

Summary report on research accreditation

I. General information

Name of organization	Institute of Power Engineering of the ASM
Organization type (<i>to underline</i>)	<u>Research institute</u> High education institution Ministerial research institute
Research direction (s) of organization	Increasing the efficiency of power sector and ensuring of energy security, including use of renewable resources; development of innovative technical solutions for equipment using in interconnection of two power systems; development of optimal scenario for implementation of Moldova's energy strategy by 2030 considering both afferent costs and consumers payment capacity; strengthening power system and decreasing energy intensity through innovative solutions; scientific support in deployment of renewable energy resources in Moldova; improving the methods for monitoring and analysis of energy security level.
Correlation with strategic research direction (s) of activity in the field of science and innovation for 2013-2020	16.02 and 18.02. "Energy Efficiency and use of renewable energy sources" Priority II. Efficiency of power sector and ensuring of energy security, including use of renewable resources
Evaluated period	2010-2014
Web of organization	www.ie.asm.md

II. Research capacity (annual average for evaluated period)

Total number of employees	61.8					
Number of scientific researches	34.2					
Number of researches who possess honorific titles, scientific degrees, scientific and scientific-didactical titles	ASM full members 2.0	ASM corresp. members -	Professor -	Associated professor 4	Dr.hab. 6	Dr. (PhD) 14.6
Number of researches involved in international projects	European Commission programmes FP7 – 4	United Nations programmes and funds -		Bilateral programmes financed from the national budget 2.8		Others 10.6
Number of young researches (under 35 years old)	PhD students 2.4			Others 11.4		
Financial resources - revenues (thousand MDL)	Public budget 2958.5			Special means 251.7		
Categories of special means (thousand MDL)	National 130.2			International 121.5		
Distribution of expenditures (thousand MDL)	Salary 2740.3	Procurement of scientific equipment 29.5		Traveling for scientific purposes (travel, accommodation, per-diems, etc.) 139.3		Other 139.3

			49.4	
List of 3 basic research methods, installations, technologies (per accredited field)	<ol style="list-style-type: none"> 1. Mathematical model of power system (RASTR) 2. Device for measurement of energy quality TS3600 3. Simulink modeling of power system elements (MATLAB) 			
List of provided scientific services	<ol style="list-style-type: none"> 1. Analysis of losses level in distribution network of enterprises and elaboration of measures for their decreasing 2. Energy audits of public building and outdoor lights systems including measures for decreasing energy consumption 3. Regimes analysis of district heating system and recommendation for its performance improvement 			
List of editorial activities	journal “Problems of the Regional Energetics”/ “Problemele energeticii regionale”, ISSN 1857-0070; category B http://journal.ie.asm.md/ro/home			

III. Distribution of number of research projects and themes during evaluated period

ASM institutional projects	2010 2	2011 2	2012 2	2013 2	2014 2
ASM projects in the frame of State Programmes	2010 2	2011 -	2012 -	2013 -	2014 -
ASM technological transfer projects	2010 -	2011 -	2012 -	2013 -	2014 -
ASM projects for equipment procurement	2010 -	2011 -	2012 -	2013 -	2014 -
ASM projects for young researches	2010 -	2011 -	2012 -	2013 -	2014 -
ASM projects in the frame of bilateral programmes	2010 1	2011 1	2012 -	2013 -	2014 1
International projects/grants	2010 -	2011 2	2012 2	2013 1	2014 1
List of 3 representative international projects/grants	<ol style="list-style-type: none"> 1. Newsletter of PROMITHEAS – „The Energy and Climate Policy Network” Program „PROMITHEAS-1/EU-BSEC“. 2. STCU no. 5388 from 2010. „Development, manufacture and testing of sample transformer quick gap adjustment of the routing phase thyristor” 3. STCU - 5842. “Investigation of transport drive systems on the base of inverters with algorithms of synchronized space-vector modulation” 				
Research contracts	2010 1	2011 2	2012 1	2013 5	2014 10
List of 3 representative research contracts	<ol style="list-style-type: none"> 1. Contract no. 35/14 from 04 August 2014. Energy audit of lyceum “Grigore Vieru”, city Nisporeni. 2. Contract no.127 from 09.09.2014. Energy audit of Nisporeni cardiologic hospital 3. Contract no.28 from 04.08.2014. Energy audit for theoretical lyceum “Gr.Vieru”, Iurceni, Nisporeni district 				

IV. Scientific publications

Total number of publications abroad	Books -	Chapters in books -	Journal papers 42	Conference abstracts 33
Total number of publications in ISI and SCOPUS journals and books	Books -	Chapters in books -	Journal papers 6	
Total number of publications in the country	Books 3	Chapters in books -	Journal papers 75	Conference abstracts 51
List of 5 representative publications (per accredited field)	<ol style="list-style-type: none"> 1. BERZAN VLADIMIR; TIRSU MIHAI; ILIESCU PAVEL. Calculation of Electric Circuit rules of Sources and Distributed Loads. ICHQP 2014. 16th International Conference on Harmonics and Quality of Power (ICHQP). Bucharest, Romania, 25-28 May 2014. SESSION 6C - Renewable Generation/Distributed Generation and Power Quality. IEEE (Journal, Magazine, Conference, Book). ICHQP_187. 978-1-4673-6487-4/14/\$31.00 ©2014 IEEE 2. CALININ LEV; GOLUB IRINA; ZAIȚEV DMITRII; TÎRȘU MIHAI. The main technical characteristics of the phase difference adjusting device with two transformers. FOREN 2014 - The 12th WEC Central & Eastern Europe Regional Energy Forum. Key ISSUE 4. INTEGRATING RENEWABLE ENERGY SOURCES INTO THE ELECTRICITY TRANSMISSION GRID. București, 21-26 iunie 2014 3. OLESCHUK V. and BARRERO F. Standard and Non-Standard Approaches for Voltage Synchronization of Drive Inverters with Space-Vector PWM: A Survey,” International Review of Electrical Engineering (IREE), vol. 9, no. 4, pp. 688-707, 2014. ISSN 1827-6660, United Kingdom, London, ICV 17.21 4. OLESCHUK V. and ERMURATSKII V. Combined Topology of Quad-Inverter Six-Phase Motor Drive with Synchronized PWM. Proc. of the IEEE Power Electronics and Motion Control Conf. (PEMC'2014, Antalya, Turkey), pp. 1159-1165, 2014. ISBN 978-1-4799-2062-4 5. ANDRONATI, N.R.; SPIVAK, V.M.; MLADENOV, GH.M.; BERZAN, V.P.; BOGDAN, A.V.; COLEVA, E.GH.; TÎRȘU, M.S.; GOLOVANOV, N. Introduction in modern micro and nanoelectronic. – Ch.: ASM Houseprint, 2013. – 340 p. ISBN 978-9975-62-357-5. 			
List of 5 citations	<ol style="list-style-type: none"> 1. V.OLESCHUK, F.BARRERO. Standard and Non-Standard Approaches for Voltage Synchronization of Drive Inverters with Space-Vector PWM. International Review of Electrical Engineering (Impact Factor: 1.36). 04/2014; 9(4). DOI: 10.15866/iree.v9i4.1852. 6 citations 2. V.OLESCHUK, G.GRANDI, P.SANJEEVIKUMAR. Simulation of Processes in Dual Three-Phase System on the Base of Four Inverters with synchronized Modulation. Advances in Power Electronics Journal, Hindawi Publishing Corporation, US 09/2011; 2011:1-9. DOI: 10.1155/2011/581306. 8 citations. 3. G.GRADITI, G.GRIVA, V.OLESCHUK. Overmodulation control of five-phase inverters with full DC-bus voltage utilization DOI: 10.1109/SPEEDAM.2010.5542120 Conference: Power Electronics Electrical Drives Automation and Motion (SPEEDAM), 2010 International Symposium on Source: IEEE Xplore. 3 citations 			

	<p>4. TIRSHU, M.; BERZAN, V.; BOGDAN, A.; ORLOV, A. Energy-effective electrical converters of solar energy based on semiconductor nanomaterials and their use in lighting systems of premises. Modern Problems of Radio Engineering Telecommunications and Computer Science (TCSET), 2012 International Conference. 3 citations</p> <p>5. BYKOVA, E.; BERZAN, V.; MORARI, L.; CHINIK, M.; GRODETSKY, M. Analysis of evolution indicators of energy security in electricity and heat sector of the Republic of Moldova. Electrical and Electronics Engineering (ISEEE), 2013 4th International Symposium 3 citations</p>
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V. Innovation outputs

Total number of patents	Registered in the country 24	Registered abroad -	Implemented 1
Total number of new developed methods and technologies	Registered 17	Non-registered -	Implemented 2
Total number of new scientific products	Registered 5	Non-registered -	Implemented -
List of 5 representative innovation outputs (per accredited field)	<p>1. ŞIT Mihail, IOIŞER Anatolii, ŞIT Boris, <i>Installation for pasteurization and cooling of milk products</i>, Patent MD 4256. 2014-05-31.</p> <p>2. ERMURACHI, IURIE; BERZAN, VLADIMIR. <i>An apparatus for converting AC to DC voltage (variations)</i>. Patent. 742 Y, BOPI 2/14, p.39.</p> <p>3. TÎRŞU, M.; UZUN, M.; SPEIAN, A.; BERZAN, V.; ANISIMOV, V. <i>Electric lighting system</i>. Patent MD 576 Z 2013.07.31.</p> <p>4. TÎRŞU, M. <i>Electric welding installation</i>. Patent MD 4185 C1 din 2013.06.30</p> <p>5. ŞIT, M.; IOIŞER, An.; ŞIT, B.; IOIŞER, Al. <i>The heat pump with vortex tube</i>. Patent MD 4208. 2013.02.28.</p>		

VI. Other outputs

Total number of scientific outputs for central and local authorities (draft of law, strategies etc.)	17		
Total number of scientific outputs for educational institutions	Handbooks for high education 2	Handbooks for pre-university institutions 1	Number of researchers – supervisors of license and master theses 11

VII. Major scientific and innovation achievements

Short description of main scientific results and its confirmation (by awards, citations, development of international projects etc.)	<p>13 scenarios on energy supply including estimation of energy security level were examined. It was demonstrated that switch off of CHP-1 will decrease the energy security level by 18% and of CHP-2 - by 100%. In the case of increasing by 40% of CHP-1 capacity, the energy security level will increase by 20%. If CHP-2 capacity grows by 100%, a normal situation in the electricity sector will be reached.</p> <p>It was demonstrated that increase of the cogeneration capacity by 500-600</p>
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	<p>MW will ensure the reduction of power losses in the Moldova-Ukraine power system by 21-24 MW and in the national power system - by 3-3.5 MW. The cogeneration on existing plants can diminish the primary energy consumption in the country above 100 thousands c.c.t. per year.</p> <p>The mathematical models of 0.4-100kV grids, which allow connecting of generation sources and including 110 kV OHL of SCEL (self-compensated controlled electrical lines) type, were elaborated.</p> <p>The energy balance for period 2014-2017 in accordance with practices existing in the EU was forecasted and submitted to the Ministry of Economy.</p> <p>The best option for Moldova power system accession to ENTSO-E based on existing policy documents in energy sector was defined.</p> <p>It was determined the economic impact of renewable electricity to meet the demand based on consumers' ability to pay.</p> <p>A lot of new innovative technical solutions concerning the use of heat pumps with ecological agent in various branches of the national economy having a COP 15-20% higher than the existing ones were developed.</p> <p>The innovative variants on construction of efficient both solar and solar-energy fuel greenhouses including mathematical models for their thermal regimes calculation were elaborated and tested.</p> <p>The importance of mentioned results are confirmed by realization of international projects:</p> <ol style="list-style-type: none"> 1. STCU, Project 5842. Power Electronic Converters with Synchronized Modulation for Electric Vehicles and for Photovoltaic Systems. 2. 09.808.05.01A. Coaxial resistive layer structure of the new generation of converters for measuring high voltage (35-110 kV) AC. 3. 10.820.06.15UA (bilateral Moldova-Ukraine) "Conversion of solar radiation into electrical energy based on photovoltaic transducers (batteries)". 4. STCU: 11.820.06.09 STCU.A / 5388. The development, manufacture and testing of sample transformer quick gap adjustment of the routing phase thyristor. 5. PROMITHEAS-4 Nr. 265 182 "Knowledge transfer and Research Needs for Preparing Mitigation / adaptation policy portfolios." FP7 6. Estimation of technical condition of transformer station 113 PDC "Ghioltosu '35/10 kV 7. Contracts on energy audits with more than 20 organizations. 				
Number of researchers invited as speakers at international conferences	2010 1	2011 13	2012 8	2013 8	2014 -
Short description of technological transfer and innovation results and its certification by implementation	<p>A lighting system based on both photovoltaic and network was elaborated and implemented in the frame of project 10.820.06.15UA (bilateral Moldova-Ukraine) "Conversion of solar radiation into electrical energy based on photovoltaic transducers (batteries)".</p> <p>A 10kW sample was elaborated and tested in the frame of project STCU: 11.820.06.09 STCU.A / 5388. The development, manufacture and testing of sample transformer quick gap adjustment of the routing phase thyristor.</p>				
Number of defended dr./dr. hab. theses per year	2010 -	2011 -	2012 -	2013 -	2014 -

VIII. Present/further involvement in the Horizon 2020 (FP7)

1. Currently one proposal was fully submitted to H2020. The consortium consists of 10 countries and Italy is the leader. ISSI-5-2015, Action type – CSA, acronym – CORSI (COncecting Research to Society for better Impact).
2. M.Tirsu, N.Timofte and V.Oleschuk from IPE of ASM are the official representatives of Moldova in the Energy Program Committee of H2020.

IX. Accredited research field and its evaluation by the National Council for Accreditation and Attestation of the Republic Moldova.

Engineering and technologies for increase of power complex efficiency – good

X. Category attributed by the National Council for Accreditation and Attestation of the Republic Moldova to the organization.

Category B

XI. Institutional development actions planned for the next 5 years (maximum ½ page).

1. Conduction of fundamental and applied researches on improving the energy security level through modeling (simulation) of processes in power complex based on multi-criteria analysis, elaboration of methodological bases aimed for solutions of efficient development tasks of Moldova power sector, risks forecast, new innovative methods for calculation of power sector technological processes, simulation of power system interconnections, justification of development concepts for new branches of power complex, modeling and elaboration of new technical means for power flow control, increasing energy use efficiency both electrical and thermal;
2. Strengthening the international collaboration in the field of energy. New agreements and contracts with international organizations will be signed, and the participation to international workshops, seminars, and conferences will be intensified.
3. Accreditation of an Institute laboratory aiming to provide energy services.
4. More active involvement of students of the Technical University of Moldova in research process of the Institute and vice versa – of Institute staff in teaching process. Increasing the number of authorized auditors and prolongation of licenses for existing auditors. The institute will ensure payment for different training courses concerning increasing of professional level of personnel in energy audit sector and energy balance forecast.
5. Offering the scientific support to decision makers in development of important documents in energy field for medium and long terms.