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	TABLE OF CONTENTS	P.
<i>Tetiana Vasyliieva, Iryna Didenko, Vladyslav Smiiianov, Soldatenko Darina</i>	INFLUENCING THE FACTORS OF COMMUNITY HEALTH INTO THE DIFFERENTIATION OF REGIONS OF UKRAINE FOR BECOMING ILL ON COVID 19	13
<i>Tetyana Vasilyeva, Serhiy Lieonov, Nataliia Letunovska</i>	THE ECONOMIC IMPACT OF COVID-19: FORECASTING FOR UKRAINIAN REGIONS	18
<i>Yuriy Petrushenko, Natalia Zemliak, Sofia Petrenko</i>	THE IMPACT OF EDUCATION ON MIGRATION	23
<i>Serhiy Lyeonov, Aleksy Kwilinski, Denys Pudryk, Shaforost Yuliya</i>	INTERNATIONAL MIGRATION AND DEMOGRAPHIC CHANGE: BIBLIOMETRIC ANALYZING AMONG RESEARCHERS USING SCOPUS AND GOOGLE SCHOLAR	27
<i>Iryna Dehtyarova, Leonid Melnyk, Oleksandr Kubatko,</i>	SOCIO-ECONOMIC EFFECTS OF DISRUPTIVE TECHNOLOGIES	34
<i>Oleksandr Kubatko, Iryna Sotnyk, Alona Olondar</i>	ESTIMATION OF THE CORONAVIRUS CRISIS IMPACT ON THE ENERGY AND ECONOMIC SECURITY OF THE NATIONAL ECONOMY	42
<i>Oleksandra Karintseva, Oleksii Goncharenko, Mariia Myslovskaya, Oksana Hrinevich</i>	ASSESSMENT OF CONSEQUENCES OF THE VIRTUAL REALITY ECO-TOURS ADVANCING IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT AND THE COVID-19 PANDEMIC	50

<i>Viktor Sabadash, Oleksandra Karintseva, Mykola Kharchenko, Viktoria Sabadash</i>	ACCESS AND RESOURCE ALLOCATION IN THE GLOBAL ECONOMY: CHALLENGES OF POST-INDUSTRIAL SOCIETY	61
<i>Shaparenko S.</i>	SOCIO-ECONOMIC PRECONDITIONS FOR THE DEVELOPMENT OF ENERGY NETWORKS	69
<i>Bilan A.</i>	BLOGGER IS A MODERN PROFESSION	77
<i>Ancibor T.</i>	OPENING YOUR OWN HAIRDRESSING SALON AS A BUSINESS	84
<i>Vorobyov I.</i>	OPENING YOUR OWN FARM-STYLE CAFE	92
<i>Bondarenko Alla, Piven V.S.</i>	ADVANTAGES AND DRAWBACKS OF SALES PROMOTION OF GOODS	100
<i>Maksym Kirilenko, MU Jianming</i>	PROBLEMS OF IMPLEMENTATION OF INDUSTRY 4.0 IN UKRAINE	106
<i>Leonid Taraniuk, Hongzhou Qiu, Karina Taraniuk, Serafima Shakhova, Samuel Bot</i>	ANALYSIS ON APPLICATION AND CONTRIBUTION OF INTERNET OF THINGS TO LOGISTICS ENTERPRISES IN THE CONTEXT OF GLOBALIZATION	114
<i>Vitaliia Koibichuk, Serhii Drozd</i>	PREDICTIVE ANALYSIS OF TRENDS IN THE TOURISM INDUSTRY IN TERMS OF EU COUNTRIES	118
<i>Iryna D'yakonova, Leonid Taraniuk, Yuri Petrushenko, Anastasiya Shebeda</i>	FORMAL AND INFORMAL APPROACHES TO RELATIONS CENTRAL BANK OF THE COUNTIES WITH THEIR GOVERNMENT	125

<i>Bhola Khan</i>	THE IMPACT OF THE SECOND NATIONAL FADAMA DEVELOPMENT PROJECT ON POVERTY REDUCTION IN THE GEIDAM LOCAL GOVERNMENT OF YOBE STATE, NIGERIA	129
<i>Olha Kuzmenko, Tatiana Dotsenko</i>	FRONTIER ANALYSIS OF THE BANKS' FINANCIAL MONITORING EFFICIENCY CONCERNING ASSESSING THE RISKS OF MONEY LAUNDERING	134
<i>Ponomarenko Ihor, MU Jianming</i>	FUTURE LOGISTIC'S TECHNOLOGOIES IN CONTEXT OF INDUSTRY 4.0	138
<i>Kateryna Zaiika, Oksana Zamora, Iryna D'yakonova</i>	INTERNATIONAL ECONOMIC TRENDS DURING PANDEMICS: FROM PLAGUE TO CORONAVIRUS	145
<i>Olexii Karpishchenko, Tetiana Illiashenko, Kostiantyn Illiashenko, Olexandr Tovstukha</i>	DIGITIZATION OF THE HOUSING SERVICES AS A TOOL FOR ENSURING SUSTAINABLE DEVELOPMENT OF SETTLEMENTS	150
<i>Tetyana Vasilyeva, Kuzmenko Olha, Kashcha M. Basanets Sofiia</i>	ECONOMIC AND MATHEMATICAL MODELING REASONS FOR DIFFERENTIATED DEVELOPMENT OF PANDEMIC IN UKRAINE	154
<i>Olena Boiko</i>	TAXATION IN LIFE INSURANCE SYSTEM	158
<i>Svitlana Ivanytska, Zatona Kateryna</i>	PECULIARITIES OF THE ORGANIZATION OF PAYMENT AT THE ENTERPRISE	163
<i>Oleksandr Zaitsev</i>	INTERACTION OF FINANCIAL DEVELOPMENT AND REAL ECONOMY	167

<i>Olha Kuzmenko, Tetyana Vasilyeva Yana Harbar, Aleksy Kwilinski Viktoria Radko</i>	OPTIMIZATION OF THE SYSTEM AND MECHANISM OF REGULATION OF FINANCIAL MONITORING OF INSURANCE COMPANIES	172
<i>Serhii Mynenko, Vitaliia Koibichuk</i>	THE BLOCKCHAIN TECHNOLOGIES IN PUBLIC ADMINISTRATION	176
<i>Chortok Yuliia, Nechyporenko Roman, Yaskevich Anastasiya</i>	SMART TRANSPORT AND LOGISTICS ENVIRONMENT	184
<i>Iryna Marekha, Tetiana Makarenko</i>	WORLD MODELS FOR ASSESING THE EFFECTIVENESS OF ENVIRONMENTAL TAXES	189
<i>Serhii Lyeonov, Serhii Mynenko, Olha Kuzmenko, Oleksii Lyulyov, Kateryna Hrek</i>	THE RISK OF MONEY LAUNDERING: OVERVIEW THROUGH THE OPERATIONS OF INSURANCE COMPANIES	193
<i>Olena Bilotserkivska, Viktoria Shcherbachenko</i>	BRAIN DRAIN FROM UKRAINE: HOW TO SLOW DOWN AND BREAK THIS TENDENCY IN THE CONTEXT OF KNOWLEDGE ECONOMY	199
<i>Olena Pavlenko, Ihor Maksymenko, Oleksii Shkulipa</i>	INFLUENCE OF BUSINESS PROCESSES ON REGIONAL INFRASTRUCTURE	204
<i>Olha Kuzmenko, Volodymyr Ovcharenko</i>	METHODS REVIEW FOR ASSESSING THE INVESTMENT ATTRACTIVENESS OF INNOVATIVE BANK TECHNOLOGIES	209

<i>Anastasiia Yurchenko, Viktoriia Shcherbachenko</i>	ACTUAL PROBLEMS OF THE ECONOMY AND SOCIETY GREENING	214
<i>Dymchenko Olena, Rudachenko Olha</i>	STATE REGULATION OF SOCIO-ECONOMIC DEVELOPMENT OF REGIONS	219
<i>Bozhenko Victoria, Petrova Ksenia</i>	MODELING THE TRANSMISSION OF SYSTEMIC FINANCIAL RISK TO THE DEVELOPMENT OF THE ECONOMY'S REAL SECTOR	223
<i>Vladyslav Shapoval, Mariia Troian</i>	THE IMPACT OF GLOBALIZATION ON COMMUNICATION	227
<i>Halyna Mishenina, Daria Pavlenko</i>	AGILE METHODOLOGY OF THE PUBLIC ADMINISTRATION SYSTEM IN THE CONTEXT OF DIGITAL TRANSFORMATION OF UKRAINE	232
<i>Ved Prakash</i>	MEASUREMENT OF POVERTY AND SOCIO-ECONOMIC REQUIREMENTS OF BPL IN INDIA	237
<i>Tetiana Kurbatova, Valeriia Vialkova</i>	ANALYSIS OF INTERNATIONAL CONFLICTS: ANALYTICAL ELEMENTS AND TOOLS	243
<i>Ahniia Havrylina</i>	FEATURES OF NON-TRADITIONAL TYPES OF INVESTMENT	246
<i>Pokhylko S., Eremenko A.</i>	USING SOCIAL MEDIA PLATFORMS TO CREATE AND DEVELOP BUSINESS PROJECTS	249
<i>Pavlo Hrytsenko, Yevhen Kovalenko, Vladyslav Popov</i>	INNOVATIVE ACTIVITY AS A BASIS FOR SUSTAINABLE ECONOMIC GROWTH	254

<i>Leonid Melnyk, Olena Matsenko, Vladyslav Piven</i>	SOCIO-ECONOMIC ASPECTS OF GREEN ENERGY DEVELOPMENT: THE EXPERIENCE OF THE EU AND UKRAINE	264
<i>Harchenko D.</i>	ECONOMIC SECURITY AND THE FIGHT AGAINST CORRUPTION	273
<i>Hanna Yarovenko, Olena Kolotilina</i>	DEVELOPMENT OF METHODOLOGY FOR ASSESSING THE RISKS OF SOCIO-ECONOMIC AND POLITICAL GROWTH OF UKRAINE	285
<i>Inessa Yarova</i>	ENVIRONMENTAL ASPECTS OF INTERNATIONAL TRADE RELATIONS	289
<i>Denys Smolennikov, Daria Pavlenko</i>	STAKEHOLDER APPROACH TO PROJECT MANAGEMENT	293
<i>Oleksandr Khadartsev</i>	MODERN ENTREPRENEURSHIP ON THE PROJECT MANAGEMENT PRINCIPLES	297
<i>Hanna Yarovenko, Victoria Kovach</i>	GLOBAL TENDENCIES FOR THE IT USE IN MANAGEMENT INFORMATION SYSTEMS	300
<i>Tatiana Shcherbyna</i>	DIGITAL MARKETING AND INTERNATIONALIZATION OF UKRAINIAN BUSINESSES	304
<i>Viktoriia Kubatko, Diana Bilous</i>	THE FIGHT AGAINST CORRUPTION AS ONE OF THE TOOLS OF THE NATIONAL ECONOMY DE-SHADOWING	308
<i>Nataliia Letunovska</i>	CHALLENGES FOR THE HEALTH COMPONENTS OF A REGION IN THE CONTEXT OF GLOBALIZATION	312
<i>Anna Rosokhata, Anna Chykalova</i>	MARKETING ACTIVITIES FEATURES FOR DIFFERENT CLASSIFICATION TYPES OF BUSINESS STRUCTURES	317
<i>Korobets Olena,</i>	MANAGEMENT OF ENVIRONMENTAL	322

<i>Yaroslav Reshetnyak, Yura Yula</i>	RISKS AT THE COMPANY: THE MARKETING DETERMINANTS	
<i>Yana Us, Tetyana Pimonenko, Oleksii Lyulyov, Yuriy Bilan, Yulia Shaforost</i>	THE GREEN-FEMININE STEREOTYPES AS A BARRIER ON THE WAY OF GREEN BRAND DEVELOPMENT	327
<i>Maryna Saienko, Tetyana Pimonenko, Oleksii Lyulyov, Yuriy Bilan, Svetlana Kostornova</i>	NEW TRENDS IN MARKETING FOR SMALL AND MEDIUM ENTERPRISES	333
<i>Ziabina Yevheniia, Tetyana Pimonenko, Oleksii Lyulyov</i>	EFFICIENCY OF UKRAINIAN ENERGY POLICY IN THE FRAMEWORK OF CIRCULAR AND CARBON-FREE ECONOMY	337
<i>Yurii Bilan, Yana Us, Volodimir Nesterenko, Huseynadze K.R.</i>	PROSPECTS OF TOURISM DEVELOPMENT	342
<i>Olena Ivakhnenko</i>	EFFICIENT AGRO-LAND USE IN THE CONDITIONS OF GLOBAL CLIMATE CHANGE	348
<i>Artem Artyukhov</i>	QUALITY OF EDUCATION AND SDGS: SOCIO-ECONOMIC ASPECT	351
<i>Nadiia Artyukhova</i>	KNOWLEDGE MARKETING AS A TOOL FOR SOCIO-ECONOMIC GROWTH: THEORETICAL AND APPLIED BASE	355
<i>Khomenko L.M.</i>	SOME ELEMENTS OF MARKETING ACTIVITIES IN BLOOD SERVICE COMPANIES: CONTENT STRATEGY OF THE SITE	360

<i>Shkarupa O.V., Mayboroda T.M., Kalchenko Y.</i>	SCALING ECO-INNOVATIONS BASED ON SOCIO-ECONOMIC EFFECTS IN THE "ENTERPRISE-REGION-STATE" SYSTEM	365
<i>Oleh Dudchenko</i>	SOCIAL AND ECOLOGICAL RESPONSIBILITY AS A SYSTEMIC ELEMENT FOR AGRICULTURAL SUSTAINABILITY	371
<i>Yevhen Mishenin</i>	ORGANIZATIONAL AND ECONOMIC MECHANISMS FOR ENVIRONMENTALLY SAFE AGRICULTURAL LAND USE	380
<i>Yuriy Derev'yanko, Olha Lukash</i>	EVALUATION ON THE BASIS OF MODERN INDICATORS	389
<i>Vita Hordiienko, Tetiana Semenenko, Violeta Tretynyk</i>	INTEREST RATE AND ECONOMIC GROWTH IN UKRAINE	398
<i>Oleksii Zakharkin, Volodymyr Novikov, Dmytro Yemelianov</i>	COMPARATIVE ANALYSIS OF THE CONCEPTS OF VALUE ORIENTED ENTERPRISE MANAGEMENT	402
<i>Liudmyla Zakharkina, Yevhenii Okhrimchuk</i>	INTERNET OF THINKS IN LOGISTICS	407
<i>Oleksii Zakharkin, Liudmyla Zakharkina</i>	THE USE OF INDICATORS OF FINANCIAL CONDITION TO DETERMINE THE ENTERPRISE'S INVESTMENT ATTRACTIVENESS	411
<i>Ivan Shkarupa</i>	FACTORS AND INSTRUMENTS OF MANAGING THE EFFICIENCY OF ENTREPRENEURIAL ACTIVITY IN MODERN TRANSFORMING CONDITIONS	417

<i>Inna Tiutiunyk, Andrii Zolkover, Sergij Lyeonov, Aleksy Kwilinski, Alina Vysochyna, Kostronova Svetlana</i>	THE INNOVATIVE FINANCIAL TECHNOLOGIES AND ITS IMPACT ON SHADOW TRANSACTIONS	422
<i>Larysa Hrytsenko, Oleksandra Tverezovska</i>	EVALUATION OF PUBLIC-PRIVATE PARTNERSHIP PROJECTS' RISKS	426
<i>Hanna Shvindina</i>	COOPETITION MODEL OF INTERACTIONS FOR INSTITUTIONS IN A SPHERE OF EDUCATION	430
<i>Yuliia Humenna, Semen Tymoshenko</i>	MERITS AND CHALLENGES OF DIGITAL ECONOMY IN DEVELOPING COUNTRIES	436
<i>Yuliia Shkodkina, Yuliia Humenna, Oleksandra Tverezovska</i>	OBSTACLES TO START-UP IMPLEMENTATION IN THE MODERN CONDITIONS OF ECONOMIC DEVELOPMENT	440
<i>Ihor Kobushko Iana Kobushko</i>	CREATING MOTIVATION FOR EMPLOYEES THROUGH KPIS SYSTEM	445
<i>Nataliia Kotenko</i>	THE IMPACT OF INTERGOVERNMENTAL FISCAL POLICY ON LOCAL SUSTAINABLE DEVELOPMENT	451
<i>Nataliia Antoniuk, Iryna Plikus, Alona Myronova</i>	INDICATORS OF FINANCIAL SYSTEM SECURITY	456
<i>Iryna Plikus, Nataliia Antoniuk</i>	THE INFLUENCE OF DIGITALIZATION ON TRANSFORMATION PROCESSES ON THE LABOR MARKET	460

<i>Oleksandr Zaitsev, Dmitro Nikitin</i>	THE MECHANISM OF FINANCIAL RECOVERY OF THE ENTERPRISE SHOULD INCLUDE THE CASH AMOUNT OF THE LOAN AS PRODUCTION COSTS	466
<i>Svitlana Kolosok, Iuliia Myroshnychenko, Yuliia Matvieieva, Denis Hryhorenko</i>	INVESTMENT MANAGEMENT FOR SMART GRID PROJECTS: A CROSS-COUNTRY ASSESSMENT	470
<i>Opanasiuk Yuliia, Taraniuk Karina, Maryn Matvii Viktoria Shkola</i>	TRANSITION TO GREEN ECONOMY: BASIC PRINCIPLES AND PROBLEMS	475
	ADVANCED DEVELOPMENT AND INTELLECTUAL CAPITAL: AN INFLUENTIAL ASSESSMENT	482
<i>Semenog A. Mykhalova A.</i>	THEORETICAL ESSENCE OF TRUST IN FINANCIAL SERVICES	488
<i>Veronika Barvinok, Anna Vorontsova, Julia Sergienko</i>	INTERNATIONAL MIGRATION AND THE COVID-19 PANDEMIC: LITERATURE REVIEW	494
<i>Kateryna Hrek, Iryna Didenko</i>	STUDY OF POSSIBILITIES OF THE BPW PACKAGE. DIFFERENCE ON CREATION OF DFD DIAGRAMS AND IDF0 DIAGRAMS: DESCRIBE THE PROCESS OF LOGISTICS AT THE ENTERPRISE	497
<i>Burnakova Valeriia</i>	SUSTAINABLE DEVELOPMENT STRATEGY FOR TOBACCO INDUSTRY	502
<i>Olena Shkarupa, Anastasija Turchyn, Kateryna Vlasenko</i>	FORMATION OF A POSITIVE IMAGE OF WOMEN LEADERS IN PUBLIC ADMINISTRATION	506

DIGITIZATION OF THE HOUSING SERVICES AS A TOOL FOR ENSURING SUSTAINABLE DEVELOPMENT OF SETTLEMENTS

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The sphere of housing services in Ukraine has always been at the center of scientists, ecologists and economists attention due to its significant energy-intensive consumption and extremely large greenhouse gases emission into the atmosphere [1, p.62]. The energy balances of Ukraine have not undergone significant changes in recent decades. In 2018, the household sector accounted for 36% of electricity consumption and almost 42 % of thermal energy consumption [4], that considerably exceeds the appropriate amounts of industry and transport consumption. At the same time, the rating of the country's economic sectors in terms of CO₂ emissions shows that 51 % of emissions are provided by the energy sector, 18 % by industry, 15 % by transport and 13 % by households [5] that, taking into account the above, makes it possible to establish the leading positions of households in generating greenhouse gases in Ukraine.

The statistics clearly demonstrate to us the advisability of focusing the main attention of urban scientists who are engaged in ensuring sustainable development of settlements specifically on households, and, to be more precise, on their energy consumption both for heating, for lighting, hot water supply and others goals.

At the same time, the possibilities, and prospects of reducing the level of energy consumption by the housing services sector and its greening in Ukraine as a result of the introduction of modern information technologies are of particular interest. The intensification of the introduction of digital technologies in the household economy sector, obviously, actualizes the need to address a range of issues, which include the following:

1. selection of the most successful model for the development of the digital economy in the housing and utilities sector of Ukraine at the local level, taking into account national specifics: planned, market, or hybrid;
2. formalization and systematization of all possible advantages and economic incentives that can act as a real driving force for the digitalization of the housing services sector in Ukraine;
3. regulatory support for the digitalization of the housing services sector;
4. determination of the participants and beneficiaries of the process of introducing digital technologies in the housing services sphere of Ukraine; groups and a list of key indicators determination for assessing the effectiveness of such

implementation [2, p. 274].

It is well known that in the market model, a significant role in digitalization is assigned to private structures, which should pick up the impetus of government events and complete the framework of a digital economy. But are there appropriate prerequisites for the implementation of the market model in Ukraine: do the interests of private players in the market of housing services coincide with the expectations of the state, society and end consumers of these services?

Today, the following factors can be distinguished, which should be considered the most important for assessing the prospects for the digitalization of the housing sector in Ukraine:

- the growth of housing services tariffs raises the issues of reducing household spending and saving wherever it possible.

- a decrease in the motivation for energy saving among companies that earn the more the more resources they sell;

- additional external costs of digitalization for obtaining more detailed and timely information about housing services and resources are difficult to associate with specific benefits and effects for consumers;

- a high level of housing services sector monopolization and the lack of interest of suppliers in increasing the transparency of the market for relevant services;

- a high level of corruption of regulatory bodies and a significant influence of certain oligarchic structures on the state regulator in the housing services sector.

The need to search for a model of long-term, sustainable and mutually beneficial public-private partnership between key players in this sector of the economy is obvious. The stability of such a model should guarantee the collinearity of the strategic interests of the population, as the party that bears the entire burden of utility bills and the state, as a key player that sets the rules of the game and regulates the intensity of traffic in the indicated direction.

Taking into account the modern European experience, one or two pilot projects for digitalization of the housing services sector could be chosen, which would have a huge social resonance and should have a significant chance of success in the realities of Ukraine, which would create a number of consistent, positive and irreversible changes for households in Ukraine.

An example of such a project could be the Smart Electrical Thermal Storage project, the essence of which is that the accumulation of thermal energy necessary for heating hundreds and thousands of apartments and houses of individual households is carried out under the control of artificial intelligence exactly at the time (not necessarily at night) when this requires the country's energy market. We will show what the key factors for the success of such a project for Ukrainian households can be and what the chances are for the successful implementation of similar projects.

We can talk about the presence of direct economic incentives for the implementation of relevant projects. Let us demonstrate this with a conditional example. For a conventional apartment with an area of 100 square meters, we will have the following data on the economic efficiency of the implementation of smart thermal energy storage systems: in the most optimistic scenario, the intelligent network management system for thermal energy storage will bring its owner an approximate positive effect in the amount of only 200\$ during the heating season and this despite the fact that at once it will be necessary to incur additional capital costs at the level of 1000 \$, which will be used to pay for the standard connection to power grids [5] and directly for the purchase of the Smart Electrical Thermal Storage equipment [3, p. 128].

But direct economic effects for the consumer are far from all that should be taken into account when assessing the feasibility of implementing such projects. It is necessary to take a comprehensive look at the problems of the energy market of Ukraine and then it will become clear where additional sources and incentives for the introduction of digital technologies in the housing and utilities sector of Ukraine are hidden.

It is widely known that atomic energy is the cheapest in the world. The nuclear energy tariff in Ukraine is really low. In April 2020, Energoatom sold electricity to the state-owned company “Guaranteed Buyer” at 0,02\$ per 1 kW*h. [7] At the same time, nuclear power plants are inflexible. They are designed to operate at a constant capacity, while the demand for electricity varies throughout the day and year. That is, for the normal operation of a system with a large number of nuclear power plants, it is always necessary to have shunting balancing capacities of thermal power plants.

But at the same time, firstly, the cost of electric energy generated by thermal plants is several times higher than similar indicators for nuclear generation and, depending on the power station, from 1.4 to 2.6 UAH per 1 kW*h of electricity [8] and, secondly, their impact on the environment is simply catastrophic compared to any other energy sources available now.

It seems absolutely logical for us to be able to balance the country's energy market not only by promptly “switching on” additional shunting capacities of thermal stations, but also by intelligently controlling the intensity and schedule of energy consumption, in particular in the housing sector. Similar ideas have already been repeatedly tested in countries with different climatic conditions and different specifics of local energy markets [9].

Considering the above, a single network of heat / electric energy consumers, which will number hundreds and thousands of isolated households with intelligently controlled energy consumption, will be able to dampen fluctuations in the energy market in a cheaper way than it is possible today. The balancing function of intelligently controlled energy consumption by households in Ukraine should be

paid for and such a fee should be at least 50% of the losses incurred by the economy today as a result of the purchase of electricity from thermal generation. The additional UAH 0.7-1.0 received by households for each kW*h consumed exactly at the moment when the country's energy system requires it, will make it possible to recoup the additional capital costs incurred during one heating season.

Thus, the implementation of digitalization projects in the housing services sector can today not only help to ensure the sustainable development of local communities primarily reducing greenhouse gas emissions Smart Electrical Thermal Storage equipment installations, but also to do this on a mutually beneficial basis for the state, society, investors and households.

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