Towards a pan-European Research Infrastructure as a multinational venture

SEEIIST

South East European International Institute for Sustainable Technologies

https://seeiist.eu

Dr. Sanja Damjanovic
Minister of Science of Montenegro
Chairperson of the SEEIIST Steering Committee

TIARA

ACCELERATING KNOWLEDGE AND INNOVATION

TIARA 17th Collaboration Council meeting
21 October 2020

SEEIIST@ESFRI Roadmap – we have applied

SEEIIST: New Research Infrastructure on Health
Single-sited with many satellite Hubs

SEEIIST application to enter the ESFRI Roadmap of future Research Infrastructure of European relevance based on 350 pages document

ESFRI

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Pan-European dimension of the **SEEIIST** Research Infrastructure and its alignment with the **EC Policy:** Green Deal & Horizon Europe Cancer Research Mission

The Pan-European Dimensions: SEEIIST Cancer Therapy Research Infrastructure Brings an Added Value for Europe

Fighting against cancer

Nuclear medicine as crucial component of future personalised cancer care

Develop advanced cancer therapy with ion beams and isotopes

Two Strategic Objectives – One initiative

Building international cooperation and scientific capacity in South East Europe

Advance European integration, reverse brain drain, connect to Europe

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Comprehensive Dimension: both Cancer Therapy and Research Center with 50% of the beam time dedicated to research – other Unique Selling Points

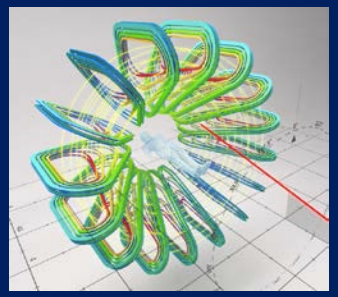
MULTI-DISCIPLINARY RESEARCH WITH HEAVY IONS

- Pre-clinical (medical, radiobiology)
- Clinical, including clinical trials
- Industrial research (microelectronics)
- Material research
- Ultra-high dose rates (FLASH)

Cutting-edge innovative and novel research in any of these topics driven by novel technological opportunities
Complementary to all existing facilities

BREAKTHROUGH IN TECHNOLOGY

- Multi-ion synchrotron (beyond presently used p and C-ions)
- More compact and much cheaper Superconducting synchrotron
- Superconducting gantry
- Higher beam intensity, faster extraction; Real time imaging



Will make cancer treatment with ions accessible to a large fraction of the European population and bring back Europe the lead position in this field

SCIENCE DIPLOMACY

- Declaration of Intent signed at CERN in October 2017 by 8 SEE countries
- MoC signed by 6 Prime Ministers of the SEE Region in July 2019, at the Summit of Berlin Process, Poznan
- Political support by the Swiss Government to establish SD roadmap

With the strong supporting consortium of 18 European research centers and clinics the SEE region is trying to revive its technological tradition

PART A:
GENERAL INFORMATION

PART B:
SCIENTIFIC CASE

PART C:
IMPLEMENTATION CASE

Political support - Lead country/entity

Country/Entity Type: MS/AC Countries
Country/Entity: Montenegro
National Ministry/Council of the Entity: Ministry of Science

Political support: prospective member country/entity

Country/Entity Type: MS/AC Countries
Country/Entity: Albania
National Ministry/Council of the Entity: Ministry of Education, Sports and Youth

Country/Entity Type: MS/AC Countries
Country/Entity: Bosnia and Herzegovina
National Ministry/Council of the Entity: Ministry of Civil Affairs

Country/Entity Type: MS/AC Countries
Country/Entity: Bulgaria
National Ministry/Council of the Entity: Ministry of Education and Science

Country/Entity Type: EIRO Forum
Country/Entity: CERN – European Organization for Nuclear Research
National Ministry/Council of the Entity: Director General of CERN

Country/Entity Type: MS/AC Countries
Country/Entity: Croatia
National Ministry/Council of the Entity: Ministry of Science and Education

Country/Entity Type: Other Entity
Country Entity: Hungary
National Ministry/Council of the Entity: Nuclear Research Development and Innovation Office – NRDIO

Country/Entity Type: Third Countries
Country/Entity: Kosovo
National Ministry: Ministry of Education and Science

Country/Entity Type: MS/AC Countries
Country/Entity: North Macedonia
National Ministry/Council of the Entity: Ministry of Healt

Country/Entity Type: MS/AC Countries
Country/Entity: Switzerland
National Ministry/Council of the Entity: State Secretary for Education, Research and Innovation – SERI

Country/Entity Type: Other Entity
Country/Entity: Test Infrastructures and Accelerator Research Area (TIARA)
National Ministry/Council of the Entity TIARA Council

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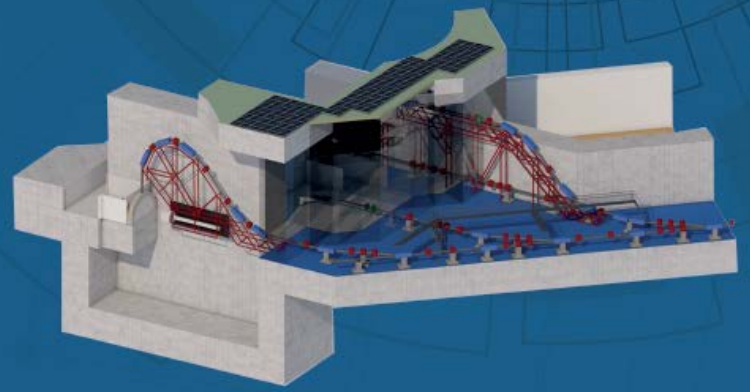

ANNEX 3

pre-TECHNICAL DESIGN REPORT
(pre-TDR)

An Accelerator-based Research Infrastructure for Cancer Therapy and Biomedical Sciences with Ion Beams

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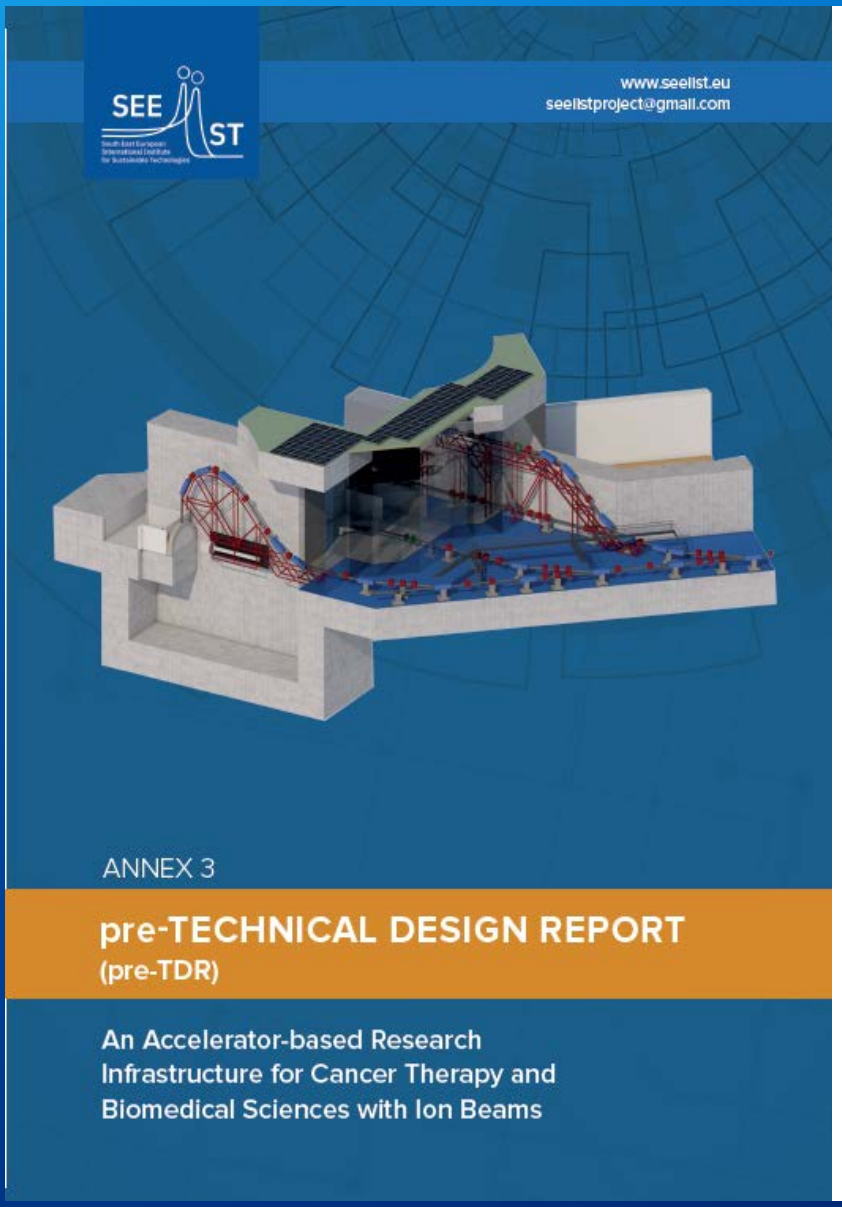
ANNEX 4

BUSINESS PLAN

SEEIIST plans and schedule



An Accelerator-based Research Infrastructure for Cancer Therapy and Biomedical Sciences with Ion Beams

SCIENTIFIC CASE

A project of the
South-East European International Institute for Sustainable Technologies – SEEIIST

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Ugo Amaldi Editor

SEEIIST@ESFRI application based on 200 pages of technical documents prepared with an important contribution from NIMMS (Next Ion Medical Machine Study) CERN et al.

Masterplan for construction in 9 years

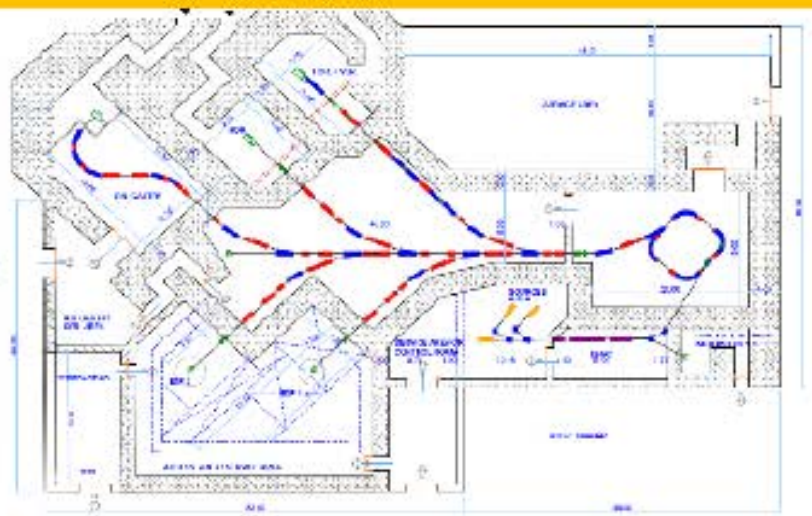
ID	Task Name
1	**1. Design and preparation**
2	1.1 Design Phase 1 (CDR)
3	1.2 Design Phase 2 (TDR)
4	1.3 Integrating Activity Project
5	*MS1 Technical Design Report (TDR)*
6	1.4 Preparatory Phase Project
7	1.5 Governance and site definition
8	*MS2 Selection of site*
9	1.6 Management and laboratory set-up
10	1.7 Funding and financing preparation
11	*MS3 Construction funding granted*
12	*MS4 Updated TDR, choice of technology*
13	**2. Building and infrastructure**
14	2.1 Building design
15	2.2 Tendering and preparation
16	2.3 Civil construction
17	2.4 Infrastructure installation
18	*MS5 Delivery of buildings*
19	**3. Equipment design and construction**
20	3.1 Specification and tendering
21	3.2 Injector construction
22	3.3 Accelerator construction
23	3.4 Beam delivery construction
24	**4. Installation and commissioning**
25	4.1 Injector commissioning off-site
26	4.2 Injector installation, commissioning
27	*DE1 Production of isotopes with injector*
28	4.3 Accelerator installation
29	4.4 Accelerator commissioning protons
30	*DE2 Protons to experimental rooms*
31	4.5 Accelerator commissioning ions
32	4.6 Licensing protons
33	*DE4 Ions to experimental rooms*
34	*DE5 Protons to therapy rooms*
35	4.7 Licensing ions
36	*DE6 Ions to therapy rooms*

Comparing the three options for SEEIIST

Maurizio Vretenar
for the NIMMS Collaboration

ATS&KT Seminar

RT synchrotron:
accelerator 1,200 m², facility 6,500 m²
estimated cost (acc. only): 42 M€



SC synchrotron:
accelerator 600 m², facility 5,500 m²
estimated cost (acc. only): 31 M€

Full linac:
accelerator 600 m², facility 5,500 m²
estimated cost (acc. only): 31 M€

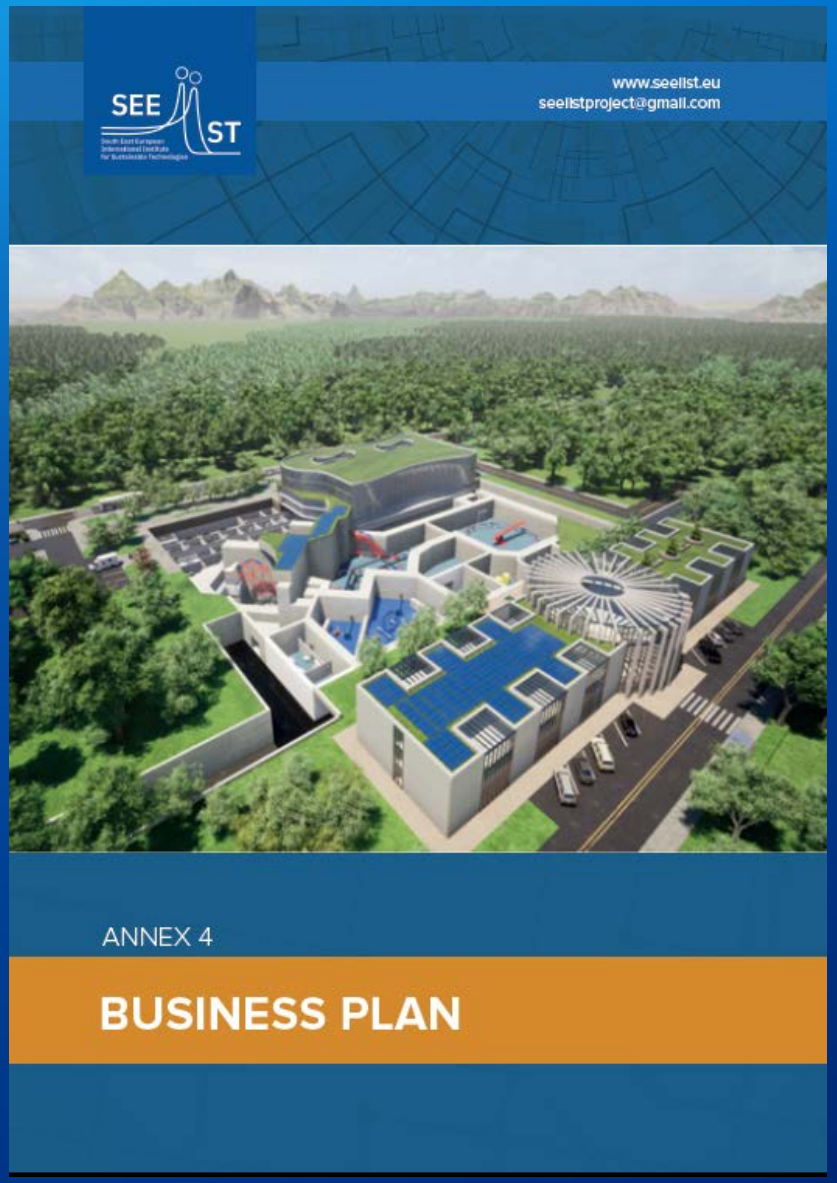
SC synchrotron or linac allow 50% reduction in accelerator dimensions, 15% in overall facility dimensions, and 20% reduction in cost.

	Construction Cost	Operation cost	Footprint	Performance	Time to development	Risk of development	Treatment protocols	Gantry
Warm (new) synchrotron	Medium	Medium	Large	Good	Low	Low	Existing	Simple design
Superconducting synchrotron	Lower	Lower	Small	Good	Medium	Medium	Existing	Simple design
Linear accelerator	Lower	Lower	Small	Better	Long	Medium	To be developed	Complex design

Linac option discarded by SEEIIST because requires R&D, is not evolutive, and needs specific medical licensing.

This study recommends to SEEIIST the adoption as baseline configuration of a warm-magnet synchrotron with novel features. Development of superconducting magnets and adequate superconducting synchrotron designs should continue as an advanced alternative option. The superconducting alternative with its potentially lower cost and smaller dimensions might become the baseline in case preparation for construction of SEEIIST would take more time than foreseen and in case of success of the superconducting magnet development. Additionally, the superconducting option might more easily become a standard commercial design for a next generation of ion therapy facilities beyond SEEIIST.

SEEIIST plans and costs



SEEIIST BUDGET SCHEDULE

Design and preparation
Building and infrastructure
Equipment design and construction
Installation and commissioning

M EUR

Budget following the Masterplan for construction in 9 years

SEEIIST@ESFRI application
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Time line for the SEEIIST Project

2017-2018:
Concept Studies

2019:
- Design Study Phase Started

2020/21:
- Applied for H2020-INFRAIA
- Applied for the ESFRI Roadmap
- Selection of the site

2023:
Start construction of the Facility

2028:
First patient treatments

Green concept for the SEEIIST project

SEEIIST First Green Particle Cancer Therapy and Research

First Green Infrastructure in-line with #HorizonEurope Cancer Mission

SEEIIST virtual center

For SEEIIST up to 240 MEUR required, guaranteeing competitivity in Europe. Multiple sources of financing necessary: EU Structural and cohesion funds, IPA funds, some contributions from member-states, other investment funds

SEEIIST – First Green Infrastructure in line with the Horizon Europe Cancer Mission

SEE IIST
South East European International Institute for Sustainable Technologies

GREEN DEAL

#HorizonEU
Cancer
European Commission

SEEIIST – strong support by the EC and Switzerland

EC: DG RTD (H2020) + Economic and Investment Plan for the Western Balkans (DG RTD and DG NEAR)

SEEIIST is the only research infrastructure part of the Economic & Investment Plan for WB via the Innovation Agenda

CH: Political support by Switzerland via FDFA for SEEIIST

Switzerland offered an official political support to develop a Science Diplomacy Roadmap for SEEIIST