, of the specific rights and obligations that have been delegated to it, of the termination of the appointment or of other relevant changes, if any.
4. The MEMBERS and OBSERVERS of ELI ERIC and their RE are listed in Annex III, which shall be kept up-to-date by the Chairperson of the GA.

Article 16 - ACCESSION POLICY OF NEW MEMBERS

1. The GA shall consider applications for the ACCESSION of new MEMBERS, subject to Article 15(1). The decision by the GA should take into account the capability of the new MEMBER to commit to the scope and activities and contribute to the sustainability of ELI ERIC.
2. The GA shall adopt a policy for accepting new MEMBERS including the process for application, expected criteria for contributions, and general conditions for ACCESSION.
3. The DG shall be responsible for negotiating terms and conditions with new MEMBERS and presenting a proposal for membership to the GA for approval.

Article 17 - OBSERVERS AND ACCESSION POLICY FOR OBSERVERS

1. ELI ERIC shall be open to consider and accept OBSERVERS. OBSERVERS may be countries or intergovernmental organisations that intend to apply for full membership but for specific reasons are not in the position to immediately join as MEMBERS. Applicants shall submit a written application to the Chair of the GA. As a rule, OBSERVERS shall be admitted for a three-year period; in exceptional cases the GA may extend the period of Observer status.
2. The GA shall determine a fee for OBSERVERS relative to conditions in Annex II, except in the case of FOUNDING OBSERVERS.
3. FOUNDING OBSERVERS are countries with Observer status that have participated in the establishment of ELI ERIC, but that shall not be obliged to pay an Observer fee for three full financial years after the establishment of ELI ERIC. FOUNDING OBSERVERS will have the same rights as OBSERVERS. At least six months prior to the end of the third full financial year, the FOUNDING OBSERVER will notify the GA whether it wishes to join ELI ERIC as a MEMBER, in which case the FOUNDING OBSERVER and the GA shall agree the relevant MEMBER Contributions and timing of accession. If the FOUNDING OBSERVER does not join as a MEMBER, the FOUNDING OBSERVER shall cease to participate in ELI ERIC at the end of the FOUNDING OBSERVER term, unless otherwise agreed with the GA according to item (a) of Article 25(9).
4. EACH OBSERVER may appoint up to two representatives to attend the GA and up to two to attend the Administrative and Finance Committee (hereinafter referred to as 'AFC') in accordance with Articles 24(5) and 28(1). OBSERVERS have no voting rights.

Article 18 - WITHDRAWAL OF A MEMBER OR AN OBSERVER, TERMINATION OF MEMBERSHIP OR OBSERVER STATUS

1. MEMBERS may withdraw from ELI ERIC after the first five years of their respective membership, by sending an official notification of withdrawal to the DG at least 24 months in advance. Withdrawal shall take effect at the end of the second full financial year following that in which notice is given.
2. FOUNDING OBSERVERS AND OBSERVERS may withdraw at the end of a financial year, following a request submitted 6 months prior the withdrawal.
3. A withdrawing MEMBER shall remain bound in respect of its obligations and undertakings towards ELI ERIC and third parties pending at the time the withdrawal takes effect, subject to the limit set forth

in Article 5(2). Such obligations may include compensation for damages at the charge of ELI ERIC due to decisions or acts accruing prior to withdrawal.

4. Subject to the conditions laid down in Article 18(1) and 18(2) MEMBERS, FOUNDING OBSERVERS, and OBSERVERS that are associated countries, third countries other than associated countries, or intergovernmental organisations, may withdraw from ELI ERIC, following changes in Regulation (EC) No 723/2009 that would materially affect their rights and obligations in relation to ELI ERIC. In this instance, and where it applies, the obligation to pay any contribution is also terminated. Other liabilities shall be evaluated by an independent arbitrator agreed by the withdrawing party and ELI ERIC in accordance with Articles and 5(2) and 18(2).

5. If a MEMBER or an OBSERVER fails to fulfil its obligations under Regulation (EC) No 723/2009 or under these Statutes, the GA may terminate the membership or status as an OBSERVER. The MEMBER or OBSERVER may rectify the breach of its obligations within a period of six months after it has received notice of its breach in writing. In case of termination by a decision in accordance with item (a) of Article 25(9) the defaulting MEMBER or OBSERVER shall cease to be a MEMBER or an OBSERVER. The defaulting MEMBER shall have no voting rights in the defaulting decision. Article 18(2) shall apply with regard to termination.

Article 19 - AGREEMENTS WITH STRATEGIC PARTNERS

1. The DG may propose Strategic Partnerships on the basis of specific agreements with third parties, for example with national agencies and/or institutions, which will contribute to the mission of ELI ERIC and support the involvement of their user communities and the operation of the ELI FACILITIES on a long-term perspective.

2. Strategic Partnership agreements are subject to approval by the GA in accordance with item (a) of Article 25(10). The GA may invite STRATEGIC PARTNERS to join in meetings of the GA where points will be discussed related to the STRATEGIC PARTNER.

CHAPTER 4 - RIGHTS AND OBLIGATIONS OF MEMBERS AND OBSERVERS

Article 20 - RIGHTS AND OBLIGATIONS OF MEMBERS

1. Rights of MEMBERS include:

- a) the right to appoint RE in accordance with Article 15(2);
- b) the right to appoint representatives to the GA and AFC in accordance with Article 24(3) and Article 28(1);
- c) the right to vote in the GA in accordance with Article 25.

2. Each HOST MEMBER and MEMBER shall:

- a) be committed to support ELI ERIC as a single integrated organisation in accordance with Annex I;
- b) contribute to the operational costs of ELI ERIC in accordance with Annex II to these Statutes;
- c) inform the Chair of the GA of any change of its RE in accordance with Article 15(3).

Article 21 - RIGHTS AND OBLIGATIONS OF OBSERVERS AND FOUNDING OBSERVERS

1. OBSERVERS have the right to appoint representatives to the GA and AFC in accordance with Article 17(4). OBSERVERS have no voting rights. FOUNDING OBSERVERS have the same rights as OBSERVERS.
2. Each FOUNDING OBSERVER and OBSERVER may appoint a RE in accordance with Article 15.
3. OBSERVERS obligation shall not apply to FOUNDING are obliged to provide an annual Observer fee in accordance with Article 17(2). This OBSERVERS.

Article 22 - COMMITMENTS AND RESOURCES

1. The GA will approve an annual budget, taking into account the assessment of the AFC and if required, supported by a review of the International Scientific and Technical Advisory Committee (hereinafter referred to as 'ISTAC').
2. The contributions to the operational costs by MEMBERS are indicated in Annex II to these Statutes.
3. Resources made available to ELI ERIC shall consist of:
 - a) Cash and in-kind contributions by the MEMBERS and OBSERVERS for the operations of ELI ERIC, including the activities in support to the USERS, shall be defined annually in an ELI ERIC 'cost book' to be approved by the GA; it shall take into account the budgetary principles in accordance with Articles 30(2), 30(5) and 30(6), and the FINANCIAL RULES, including limits of in-kind contributions in accordance with Articles 30(4) and 30(5) and in-kind rules to be established and approved by the GA.
 - b) Financial grants, supports and other financial contributions from research and technology development activities. The GA shall adopt IMPLEMENTING RULES for the use of revenue from external contracts and contributions, approved by the GA in accordance with Article 25(10), in particular from the European Union and/or nationally-funded activities.
 - c) Any other income as defined in Article 2(3) and the income shall be accounted according to Articles 30(9) and 30(10).
 - d) Other entries and financial resources in order to develop specific activities or projects falling within the scope in accordance with Article 2.
 - e) Donations and grants such as those from charities, lottery funds, and non-for-profit entities. Subject to approval by the GA, ELI ERIC shall be entitled to accept grants, special contributions, gifts, donations and other payments from any natural person or legal entity such as charity or a lottery fund for the non-economic tasks and activities set out in these Statutes.
4. Resources available to ELI ERIC shall solely be used for performing the tasks and activities in accordance with Article 2, and also within the possible restrictions and limits laid down in Annex II. To ensure an adequate and sustainable level of cash resources for operations, the GA shall determine allowable in-kind contributions within each MEMBER's contribution in the FINANCIAL RULES. The GA may decide, after recommendation of the AFC, to offset MEMBER contributions with additional income in accordance with Article 30.
5. The methods, limits, and accounting provisions for in-kind and cash contributions shall be laid down in the FINANCIAL RULES adopted by the GA in accordance with Article 25(10) and Article 30.

CHAPTER 5 – GOVERNANCE

Article 23 - BODIES

The ELI ERIC statutory bodies shall be the GA and the DG. They shall govern ELI ERIC as a single integrated organisation, including the ELI ERIC science and user program and operations of the ELI FACILITIES according to Article 2(1).

Article 24 - GENERAL ASSEMBLY

1. The GA shall be the governing body of ELI ERIC with final authority to determine ELI ERIC's statutory policies and any other matters that are necessary to fulfil the mission of ELI ERIC. The GA may issue instructions to the DG.

2. The GA shall draw up its own RULES OF PROCEDURE in compliance with these Statutes. The GA shall make all decisions on an objectively reasonable basis.

3. Each MEMBER may appoint up to two delegates to be represented in the GA. Each MEMBER shall inform without undue delay the Chair of the GA in writing of any appointment or termination of appointment of its delegates. If one or both delegates of a MEMBER are unable to attend a meeting and need to be represented by another authorised individual, the MEMBER concerned shall send a written notification to the Chair of the GA in accordance with the GA's RULES OF PROCEDURE, in advance of the meeting. The DG and other employees of ELI ERIC and of the ELI FACILITIES cannot serve as delegates to the GA at the same time.

4. Delegates may be accompanied by a limited number of expert advisors in accordance with the GA's RULES OF PROCEDURE.

5. Up to two delegates per OBSERVER may attend the GA without a right to vote.

6. Up to two delegates per STRATEGIC PARTNER may attend the GA without a right to vote if the STRATEGIC PARTNER will be invited to the meeting of the GA according to Article 19(2).

7. The GA shall elect a Chair and a Vice-Chair from the delegations of the MEMBERS for a three-year term. Re-election shall be permitted once for a second term not exceeding two years. With their

election, the Chair shall become supra-partes and leave his/her delegation. The Vice-Chair shall substitute the Chair in his/her absence or in case of conflict of interest, and shall only become supra-partes and leave his/her delegation while substituting for the Chair.

8. The DG, the Chair of the ISTAC, and the Chair of the AFC, shall attend all meetings of the GA unless otherwise directed by the Chair of the GA.

9. Decisions of the GA shall be taken in accordance with Article 25. The Chair of the GA may determine and resolve that a decision is to be made by written procedure in between meetings of the GA. Details are laid down in the RULES OF PROCEDURE of the GA.

10. The GA shall meet at least twice a year. The meetings of the GA shall be convened by the Chair.

11. The participation in the GA meetings and the exercise of membership rights may also be exercised by electronic media. Details are regulated by the RULES OF PROCEDURE of the GA.

12. The cost of participation of the MEMBERS' delegates and their experts in the GA shall be borne by the MEMBERS. The cost of participation of the OBSERVERS' delegates in the GA shall be borne by the OBSERVERS. The costs of participation of other invitees proposed by OBSERVERS or STRATEGIC PARTNERS shall be borne by the proposing OBSERVER or STRATEGIC PARTNER. The costs of other invited persons in a consultative function invited by the Chair (e.g. the Chairs of the ISTAC and the AFC or the Auditors) shall be borne by ELI ERIC unless otherwise agreed.

Article 25 - VOTING PROCEDURE

1. Each MEMBER shall have a single indivisible vote. A MEMBER will be duly represented when at least one delegate is present in person or by electronic media. Defaulting MEMBERS shall not have a vote.

2. The votes of the MEMBERS shall be weighted according to the proportion of their respective due contributions to the total annual due contributions of the MEMBERS.

3. A 'simple majority' means a majority of more than 50 % of the votes of the MEMBERS represented at the meeting and not more than half of the MEMBERS voting against.

4. A 'qualified majority' means a majority of at least 67 % of the votes of the MEMBERS represented at the meeting and not more than half of the MEMBERS voting against.

5. A 'unanimous vote' means no MEMBER voting against and votes cast representing at least 90 % of the votes of the MEMBERS.

6. Abstentions shall not be taken into account as votes cast but shall be recorded in the protocols.

7. The GA has a quorum and decisions are valid if the following conditions are met:

- a) Two thirds of the MEMBERS are represented;
- b) Member States of the European Union and associated countries hold jointly the majority of the votes.

8. The GA delegates shall make their best efforts to reach consensus on their decisions.

9. The following matters shall require the approval of the GA by unanimous vote:

- a) Admission and termination of a MEMBER or OBSERVER status and the agreement between ELI ERIC and the acceding MEMBER or OBSERVER according to Article 16 and Article 17;
- b) Proposal for amendment of these Statutes and amendment of its Annexes;
- c) Taking out of loans in exceptional cases;
- d) Addition of a facility by a MEMBER, complementing the set of ELI FACILITIES;
- e) The annual contributions of the MEMBERS;
- f) Decision to extend the duration of ELI ERIC.

10. The following matters shall require the approval of the GA by qualified majority:

- a) Strategic partnership agreements in accordance with Article 19;
- b) Organisational and operational structure of ELI ERIC;

- c) RULES OF PROCEDURE of the GA in accordance with Article 24(2);
- d) FINANCIAL RULES of ELI ERIC;
- e) ELI ERIC Statutory Policies;
- f) Election of Chair and Vice-Chair of the GA;
- g) Establishment of advisory committees or bodies other than the ISTAC, the AFC and the Ethical Advisory Committee;
- h) Appointment of the Chair and members of the ISTAC in accordance with Article 27(2), of the AFC in accordance with Article 28(1) and of the Ethical Advisory Committee in accordance with Article 29(1);
- i) Appointment or termination of the appointment of the DG and attributions of specific powers;
- j) In the Steady State Operations period, confirmation of appointment, or termination of the appointment of Directors of the ELI FACILITIES;
- k) Winding-up of ELI ERIC and the settlement of assets;
- l) Annual activities program and five-year scientific and technical programme of ELI ERIC;
- m) The ELI ERIC cost book applied to cost estimations including the value of in-kind contributions;
- n) The annual budget and five-year budget plan of ELI ERIC;
- o) Adoption of specific projects and related budgets;
- p) Approval of upgrades to the ELI FACILITIES;
- q) Adoption of the annual financial statement of ELI ERIC;
- r) Adoption of the annual activity report of ELI ERIC;
- s) Policy for the allocation of and access to beam time in ELI FACILITIES;
- t) Approval of the RULES OF PROCEDURE of the ISTAC, the AFC and the Ethical Advisory Committee.

11. Except where otherwise provided in these Statutes, all other decisions of the GA shall be taken by a simple majority.

Article 26 - DIRECTOR GENERAL

1. The DG shall be the legal representative of ELI ERIC. The DG shall be responsible to execute the day-to-day management of ELI ERIC with due diligence and in accordance with these Statutes, the instructions and resolutions of the GA, and applicable legal requirements.

2. The DG shall present an organisational structure to the GA for approval. That will identify the Directors and senior officers in the organisation. The DG shall appoint the Directors of the respective ELI FACILITIES to maintain consistency and collaboration between the ELI FACILITIES, except during Initial Operations Period when the Facility Directors shall be appointed by the respective HOST COUNTRIES.

3. The DG shall prepare and submit strategic, technical, scientific, legal, budgetary and administrative decisions to the GA.

4. The DG shall present an annual activity report to the GA and shall present once a year an audited financial statement to the GA.

5. The DG shall be appointed by the GA for a period of up to five years; the appointment may be extended once by a period of up to five years.

6. In the event of the DG's post falling vacant, the GA shall designate an acting DG in accordance with Article 25(10). The appointment decision shall specify the powers and responsibilities of the acting DG.

Article 27 - INTERNATIONAL SCIENTIFIC AND TECHNICAL ADVISORY COMMITTEE

1. The ISTAC shall provide independent advice to the DG and GA on all strategic issues, as well as on the scientific and technical activities, specific projects, and upgrades carried out by ELI ERIC.

2. The GA shall appoint in accordance with item h) of Article 25(10) the ISTAC members, who shall be outstanding personalities in the fields relevant to ELI. The number of ISTAC members, the terms of reference and RULES OF PROCEDURE shall be defined by the GA.

3. The ISTAC shall elect a Chair amongst its members to be approved by the GA.

4. The costs of the functioning of the ISTAC shall be borne by ELI ERIC

Article 28 - ADMINISTRATIVE AND FINANCE COMMITTEE

1. The GA shall set up an AFC composed of up to two delegates nominated by each MEMBER. The Chair of the AFC shall be appointed by the GA and shall be supra-partes. The GA shall also appoint a Vice-Chair of the AFC who shall support the Chair in his/her activities, and act on their behalf upon request. The AFC shall advise the GA on matters of administrative, legal, procurement and financial management. Up to two delegates of each OBSERVER may be invited in a consultative role to the AFC.

2. The operation of the AFC shall be detailed in RULES OF PROCEDURE of the AFC, which shall be defined by the GA.

3. The costs of the functioning of the AFC shall be borne by ELI ERIC, while the costs of participation of the delegates to the AFC shall be borne by the MEMBERS and OBSERVERS.

Article 29 - ETHICAL ADVISORY COMMITTEE

1. The GA shall set up an Ethical Advisory Committee to advise the GA and DG on all ethical matters relevant to the operations of ELI ERIC, including the performance of user experiments to be performed at the ELI FACILITIES, scientific evaluation, research integrity and employment issues.

2. The GA shall appoint in accordance with item (h) of Article 25(10) the members of the Ethical Advisory Committee, who shall be knowledgeable in matters relevant to ELI ERIC. The number of members of the Ethical Advisory Committee, the terms of reference and RULES OF PROCEDURE shall be defined by the GA.

CHAPTER 6 - FINANCIAL MATTERS

Article 30 - FINANCIAL YEAR, ANNUAL ACCOUNTS, BUDGETARY PRINCIPLES AND FISCAL ASPECT

1. The financial year shall run from 1 January to 31 December.
2. The revenues and expenditures in the budget must be balanced. The MEMBERS shall contribute to the operational costs of ELI ERIC and the apportionment of MEMBERS' contributions to the operational costs shall be defined according to Annex II to these Statutes.
3. The GA shall avoid a lasting and significant imbalance between the use of the ELI FACILITIES by the scientific community of a MEMBER and its financial contribution to ELI ERIC.
4. The annual budget plan shall be reviewed by the AFC and approved by the GA at least one month in advance of the coming financial year.
5. ELI ERIC shall keep account of cash and In-kind contributions, and of the expenses, and shall ensure sound financial management aimed at achieving a balanced budget.
6. The annual accounts shall be reviewed by the AFC and be approved by the GA within five months after the end of the financial year. The annual accounts shall be accompanied by a report on the budgetary and financial management of the financial year to be included as part of the 'ELI ERIC Annual Activity Report' which shall be submitted to the European Commission.
7. The annual accounts shall include the agreed value of in-kind contributions and other revenue provided in accordance with Article 22.
8. VAT and Excise duty exemptions based on Articles 143(1)(g) and 151(1)(b) of Council Directive 2006/112/EC ², Article 12 of Council Directive 2008/118/EC ³, and in accordance with Articles 50 and 51 of Council Implementing Regulation (EU) No 282/2011 ⁴, shall be applied to purchases of goods and services by ELI ERIC and by an ELI ERIC MEMBER in the meaning of Chapter 3 of the Statutes which are for the official and exclusive use by the ELI ERIC, provided that such purchase is made solely for the non-economic activities of the ELI ERIC in line with its activities. VAT exemptions shall be limited to purchases exceeding the value of EUR 300. Purchases by staff members shall not be covered by the exemptions.
9. ELI ERIC shall open separate accounts to record the costs and revenues of its economic activities. Market prices shall be charged where they can be ascertained, or full costs plus a reasonable margin. Value added tax shall be applied to these activities.
10. The GA shall establish FINANCIAL RULES that define all other IMPLEMENTING RULES relating to ELI ERIC's budget, accounting standards, and finances including rules regarding preparation, filing, auditing, and publication of accounts.
11. The DG shall submit to the GA the budget documents as detailed in the FINANCIAL RULES, after having been reviewed by the AFC.

² Council Directive 2006/112/EC of 28 November 2006 on the common system of value added tax (OJ L 347, 11.12.2006, p. 1).

³ Council Directive 2008/118/EC of 16 December 2008 concerning the general arrangements for excise duty and repealing Directive 92/12/EEC (OJ L 9, 14.1.2009, p. 12).

⁴ Council Implementing Regulation (EU) No 282/2011 of 15 March 2011 laying down implementing measures for Directive 2006/112/EC on the common system of value added tax (OJ L 77, 23.3.2011, p. 1).

12. The audit of the financial situation, the annual accounts, and the verification that the transactions set out in the annual accounts comply with the legal requirements and the Statutes shall be entrusted to one or several auditors, appointed by the GA according to applicable laws and regulations. The auditors shall perform their functions as laid down in the FINANCIAL RULES. The DG shall provide the auditors with information and assistance as they may require.

CHAPTER 7 BASIC PRINCIPLES AND FINAL PROVISIONS

Article 31 WORKING LANGUAGE

The working language of ELI ERIC shall be English.

Article 32 CONSOLIDATED VERSION OF THE STATUTES

These Statutes shall be kept up-to-date and made publicly available on the website of ELI ERIC and at its Statutory Seat.

Any amendment to these Statutes shall be clearly indicated with a note specifying whether the amendment concerns an essential or non-essential element of these Statutes in accordance with Article 11 of Regulation (EC) No 723/2009 and the procedure followed for its adoption.

Article 33 REPORTING TO THE EUROPEAN COMMISSION

1. ELI ERIC shall produce an annual activity report, the 'ELI ERIC Annual Activity Report', containing in particular the scientific, operational and financial aspects of its activities. The report shall be approved by the GA and transmitted to the European Commission and relevant public authorities by June 30th from the end of the corresponding financial year. This report shall be made publicly available.

2. ELI ERIC shall inform the European Commission of any circumstances that threaten to seriously jeopardise the achievement of ELI ERIC's tasks or hinder ELI ERIC from fulfilling requirements laid down in Regulation (EC) No 723/2009.

Article 34 APPLICABLE LAW

The internal functioning of ELI ERIC shall be governed by:

- a) Community law, in particular Regulation (EC) No 723/2009, as amended by Council Regulation (EC) No 1261/2013⁵, and the decisions in accordance with Articles 6 (1)(a) and 11 (1) of this Regulation;
- b) The law of the state where ELI ERIC has its Statutory Seat in the case of matters not, or only partly, regulated by acts referred to in item (a) of this Article;
- c) The law of the state where ELI ERIC operates an ELI FACILITY where not applicable in items (a) and (b) of this Article;
- d) These Statutes, their IMPLEMENTING RULES and the RULES OF PROCEDURE.

⁵ Council Regulation (EU) No 1261/2013 of 2 December 2013 amending Regulation (EC) No 723/2009 concerning the Community legal framework for a European Research Infrastructures Consortium (ERIC) (OJ L 326, 6.12.2013, p. 1).

Article 35 DISPUTES

1. The MEMBERS and the OBSERVERS shall as far as possible try to settle by amicable means any disputes that may arise from the interpretation or application of these Statutes.
2. The Court of Justice of the European Union shall have jurisdiction over litigation among the MEMBERS in relation to ELI ERIC, between MEMBERS and ELI ERIC and over any litigation to which the European Union is a party.
3. European Union legislation on jurisdiction shall apply to disputes between ELI ERIC and third parties. In cases not covered by European Union legislation, the law where ELI ERIC has its Statutory Seat shall determine the competent jurisdiction for the resolution of such disputes.

ANNEX I - TECHNICAL AND SCIENTIFIC DESCRIPTION

1 PURPOSE AND SCOPE OF THIS DOCUMENT

This document describes the scientific purpose and technical systems that the Extreme Light Infrastructure ERIC (ELI ERIC) will provide to researchers. The specific aspects of the facilities the Host Countries will make available for ELI ERIC are described here. This document is foundational for determining the scope and definition of 'Operations' for ELI ERIC.

The document lists the scientific objectives and purpose of ELI ERIC. In some cases where relevant, reference is made to the ELI 'White Book', the primary technical ELI document prior to construction. It is recognized that aspects of the vision for ELI described in that important document remain, but for the purposes of this document and the establishment of ELI ERIC, only the technical facilities offered by the founding ERIC Host Members are described.

The current scientific scope is summarised, as are the technical aspects of the ELI Facilities. The budgetary and schedule elements at the start of Operations are also indicated. This information is a reference for the ELI ERIC Statutes, especially Article 22, Commitments and Resources, and is the

baseline for agreements between ELI ERIC and facility owners (Host Institutions) to make the ELI Facilities available for the user community. As such, this document is an integral part of the ELI ERIC Statutes at the initial formation of ELI ERIC and stands as the baseline reference relative to the scope and mission of the facilities.

2 INTRODUCTION AND BACKGROUND

The Extreme Light Infrastructure ERIC is an international laser facility with the aim to develop new interdisciplinary research opportunities using extreme light from the highest peak power laser sources, currently available, and dedicated to the purpose of research. These lasers and the secondary radiation derived from them will enable unprecedented discoveries across a broad range of scientific disciplines as well as societally relevant applications.

The ELI ERIC, consistent with the Council Regulation (EC) No 723/2009⁶ is a single-sited research infrastructure with multiple places of operations in Member Host states in addition to the place of the seat. The ELI Facilities will be based on two sites, located in the Czech Republic and Hungary. They are being made available to an international scientific user community.

In 2018 the Nobel Prize for Physics was awarded to Gérard Mourou and Donna Strickland for their work on Chirped Pulse Amplification (CPA) laser technology. This Nobel Prize is special in many ways for ELI, since it timely highlights the underpinning technology that makes extreme laser light possible. The ELI facilities will push the CPA technique to allow unprecedented peak power levels to become available (see Fig. 1), opening up a variety of applications for fundamental science as well as for societal benefits.

⁶ Council Regulation (EC) No 723/2009 of 25 June 2009 on the Community legal framework for a European Research Infrastructure Consortium (ERIC) (OJ L 206, 8.8.2009, p. 1).

The specific goal of ELI ERIC is to address two ‘Grand Challenges’, originally stated in the ELI White Book and still relevant, aiming to develop:

- High Energy beam facility and X-rays: ultra-short energetic particles (> 10 GeV) and radiation (up to few MeV) beams produced from compact laser plasma accelerators.
- Attosecond science: snapshot in the attosecond scale of the electron dynamics in atoms, molecules, plasmas and solids.

In particular:

- **The ELI-Beamlines in Dolní Břežany (near Prague), Czech Republic**, will focus on the development of short- pulse secondary sources of radiation and particles, and on their multidisciplinary applications in molecular, biomedical and material sciences, physics of dense plasmas, warm dense matter, laboratory astrophysics. In addition, the facility will utilise its high-power, high-repetition-rate lasers for high-field physics experiments with focused intensities of about 10^{23} W/cm², investigating exotic plasma physics, and non-linear QED effects.
- **The ELI Attosecond Light Pulse Source (ELI-ALPS) in Szeged, Hungary**, is establishing a unique facility, which provides light sources between THz (10^{12} Hz) and X-ray ($10^{18} - 10^{19}$ Hz) frequency range in the form of ultrashort pulses with high repetition rate. ELI-ALPS will be dedicated to extremely fast dynamics by taking snapshots in the attosecond scale (10^{-18} s) of the electron dynamics in atoms, molecules, plasmas and solids. It will also pursue research with ultrahigh intensity lasers.

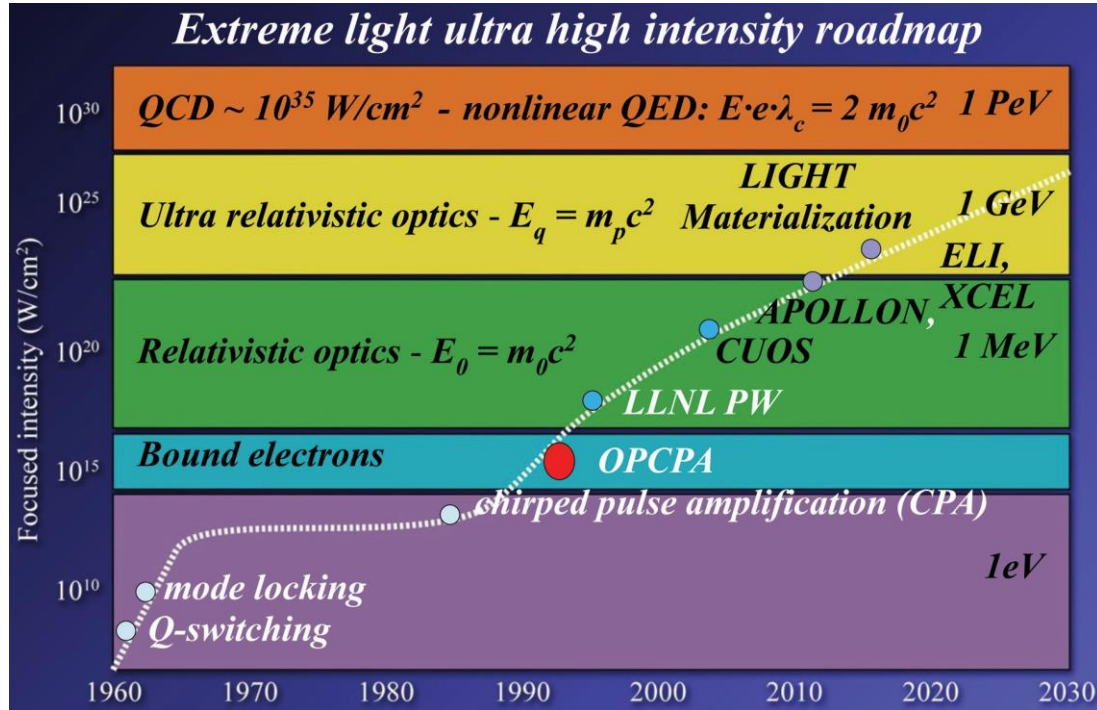
The ELI Facilities will provide a collection of the most powerful and shortest-pulsed systems currently available. More precisely, ELI will be the first infrastructure dedicated to the fundamental study of laser-matter interaction in the ultra- relativistic regime ($I > 10^{24}$ W/cm²). The facilities are already testing a new generation of innovative, very compact beamlines delivering energetic particle and radiation beams of femtosecond (10^{-15} s) to attosecond (10^{-18} s) duration.

With this variety in research activities, the ELI Facilities are expected to deliver significant societal benefits and drive innovation in the medium and long term, including improved oncology treatment (ion radiation beams), medical and biomedical imaging, a new generation of photonics and the development of new methods of nuclear waste processing through transmutation.

Altogether, the ELI Facilities represent nearly 54 000 m² on two sites and are expected to include up to 600 scientists, engineers, technicians and support staff.

Figure 1

The Highest focused intensities over time ⁽⁷⁾



Originally the ELI ‘White Book’, as presented in 2011, laid out a vision for the facility that will push the limits of ‘extreme light’ and laser technology that is as relevant now as ever:

‘Today’s top specifications of high power laser systems are characterized by a peak power between one and two petawatts (PW) at very low (sub Hz) repetition rates, this being unchanged over more than one [now two] decade now. The majority of high power systems, however, still rest at the 100 TW level. ELI and its national predecessor projects like ILE and Vulcan-10PW will boost the peak power of single lasers (modules) into the 10 PW or multi-10 PW regime at much higher repetition rates, constituting an evolution of more than one order of magnitude in both of these parameters.’

This vision opens the way to even more powerful, combined, coherent 100 PW laser systems foreseen to be realized in future ELI facilities, based on technologies being deployed for the first time at ELI Facilities. Such systems open up a new type of interaction, enabling for the first time the possibility to penetrate beyond atomic physics to explore matter strata relevant to nuclear physics, particle high energy physics, astrophysics, fields traditionally studied with high energy particle accelerators. It is expected that ELI may bring a completely new approach to the investigation of fundamental physics. The laser ultra-relativistic intensity is ELI’s essence, leading to the:

⁷ CPA and solid-state laser technology have pushed the present peak intensity beyond the range of 10²² W/cm². ELI ERIC will increase that by more than one order of magnitude. Shown also is the SLAC E144 experiment (blue dot) that achieved high intensity by boosting the laser-matter interaction into a relativistic frame. The horizontal lines indicate the intensity of the ponderomotive (quiver) energy U_p of an electron at 800 nm (Ti:Sapphire) laser equal to one atomic unit; and for U_p to be equal to Electron rest mass; or the ultimate goal of Schwinger intensity $Y=1$ where the vacuum becomes unstable and light is converted to matter. Source: Gérard Mourou, École Polytechnique.

- Highest electromagnetic field,
- Possibility for light to move matter, electrons and ions at relativistic velocity,
- Generation of coherent or incoherent high energy radiation, X or γ ,
- Possibility to produce much shorter pulses than currently possible, eventually even shorter than the attosecond range.

These four unique features alone or combined offer a new set of powerful structural dynamic tools.

3 THE ELI FACILITIES RELATIVE TO THE EXTREME LIGHT INFRASTRUCTURE ERIC

Access the ELI Facilities will be competitive, international, and open to users from within and outside the Members countries, based on ELI ERIC Statutes Article 2(2)a, as well as the ELI ERIC Access Policy for Users, as defined in the ELI ERIC Statutes Article 6, as well as principles established in the European Union Charter for Access to Research Infra- structures⁸. All 'User access' must be subject to peer review. ELI ERIC will ensure a common access point for users responding to a unified call for proposals, including all the available capabilities of the ELI Facilities in an integrated way.

From a scientific perspective, access is 'open', meaning that the ELI Facilities are open to potential researchers from Member countries, and also from non-member countries. Proposals are competitive and being 'open' also means the data and eventual use of the data in publications shall be available and reviewable to anyone.

In addition to 'open' access, there is also 'proprietary' access, which is paid by the user and thus the results in the form of data may be the property of the user and 'closed'.

Finally, there will also be possibilities for access relative to 'mission' based objectives. This may be thematically directed research in specific disciplines and may also include technology development in terms of collaboration on innovations and procurement. Training and education for capacity is a priority for the Members and the European Research Area, but may also extend beyond the Members.

The Host Members commit to make the ELI Facilities available to ELI ERIC as part of their contribution. This no-cost contribution from the Hosts is in the public interest and the costs of the investment for construction are not amortised or factored into the Operations Costs. The concept of *availability* does not require, imply, or exclude a *transfer of ownership* of the facilities, in part or in full. The meaning of *availability* in this specific context is defined and agreed between ELI ERIC and its Host Members as full access to, control of, and responsibility for the respective facilities. It is legally regulated through specific agreements on facility operation between the ELI ERIC, the Host Member, and where applicable, the owners of the ELI Facilities.

Those agreements cover their operation, support and management, and will refer directly to the ELI ERIC Statutes to establish their legal basis. They shall take into account pre-existing commitments, liabilities and obligations, including those defined in the European Structural and Investment Funds (hereinafter referred to as 'ESIF') executive projects. The agreements are further discussed in the ELI ERIC Management Operations Model and cover two types of milestones relative to availability:

⁸ <https://op.europa.eu/s/pcrm>

- Technical milestones – described below, namely specific instrument suites and experimental stations, working and ready for the user, recommended by a review panel including independent experts and approved by ELI ERIC GA.
- Organisational Milestones – Organisational milestones are defined independently for each ELI Facility.

This approach must be consistent with the stated goal of the ELI ERIC Statutes to operate as a single legal entity and evolve in a direction similar to other leading research infrastructures, i.e. toward a single integrated organization and management, as defined in Article 3(1) of the ELI ERIC Statutes.

The following sections provide detailed descriptions of each ELI Facility and define the essential scientific and technical nature of each as well. This forms an important basis for the above-described approach to making ELI Facilities available. The timing of availability for ‘User Access’ for each facility, and its respective estimated costs of future operation for the first three years, up to and including the first two years of ‘Steady-State Operations’ is also described. The sections briefly describe the current legal status of each ELI Facility and how that may affect access in the future relative to ELI ERIC.

4 ELI ATTOWECOND LIGHT PULSE SOURCE (ELI-ALPS)

The ***ELI Attosecond Light Pulse Source (ELI-ALPS)*** Facility, in Szeged (Hungary) will make available to an international community, within ELI ERIC, a wide range of radiation and particle sources, emitting, in a stable-in-specifications and robust-in-operation manner, energetic pulses of ultrashort duration and coherent radiation in the attosecond (10^{-18} s) time range. It is a single-site, greenfield facility occupying more than 24 000 m², and expected to employ approximately 200 staff.

The ELI-ALPS Facility is currently owned and built by ELI-HU Non-Profit Ltd. (ELI-HU), an independent state-owned, non-profit company that is 90 % owned by the Hungarian State, and 10 % owned by local stakeholders. ELI-HU has full autonomy and legal personality in Hungary.

4.1. Technical Structure and Sources

The primary mission of the ELI-ALPS Szeged research facility is to make a wide range of ultrashort light sources accessible to the international scientific community user groups. Laser driven secondary sources emitting coherent extreme-ultra-violet (XUV) and X-ray radiation, that are confined in attosecond pulses is a major research initiative of the infrastructure. A secondary purpose of the facility is to contribute to the necessary scientific and technological developments required for high peak intensity and high average power lasers.

Table 1

ELI-ALPS Foreseen Performance Parameters for Laser Sources @ laser output

PRIMARY LASER SOURCES		Peak power	Average power	Pulse energy	Pulse duration	Repetition rate
ELI-ALPS	HR1	> 0,13 TW > 0,16 TW	100 W 80 W	> 1 mJ > 0,8 mJ	< 2,2 cycles < 1,9 cycles	100 kHz
	HR2	> 1 TW	500 W	> 5 mJ	< 1,8 cycles (< 6 fs)	100 kHz
	MIR	> 3,6 GW	15 W	> 0,15 mJ	< 4 cycles (< 42 fs)	100 kHz
	MIR HE foreseen upgrade	~ 0,5 TW	15 W	~ 15 mJ @ 3 μ m ~ 20 mJ @ 1,5 μ m	~ 3 cycles (30 fs)	1 kHz
	SYLOS2	> 5 TW	35 W	> 35 mJ	< 2,2 cycles (< 7 fs)	1 kHz
	SYLOS3 foreseen upgrade	~ 15 TW	120 W	~ 120 mJ	~ 2,5 cycles (~ 8 fs)	1 kHz
	SYLOS Experiment Alignment	3 TW	0,4 W	> 40 mJ	< 12 fs	10 Hz
	HF PW	> 2 PW	340 W	34 J	17 fs	10 Hz
	THz Pump	> 1 TW	25 W	> 500 mJ	0,5 ps	50 Hz

The ELI-ALPS infrastructure provides the users, in the fields of scientific research and industrial applications, primary laser pulses in conjunction with an impressive array of synchronized secondary light and particle pulses. The outstanding characteristics of the source parameters include:

- Few-cycle pulses, from the terahertz/infrared up to the petahertz/ultraviolet, with an impressive 10 Hz to 100 kHz repetition rate
- attosecond, extreme-ultraviolet, soft and hard x-ray pulses with a 10 Hz – 100 kHz repetition rate and pulse energies ranging from few μ J to mJ
- Relativistic and ultra-relativistic particle and spatially coherent X-ray sources with femtosecond duration.
- Controlled ultra-relativistic pulse shapes with ultra-high contrast at a few Hz and kHz repetition rate.

A parallel mission of ELI-ALPS is to contribute, with the other ELI Facility, to the technological developments towards high peak power and high average power lasers especially for attoscience and relevant applications. The parallel existence of attosecond pulses and state of the art lasers including PW-class lasers within the same facility, offers unique time- resolved investigation possibilities for both non-relativistic and relativistic interaction of light with all the four phases of matter.

The ELI-ALPS facility has a specific focus towards the stimulation, through spill over effects, of industrial applications, taking into account also the possible strong impact on its surrounding territory, which will host a large Science Park.

Table 2

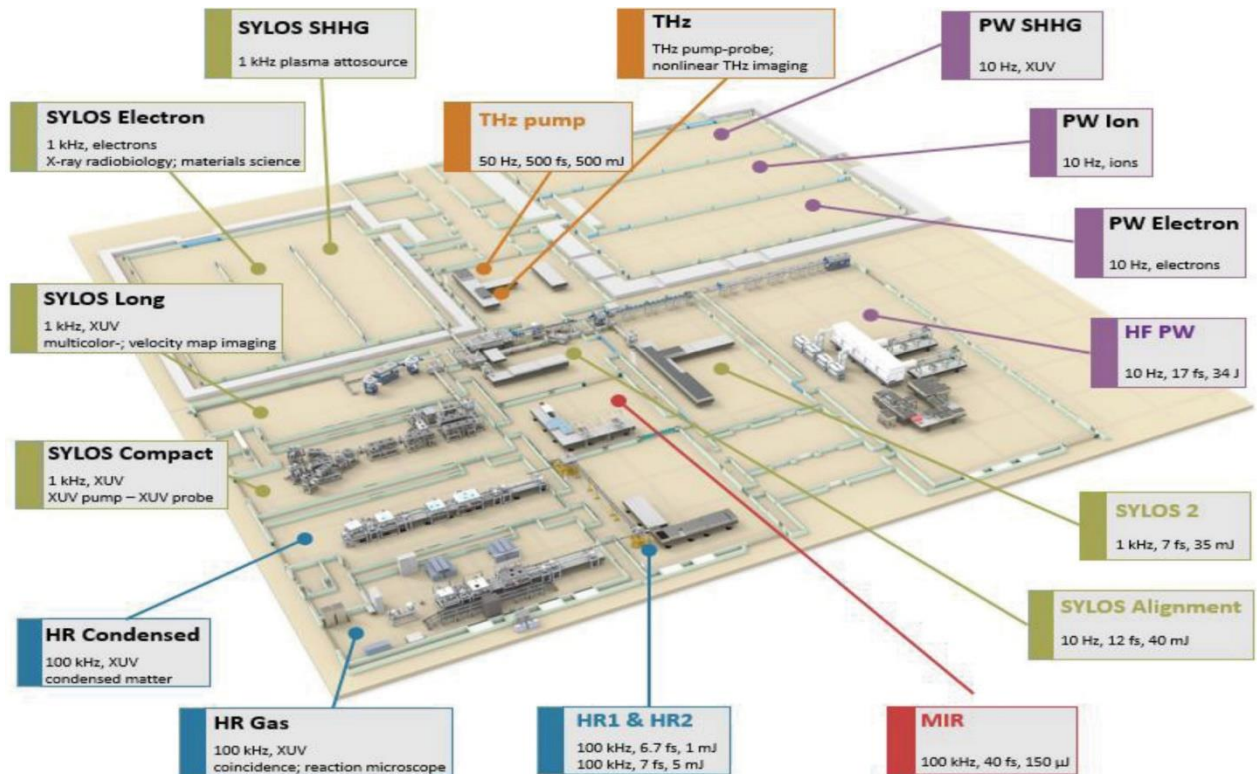
ELI-ALPS Milestones for Laser Sources

AVAILABILITY OF LASER SOURCES ELI-ALPS	COMMISSIONING STARTS	ACCESS FOR USERS
HR1	10.2017	Available (0,8 mJ, < 1,9 cycles) 11.2021 (full specs)
HR2	3.2021	5.2021
MIR	10.2017	Available
MIR HE – FORESEEN UPGRADE	10.2022	1.2023
SYLOS2	3.2019	Available
SYLOS3 – FORESEEN UPGRADE	10.2022	1.2023
SYLOS EXP ALIGNMENT	12.2018	Available
HF PW	5.2018	10.2021
THZ PUMP	1.2021	3.2021

4.2. Experimental Stations

Figure 2

Layout of ELI-ALPS Experimental Stations



ELI-ALPS offers numerous state of the art ultrashort high intensity laser pulses in combination with cutting-edge secondary sources and advanced user end-stations that will create an outstanding environment for fundamental and applied scientific research. There are a few areas where ELI-ALPS will be world leading from the very beginning:

- Valence and Core Electron Science – Dynamics of valence and core electrons in small systems can be individually monitored and controlled with attosecond pulse interactions.
- Visualization of ultrafast structural dynamics and correlation effects – Combinations of sources with ultrashort pulses and short wavelengths, allow the visualization of charge dynamics in complex and (strongly) correlated systems.
- Ultrafast surface and condensed matter dynamics – Beyond state of the art high repetition rate attosecond sources in conjunction with a sophisticated NanoEsca users' end-station open up unique opportunities in surface and condensed matter science.
- Plasma attoscience – Relativistic few cycle pulses or PW pulses with superior spatial and temporal contrast would be utilized to study, optimize and apply sub-cycle emission processes to investigate relativistic surface dynamics, relativistic pulse shaping, radiobiology etc.

- THz Radiation research – High-intensity, ultrashort THz sources with unprecedented peak electric field strength (up to 5 MV/cm) and 1 mJ pulse energy will be available in the 0,1–2 THz frequency range.

The unique combination of the high repetition rate radiation sources at ELI covering the electromagnetic spectrum from the X-ray to the far infrared and THz make this facility very attractive for research on complex, applied systems. Applied research areas include novel attosecond sources, new particle sources, nanotechnology, cultural heritage, biological imaging, and biomedical applications such as advanced phase-contrast tomography and multidimensional spectroscopy.

Table 3

ELI-ALPS Secondary Sources Milestones

SECONDARY SOURCES ELI-ALPS	COMMISSIONING STARTS	ACCESS FOR USERS
GHHG HR1 & 2 GAS (LTA4)	8.2018	12.2021 (HR1) 7.2021 (HR2)
GHHG HR1 & 2 CONDENSED (LTA3)	10.2020	12.2021 (HR1) 7.2021 (HR2)
GHHG SYLOS COMPACT (LTA2)	3.2020	7.2021
GHHG SYLOS LONG (LTA1)	1.2021	2.2022
SHHG SYLOS (MTA)	11.2021	1.2023
SHHG HF (HTA)	6.2022	1.2023
MIR HE GENERATED ATTO – FORESEEN UPGRADE	1.2023	4.2023
THZ SPECTROSCOPY (THZ)	10.2019	2.2020
THZ HIGH ENERGY (THZ)	7.2021	12.2021
ELECTRON- SYLOS (MTA)	12.2021	4.2022
ELECTRON PW – FORESEEN UPGRADE (HTA)	1.2023	4.2023
ION BEAMLINE – POTENTIAL UPGRADE	9.2023	12.2024

Table 4

ELI-ALPS Experimental Stations Milestones

EXPERIMENTAL STATIONS ELI-ALPS	COMMISSIONING STARTS	ACCESS FOR USERS
REACTION MICROSCOPE	6.2021	9.2021
VMI SPECTROMETER ENDSTATION	8.2020	10.2020
CONDENSED MATTER STATION (NANOESCA)	12.2019.	6.2020 (standalone) 7.2021 (with attosecond)
MAGNETIC BOTTLE E SPECTROMETER	4.2021	12.2021
NANOSCIENCE & NANOFABRICATION	6.2018	12.2019
BETATRON IMAGING – FORESEEN UPGRADE	4.2023	12.2023
CHEMICAL REACTION CONTROL STATION	6.2020	8.2020
LIQUID JET ENDSTATION	4.2022	8.2022
MULTIDIMENSIONAL SPECTROSCOPY (FEM- TOBIOLOGY) – FORESEEN UPGRADE	8.2021	12.2021
HIGH FIELD PHYSIC STATION (PW TARGET AREA)	12.2022	2.2023
RADIOBIOLOGY / BIOMEDICAL	8.2018	2.2020

The table above lists the stations expected to come available to ELI ERIC as a part of ‘User Access’ in the coming years. They are the critical technical milestones for ELI-ALPS and Hungary as a host in relation to ELI ERIC. Stations are expected to be available at different times. Once the final experimental station has been opened for User Access, the facility will be considered to have entered ‘Steady State Operation’ mode. In addition, the table above presents foreseen upgrades of the facility that shall be the subject of future review and considerations of ELI ERIC.

As primary laser and accelerator sources begin commissioning, early user groups will assist in helping to characterise the sources and finalize construction of the experimental stations. These activities are managed and initiated directly through ELI-ALPS. As the first lasers (MIR, HR1) became operational at the end of 2017, access for assistance in commissioning has already been provided for the first international commissioning user groups (FORTH Greece, ETH Zurich, CEA France, Hebrew University, Freiburg University, AARHUS University, Universite de Limoges, MPQ Garching, Friedrich Schiller University Jena, Gwangju Institute of Science & Technology, South Korea, Wigner Research Institute, Hungary,) since then.

As each experimental station passes commissioning and comes online, supported by a functioning primary source and/or secondary source, the User Access program can begin, and ELI ERIC can begin to accept proposals for those stations.

The confirmation and acceptance of each experimental station will be monitored and a formal ‘Operational Acceptance Review’, consisting of independent experts, experts from ELI-ALPS, and experts from the other ELI Facility will confirm readiness for Users and make a formal recommendation to the ISTAC and the ELI ERIC General Assembly.

4.3. User Access and Operational Modes

The access mode will be familiar to users of other leading laser and research facilities. Experiments are expected to be conducted in terms of days and in some cases weeks. Overall, the facility goal is to be available [220 days/yr × 8 hrs/day] for a total of 1 760 hrs/Yr.

4.4. Aspects relative to Operations and the Relationship between ELI ERIC and ELI-ALPS

While ELI ERIC is mandated to manage access to the ELI-ALPS facility as it is made available, the physical plant of the facility is owned and will be managed directly at the beginning by ELI-HU Non-Profit Ltd. (ELI-HU). It is a ‘research organisation’ for the purposes of State aid rules for research and development.

In addition to the important technical and scientific milestones listed above, there are also organisational milestones linked to the overall integration of ELI-ALPS into ELI ERIC. Those organisational milestones are listed in the table below.

Table 5

ELI-ALPS Estimated Organisational Transition Milestones

INTEGRATED ORGANISATION MODEL ELI-ALPS	2020	2021	2022
GOVERNANCE	X	X	X
SCIENCE POLICY	X	X	X
USER ACCESS	—	X	X
BUDGET	—	X	X
EMPLOYMENT POLICY	—	—	X
TECHNOLOGY MANAGEMENT	—	—	X
FACILITIES MANAGEMENT	—	—	X
LEGAL & LIABILITY	—	X	X
ADMINISTRATIVE	—	X	X

In the case of ELI-ALPS, activities will transition to ELI ERIC over at least a two year period with some activities transitioning at the end of the period. Taken together with the technical milestones listed for the Experimental Stations, the overall transition plan can be determined.

The table below lists the estimated costs, related to User Access, at ELI-ALPS to operate the facility for ELI ERIC from the period 2020-2021, the Transition Period. This is the period of time when it is assumed responsibilities, resources, and assets will undergo a change in management responsibility from ELI-HU to ELI ERIC.

Table 6

ELI-ALPS Estimated Access Costs

					EUR
ELI-ALPS	2020	2021	2022	2023	2024
Personnel direct costs		1 729 009	2 950 040	3 590 338	3 782 380
Hardware direct costs		2 425 972	3 766 587	5 098 323	5 371 024
<i>Personnel + HW costs</i>		<i>4 154 981</i>	<i>6 716 627</i>	<i>8 688 661</i>	<i>9 153 404</i>
<i>Person + HW %/Total</i>		<i>27 %</i>	<i>37 %</i>	<i>42 %</i>	<i>42 %</i>
Indirect costs		11 249 019	11 281 373	12 194 339	12 846 596
Total costs ELI-ALPS		15 404 000	17 998 000	20 883 000	22 000 000

5 ELI BEAMLINES (ELI-BL)

The **ELI-Beamlines (ELI-BL)** Facility in Dolní Břežany, near Prague (Czech Republic), even in its name, underlines its capability to support multiple, different experiments for a range of Users, offering the availability of various laser lines. It is designed to offer a high-energy and high repetition-rate capabilities. It is a single-site, greenfield facility occupying more than 30 000 m², and expected to employ approximately 200-300 user support staff.

The facility is owned and managed by the Institute of Physics of the Czech Academy of Sciences, which has full autonomy and legal personality in the Czech Republic as a public research institution.

5.1. Technical Structure and Sources

Table 7

ELI-BL Foreseen Performance Parameters for Laser Sources

PRIMARY LASER SOURCES		Peak power	Energy in pulse	Pulse duration	Repetition rate
ELI-BL	L1	> 5 TW	100 mJ	< 20 fs	1 kHz
	L2 OPCPA, Dual color	100 TW	≥3 J OPCPA/ 1 mJ MIR	≤ 20 fs	20 Hz
	L3	≥ PW	≥ 30 J	≤ 30 fs	10 Hz
	L4f	10 PW	≥ 1,5 kJ	≤ 150 fs	1 shot per min
	L4n		≥ 1,5 kJ	ns	1 shot per min
	L4p	≤ 1 PW	150 J	150 fs-150 ps	1 shot per min
	Astrella		6 & 10 mJ	20 fs	1 kHz
	Bio-laser		6 mJ CEP stabilization	20 fs	1 kHz

Table 8

ELI-BL Beamlines Milestone Dates for Access

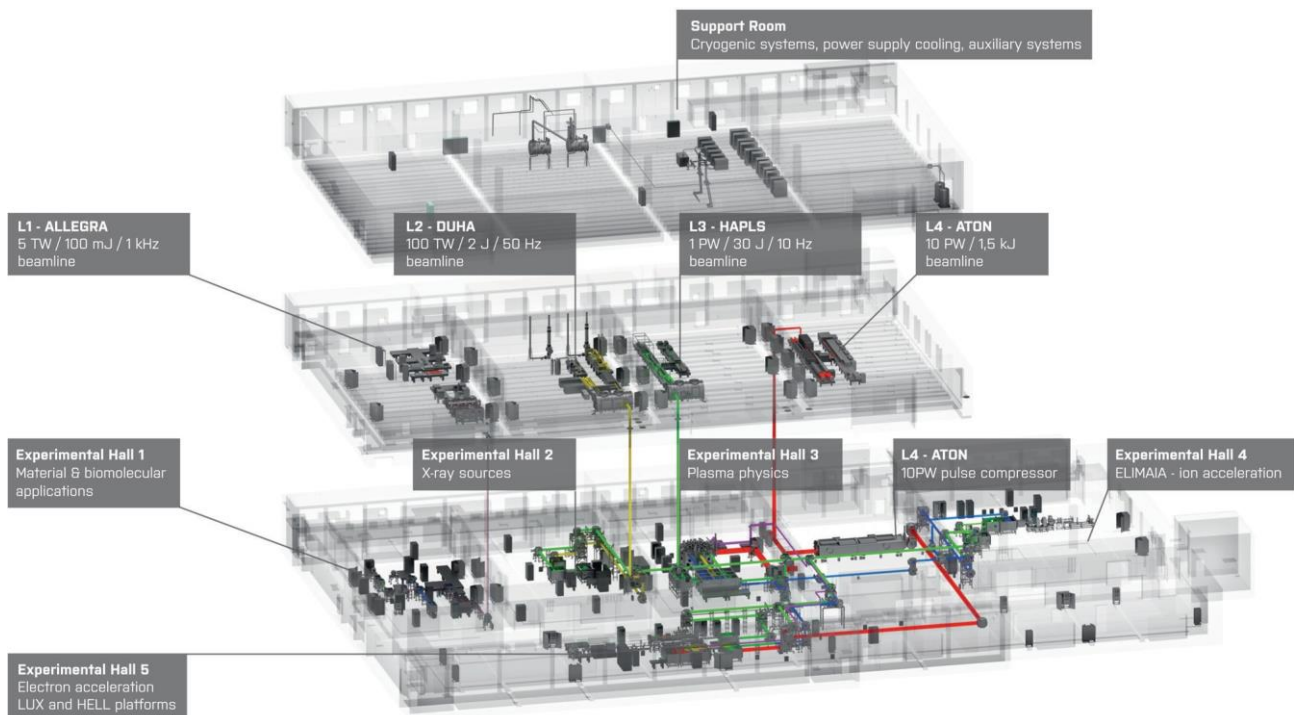
LASER SOURCES ELI-BL	COMMISSIONING STARTED	ACCESS FOR USERS
L1	1.2018	12.2019 (30 mJ) 12.2020 (50 mJ) 12.2021 (100 mJ)
L2	1.2022	6.2022
L3	11.2017	7.2018 (0,4 PW) 12.2019 (1 PW)
L4F	9.2018	6.2020
L4N	9.2018	1.2021
L4P	6.2022	12.2022
ASTRELLA	2.2018	4.2018
BIO-LASER	4.2018	6.2018

There is a strong emphasis on possible applications in different fields of societal relevance like for instance medicine or biology. ELI-BL, together with the connected HiLaSE Centre (also owned and managed by the Institute of Physics of the Czech Academy of Sciences) dedicated to the laser technology development and transfer, which already serves as an attractor for companies and spin-offs in different fields installed in the so-called STAR region (Science and Technology advanced Region) which is surrounding the ELI-BL facility, creates the favourable environment for intensive cooperation between research and industry.

5.2. Experimental Stations

Figure 3

Layout of ELI-BL Experimental Stations



The ultrashort and ultra-intense pulses of light and the particles generated from interaction with solid state and gas target materials will allow a broad spectrum of projects in fundamental and applied research in chemistry, biology, medical technologies, development of new materials, and other areas. The research activities within the ELI-BL Facility are structured into six experimental halls.

Table 9

ELI-BL Secondary Sources/Beamlines and Milestones

SECONDARY SOURCES ELI-BL	SOURCE	COMMISSIONING STARTED	ACCESS FOR USERS
E1: X-RAY SOURCES	HHG	2.2018	1.2019
E1: X-RAY SOURCES	PXS	3.2018	4.2019
<i>E2: X-RAY SOURCES</i>	<i>Betatron</i>	<i>6.2019</i>	<i>11.2019</i>
<i>E2: X-RAY SOURCES – FUNDED UPGRADE</i>	<i>Compton</i>	<i>1.2020</i>	<i>12.2020</i>
E5: LASER UNDULATOR X-RAY SOURCES	LUIS	3.2019	6.2020
E4: ION ACCELERATION	ELIMAIA	11.2018	10.2019
E5: ELECTRON ACCELERATION	HELL	1.2019	3.2020

Table 10

ELI-BL Experimental Stations and Milestones

EXPERIMENTAL STATIONS ELI-BL	STATION	COMMISSIONING STARTED	ACCESS FOR USERS
E1: MATERIAL AND BIOMOLECULAR APPLICATIONS	MAC	4.2018	1.2019
E1: MATERIAL AND BIOMOLECULAR APPLICATIONS	Trex	6.2018	5.2019
E1: MATERIAL AND BIOMOLECULAR APPLICATIONS	SRS	6.2018	3.2019
E1: MATERIAL AND BIOMOLECULAR APPLICATIONS	ELIps	9.2018	3.2019
<i>E2: X-RAY SOURCES – FUNDED UPGRADE</i>	<i>Compton Station</i>	<i>7.2021</i>	<i>7.2022</i>
E5: LASER UNDULATOR X-RAY SOURCES	LUIS Station	3.2019	6.2021
E3: PLASMA PHYSICS PLATFORM	P3	9.2018	10.2020
E4: ION ACCELERATION	ELIMED	11.2018	1.2021
E5: ELECTRON ACCELERATION	ELBA Station	1.2019	7.2021

Experimental hall **E1** hosts laser-driven secondary sources and experimental end-stations for applications in molecular, bio-medical, and materials sciences. Experiments will exploit synchronized laser photon beams in the VUV and hard X-ray range (High Harmonics Source – A kHz source of ultra-short EUV pulses emitted in a coherent beam with low-divergence and Plasma X-ray Source – femtosecond pulses of X-ray radiation in the spectral range of 4–30 keV).

Instruments include:

- MAC: a Multi-purpose chamber for atomic, molecular, and optical sciences and Coherent Diffractive Imaging.
- ELIps: VUV ellipsometer for sub-ps experiments; an end-station for VUV and soft X-ray materials.
- Hard X-ray end-station: a modular station for Time Resolved Experiments such as scattering, diffraction, spectroscopy and imaging with X-rays.
- Optical probes and pump beams: an advanced station for optical spectroscopy, including stimulated Raman scattering; the source for a wide array of synchronized pump beams from UV to IR and THz.

The experimental hall **E2** is dedicated to ultrafast and bright, hard X-ray beams. A PW-class laser will be available at a 10 Hz repetition rate. A range of parameters may be adjusted including laser intensity, laser spot size and duration, and electron density in the gas. Electrons are accelerated to relativistic energies and wiggled by the plasma itself (Betatron source) or by a second laser pulse (Compton source). Intense femtosecond X-ray or gamma-ray beams are emitted by a micron-size source. Users may request narrow spectrum (10 % energy spread) or broadband radiation in a spectral range from keV to a few MeVs.

The plasma physics platform located in the experimental hall **E3** is a multi-functional experimental infrastructure designed to perform laser-plasma and laser-matter interaction research predominantly on the following topics:

- High energy density physics (HEDP)
- Warm dense matter (WDM)
- Plasma optics (PO)
- Laboratory astrophysics (La)
- Ultra-high intensity interaction (UHI).

The **E4** experimental area allows users to test various samples with laser accelerated ion sources because of its ion beam transport and dosimetry section, as well as to investigate innovative schemes for laser-driven ion acceleration that can be accommodated in the flexible interaction chamber. The ELIMAIA beamline will allow user to investigate multidisciplinary applications using laser driven ion beams, such as in-vitro radiation biology and pre-clinical studies within the ELIMED international cooperation.

The **E5** experimental hall contains the LUIS beamline and is dedicated to users interested in the irradiation of various samples through the most advanced techniques. It also houses the ELBA platform, a flexible experimental area dedicated to users who want to test innovative concepts and use the most advanced technologies for accelerating electrons with lasers at multi-GeV levels.

Apart from the original scope for the ELI-BL Facility, the table above presents in addition already funded capacity enhancements and upgrades of the facility through dedicated projects ADONIS, HIFI and ELIBIO that shall be subject of future review and considerations of ELI ERIC.

The confirmation and acceptance of each experimental station will be monitored and a formal 'Operational Acceptance Review', consisting of independent experts, experts from ELI-BL, and experts from the other ELI Facility will confirm readiness for users and make a formal recommendation to the ISTAC and to the ELI ERIC GA.

5.3. User Access and Operational Modes

The access mode will be familiar to users of other leading laser and research facilities. Experiments are expected to be conducted in terms of days, and in some cases weeks. Overall, the facility has a goal to be **available [220 days/yr × 8 hrs/day] for a total of 1 760 hrs/Year**.

5.4. Aspects Relative to Operations and the Relationship between ELI ERIC and ELI-BL

While ELI ERIC is mandated to manage access to the ELI-BL facility as it is made available, the physical plant of the facility is owned and will be managed directly at the beginning by the Institute of Physics of the Czech Academy of Sciences, which has full autonomy and legal personality in the Czech Republic. It is a 'research organisation' for the purposes of state-aid for research and development.

In addition to the important technical and scientific milestones listed above, there are also organisational milestones linked to the overall integration of ELI-BL into ELI ERIC. Those organisational milestones are listed in the table below and detailed in the Appendix, 'The Management Operations Model'.

Table 11

ELI-BL Estimated Organisational Transition Milestones

INTEGRATED MODEL ELI-BL	2020	2021	2022
GOVERNANCE	X	X	X
SCIENCE POLICY	X	X	X
USER ACCESS	—	X	X
BUDGET	—	X	X
EMPLOYMENT POLICY	—	—	X
TECHNOLOGY MANAGEMENT	—	—	X
SITE MANAGEMENT	—	—	X
LEGAL & LIABILITY	—	X	X
ADMINISTRATIVE	—	X	X

The Czech Republic commits to make available full capacity of the ELI-BL facilities to ELI ERIC.

The table below lists the estimated costs at ELI-BL to operate the facility relative to User Access for ELI ERIC from the period 2020-2021, or the 'Transition Period'. This is the period of time when it is

assumed responsibilities, resources, and assets will undergo a change in management responsibility from the Institute of Physics of the Czech Academy of Sciences to ELI ERIC.

Table 12

ELI-Beamlines Estimated Access Costs

					EUR
ELI-BL	2020	2021	2022	2023	2024
Personnel direct costs		4 892 490	5 577 230	5 928 203	5 936 667
Hardware direct costs		7 831 675	7 565 111	7 428 934	7 439 541
<i>Personnel + HW costs</i>		<i>12 724 165</i>	<i>13 142 341</i>	<i>13 357 138</i>	<i>13 376 209</i>
<i>Person + HW %/Total</i>		<i>51 %</i>	<i>52 %</i>	<i>53 %</i>	<i>53 %</i>
Indirect costs		12 342 835	11 999 659	11 856 862	11 873 791
Total costs ELI-BL		25 067 000	25 142 000	25 214 000	25 250 000

6 ESTIMATED COSTS

To define the conditions needed to reach long-term sustainability, the costs and the possible financial sources need to be detailed. As provided for in the ELI ERIC Statutes, the general principles for the use of the ELI Facilities shall be documented in a stand-alone policy agreed by the GA, and the apportionment of Members' contributions to the operating costs is laid down in Annex II, creating also the prerequisites to avoid a significant and lasting imbalance between the use and the cash/in-kind contributions by each Member.

In what follows, the basic elements to define costs are presented and can be grouped into the following categories:

- 1) Construction – Capital investment expenditures (CAPEX) before operations;
- 2) Operations – Operational expenditures (OPEX) of peer reviewed access;
- 3) Future upgrades – New investments (CAPEX) needed to improve specifications and available instruments in response to competition and users' requirements.

The following text focuses on aspects of points 1 (Construction) and 2 (Operations).

6.1. Construction

The total investment (construction costs) of the ELI Facilities will be of around EUR 556 million over the construction period as detailed in Table 13.

Table 13

Construction Costs of the ELI Facilities

EUR thousand

ITEM	ELI BL	ELI ALPS	ELI
BUILDING + LAND	94 643	88 705	183 348
TECHNOLOGY	181 876	105 435	287 311
SERVICES	7 601	9 788	17 389
PERSONNEL	41 206	27 484	68 690
TOTAL	325 326	231 412	556 738

These costs are completely covered by the Host Countries, through ESIF and national funding, based on the projects, which were approved and monitored by the national Managing Authorities. The investments have been of about 25 % in buildings, 65 % in technology and 10 % in personnel and services. These costs are, from the position of ELI ERIC, non- recoverable and will not be factored into the operating costs of ELI ERIC. No initial investment or construction costs will be paid for by contributions, which are reserved for Initial Operations, Steady State Operations and Upgrades only.

6.2. Operations

The commitment of the Host Members enables other non-Host Members to define a gradual approach to their future commitments and reach longer-term sustainability of the ELI ERIC based on Members' contributions:

Table 14

Estimated ELI ERIC Operation Costs for the ELI Facilities

EUR

ELI ERIC Operations Costs	2020	2021	2022	2023	2024
Direct personnel costs		6 621 499	8 527 271	9 518 542	9 719 048
Direct hardware costs		10 257 647	11 331 697	12 527 257	12 810 565
Indirect costs		23 591 854	23 281 032	24 051 201	24 720 387
Total ELI Facilities		40 471 000	43 140 000	46 097 000	47 250 000

ELI ERIC seat	500 000	2 551 000	2 564 000	2 600 000	2 600 000
Total ELI ERIC	500 000	43 022 000	45 704 000	48 697 000	49 850 000

The entry of non-Host Members during the Initial Operations Period allows for a gradual ramp-up of contributions after the establishment of ELI ERIC, and for a decision on the final level and commitments for their contribution soon after establishment. The early entry allows prospective Members to be involved in setting up the basic rules for the operation of the ELI Facilities, while ramping-up financial commitments at the beginning.

Above are the projected ELI ERIC Operating costs, adjusted for current milestones. They probably represent an upper estimate relative to User Access costs during the Initial Operations Period depending on whether or not milestones are achieved. Estimates must be established and monitored on a yearly basis for the duration of the Initial Operations Period.

6.3. Future Upgrades

The ELI ERIC Operating costs do not take into account future upgrades of the laser systems and facilities. They cover the running costs, including spares and maintenance.

Advanced laser systems are developing quickly and it is generally recognised that ongoing development will be necessary to maintain competitiveness. To that end specific upgrades projects will be proposed by ELI ERIC management and a 5-year and 10-year analysis will be conducted to understand the potential developments and their costs. Specific upgrade campaigns will be organised to address the capital investment requirements and sources.

7 DEVELOPMENT AND OBJECTIVES

The Extreme Light Infrastructure ERIC is an important development, not only for the laser community in Europe, but also for the broader European Research Area. Laser technology is both established and at the same time a fast developing field. As it develops, the field is becoming more relevant for scientific applications, and is already extremely important in terms of European competitiveness.

The Extreme Light Infrastructure ERIC will have broad benefits for society in areas such as improved clinical cancer therapy, biomedical imaging, and nuclear materials and waste processing. Furthermore, ELI ERIC will aid the European photonics industry and will provide educational and training opportunities for new scientists and engineers in photonics and laser-enabled areas of research.

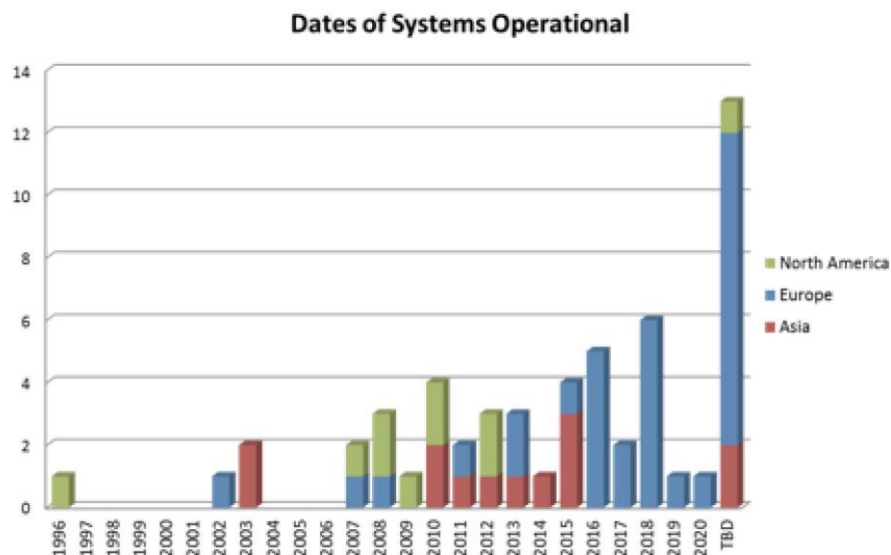
The Extreme Light Infrastructure ERIC is essential for Europe-wide initiatives to maintain competitiveness in the very strategic field of high-power, short-pulse laser systems and the constituent scientific and innovation fields. The steep development curve of laser technologies indicates the field is well positioned to dramatically disrupt existing large-scale scientific and industrial platforms in the mid and long-term future. Before that can happen however, ELI ERIC must demonstrate the capability to operate sustainably.

magnitude above the level where the electron quiver energy equals the rest mass energy (or 1 018 W/cm² of the electron). This heralds the relativistic laser plasma interaction and the subatomic regime, including nuclear and particle physics. Future developments at ELI ERIC may realistically compete with the world's most powerful accelerators at a fraction of the cost and with more traditional techniques, where high acceleration gradients are needed in targeted applications as for example the radiation therapy of tumours into a hospital environment, where space and costs become crucial.

In terms of technology development, ELI ERIC will focus heavily on critical areas of collaboration identified by ELI and leading partners in LaserLab. Key bottlenecks to the reliable and cost-efficient operation of PW-class systems and facilities will be addressed with industry to overcome those bottlenecks. This will not only positively affect European industry in the field, the European Research Area, and the network of partners in LaserLab today, it will directly lead to the sustainable operations of the ELI facilities, ensuring world-class reliability.

Figure 5

Number of petawatt-class laser systems coming online each year, sorted by the continent in which those systems are based (*)



(*) This chart includes operational and under construction facilities. *Source:* J. Collier, Rutherford Central Laser Facility.

The physics is clear, and the challenge is to develop the technology. A number of enabling technologies will be developed by ELI, in collaboration with industry and other leading research centers, especially next-generation optical components.

7.2. ELI ERIC Organisational Objectives

7.2.1. Establish Operation

The combined resources and attention on ELI ERIC will have a profound and long-term impact on science in the field as well technological advancement. But the first objective is pragmatic and localised: to simultaneously stand up and merge the management of two facilities and to efficiently integrate resources.

The ELI ERIC, consistent with Regulation (EC) No 723/2009, is a single-sited research infrastructure with multiple places of operations in Member Host states in addition to the place of the seat. While there are other multi-site scientific organisations, there are very few greenfield European projects built in different countries using structural funds for the purpose of coming together as one research infrastructure. Also, there are no large laser-based user facilities. ELI ERIC will need transition those facilities first into operations before addressing broader interests. This is a technical as well as managerial challenge.

7.2.2. Establish Collaboration

The second objective is to identify opportunities for technical synergies across of Europe's leading high-power, short- pulse laser centres. Historically high-powered, PW-class lasers have been challenging to operate in a user environment, with issues related to reliability and expensive component replacement. Combined, the ELI facilities alone will have more than 30 PW of power.

With partners at national facilities in France, Germany, Spain, the UK, and Italy (all Laserlab Europe Members) ELI ERIC will bring together the largest concentration of the most advanced high-power, short-pulse laser facilities in history. There is no real comparison as the ambition is to create an unprecedented collaboration to identify components and processes inhibiting the operation of PW-class lasers, and identify solutions and standard approaches to operations.

It is anticipated that by working together, and together with industry, facilities can lower operations cost by up to 30 % in some cases, and increase availability for users up to 90 % of beam time. This offers the opportunity to realise unique economies of scale and scope, enabling significant technological advances in a short time period. Such advances will resonate globally throughout the laser industry.

7.2.3. Establish Reputation

The third ambition is to scientifically demonstrate the performance and potential of the ELI ERIC systems early in the operations phase of the scientific program. The ELI Facilities, assisted by the experience of other partner facilities will attempt to have 80 % of its estimated facility user hours available by 2021, with 90 % of its primary laser systems in operations, most of which are high to medium repetition rate.

By comparison, the state of the art today for PW-class lasers is several shots an hour and ELI ERIC and some partner facilities will aim to operating at Hz and multi-Hz rates. This is all the more remarkable considering that ELI ERIC is operating in some cases world-leading lasers in terms of performance. Early calls will enable experiments at these enhanced repetition rates with joint developments and production of targets for users.

These experiments will not only lead to breakthrough discoveries, but will also enable world record performance for secondary sources, such as GeV wake field acceleration. Such ground-breaking, controlled experiments, early in the life of the facilities, combined with extensive outreach and dissemination activities, will generate intense interest in ELI ERIC and in laser science in general. This will impact the whole of laser science in Europe and the world, leading to many practical applications such as advanced cancer therapies and transformation of dangerous nuclear waste. The ambition is to demonstrate this potential and create a growing, sustainable basis for support for ELI ERIC and all laser science in Europe.

7.2.4. Establish Innovation

The impact of ELI ERIC on the innovation and technology of the laser industry won't stop at the end of the construction stage. The present challenge for the operational stage is a sustainable technological development. ELI will build long-term relations with industrial partners to address

problems of procurements of key components and of continuous technological development with a focus on the sustainability of the operations.

In term of relations with the industry, one of the challenges will be to open dialogue with the suppliers to identify the constraints of product improvements or risk mitigation processes (large availability of spare parts, multiples suppliers ...), especially in the perspective of a sustainable operation of the ELI Facilities on the long term.

The technological development driven by the ELI ERIC's requirements will continue during the operational stage. A few examples are:

- **Key optical components for the high power/high repetition rate lasers.** The transport and focusing optics, as well as the diffraction gratings and the active materials need to be developed further to withstand for a long period of time high energy and high peak power pulses, and over large beam diameters, and this must be done for a high number of shots.
- **Short pulses, large beams metrology.** Disruptive solutions to measure the performances of the systems on short pulses and large beams are necessary, to support the understanding of the unique scientific results that will be achievable with the ELI facilities.
- **Complete control for complex systems.** The experimental systems must guarantee the performances and the smooth operation. Intelligent and completely interfaced control systems are needed.

The ELI Facilities will focus the collaborations with industrial partners able to disrupt the present technology with innovative solutions. The innovation content won't focus only on the short term technical aspect but will also address the issues of the sustainability of the solution on the long term, to guarantee to ELI ERIC the best performances, the longest uptime and the most efficient control of the maintenance costs. The unique scientific results of ELI ERIC will be based, in the long term, on the most sustainable technological solutions of the high peak power lasers.

7.2.5. Impact in the Host Countries

A key reason for investing in and siting ELI ERIC in central European countries is to impact the regions with a high-value research and technology center. There are multiple studies of other RIs indicating that significant portions of the investment and innovation impact take place within 100 km of the facility, showing that proximity matters. Some expected impacts include:

- **Direct impact from investment** – The hosts are expected to receive 50-80 % of the operating costs from other members, meaning that investment should have a direct impact on the local economy. ELI will track and report on those impacts. It is expected that anywhere from > 50 % of that will be spent within the local region, affecting two different central European areas
- **Increased opportunities for national/local researchers** – The ELI Facilities are all located in cities (Prague, Szeged) with universities. Each university, aware of the upcoming developments at ELI ERIC has positioned students and academics with programs to take advantage of the proximity. In this context of this project there are specific activities aimed at reaching local researchers so that it is expected that within 10 years of establishing ELI ERIC, each country will have leading researchers in the field.
- **Increased innovation opportunities for local industry** – Beyond the direct investment impacts described above, the proximity to the facilities will drive innovation in at least two measurable ways. First, capable industry will see an opportunity and approach the facility proactively either to sell products or try to understand how to adapt their offer to the facility. Through 'Outreach to Industry' events, both the procurement teams and the Industrial Liaison Officers will help facilitate information sharing about the facilities. In addition, there are some areas where having a local supplier may be advantageous to the facilities for strategic reasons. This

may be driven by the low cost of the area, but more likely by the proximity and convenient access to suppliers to adapt technical solutions.

8 KEY RISKS

8.2. Risk Analysis

Table 15

High-level Risk Assessment to implementation of the ELI ERIC Facilities

Potential Risk	Probability <i>Low 1–5 High</i>	Impact <i>Low 1–5 High</i>	Prevention / Mitigation
Attracting Staff and Competitive Remuneration – There is a risk ELI ERIC will find it difficult to attract ‘world leading’ experts to join the staff.	4	5	Active recruitment, term contracts, research opportunities, ‘quality of life’ initiatives
Technical risk of not meeting key parameters – Risk that ELI will not achieve some key performance parameters which may prevent some experimental possibilities.	3	3	Planning and dialogue with User Community and ISTAC to manage expectations and determine alternative experimental priorities.
Escalation of Salaries over first 5 years – salaries at ELI ERIC will increase significantly, anywhere from 5-10 % annually due to local labour market dynamics.	5	3	Planning and dialogue with staff establishing expectations
Equipment/component Obsolescence – The technology in the laser systems will develop quickly in the coming year and ELI risks not being competitive if there is not ongoing capital expenditure.	3	4	Planning in the form of Technology Roadmap; seeking complementary funding
Bad Initial User Experiences – Damage at the beginning due to a) facility not performing b) staff not supporting or c) bad communication/expectation management. This can cause bad word of mouth among researchers and a very slow uptake of services.	3-4	4-5	Work closely at the beginning with ‘friendly users’, user surveys, plan for ‘User Coordinators’ to offer ‘concierge’ services
Failure to Successfully Integrate the ELI Facilities – Due to management/governance issues the organisational merging is delayed or fails. This leads to increased costs, damage to the integrity and reputation of ELI-ERIC.	2	5	Close management monitoring, high- level supported ‘change management’ and training workshops, dedicated resources and reasonable timing expectations

ANNEX II - ESTIMATE OF ELI ERIC OPERATIONS COSTS AND CONTRIBUTIONS

1. The purpose of this document is to provide:

- a) A high-level baseline estimate of ELI ERIC operating costs, based on the scope of operations as described by the ELI Delivery Consortium peer-reviewed cost analysis established in 2019.
- b) A mechanism to calculate the contributions by Members and Observers and other contributors.
- c) Further rules specifying the conditions under which contributions may be spent for the purpose of carrying out the tasks and activities referred to in Article 2 of the Statutes.

2. Cost of Operations

- a) The overall operational budget includes the costs of operations foreseen to fulfil the ELI ERIC tasks and activities in accordance with the Statutes.
 - i. Initial Operations (2020-2021);
 - ii. Steady State Operations (starting 2022);
 - iii. Upgrades.
- b) The Initial Operations Period corresponds to the period in which the scientific instrumentation is to be made available for access to users through ELI ERIC. The budget includes costs for the start of the user programme, the ramping up of the laser sources, beamlines and spare parts. No construction or implementation costs are included. The following table summarises the results of the cost analysis and the projected estimate:

	<i>EUR</i>				
ELI ERIC Operations Costs	2020	2021	2022	2023	2024
ELI-ALPS	—	15 404 000	17 998 000	20 883 000	22 000 000
ELI-BL	—	25 067 000	25 142 000	25 214 000	25 250 000
ELI ERIC statutory seat	300 000	2 551 000	2 564 000	2 600 000	2 600 000
Total	300 000	43 022 000	45 704 000	48 697 000	49 850 000

- c) The Steady State Operations are foreseen to start in 2022 and include all estimated costs for sustainable operations. The annual Steady State Operations baseline budget projection for 2022-2024 is estimated in the table above.
- d) Upgrade and development costs are related to the need to maintain the world unique and leading capacities of the ELI Facilities. They are not included here. The particular scope and investment activities and upgrade projects shall be subject to the ELI ERIC General Assembly (GA) decision in accordance with the ELI ERIC Statutes.

3. Contributions

- a. The overall level of contributions to be paid by Members and Observers shall be defined in the annual budget in accordance with a five-year Financial Plan and the Annual Activity Plan approved by the GA. The Annual Activity Plan shall be adjusted yearly.
- b. The GA shall decide contributions of Strategic Partners on a case-by-case basis.
- c. Any contribution received under paragraph (3b) shall be deducted from the contribution according to paragraph (3a) unless otherwise agreed.
- d. Contributions to Initial Operations

- i. The Host Members, during the Initial Operations period specific for each of the respective ELI Facilities shall contribute 50 % of the budget of their respective ELI Facility.
- ii. The following non-Host countries have committed, as Founding Members, to making the following total cash contributions towards the Initial Operations period 2020-2021:

Italy EUR 2 550 000

Lithuania EUR 200 000

- iii. The following countries will join ELI ERIC as Founding Observers during the Initial Operations period:

Germany

Bulgaria

Founding Observers are countries that intend to join ELI ERIC as full Members, but are not able to commit as Members at the time of founding. They are not subject to an Observer fee, and have no rights to vote at the GA.

- iv. Any new Member during the Initial Operations period shall contribute as agreed with the Ga, taking into account expected future use of ELI.
- v. An Observer shall contribute during the Initial Operations period with a fixed fee of EUR 250 000 per year, or as decided by the Ga in accordance with the ELI ERIC Statutes. This does not apply to Founding Observers.
- vi. The Host Members shall cover any deficit in the operational budget of their respective ELI Facilities, being given the possibility to provide in-kind contributions. Such contributions are calculated to the overall Host Member contribution.
- vii. The Czech Republic shall provide an annual cash contribution of EUR 2 000 000 to ensure the operational costs of the ELI ERIC statutory seat, during both the Initial Operations and the Steady State Operations.

e. Contributions to Steady State Operations

- i. A Member shall contribute to the Steady State Operations budget based on the principle of the proportionality of their use of ELI ERIC.

The Member contributions shall take into account the average percentage usage of ELI ERIC in the previous three years. In case of new Members, the contribution shall be defined in taking into account the expected future use of ELI ERIC and the ELI Facilities.

- ii. The Host Members shall jointly contribute 20 % to the Steady State Operations budget. Each Host Member contribution shall be proportional to the budget of their respective ELI Facility.
- iii. No non-Host Member shall pay more than 25 % of the operating costs in the first five years.
- iv. An Observer shall contribute to the Steady State Operations budget at a fixed fee of EUR 250 000 per year, or as decided by the GA in accordance with the ELI ERIC Statutes.
- v. The Host Members, during the first 2 years of the Steady State Operations period shall also cover any deficit in operational budget of their respective ELI Facilities in case not covered, being given the possibility to provide in-kind contributions. Such contributions are calculated to the overall Host Member contribution.

f. In-kind Contributions

- i. In-kind Contributions (IKC) are possible to support Initial and Steady State Operations and must be consistent with 3(a) and based on the GA approval. The IKC shall be limited to levels that ensure sufficient cash flow to maintain ELI ERIC's operational effectiveness.
- ii. In-kind Contributions (IKC) are possible to support Initial and Steady State Operations and must be consistent with 3(a) and based on the GA approval. The IKC shall be limited to levels that ensure sufficient cash flow to maintain ELI ERIC's operational effectiveness.
- iii. In-kind Contributions shall be defined by ELI ERIC in advance of the annual budget commitment, reviewed by the ELI ERIC Administrative and Finance Committee (AFC), and approved by the GA. They shall, upon approval, be treated as cash-equivalent contributions with regards to voting rights/weights.
- iv. In-kind Contributions shall be delivered on the basis of an IKC agreement between ELI ERIC and the delivering party.

g. Indication of contributions

- i. The Founding Members have projected (EUR based on 2020) the following contributions towards the estimated operating costs of ELI ERIC; these projections are indicative and may change based on additional contributions of future Members and the actual costs of operating the ELI Facilities:

EUR					
ELI ERIC Member	2020	2021	2022	2023	2024
Czech Republic (incl. deficit + seat)	—	26 117 500	25 449 000	25 539 000	25 575 000
Hungary (incl. deficit)	—	14 454 500	16 305 000	19 208 000	20 325 000
Italy	300 000	2 250 000	3 750 000	3 750 000	3 750 000
Lithuania	—	200 000	200 000	200 000	200 000
Total	300 000	43 022 000	45 704 000	48 697 000	49 850 000

4. Conditions of use of the contributions

Resources specified in Article 22(3)(a) of the Statutes may be used for the purpose of covering the personnel costs of the employees of ELI ERIC only to the extent strictly necessary to carry out the tasks and activities in Article 2 of the Statutes. This necessary range of personnel costs shall mean, in relation to an individual employee, the cost of income, income reimbursement (e.g., for leave taking or for obstacles to work), travel allowances, and remuneration for standby to which the employee is entitled based on the existence of an employment relationship with ELI ERIC. Other claims arising out of the employment relationship (e.g., payments provided in connection with the termination of employment) may be exceptionally covered from other resources listed in Article 22(3)(b) through (e) of the Statutes, but not from the resources specified in Article 22(3)(a) of the Statutes.

ANNEX III - MEMBERS AND OBSERVERS

MEMBERS

Country	Representing Entity
Czech Republic	(1) Ministry of Education, Youth and Sports (2) Czech Academy of Sciences
Hungary	Ministry for Innovation and Technology
Italy	National Research Council
Lithuania	(1) Vilnius University (2) Centre for Physical Sciences and Technology

OBSERVERS

Country	Representing Entity
Germany	(1) Federal Ministry of Education and Research (2) Helmholtz Zentrum Dresden-Rossendorf
Bulgaria	(1) Ministry of Education and Science (2) Institute of Electronics of the Bulgarian Academy of Sciences

APPENDIX - THE ELI ERIC MANAGEMENT OPERATIONS MODEL

BACKGROUND

This document describes the strategy for ELI-ERIC to provide service to its Members in the form of ‘User Access’, and how it will integrate the ELI facilities. It describes the objectives of ELI-ERIC as stated in the ELI-ERIC Statutes. It also defines how to transition responsibilities from the ELI Host Institutions – the institutional partners who constructed the ELI Facilities – to the ELI-ERIC organisation. It describes the framework of an ELI ERIC Management System and the operational agreements, as well as information linking member contributions and costing.

CONSIDERATIONS

The document is for the benefit of the Members and potential members to clarify how the facilities will be managed and shared, especially in the transitional time between construction and steady-state operations.

It describes the future ELI ERIC Management System and how it relates to the strategy to integrate the management and operations of the ELI Facilities. It still includes some costing information and how it relates to contributions and the milestones for integration. An outline is included of the future operational agreements between ELI ERIC and the Host institutions that built the ELI Facilities. This document also includes a list of important definitions used in this and other foundational documents for discussing topics related to ELI ERIC.

1. PURPOSE AND SCOPE OF THIS DOCUMENT

The Extreme Light Infrastructure ERIC (hereinafter referred to as the ‘ELI ERIC’) enters its operations phase starting in 2019.

This document describes the objectives of ELI ERIC as stated in the ELI ERIC Statutes and based on an accompanying document, the *ELI Technical and Scientific Description*. This document describes how ELI ERIC will provide services in the form of ‘User Access’ to its Members, and how it will integrate the ELI Facilities into a single organisation. It provides a framework to transition responsibilities from the ELI Host Institutions – the institutional partners who constructed the ELI Facilities – to the ELI ERIC organisation, so that it may fulfil its mandate to coordinate the ELI Facilities according to the ELI ERIC Statutes.

The *ELI Technical and Scientific Description* defines the scientific and technical scope of ELI and tells ‘what’ is being provided by ELI ERIC, in terms of facilities for users, and when those facilities will be available. Both budgetary and schedule elements are indicated. This information is a reference for the ELI ERIC Statutes and is the basis for agreements between ELI ERIC and the Host Countries on how to make the ELI Facilities available for ‘User Access’.

2. MISSION AND THE SCOPE OF ELI ERIC

The ELI ERIC is a research infrastructure supporting experiments and the development of advanced technologies based on extreme light-matter interactions at the highest intensities, shortest timescales and broadest spectral range. This is consistent with the ELI ERIC Statutes. The research infrastructure aims to provide world leading tools and facilities for multidisciplinary scientific and technical applications.

2.1. Scientific Evaluation Policy

According to the ELI ERIC Statutes (‘Scientific Evaluation Policy’), ELI ERIC ‘... shall ensure that research carried out by use of ELI meets the highest standards of quality and excellence, and shall promote

training and exchange on best practice. Impact assessment shall provide information on research policy and allocation of resources that support these standards'. This evaluation is the responsibility of ELI ERIC and supported by all the Members.

The ELI ERIC shall establish a quality system for monitoring and ensuring consistent excellence in facilitating scientific research. This shall be done with the International Scientific and Technical Advisory Committee (hereinafter referred to as 'ISTAC'), Strategic Partners, and the support of expert advisors. That system shall be structured, reproducible, and applied consistently across all the ELI ERIC Facilities. The system shall be the cornerstone of the overall ELI ERIC Management System.

2.2. User Access

For the purpose of clarity, 'User access' shall mean access to the ELI Facilities for scientific research, with an emphasis to publish and create new knowledge. The ELI ERIC Statutes clearly indicate ('access Policy for Users') an excellence-based, open access policy for users.

Access to the ELI Facilities will be competitive, international, and open to users from within and outside the Members countries, based on principles established in the European Union Charter for access to Research Infrastructures⁹ all 'User access' must be subject to peer review. ELI ERIC will ensure a common access point for users responding to a unified call for proposals, including all the available capabilities of the ELI Facilities in an integrated way.

If access is 'open' it means that the ELI Facilities are open to potential researchers from any country. Being 'open' also means the data and eventual use of the data in publications shall be available and reviewable to anyone.

In addition to 'open' access, there is also 'proprietary' access, which is paid by the user and thus the results in the form of data may be the property of the user and 'closed'.

There will also be possibilities for access to technology development in terms of collaboration on innovation initiatives and procurement. Training and education for capacity is a priority for the Members and the European Research area, but may also extend beyond the Members. Commercial use within the limits normally applied in similar research infra- structures is also planned.

2.3. Technical Innovation

In addition to the scientific scope and mission, ELI ERIC also has a mission to pursue excellence in technical innovation. as per the ELI ERIC Statutes, ELI ERIC is responsible to '... develop a policy and strategy for innovation, including intellectual property, know-how exploitation, and support to industrial developments and users.' The ELI ERIC Statutes define the basic parameters of an 'Innovation and Industry Policy' to guide strategic activities in that areas. These activities shall be considered fully integrated, and are the responsibility of ELI ERIC from its establishment.

3. OBJECTIVES OF ELI ERIC

Collectively, the ELI Facilities will form the most unique and advanced user laser research centre of its kind, bringing Europe to the lead in this innovative field. It will significantly contribute to the development of the broader European Research area and strengthen ties between researchers in Central-Eastern and Western Europe.

⁹ <https://op.europa.eu/s/pcrm>

The ELI Facilities have been built taking into account the conceptual design of the ELI ‘White Book’, formed during the preparatory phase. This was the basis of the current design and implementation of ELI as an integrated organisation, as well as for each individual ELI Facility.

3.1. Role and Responsibilities of ELI ERIC

As stated in the ELI ERIC Statutes, ‘Tasks and activities’, ‘ELI ERIC shall operate the ELI as a single research infrastructure comprised of the ELI Facilities built through the implementation projects.’

In addition to the specific responsibilities listed in the ELI ERIC Statutes, the term ‘operate’ specifically means that, from establishment, ELI ERIC shall have a clear mission and responsibility for the operation of the research infrastructure. That includes the following:

- Define the overall strategy;
- Provide and support effective access to the research infrastructure;
- Define common standards and improve interoperability among the ELI Facilities;
- Provide or support training and facilitate mobility of researchers and technical and administrative personnel;
- Support technology transfer activities.

3.2. Timing and Transition to Operations

The Initial Operations Period is a transitional time period when the ELI Facilities are completing the Implementation, or Construction Phase, and beginning the Operations Phase. This means that activities from two distinct phases are overlapping. There is no one point in time when a clear switch from one phase to the other takes place. The ELI Facilities are being completed on independent schedules.

For that reason, ELI ERIC and the Host Institutions (the legal entities that are responsible for the ELI Facilities) will identify a combination of technical and organisational milestones that signal this transition incrementally. More is discussed about this in sections four (4) and five (5).

The Initial Operations period corresponds to the period covering the peer reviewed completion of the scientific instrumentation, which is to be made available for access to users through ELI ERIC. This period is foreseen from 2019-2021, specific for each of the respective ELI Facilities.

In that period, operational agreements between ELI ERIC and the Host institutions will be put in place. Those agreements, supported by the respective Host Members, will enable ELI ERIC and the Host Institutions to organise access of users selected by ELI ERIC to the ELI Facilities. The agreements will also enable the transfer of direct operational responsibility to ELI ERIC.

By the end of 2021, it is anticipated that ELI ERIC will directly operate the ELI Facilities. The ELI Technical and Scientific Description is an overview of how technical systems for each of the ELI Facilities come online for users. The first years of operation aim to achieve early scientific success to assure the research community of the quality of the new research infrastructure and to attract other users.

The shared responsibilities and obligations to operate the ELI Facilities between the ELI ERIC and the Host Institutions, require clear identification of the activities and resources. The rest of this

document aims to identify those differences, as well as indicate how the responsibility for activities and resources may change during the transitional period.

4. ORGANISATION

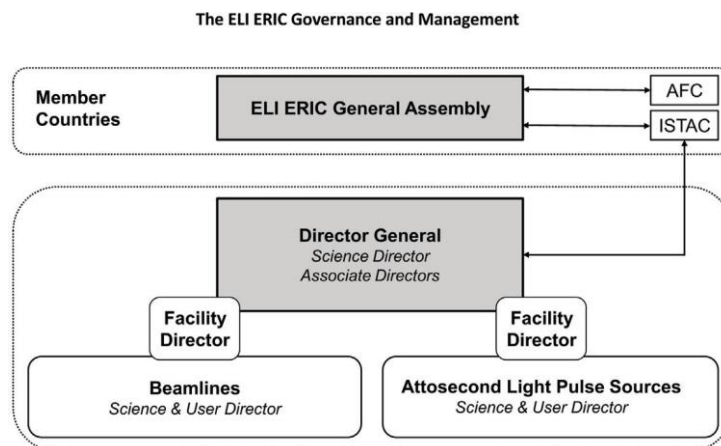
As charged in the ELI ERIC Statutes, ELI shall operate ‘...as a single organisation comprising the ELI Facilities...’ The ELI ERIC Director General is, ‘...responsible for the day-to-day management of ELI with due diligence and in accordance with these Statutes, the instructions and resolutions of the GA, and applicable legal requirements.’ This means the institutional framework of ELI ERIC ensures a coordinated and consistent operational management *across* the ELI Facilities (horizontally operations) while ensuring the best possible scientific offer to the users by optimising the processes, resources and technical capabilities at each ELI Facility (vertical operations).

4.1. Organisational Model

The governance and management structure of ELI ERIC aims to ensure an integrated operational capability, as required by the ELI ERIC Statutes. The Figure 1 below shows the bodies and committees – General Assembly (‘GA’), Director General, ISTAC, Administrative and Finance Committee (‘AFC’) - of ELI ERIC, and the operational management of ELI – and their relationship with the ELI Facilities.

Figure 1

ELI ERIC Integrated Operations Model with ELI Facilities



The GA, along with the Director General, will set the key policies which will be in effect for all the ELI Facilities, monitored by ELI ERIC, and supported by the Host Institutions. In practice those policies will be developed by the Director General together with the Facility Directors to ensure relevant input and agreement. The policies provide the basis of the ELI ERIC Management System, a definition of ‘how’ and to what standard the organisation(s) will operate.

Once policies are established, the operational management will play an important role in further elaborating the ELI ERIC Management System, a comprehensive framework to implement the policies defined by the Ga and Director General. The aim is an ‘Integrated Organisation Model’, acting together under one governance and one management to guide all decision-making.

During the Initial Operations Period, the ELI Facilities and their Host Institutions will work according to agreements on ELI Facility Operation, and begin to adopt the same ELI ERIC Management System. They will embed the same processes and rules into their organisational

structures, and follow a common communication policy. Rules and procedures may be adapted to meet local conditions, but under common management.

Organisational integration will be achieved when the ELI ERIC Management System and structure has been fully adopted, and operational responsibilities are managed within a single legal entity. at that point, agreements on ELI Facility Operation will no longer be necessary.

4.2. The ELI ERIC Management System

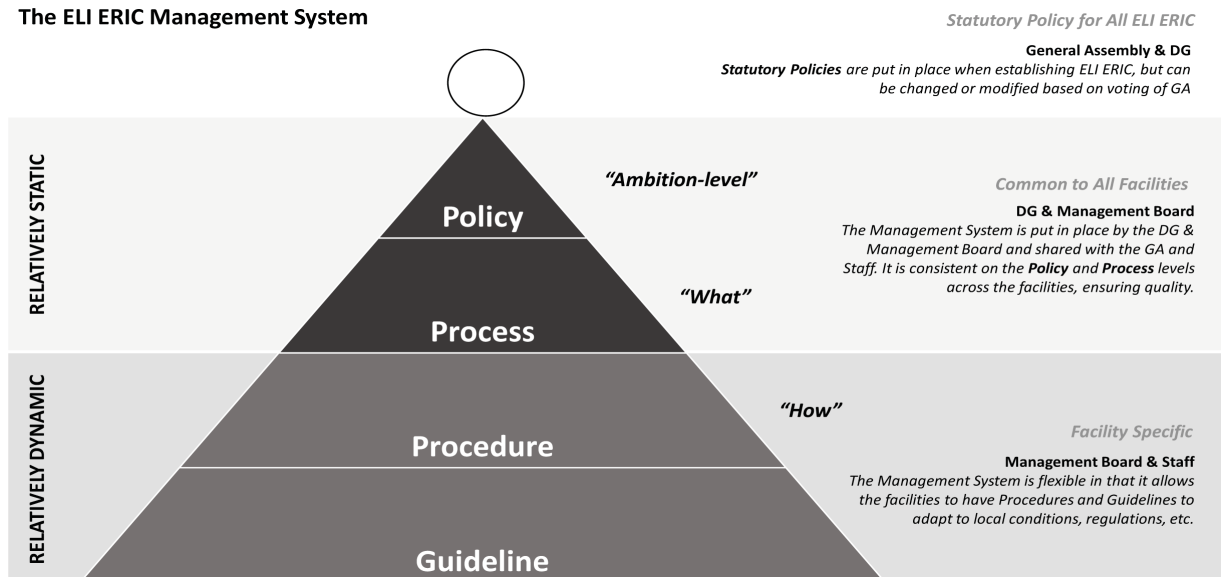
From the establishment of the ELI ERIC there will be a 'Transition Period' when the ELI ERIC will act as a central hub coordinating the operation of the ELI Facilities, while the Integrated Organisation Model is being introduced.

The approach is to develop an ISO 9001 compliant system, but without necessarily aiming at ISO certification. Used by other research infrastructures in Europe, this approach is well suited to ELI and to give a structure for setting up the organization – in particular given the transition phase during which integration of the ELI Facilities will be achieved – and for pushing for quality conformity in the future. It is a 'process based' system including four main levels of supporting documentation starting from general (strategic) to specific (operational), as shown below.

Figure 2

Overview of management system layers

The ELI ERIC Management System



The management system revolves around four layers:

- Policy – Strategic level: document decided at the General assembly level and amended only very seldom
- Process – Tactical level: document decided at the Director General and management level; it can be adapted/added by the Director General and management
- Procedure – Operative level: such documents can be changed/adapted at the organisational level
- Guidelines – Sub-operative level (best practices, etc.): guidelines are meant to adapt the Procedures to local realities.

Policies and processes will be instrumental in organizing the convergence of the ELI Facilities towards full integration in the context of the transition phase. They will ensure that procedures, rules and

guidelines, defined and adopted in most cases locally, gradually align and facilitate the eventual legal transition to full integration.

The scope of this work is to prepare and implement the key policies foreseen in the ELI ERIC Statutes as well as implementing procedures. This will be done through strong collaboration among the management staff of the ELI Facilities and ELI-DC (ELI ERIC in the future). All policies will be submitted for approval to the ELI ERIC General assembly.

Consultants with expertise in the ISO 9001 standard will be used to support the activity. The task is obviously dependent in its timing on the establishment of ELI ERIC as far as adoption and implementation of the policies and procedures are concerned. Preparatory work can nevertheless start as of the outset of the project even under ELI-DC building on work done in particular within the framework of the ELITRANS project.

The Design and implementation of legal transition from operating agreements-based operations to fully integrated operations (ELI) consists of the preparation and implementation of legal measures to 'transition' the ELI Facilities from operations under operating agreements to direct operation by ELI ERIC.

This legal transition will have to be carefully planned to define the conditions and timing of the handing over of risks, liabilities, assets, and financial commitments to ELI ERIC. This will involve substantial due diligence where relevant and required, with the support of legal experts and consultants, in collaboration with the staff of ELI ERIC and of the ELI hosting institutions.

Management integration and transition to a single organization requires IT support systems for information sharing and management of resources and risks within ELI. This task will include two main dimensions:

- Aligning the strategies of the ELI Facilities in terms of IT 'back-office' systems and networks to provide a truly unified environment to ELI staff and external users;
- Design and initial implementation of an Enterprise Resource Planning System for ELI.

The first dimension will build on the situation analysis already performed within the framework of a previous H2020 project (ELITRANS) and the recommendations provided by the IT managers of the ELI Facilities. It will focus in particular on standardization of solutions and equipment – in particular for internal communications and information-sharing. Actual implementation of the aligned strategies will be beyond the scope of this project given the costs.

The second dimension will be to define the detailed requirements of ELI's integrated ERP system and implementation plan. The overall strategy should take into consideration in particular the existing legacy resource management systems currently in use at the ELI Facilities, the impact of local legislations (in particular in the area of human resources) and the evolving needs during transition as reporting requirements and conditions will necessarily evolve.

Work will be carried out in two phases with a design phase leading to a strategy and investment plan submitted for approval to the governing bodies of ELI ERIC and an initial implementation and deployment phase focusing on the core components of the ERP system.

The overall transition phase will require substantial training to facilitate the adoption of the evolving management conditions and supporting systems of the integrated organization. An initial assessment of the training needs and of the timing of the training measures will be performed after which training will be delivered and reviewed periodically.

Training measures will necessarily take various forms and configurations (online, on site), involving consultants wherever required and the use of digital technologies. Some elements will be common to all ELI staff, while some customized elements will be considered to address the peculiarities of each Facility. An important component of the training measures will be the support to the development of a common corporate culture within the organization.

4.3. Strategic Policy Areas

The ELI ERIC GA governs through policies and rules put in place by the GA and/or the Director General. The ELI ERIC Management System will take policies from the ‘governance’ level and translate that into ‘operative’ level processes and procedures, consistent in key strategic areas. The section below describes nine (9) strategic areas with indicators for transitioning responsibility to the Integrated Organisation Model.

1.1.1. Governance

From the beginning it is understood that the ELI ERIC GA, advised by the ISTAC and the AFC, makes all ELI ERIC policy decisions. The Director General, as the legal representative of ELI ERIC and the only executive body is responsible for the day-to-day management of ELI ERIC works with the Directors of the Facilities to coordinate operations. The financial responsibility stays with the ELI ERIC GA and its delegates, who directly represent the Members.

1.1.2. Scientific Evaluation Policy

All decisions in regard to instrumentation, targeted user groups, and prioritisation for ‘User Access’ are approved by the GA, coordinated and executed by the Director General in close cooperation with the Facility Directors. The ‘Scientific Evaluation Policy’ is established in Article 7 of the ELI ERIC Statutes and detailed in chapter 2.1 of this Annex.

1.1.3. User Access

The User Access Policy, a statutory policy, provides high-level guidance from the GA relative to User Access. According to the ELI ERIC Statutes, the Director General approves all access, including provisions for local researchers, after review by an appointed peer review panel. ‘User Access’ is granted as ELI Facilities become available. The ELI ERIC is charged with managing an integrated system for coordinating users, and implementing a common system for quality assurance of services provided to the Users.

1.1.4. Budget

The ELI ERIC budget includes the full scope of ELI ERIC ‘User Access’ and ELI Facilities related costs. Capital investment shall not be part of the Operational Expenditure, but is subject to approval by ELI ERIC GA with respect to the ELI ERIC mission, and critical to sustain the scientific and technological excellence of the ELI Facilities over its lifetime. Members' contributions are fully transparent and consistent with planned activities, cash or in-kind in line with the ELI ERIC Financial Rules.

1.1.5. Employment Policy

Staff are ‘integrated’ to ELI ERIC when they fully available and employed or seconded according with the rules approved by ELI ERIC GA. An ELI ERIC Staff Policy will be applied across all the ELI Facilities as well as an ELI ERIC Code of Conduct.

1.1.6. Technology Management

Technology management means the operation and maintenance of equipment, such as primary or secondary sources, and user instrumentation. It includes a responsibility to provide availability, as well

as liability for operation. It also includes related software, support systems, and workshops. This includes the Technology Development Policy and Innovation Policy.

1.1.7. Facility Site Management

1.1.8. Safety and environmental management, as well as maintenance, security, supervision and access to the ELI Facilities are subject to an ELI ERIC Safety and Environmental Policy.

1.1.9. Legal and Liability

These aspects of operations are managed by ELI ERIC as an international organisation for the purpose of VAT exemption and recognised as a pan-European entity with a legal character in the Host and Member Countries. It takes into account the legal responsibilities and liabilities of the ELI Facilities. There may be several policies governing this area, including an 'Intellectual Property Policy', a 'Data Protection Policy', etc.

1.1.10. Administrative

These are activities managed according to ELI ERIC policies and rules, include but are not limited to information and management accounting systems, procurement, logistics planning, ICT systems, human resources, and the management of resources and budgets relative to those activities. In particular, this includes the 'Procurement Rules' and an 'ICT Policy', including cyber-security measures.

4.4. Timing of the Transition Period

The approach to integrate activities according to the ELI ERIC Integrated Organisation Model may be applied in a consistent way across each of the ELI Facilities, but each Host Country has an individual view on how fast, and to what extent its ELI Facility can be integrated into ELI ERIC. One size may not fit all and there may be legal and political conditions limiting the speed and level of integration.

Table 1

Transition from Distributed Integrated Operations by ELI Facilities

ELI ERIC Integrated Organisation Model	2019	2020	2021	2022
Governance	CZ/HU	CZ/HU	CZ/HU	CZ/HU
Science Policy	CZ/HU	CZ/HU	CZ/HU	CZ/HU
User Access	CZ/HU	CZ/HU	CZ/HU	CZ/HU
Budget	CZ/HU	CZ/HU	CZ/HU	CZ/HU
Employment Policy	—	CZ	CZ	CZ/HU
Technology Management	—	CZ	CZ	CZ/HU

Facilities Management	—	CZ	CZ	CZ/HU
Legal & Liability	—	CZ	CZ/HU	CZ/HU
Administrative	—	CZ	CZ/HU	CZ/HU

That means that certain activities may be integrated, while others remain governed by the Agreements on ELI Facility Operation for a period of time. Each section about the ELI Facilities describes also the stated intent of each Host Country in respect to the ELI facility located on its soil and the transition period. This is important because it is linked as well to the contribution level of each Host and the contribution levels of the non-Hosts, as discussed in Section 5.3.

5. ESTIMATED COSTS OF THE ELI FACILITIES

To define the conditions needed to reach long-term sustainability, the costs and the possible financial sources need to be detailed. As provided for in the ELI ERIC Statutes, the general principles for the use of the ELI Facilities and the apportionment of Members' contributions to the operating costs shall be documented in a stand-alone policy agreed by the GA, creating also the prerequisites to avoid a significant and lasting imbalance between the use and the contributions by the scientific community of each Member.

In what follows, the basic elements to define costs are presented and can be grouped into the following categories:

- 1) Construction – Capital investment expenditures (CAPEX) before operations;
- 2) Operations – Operational expenditures (OPEX) of peer reviewed access, including some capital investment Expenditures (CAPEX) to maintain specifications and capability as defined in the ELI OPEX Report;
- 3) Future upgrades – New investments (CAPEX) needed to improve specifications and available instruments in response to competition and users' requirements;

The following text focuses on aspects of points 1 (Construction) and 2 (Operations).

5.1. Construction

The total investment (construction costs) of the ELI Facilities will be of around EUR 509,3 million over the construction period as detailed in Table 2.

Table 2
Construction Costs of the ELI Facilities

ITEM	EUR		
	ELI BL	ELI ALPS	ELI
BUILDING + LAND	94 643	88 705	183 348
TECHNOLOGY	181 876	105 435	287 311

SERVICES	7 601	9 788	17 389
PERSONNEL	41 206	27 484	68 690
TOTAL	325 326	231 412	556 738

These costs are completely covered by the Host Countries, through ESIF and national funding, based on the projects, which were approved and monitored by the national Managing Authorities. The investments have been of about 30 % in buildings, 60 % in technology and 10 % in personnel and services. These costs are, from the position of ELI ERIC, non-recoverable and will not be factored into the operating costs of ELI ERIC.

5.2. Operations

The commitment of the Host Members enables other non-Host Members to define a gradual approach to their future commitments and reach longer-term sustainability of the ELI ERIC based on Members' contributions from 2019 onwards.

Table 3

Estimated ELI ERIC Operation Costs for the ELI Facilities

EUR thousand

	2019	2020	2021	2022	2023
Direct personnel costs	2 772	5 895	8 789	9 370	9 632
<i>ELI-ALPS</i>	<i>411</i>	<i>1 529</i>	<i>2 752</i>	<i>3 334</i>	<i>3 596</i>
<i>ELI-BL</i>	<i>2 361</i>	<i>4 366</i>	<i>6 036</i>	<i>6 036</i>	<i>6 036</i>
Direct hardware costs	3 530	7 980	11 423	11 823	12 536
<i>ELI-ALPS</i>	<i>47</i>	<i>1 707</i>	<i>4 035</i>	<i>4 435</i>	<i>5 148</i>
<i>ELI-BL</i>	<i>3 483</i>	<i>6 273</i>	<i>7 388</i>	<i>7 388</i>	<i>7 388</i>
Indirect costs	4 904	12 347	19 615	21 303	23 285
<i>ELI-ALPS</i>	<i>457</i>	<i>4 002</i>	<i>8 616</i>	<i>10 230</i>	<i>12 139</i>
<i>ELI-BL</i>	<i>4 447</i>	<i>8 346</i>	<i>10 999</i>	<i>11 074</i>	<i>11 146</i>
Total costs ELI Facilities	11 205	26 223	39 826	42 496	45 453
<i>Head office</i>	<i>1 531</i>	<i>2 477</i>	<i>2 551</i>	<i>2 564</i>	<i>2 641</i>
Total ELI ERIC	12 736	28 700	42 378	45 060	48 094

The entry of non-Host Members during the founding phase allows for a gradual ramp-up of contributions over the start-up period and for a decision on the final level and commitments for their contribution soon after establishing the ELI ERIC. The early entry allows prospective Members to be involved in setting up the basic rules for the operation of the ELI Facilities, while ramping-up financial commitments at the beginning.

Above are the projected ELI Operating costs, adjusted for current milestones. They probably represent an upper estimate relative to User access costs during the Initial Operations Period

depending on whether or not milestones are achieved. Estimates for must be established and monitored on a yearly basis for the duration of the Initial Operations Period.

5.3. Contributions

The link between milestones, both technical and organisational, and contributions to facilitate the transition, is critical. The Host Countries are incentivised to reach milestones and to integrate the ELI Facilities into ELI ERIC. It ensures that the non-Hosts are ramping-up contributions for funding access, activities and assets that they have direct control over through ELI ERIC governance and management bodies.

For each step an ELI Facility and its respective Host Country make towards a higher level of integration, there will be an increase in responsibility of the ELI ERIC to 'operate' the ELI Facility. Correspondingly, the level of responsibility to directly fund the ELI Facility by the respective Host Country will decrease, as will the level of funding.

The progress towards these milestones will be recognised by the non-Host Members and reflected in the level of contributions required from each Host Country as milestones are reached, and balanced by contributions from non-Host Countries. Target contribution levels are established between the Hosts and non-Hosts. Individual milestones will be weighted and timing will be determined and detailed in the Agreements on ELI Facility Operation designated in Article 3(1) of the ELI ERIC Statutes.

This transition of risk, responsibility, assets, and financial commitments, is the basis of a working model for the transition period. It secures technical and organisational commitments for the non-Host Members, while balancing that with reductions in financial commitments for the Host Members.

This step-wise and systematic approach is supported by the Agreements on ELI Facility Operation, which detail the transition for each facility. The 'hand-over' of responsibility is monitored on an on-going basis and is the basis for annual planning during the Initial Operations Phase. The achievement of each milestone will be subject to a review, documented, reviewed by the AFC and approved by the GA.

After the Initial Operations Period, the contributions shall be defined based on the principle of effective usage.

6. AGREEMENTS ON ELI FACILITY OPERATION

At the establishment of ELI ERIC, the ELI Facilities will be ending the Implementation Phase, completing installation and going through a period of commissioning. The ELI Facilities are owned by local legal entities in the Host Countries. Those local entities may, in the case of being named the Host Member's Representing Entity, have a formal legal connection to ELI ERIC. This is not however automatic, and may not be the case if there is not a political and legal basis in a Host Country.

Direct transfer of assets and ownership of the facilities, or parts of the ELI Facilities, to ELI ERIC will not be immediately possible at the beginning of Operations. For ELI ERIC to carry out its mandate and enable access for users to the facilities and 'operate', some formal arrangement will need to be established with the Host Countries, and/or the local institutions. This is especially true at the beginning of operations, during the transition period to the Steady State Operations, allowing for a transferal of responsibility for resources over a defined time period. No investment or construction costs will be paid for by Member Contributions; contributions are reserved for Initial Operations, Steady State Operations and Upgrades after 2022 only.

This arrangement is defined in article 2(1) of the ELI ERIC Statutes where it says that the ELI Facilities are described in annex I, the Technical and Scientific Description. Article 19 of the Statutes establishes that ELI governs the ELI Facilities in a single integrated organisation with one governance and one management.

6.1. Form of Agreements

Although the agreements involve different legal entities all of the Hosts and Host Institutions agree the form of agreement should be consistent and applied equally to all the ELI Facilities. In principle each agreement will consist of two parts:

- Main agreement – Contains terms and conditions, establishing a relationship between ELI ERIC, the Facility Owner (institutional) and/or the respective Host Member; it contains the same terms and conditions for all ELI Facilities and forms a legal basis for the agreement.
- Technical Annex – Contains specific information for each ELI Facility, including definition of the exact technical scope, cost, and schedule/milestones for systems to formally enter into 'Operations', including technical requirements, principles for technical acceptance and quality control. Reflects the Technical and Scientific Description of the ELI Facilities. The Technical annex may be updated in conjunction to annual plans.

6.2. Content of Agreements

In order to balance the principle of common interest to fulfil the ELI ERIC mission to operate effectively and also to ensure a consistent approach over the ELI Facilities certain elements are essential to be embedded in the Agreements. These elements may be informed and guided by a well-defined management system, but a minimal level of explicit agreement on certain points is needed for an effective collaboration in any case.

A clear statement is required of 'Who' are the parties involved in the arrangement, their respective roles and responsibilities. Individual people should be named as responsible representatives to the arrangement.

A legal nature of the arrangement shall be defined in order to correctly specify the scope and duties on one hand and balance and safeguard the interest to integrate without too restrictive legal and administrative hurdles. All parties shall exercise due diligence in securing their commitments.

- **A Basic Definition of 'What' is being offered and how the 'acceptance' will be acknowledged.** This definition of the facilities, services and acceptance principles should be sufficiently defined to ensure predictability and smooth transition from the implementation into operation phase, including a basis for determining aspects related to funding, such as annual planning and budgeting.
- **Define cash flows.** A statement on what basis and through which costs-contributions mechanism ELI ERIC will secure cash flows and what will be the balance between cash and in-kind. The agreed approach should be able to accommodate all possibilities and should be clearly accounted for and auditable.
- **Implementation of ELI ERIC policies.** Be it General management system, Standard of Performance, Working conditions, Maintenance approach or Facility management and Safety Standards the Agreement shall specify implementation scheme for the ELI ERIC policies by the Host Institutions. Should be jointly determined by the ELI Facilities and ELI ERIC, but may need to be applied according to the commissioning stage of each ELI Facility.
- **Communication and Representation.** Channels of communication and 'agency' or 'acting on behalf' of each other need to be defined relative to external parties, including scientific users,

suppliers, authorities at all levels. A clear chain of communication should be defined and plans for crisis communications required.

- **Liability and Responsibility at and for the Site.** Safety and liability at the sites and for certain actions/activities in cases where staff from different organisations work together. Guidelines, training, communication and responsible roles need to be defined.
- **Duration.** The aim is to work to establish and operate an integrated organisation, and although that may not be possible from the beginning, time frames should be agreed according to milestones.
- **A method to deal with issues that may arise.** The best plans and intentions can sometimes turn out differently. In this case where all the parties must work closely and strengthen collaborations, issues must be dealt with in a way that all parties feel a shared responsibility to confront issues and find solutions.
- **Jurisdiction and Remedies.** Agreements to operate within the ELI ERIC are not commercial transactions, but more like scientific collaborations. The difference from a scientific collaboration however might be an increased level of accountability from both parties. No matter what the eventual contractual relationship is, the commitment to ‘make available’ the facilities comes from the Host Countries, who are members of the ELI ERIC GA. For that reason, in the event of disputes or non-compliance, the ELI ERIC GA is the logical body to govern disputes, unless another body is recognised by the GA.

7. IMPORTANT DEFINITIONS

The following are a list of important terms and concepts used frequently in the foundational documentation referencing ELI ERIC. That includes this document and also statutory documents like the ELI ERIC Statutes (which contains an abbreviated version of this list) and supporting Annexes. This list may not be complete or contain all relevant terms and definitions. It may be revised as new terms are introduced or terms become irrelevant or invalid.

For the purposes of ELI ERIC, the following definitions shall apply:

- 1) **ACCESS FOR USERS** means the legitimate and authorised physical, remote and use of ELI’s offered scientific facilities and services to individuals, teams and institutions from academia, industry and public services according to ELI’s User Access policy (ELI Statutes, Article 6).
- 2) **ACCESSION** means the act of joining ELI as a Member after entry into force of the European Commission Implementing Decision on setting up the ELI European Research Infrastructure Consortium.
- 3) **ADMINISTRATIVE AND FINANCIAL COMMITTEE** or **AFC** means the committee established under article 24 of the ELI ERIC Statutes to advise the ELI General Assembly on financial and administrative issues. The AFC delegates are nominated by the ELI ERIC Members and appointed by the GA according to article 21(9).
- 4) **DIRECTOR GENERAL** is the primary executive body of ELI ERIC. The person occupying the position is chosen and approved by the ELI ERIC GA.
- 5) **ELI FACILITY** means the high-power laser facilities that is operated by ELI ERIC. a detailed technical description is provided in Annex I.
- 6) **ELI FACILITY DIRECTOR** means a person with full legal power and responsibility for the respective ELI FACILITY. The authority may be assigned by the Host Country during the Initial Operations Period (below) and later by the DG, and approved by the GA.
- 7) **FOUNDING MEMBER** means a country participating in ELI before and at the establishment of ELI ERIC and contributing financially and having the right to vote in ELI business.

- 8) **FOUNDING OBSERVER** means a country with Observer status participating in ELI before and at the establishment of ELI ERIC, which shall have the rights set out in article 15(1) of the Statutes.
 - 9) **GENERAL ASSEMBLY (GA)** The primary governing body of ELI ERIC. It is made of representatives of the ELI ERIC Members.
 - 10) **HOST MEMBER** means a Member country where an ELI FACILITY is located and having specific obligations as outlined in Annex II.
 - 11) **INITIAL OPERATIONS PERIOD** means the period covering the peer-reviewed completion of the scientific instrumentation, which is to be made available for access to users through ELI ERIC. also a period conceived to integrate the respective ELI Facilities into ELI ERIC. This period is foreseen from 2019-2021.
 - 12) **IMPLEMENTATION PROJECTS** means the executive projects funded by European Structural and Investment Funds (hereinafter referred to as 'ESIF') and national funds for the construction of the ELI FACILITIES.
 - 13) **INTERNATIONAL SCIENTIFIC AND TECHNICAL ADVISORY COMMITTEE or ISTAC** means the scientific and technical advisory body to the ELI ERIC General Assembly according to Articles 21(9) and 23.
 - 14) **MEMBER** is a country or intergovernmental organisation that has joined and contributes to ELI ERIC and is permitted to vote at the ELI ERIC General assembly (GA).
 - 15) **OBSERVER** is a country/nation or intergovernmental organisation that participates in ELI ERIC governance but has no vote.
 - 16) **RULES OF PROCEDURE** means the policy and procedure documents as approved by the ELI ERIC GA.
 - 17) **STEADY STATE OPERATIONS PERIOD** means full operation of the ELI FACILITIES by ELI ERIC. It is foreseen to start in 2022, upon completion of the Initial Operations period and integration of each of the respective ELI Facilities to ELI ERIC.
 - 18) **A STRATEGIC PARTNER** is a third party, such as national agencies and/or institutions, which will contribute to the mission of ELI and support the involvement of their user communities and the operation of the ELI FACILITIES on a long-term perspective through a partnership agreement, consistent with article 19 of the Statutes.
 - 19) **TRANSITION PERIOD** means the period when the ELI Facilities are transitioning under ELI ERIC governance into integrated operations. The period is defined with respect to each ELI Facilities by technical and organisational milestones defined in Annex I, the 'Technical and Scientific Description' of the ELI Facilities.
 - 20) **USER** means individuals, teams and institutions from academia, industry and public services that will access the ELI FACILITIES according to ELI's User Access policy (Article 6).
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