

# Policy Paper

## Energy Research, Development and Innovation in Romania

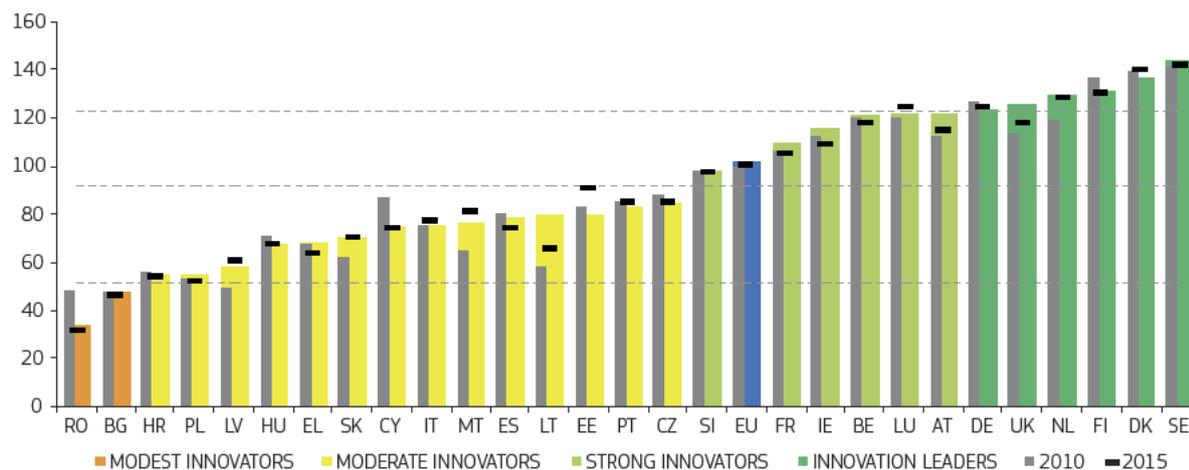
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Romania ranks last in the European Innovation Scoreboard. One of the reasons is that, at national level, the approach to innovation is still top-down with few private sector projects. When they exist, such projects are the exception, not the rule. Big projects grab attention and are meant to compensate for the overall weakness in this area. SMEs in Romania are having a hard time because of scarce public funding and strong competition from an oversized network of state R&D institutes. With the exception of EU policies and programmes, public funding is still backward looking (geared towards keeping alive the communist-era research institutes irrespective of the quality of research they produce). However, the availability of European funding and partnerships with European entities provide hope for Romania's R&D. While still a junior in European innovation, Romania does have a few success stories that are presented in the last section of this paper, which are indicative of the huge potential and significant room for growth going forward.

## Romanian policy towards innovation

Unfortunately, Romania ranks last among EU-28 in terms of innovation, which speaks of a poor innovation capacity, despite excellent potential.

Figure 4: Performance of EU Member States' innovation systems



Source: European Innovation Scoreboard 2017

Government expenditure on R&D (GERD) as % of GDP is a useful indicator. The Europe 2020 Strategy set a 3% target for R&D intensity for the EU as a whole. Romania set itself the target to increase public spending on R&D to 1% of GDP (and overall spending to 2% which includes also 1% private spending) by 2020 and plans to further up the overall spending on R&D to 3% after 2020.

The main document of government policy is the **National Strategy for Research, Development and Innovation 2014–2020**, the 3rd such document, enacted by GD 929 of 21 October 2014. The **National Research, Development and Innovation Plan 2015–2020**<sup>1</sup> (adopted by GD 583/2015) is the main instrument to implement the national strategy in Research & Innovation. At operational level, the key implementing document is the National RDI programme PNCDI 2014–2020 ('National Plan 3' or NP3).

<sup>1</sup> State aid support schemes associated with the plan were approved by ANCSI decision 9281/2015 for the following programmes: Development of the national R&D system; Increase competitiveness of Romanian economy through RDI;  
- European and international cooperation; RDI for Space Technology and Advanced Research—STAR; RDI for ultra-powerful laser technologies—ELI-RO; Participation in national and international research programmes in atomic and subatomic field; RDI for river, delta and sea systems—Danubius.

Priority fields of the national Research, Development and Innovation (RDI) strategy are:

- Smart specialisation:<sup>2</sup> Bio-economy; ICTs, security and space; Energy, Environment and Climate Change; Eco-Nano-Technologies and Advanced Materials.
- Specific national interest domains: Health; National identity and assets, Future Emerging Technologies;
- Fundamental research: Basic sciences, Materials and nano-sciences, Lasers and plasma,
- Nuclear and particles physics, Photonics.

Romania's current R&D system is underfinanced while the landscape is a mixed one. First, a clear distinction must be made between the state-owned research and development infrastructure and the private one, although both have benefited from the support of EU funds.

- State R&D
- Private R&D

### State R&D

Romania has inherited from its recent communist past a large network of R&D institutes, which previously used to serve the R&D needs of a centralised economy. Some have adapted their research activities to new market conditions, others are engaged in cutting-edge R&D activities, yet others survive only based on state funding and their existence in the current economy is difficult to justify other than as 'remnants of an outdated economy'—evidence of an incomplete transition from a planned to a market-based economy. With very few exceptions, the correlation between current market needs and the state-funded research is weak, most of the state-funded research never makes it to the market and does not always justify the public money spent on it. Rather, it continues a tradition of dependency on state funds without bringing too much value to the real economy. With notable exceptions, state-funded research in Romania does not have a commercial focus (is not conducted with the purpose of bringing new products and services to the market). Under pressure from EU, this is slowly starting to change, but there is still a lingering communist mentality in the approach to R&D in the public sector (science for science sake). However, availability of European funding for R&D has opened new avenues of development for these entities (which were set up in a different era, for an altogether different purpose—to serve the needs of a centralised economy), and some have successfully adapted and boldly taken on new challenges.

### R&D institutional architecture:

- Ministry of Research and Innovation (MRI);
- Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI) – implements the National RDI plans;
- Network of state research institutes<sup>3</sup> subordinated to or coordinated by the MRI. Of the 47 national RDI institutes the following have energy related activity:

<sup>2</sup> Initially, there were only four smart specializations (bioeconomy, ICT, energy and environment, eco-technologies), but by political decision the following were added: space and security, energy production, climate change, and new materials (Chioncel & Zifciakova, *RIO Country Report 2016: Romania, 2017*, p. 9).

<sup>3</sup> <http://www.research.gov.ro/ro/articol/4486/structuri-subordonate-si-in-coordonare>

- Institute of Atomic Physics (IFA);
- National R&D Institute for Turbomotors – COMOTI Bucharest;
- National R&D Institute for Physics and Nuclear Engineering 'Horia Hulubei' – IFIN-HH Bucharest;
- National R&D Institute for Cryogenic and Isotopes Technologies – ICSI Râmnicu Vâlcea;
- National R&D Institute for Electrical Engineering-Advanced Research – ICPE-CA Bucharest;
- National R&D Institute and Experiments for Electro-technic – ICMET Craiova;
- National R&D Institute for Energy – ICEMENERG Bucharest;
- National R&D Institute for Constructions and Urbanism and Sustainable Territorial Development – URBAN-INCERC.

▪ **Romanian Academy** has 65 research centres/departments that perform 'fundamental research' (mostly in social-economic and humanities) which results in a high-volume body of work each year. However, this academic production is disconnected from societal needs and the real economy, and has a huge delay compared to when key topics arise and are discussed by peer researchers globally (timing issue). Moreover, there is a credibility question mark that hovers over Romania's entire higher academic production (questionable quality and cases of unsanctioned plagiarism, especially in social sciences). There is also a circulation problem (almost nobody outside the Academy members themselves read its production). Consequently, Romania's research system is described as 'isolated' by the World of Research 2015 report (European Commission November 2016 study,<sup>4</sup> p. 29) with little international collaboration.

▪ **Public universities** perform rather well on the research front. Five top-performers stand out: Babes-Bolyai University, Politehnica Bucharest, University of Bucharest, Technical University Iasi, and Politehnica Timisoara. However, it must be emphasised that of the 56 public and 46 private Romanian universities in 2015, not one is in the Shanghai Top 500 universities.<sup>5</sup>

The 2015 RIO report on Romania confirms this strong legacy of the communist past in the public R&D and describes the Romanian RDI system as 'highly centralised,' with 'roughly the same number of "applied" and "fundamental" research organizations'. The institutional funding in the public R&D system is not based on performance (!), but on institutional survival needs.

#### Private R&D

Private sector investment in R&D is extremely low (Nov. 2016 EC study). Compared to the EU-28 GDP average of 1.3%, Romania's increase to 0.21% of GDP (in 2015) from 0.16% of GDP (in 2014)<sup>6</sup> is practically irrelevant. What is more staggering is to judge this % against the official Ministry of Research and Innovation statistic, according to which, there are 1,000 private companies that perform R&D.<sup>7</sup> This mismatch could indicate that either businesses do not invest significantly in local R&D and prefer to import proven Western technology, or that activities that are not R&D are mislabelled as such.

<sup>4</sup> Alfred Radauer and Laura Roman, *The Romanian Entrepreneurial Ecosystem. Background Report*, November 2016, written by Technopolis Group, Brussels for the DG for Research and Innovation.

<sup>5</sup> Mariana Chioncel, Jana Zifciakova, *RIO Country Report 2016: Romania*, JRC Science for Policy Report, 2017, p. 12.

<sup>6</sup> <https://rio.jrc.ec.europa.eu/en/country-analysis/Romania/country-report - Highlights>.

<sup>7</sup> Rolanda Predescu, *Energy Research Perspectives in Romania*, Ministry of Research and Innovation, General Directorate of RDI Policy and Programmes, presentation, June 2017. <http://www.crenerg.org/wp-content/uploads/2017/06/RO-RDI-Rolanda-Predescu-jun2017.pdf>

## Energy innovation in business sector

### Large companies:

Although multinational companies (MNC) have R&D centres in Romania (Renault Technology Romania, Honeywell Romania, Infineon Technologies, Continental Automotive, IBM, Adobe Systems, Alcatel-Lucent, Ubisoft)<sup>8</sup> private sector R&D is more developed in the ICT and automotive than in the energy sector. Moreover, there is no company from Romania in the top 1,000 EU R&D performers (EU Industrial R&D Investment Scoreboard 2016).<sup>9</sup>

National companies (NC) have a tradition of relying on cooperation with the state research institutes and universities (so, external partnerships), rather than have their own R&D departments (which is more a Western tradition). Then, companies may mislabel as 'R&D' activities that have to do with business development, market/commercial/policy analysis, technical performance studies, or support services (see for instance, Transelectrica's 2016 Annual Report<sup>10</sup>, p. 40, section 5.5–Research and development activities).

### SMEs:

A 2016 European Commission report on the Romanian Entrepreneurial Ecosystem cites the RIO 2015 report for Romania stating that 'the SME sector consists, to a large extent, of "subsistence organisations" (...). For example, in 2016 over 71% of SMEs were financing their activities from their own sources (see CNIPMMR, 2016). This figure has, nevertheless, decreased from the peak of 91% of all Romanian SMEs being entirely self-financed in 2013 (see Uritu and Popa, 2015).<sup>11</sup> The report identifies 'financial support' and poor government support as key problems for entrepreneurship. Moreover, the 'current state of funding, bureaucracy and education' are seen as inhibitors for growth.<sup>12</sup>

As far as patents are concerned, European Commission reports (2013) 'describe the Romanian patenting activity as weak. Data provided by OSIM indicates a decrease in the number both of patent applications and patent approvals. Regarding the European patents, the situation is a bit more encouraging, as the number of patent applications has slowly increased.'<sup>13</sup>

Based on ROEC's own work as a KIC InnoEnergy representative in Romania during 2015, the following observation can be made: there is a low quality of innovations incoming for business uptake and very few, who have successfully made it on the market. Too many ideas are stuck in TRL (Technology Readiness Level) 2–6 without being successfully accelerated, although they are good at idea level. Access to financing and support to start and grow business are particularly thorny issues in early stages of development.

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<sup>8</sup> Mariana Chioncel, Jana Zifciakova, *RIO Country Report 2016: Romania*, JRC Science for Policy Report, 2017, p.14.

<sup>9</sup> Idem.

<sup>10</sup> [https://bvb.ro/infocont/infocont17/TEL\\_20170427202000\\_Raport-anual-2016-ENG-de-cpostat-comp.pdf](https://bvb.ro/infocont/infocont17/TEL_20170427202000_Raport-anual-2016-ENG-de-cpostat-comp.pdf)

<sup>11</sup> European Commission – *The Romanian Entrepreneurial Ecosystem. Background Report*, written by Alfred Radauer and Laura Roman, Technopolis Group, Brussels, Belgium, November 2016, p. 18.

<sup>12</sup> UEFISCDI, p. 29.

<sup>13</sup> Curaj A., Mitroi M. & all, *Romanian Entrepreneurial Ecosystem*, UEFISCDI study, 2015, p. 24.

Moreover, 49% of Romanian companies are individual entrepreneurs which is symptomatic of a low trust society. Most Romanian entrepreneurs are self-made, not a product of a developed ecosystem, or of supportive government policy. However, there have been some improvements to the SME and R&D support policy framework in the past 3 years:

- SMEs Law (Law #346/2014)
- Business Angels Law (Law #120/2015)
- Business Incubator's Law (Law #102/2016)
- Public-private partnerships Law (Law #233/2016)
- New Tax fiscal stimuli for R&D activities (GEO 32/2016)
- Tax Code amendment (Art 22) grants a 10-year tax holiday to RDI-only companies

There exist a number of energy related clusters:<sup>14</sup> Cluster Association – Romania (CLUSTERO); Sustainable Energy Cluster-ROSENC (Timisoara); Biomass Cluster-GREEN ENERGY (Covasna County); Electrical Engineering Pole-ALL ELECTRIC (Bucharest).

Public funding for RDI<sup>15</sup> is available through:

- **National RDI Plan 2015-2020, NP3** (national budget);
- **Competitiveness Operational Programme, Axis 1**—Research, development and innovation; (structural funds + national budget). By 6 October 6 2017, already 189 contracts have been signed;<sup>16</sup>
- **ROP-Regional Operational Programme, Axis 1**—Technology transfer;
- **Ministry of Economy:** Sectoral RDI Plan (national budget).

Public funds available for SMEs & Start-ups specifically include:

- Multi-annual *de minimis* scheme for SMEs;
- SRL-D programme;
- START programme for development of entrepreneurial skills in young people;
- Programme for commercialisation of SME products and services;
- Start-Up Plus scheme.

## Success stories and main challenges

Romania's success rate in H2020 projects stands at 11%. SME participation in H2020 programmes is not so widespread either (only 77 companies). Moreover, Romania rarely has a leading role (as project coordinator or principle investigator), the vast majority of its participation is in projects lead by entities from Italy, Germany, Spain, the UK and France. In fact, Romania is known to have assumed a leadership role in just two high-profile European projects: ELI-NP (nuclear physics) accepted on the ESRI list in 2006 and Danubius-RI (research infrastructure) which was accepted in 2016.

<sup>14</sup> Rolanda Predescu, *Energy Research Perspectives in Romania* presentation, slide 7.

<sup>15</sup> Ibidem, slide 8.

<sup>16</sup> <http://www.poc.research.gov.ro/uploads/anunturi/2017/contracte-de-finantare-axa-1-poc-06-10-2017.pdf>

### Romania's participation in Horizon 2020 (all fields)

Total number of participants, total EU financial contribution € million	575 participants receiving € 93,43 m in H2020
Total number of SME participants, total EC financial contribution € million	77 SMEs receiving € 11,45 m in H2020
Number of ERC Principal Investigators, total EC financial contribution € million	4 ERC grantees receiving € 3,62 m in H2020
Number of Marie Skłodowska-Curie Actions research Fellows	27 MSCA Fellows
Number of applicants	4.916 (1,13% of EU-28)
Success rate (EU-28 = 13,5%)	11,6%
Rank in number of participants signed contracts (EU-28)	18
Rank in budget share (EU-28)	19
Top collaborative links	1. IT - Italy (888) 2. DE - Germany (748) 3. ES - Spain (722) 4. UK - United Kingdom (677) 5. FR - France (561)

Source: Romania country profile,<sup>17</sup> Research & Innovation Horizon 2020, 24 October 2017

The top largest Romanian beneficiaries of H2020 funding is dominated by the state executive agency (UEFISCDI)—which is also the main distributor of national funding, four public universities (two with technical focus), one state institute, two big NGOs (NEC and CRE), and two big companies (SIVECO and Siemens). Not one SME. See below:

#### Top 10 Romanian beneficiaries of EC financial contribution granted in H2020

Name	Number of Participants	EC financial contribution € million
Unitatea Executiva pentru Finantarea Invatamantului Superior, a Cercetarii, Dezvoltarii si Inovarii (UEFISCDI)	35	7,71
SIVECO ROMANIA SA	9	4,04
UNIVERSITATEA POLITEHNICA DIN BUCURESTI (UPB)	19	3,93
INSTITUTUL DE CHIMIE MACROMOLECULARA PETRU PONI (ICMPP)	3	2,66
UNIVERSITATEA TEHNICA CLUJ-NAPOCA (UTC)	9	2,51
CENTRUL ROMAN AL ENERGIEI - CRE	5	2,47
UNIVERSITATEA BABES BOLYAI (UNIVERSITATEA BABES-BOLYAI)	6	2,00
UNIVERSITATEA DIN BUCURESTI (UB)	13	1,85
FUNDATIA NOUA EUROPA (NEC)	2	1,61
SIEMENS SRL	7	1,57

Source: Romania country profile,<sup>18</sup> Research & Innovation Horizon 2020, 24 October 2017

<sup>17</sup> EC, Romania country profile, 24 October 2017: [http://ec.europa.eu/research/horizon2020/pdf/country-profiles/ro\\_country\\_profile\\_and\\_featured\\_projects.pdf#zoom=125&pagemode=none](http://ec.europa.eu/research/horizon2020/pdf/country-profiles/ro_country_profile_and_featured_projects.pdf#zoom=125&pagemode=none)

<sup>18</sup> EC, Romania country profile, 24 October 2017: [http://ec.europa.eu/research/horizon2020/pdf/country-profiles/ro\\_country\\_profile\\_and\\_featured\\_projects.pdf#zoom=125&pagemode=none](http://ec.europa.eu/research/horizon2020/pdf/country-profiles/ro_country_profile_and_featured_projects.pdf#zoom=125&pagemode=none)

As far as energy innovation projects are concerned, Romania participates in a variety of projects led by other countries (in nuclear, transportation, RES integration, smart grids).

**Romanian participation in Horizon 2020 energy innovation projects**

Sector	Project acronym	Topic	Coordinator	Romanian participant	Funded under
Nuclear	Eurofusion <sup>19</sup>	Energy fusion	Germany	Institute for Atomic Physics (IFA)	Horizon 2020-Euratom
Nuclear	FUSENET <sup>20</sup>	European Fusion Education Network (FUSENET) - education in fusion science & technology	Netherlands	UAIC Iasi	FP7-EURATOM-FUSION
Nuclear	EURANOS <sup>21</sup>	Radiation protection	Germany	HH National R&D Institute for Nuclear Physics & Engineering	FP6-EURATOM-RADPROT
Transport	ARMEVA <sup>22</sup>	Nextgen electric motors	Belgium	Technical University Cluj Napoca	FP7- Transport
Transport	Prominent <sup>23</sup>	Greener ships	Netherlands	Navrom	H 2020 – EU.3.4 – smart, green transport
SME Research	COELUX <sup>24</sup>	sky light reconstruction in artificial illumination	Italy	Griffin Software SRL	FP7-SME

<sup>19</sup> More about Eurofusion here: [http://cordis.europa.eu/project/rcn/193159\\_en.html](http://cordis.europa.eu/project/rcn/193159_en.html)

<sup>20</sup> More about Fusetnet here: [http://cordis.europa.eu/project/rcn/89516\\_en.html](http://cordis.europa.eu/project/rcn/89516_en.html)

<sup>21</sup> More about Euranos here: [http://cordis.europa.eu/project/rcn/74116\\_en.html](http://cordis.europa.eu/project/rcn/74116_en.html)

<sup>22</sup> More about Armeva here: [http://cordis.europa.eu/project/rcn/110867\\_en.html](http://cordis.europa.eu/project/rcn/110867_en.html)

<sup>23</sup> More about Prominent here: [http://cordis.europa.eu/project/rcn/193260\\_en.html](http://cordis.europa.eu/project/rcn/193260_en.html)

<sup>24</sup> More about Coelux here: [http://cordis.europa.eu/project/rcn/98534\\_en.html](http://cordis.europa.eu/project/rcn/98534_en.html)

Transport	Plus-Moby <sup>25</sup>	Solar-powered EVs	Italy	ICPE SA	FP7-TRANSPORT
Batteries/ Electrochemical storage	SOMABAT <sup>26</sup>	Development of novel SOLID MAterials for high power Li polymer BATteries	Spain	Timisoara Chemistry Institute (Romanian Academy)	FP7-NMP
Energy - RES	GROUND-MED <sup>27</sup>	Prove geothermal heat pump systems (GSHP) for H&C in 8 demonstration sites in South Europe	Greece	Oradea University	FP7-ENERGY
Electricity networks- distributed gen, RES	ADDRESS <sup>28</sup>	Active Distribution networks with full integration of Demand and distributed energy RESourceS	Italy	Enel Distributie Dobrogea	FP7-ENERGY

*Source: CORDIS database (success stories), selection by Eugenia Gusilov*

The following energy sub-fields have experienced positive developments in R&D:

- Nuclear
- Smart grids
- E-mobility

## Nuclear

The nuclear field features Romania's biggest success stories in terms of attracting meaningful European financing and building world-class research facilities. Romania's star research project is ELI-NP.

<sup>25</sup> More about Plus-Moby here: [http://cordis.europa.eu/project/rcn/110642\\_en.html](http://cordis.europa.eu/project/rcn/110642_en.html)

<sup>26</sup> More about Somabat here: [http://cordis.europa.eu/project/rcn/97647\\_en.html](http://cordis.europa.eu/project/rcn/97647_en.html)

<sup>27</sup> More about GROUND-MED here: [http://cordis.europa.eu/project/rcn/90316\\_en.html](http://cordis.europa.eu/project/rcn/90316_en.html)

<sup>28</sup> More about ADDRESS here: [http://cordis.europa.eu/project/rcn/100636\\_en.html](http://cordis.europa.eu/project/rcn/100636_en.html)

## ELI-NP

The ESFRI Project ELI—Extreme Light Infrastructure—is a pan-European research project which is hosted in three countries: the Czech Republic, Hungary and Romania. The three pillars of the project are: ELI–Beamlines (Prague, the Czech Republic), ELI–Attoseconds (Szeged, Hungary), and ELI–NP (Bucharest, Romania). The Romanian leg of the ESFRI Project ELI is developed in Magurele and overseen by the National Institute of Physics and Nuclear Engineering Horia Hulubei (IFIN–HH<sup>29</sup>). It is a flagship investment project, the largest so far in Romania’s R&D system and reflects the collaborative effort of two scientific communities (high-power lasers and nuclear physics). The project will result in an interdisciplinary research facility and, therefore, consists of two systems:

- High-Power Laser System
- High-Brilliance Gamma Source

Scheduled to become operational in early 2019, ELI–NP will be the most advanced European and global research facility dedicated to the study of photonuclear physics and its applications (in nuclear materials, radioactive waste management, material science and life sciences). ELI–NP was selected by the most important science committees in Nuclear Physics in Europe—NuPECC—in the Nuclear Physics Long Range Plan in Europe as a major facility.<sup>30</sup>

Implementation: the project is financed from structural funds in two cycles:

The first phase (2013–2015) focused on the recruitment of specialised staff, the components of the first 10PW laser in the world, the first part of gamma beam system and civil constructions. Total investment in Phase 1 was €179,988,881 (with €149,390,771 from ERDF funded through the ‘Increase Economic Competitiveness,’ Priority—‘Research, Technological Development and Innovation for Competitiveness’ (2007–2013)).<sup>31</sup>

The second phase (2017–2017) has been approved for financing by the European Commission in 2016. Total investment is €205,192,326 with an ERDF contribution of €140,643,176 through the 2014–2020 ‘Competitiveness’ OP.<sup>32</sup>

**ALFRED** (Advanced Lead Fast Reactor European Demonstrator) is a generation IV nuclear reactor technology. This is a demonstrative prototype for Lead Fast Reactors (LFR) technology. The project is developed by the FALCON consortium comprised of RATEN and ICN (Romania), Ansaldo Nucleare and ENEA (Italy), and Czech Republic. The pilot will have a total power of 300 MW<sub>th</sub> and will be developed at the Nuclear Research Institute (ICN) in Pitesti, Romania.<sup>33</sup> The project has two stages:

- Phase 1 (2014–2015): preparatory activity carried out as non-incorporated entity

<sup>29</sup> IFIN–HH alone accounts for 10% of the national scientific output.

<sup>30</sup> More about ELI-NP here: <http://www.eli-np.ro/>

<sup>31</sup> [http://ec.europa.eu/regional\\_policy/en/projects/major/romania/romania-welcomes-world-class-physics-project](http://ec.europa.eu/regional_policy/en/projects/major/romania/romania-welcomes-world-class-physics-project) , 22 May 2013.

<sup>32</sup> [http://ec.europa.eu/regional\\_policy/en/projects/romania/new-r-d-facility-in-romania-to-undertake-research-in-nuclear-physics](http://ec.europa.eu/regional_policy/en/projects/romania/new-r-d-facility-in-romania-to-undertake-research-in-nuclear-physics) , 23 March 2017

<sup>33</sup> <http://www.research.gov.ro/ro/articol/4522/alfred-advanced-lead-fast-reactor-european-demonstrator>

- Phase 2 (>2015): actions as a consortium

Although the consortium agreement was signed in December 2013, it is still in early stages. To this date, it is not known for ALFRED to have been able to secure financing, but its efforts are targeting EU funding for R&D infrastructure.

The nuclear industry fares well also in terms of fostering international cooperation. For instance, **Technologies for Nuclear Energy State Owned Company (RATEN34)** has an impressive track record of participation in H2020 and FP 7 projects: 19 projects of which in two (NEWLANCER and ARCADIA) it has as a coordinator role.<sup>35</sup>

RATEN participation in H2020 and FP7 projects

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
FORGE											
STYLE											
IPPA											
NEWLANCER			Coordinator	Coordinator	Coordinator						
MATTER											
SEARCH											
MAXSIMIA											
ARCADIA			Coordinator	Coordinator	Coordinator	Coordinator	Coordinator	Coordinator			
ASAPMSA-E											
EAGLE											
MARISA											
NUGENIA +											
PLATENSO											
ESNII +											
MATISSE											
CAST											
JOPRAD											
CEBAMA											
FASTNET											

Source: RATEN

RATEN carries on nine research projects together with IAEA in Vienna, and has working relationships with partner organisations in France, Canada, Belgium, Italy and the USA.

## Smart grids

A requirement of EU Directives, the field has known a slow development in Romania, although there is an Action Plan for implementation of smart grids in Romania approved by order of the Economy Minister since 2010. There are a few pilot smart grids projects.

### Two Brasov smart grid projects

- Smart Grid Brasov is one of the first such project in Romania. Implemented by Electrica (state-owned distribution utility) together with Ormazabal and Flashnet, in 2010, the Brasov pilot covered 7 transformer points and implemented the PRIME (Powerline Intelligent Metering Evolution) standard. Project uses 'medium voltage (MV) as a backhaul pipe, pulling voltage and current measurements to detect grid events on the low voltage (LV) lines and read meters using simple power line

<sup>34</sup> RATEN has two subsidiaries: RATEN managed two Subsidiaries: Institute for Nuclear Research Pitesti (RATEN ICN) and Center of Technology and Engineering for Nuclear Projects, București Magurele (RATEN CITON)

<sup>35</sup> [https://www.raten.ro/?page\\_id=180&lang=en](https://www.raten.ro/?page_id=180&lang=en)

communications (PLC) networking technologies'.<sup>36</sup> The first stage covered 5–10,000 residential and industrial customers and was worth €5–7 million, to be followed up by smart meters deployment in all Brasov homes.<sup>37</sup>

- The first private smart grid project implemented in Romania, in 2012, is located also in Brasov. ICCO selected Lockheed Martin to implement a smart grid in its industrial park in Ghimbav, Brasov. The project integrated PVs and wind turbines supplied by American companies (Tenksolar, Helios and Windstream Technologies) and costed \$12 million.<sup>38</sup>

**Ploiesti smart grid** was implemented by Electrica Muntenia Nord together with Eximprod Group and Flashnet in 2013. Project consists of implementing a medium voltage data communications network for SCADA transmissions between the transformer stations (on the existing grid).<sup>39</sup>

Interest in smart grids has picked up lately with Romania's participation in topical projects increasing in the past couple of years. The Romanian energy companies lobby association (CRE) reports being a partner in five EU-financed projects as of 2016:

- **SUCCESS** – Securing Critical Energy Infrastructures<sup>40</sup> (together with Electrica), Romania is one of the three trial sites;
- **RE-SERVE** – Renewables in a Stable Electric Grid<sup>41</sup> (together with Transelectrica and Politehnica Bucharest). The Germany-lead project aims to 'stabilise energy systems with up to 100% RES to generate 'RESERVEs' so that society can relax in the knowledge that it has a stable and sustainable energy supply' and features research into new energy system concepts. Romania is one of the two trial sites (focus is on lab based frequency control for a 100% RES scenario);
- **WISEGRID** – Wide-scale demonstration of Integrated Solutions and business models for European smart GRID<sup>42</sup> (novel mechanisms for the grid that will integrate storage technologies, demand response schemes, increased RES, and large-scale charging infrastructure for EVs);
- **CROSSBOW**<sup>43</sup> (together with Transelectrica) will research cross-border management of RES and storage. Project just started (November 2017) and will run until October 2021.
- **NRG5** – Enabling Smart Energy as a Service via 5G Mobile Network advances (together with Romgaz).

The **Smart City Sibiu** project is another example of sustainable city-level planning for the future. It has a modular architecture which includes a smart grid component, alongside smart meters, storage, RES integration, public lighting, energy efficiency in buildings, EVs, high energy efficiency cogeneration, etc. The Municipality of Sibiu adopted the *Sibiu Smart City—Sustainable Energy Action Plan*<sup>44</sup> in April 2014, the implementation of which is estimated at €291 million over the period 2014–2020. The city has chosen the HIPODROM district (a residential area in the southern part of the city) as the area for the pilot 'Smart District Hipodrom'.

<sup>36</sup> <http://inteligrid.eu/portfolio/brasov-smart-grid-project/>

<sup>37</sup> <https://www.ormazabal.com/sites/default/files/descargas/Case-Study-I-Electrica-SA.pdf>

<sup>38</sup> <https://2016.export.gov/romania/csbucharesthighlights/2012events/smartgrid/index.asp>

<sup>39</sup> <http://inteligrid.eu/portfolio/ploiesti-smart-communication-network/>

<sup>40</sup> More about the project here: <http://www.success-energy.eu/what.html>

<sup>41</sup> More about the project here: <http://www.re-serve.eu/what.html>

<sup>42</sup> More about the project here: <https://www.wisegrid.eu/about>

<sup>43</sup> More about the project here: [http://cordis.europa.eu/project/rcn/211949\\_en.html](http://cordis.europa.eu/project/rcn/211949_en.html)

<sup>44</sup> [http://www.sibiu.ro/ro2/paed/memoriu\\_anexe\\_PAED-SIBIU\\_ONLINE\\_final.pdf](http://www.sibiu.ro/ro2/paed/memoriu_anexe_PAED-SIBIU_ONLINE_final.pdf)

## E-mobility

At the end of 2015, according to Ministry of Interior data, Romania had a registered vehicle fleet of 5,153,182 cars, of which:

- 3,240,472 (on gasoline) – 63%
- 1,905,592 (on diesel) – 37%
- 7,118 (other fuel: EV, hybrid, plug-in hybrid, CNG) – 0.14%

So, Romania currently has a very low uptake of alternative fuel cars: < 0.14% (2015).

Car sales in Romania by fuel type (2011–2015)

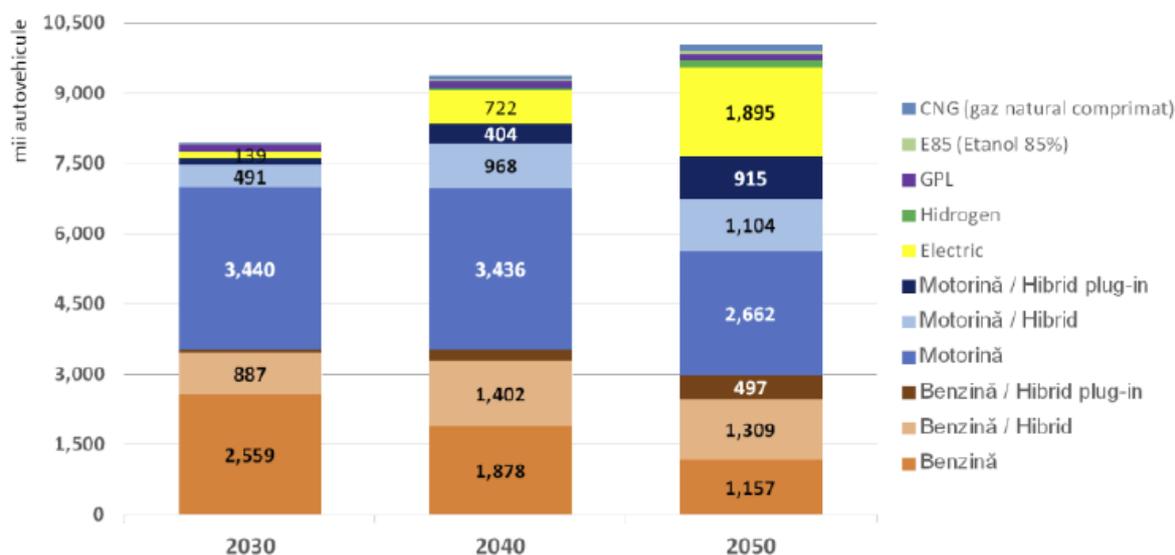
Fuel	2011	2012	2013	2014	2015
Diesel	39,122	37,025	36,895	46,767	52,631
Gasoline	55,497	35,151	31,575	35,805	45,199
EV + Hybrid	5	1	234	236	495
<b>Total</b>	<b>94,624</b>	<b>72,177</b>	<b>68,704</b>	<b>82,808</b>	<b>98,325</b>

Source: APIA statistic

**NOTE:** EV + Hybrid category includes: **FCV** = Fuel Cell Vehicle; **HEV** = Hybrid Electric Vehicle, uses both electricity and gasoline/diesel (can be gasoline hybrid, gasoline hybrid plug-in, diesel hybrid, diesel hybrid plug-in); **CNG** = Compressed Natural Gas vehicle.

The newly completed Romanian Energy Strategy 2016–2030 has been criticised for its conservative view and slow projection for EV deployment: 'For Romania, it is not fit to burn through these steps (of EV deployment) faster than it is economically efficient, except for some support schemes limited to the development of the public recharge infrastructure and a marginal support to the market in the early stages of development' (p. 99). In translation: do not expect a meaningful governmental support for EV development until 2030.

### Romania's car fleet development 2030–2050 (forecast)



Source: PRIMES model, Romania's Energy Strategy 2016-2030

However, the conservative view of the strategy drafted in 2016 is not reflected by the recent governmental measures which are quite generous towards EVs. The Rabla Plus programme for 2017 offers a €10,000 subsidy for the purchase of a new EV. Moreover, in July 2016, Romania approved a support scheme for the development of charging infrastructure, a programme that targets 6,000 charging stations by 2020. However, the starting point is low since, according to the Environment Fund Agency (AFM), in May 2016 there were only 55 charging points in Romania (22 of which in Bucharest).

Municipalities are also making progress on the EV infrastructure front: Bucharest Municipality plans to add some 30 new charging points in the near future.<sup>45</sup> Suceava will have 28 EV charging points operational in the next period (a project financed through Swiss grants) and will allow their free use over the next 5 years (costs to be covered by the city hall).<sup>46</sup>

NEXT-E, a project developed by MOL and E.ON received this year a €18.8 million financing through Connecting Europe Facility (CEF), the largest sum granted to an EV project, in order to develop a network of 222 fast charging stations (50 kW) and 30 ultra-fast (150–350 kW) in the Czech Republic, Slovenia, Hungary, Croatia and Romania. As part of this project, 40 fast chargers will be installed in Romania (21 by MOL and 19 by E.ON) by 2020.<sup>47</sup>

<sup>45</sup>[http://www.hotnews.ro/stiri-administratie\\_locala-21848309-primaria-capitalei-amenaja-30-statii-alimentare-pentru-masini-electrice.htm](http://www.hotnews.ro/stiri-administratie_locala-21848309-primaria-capitalei-amenaja-30-statii-alimentare-pentru-masini-electrice.htm)

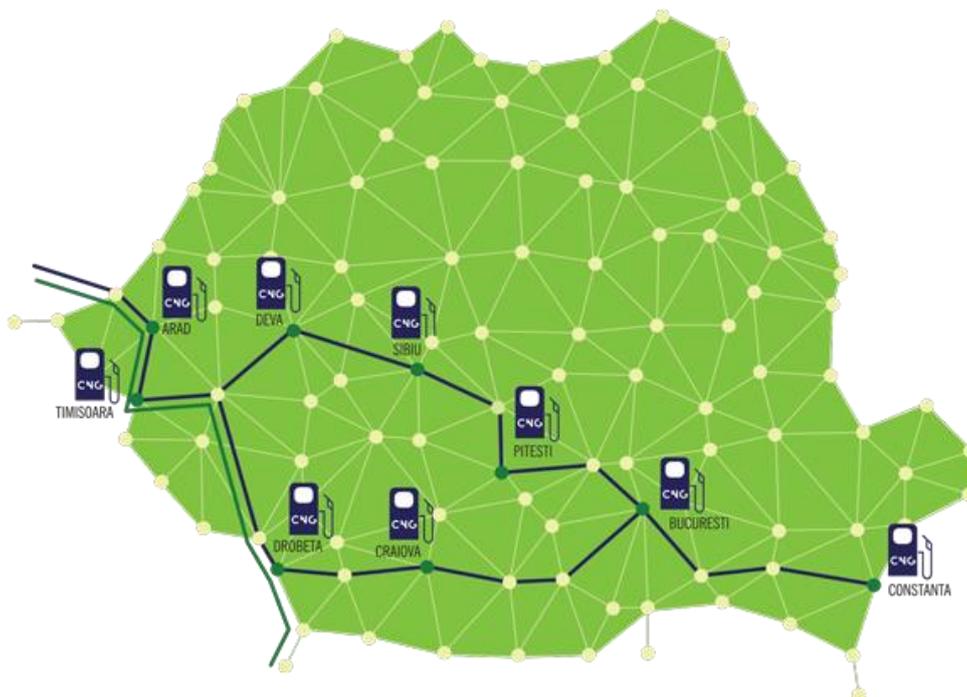
<sup>46</sup><http://www.administratie.ro/statiile-de-incarcare-a-autovehiculelor-electrice-vor-fi-functionale-din-aceasta-luna-la-suceava/>

<sup>47</sup><https://molromania.ro/ro/despre-mol/relatii-cu-media/stiri/15863-consortiul-next-e-si-ue-semneaza-un-acord-de-finantare-pentru-252-de-statii-de-incarcare-rapida-si-ultrarapida-pentru-autovehicule-electrice-in-europa-centrala-si-de-est>

Against this background, Romania is also involved in projects researching the future of e-mobility. For instance, during 2013–2016, ICPE (National R&D Institute for Electrical Engineering) was involved in the **Plus-Moby** (Premium Low weight Urban Sustainable e-MOBility) project lead by Italy and financed by European funds (FP7 Transport). ICPE designed, modelled, simulated and developed a synchronous reluctance motor (PMaSyR).<sup>48</sup>

The **CNG infrastructure in Romania** has received a significant boost through the project 'CNG ROMANIA: Initial Market Deployment of a Refuelling Station Network along the Core Network Corridors'. With a total estimated cost of €5.2 million (of which €4.4 million EU contribution), the project aims to build 9 CNG stations by the end of 2019 in the following cities: Constanta, Bucharest, Craiova, Drobeta Turnu-Severin, Deva, Pitesti, Sibiu, Arad and Timisoara.

First CNG refuelling network in Romania



Source: <http://cngromania.eu/>

The project is coordinated by Denisson Energy SRL, is overseen by the Innovation and Networks Executive Agency (INEA) and was financed through the Connecting Europe Facility (CEF)–Transport.

An association for CNG producers and users (*Asociația Producătorilor și Utilizatorilor Gazului Natural Comprimat, APUGNC*) was established in Romania in 2015. ENGIE Romania, IVECO Romania and Denisson Energy are members in this association. In August 2017, the government submitted for public consultation a 'National Framework Policy for Development of an Alternative Fuel Market in Transport and Relevant Infrastructure' which proposes to build 54 CNG stations by 2020 in Romania.

<sup>48</sup> For more details, see: [http://cordis.europa.eu/result/rcn/174271\\_en.html](http://cordis.europa.eu/result/rcn/174271_en.html)

## Lessons learned

An analysis of the energy projects financed with European funds during 2007–2013 shows that investments made in energy during that period were mainly in renewable projects and modernisation of electricity and natural gas networks. Most of the projects supported by structural funds were financed through OP Increased Economic Competitiveness (Axis 4) and, indirectly, through OP environment. During 2007–2013, structural funds contributed to the implementation of SCADA system in the entire Transgaz network. Structural funds have also financed the first city in Romania to be heated entirely with geothermal energy (more than 200,000 Gcal of annual heat consumption). The project 'Beius–geothermal city' worth €4.3 million was funded through SOP—Increased Economic Competitiveness (Axis 4).<sup>49</sup> Applications of geothermal energy in heating and electricity are at a very early stage in Romania, and geothermal energy received very little attention in the past years (despite being eligible for the RES support scheme). Overall, European funding attracted by the energy sector in 2007–2013 was focused on RES project development and energy system modernisation.

In the current financial exercise (2014–2020) OP Competitiveness–Axis 1, has various actions for R&D: 1.1.1–Big research infrastructure; 1.1.2–Development of networks for R&D centres; 1.1.3–Creating synergies with H2020; 1.1.4–Attracting staff from abroad; 1.2.1–Stimulate SME demand for innovation through RDI projects. Most of the 189 contracts already signed (in all fields) by 6 October 2017, under OP Competitiveness–Axis 1, are with universities and national R&D institutes. Some of them are for energy projects, for instance:

- with the National R&D Institute in Rm. Valcea (hydrogen-based storage of RES-E);
- with Iasi Technical University (eco-innovating products and services for energy efficiency in construction);
- with Cluj-Napoca Technical University (a €3 million project on advanced technologies for smart urban EVs);
- with Smart Renewables (for development and production of an energy storage solution);
- with ALRO Slatina (an €8 million investment in its R&D department).<sup>50</sup>

The main driver of innovation (in all sectors) are the EU policies and funds. Aside from the few high-prestige R&D projects, innovation in energy is not monitored by a specific institution, but rather reported in an aggregate manner together with research projects in other fields (by the Ministry for Research and Innovation or by the Operational Programmes). There is significant room for growth in innovation in general, and energy innovation in particular, and the role of European funds is critical for the development of R&D both in the private and public sectors and for boosting confidence and strengthening Romanian home-grown R&D activities.

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<sup>49</sup> <http://www.primariabeius.ro/pagina/orasul-geotermal>

<sup>50</sup> <http://www.poc.research.gov.ro/uploads/anunturi/2017/contracte-de-finantare-axa-1-poc-06-10-2017.pdf>

**Romania Energy Center (ROEC)** is Romania's first English language energy studies think tank, an independent non-governmental organisation focused on energy research, analysis and consulting. ROEC specialises in custom-made research and analysis for informed decision-making. We focus on energy markets and infrastructure, diagnostic and trend analysis, forecasting, energy policy, political risk assessment, monitoring of the energy regulatory framework. ROEC's mission is to engage Romanian and foreign energy professionals on various energy matters, to tackle analysis worthy topics that escape the radar of the public eye, to enrich the current understanding of South East European energy markets with a strong Romanian perspective. ROEC publishes research and policy papers, briefs, studies, special reports, outlooks, expert commentaries and articles on various topics of interest.

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