



Republic of Moldova
Government
DECISION No. _____
dated _____ 2012
Chisinau

Approval of the Energy Audit Regulation

Pursuant to Article 11 paragraph 1) of the Energy Efficiency Law No. 142 dated 02 July 2010 (Official Gazette of the Republic of Moldova, 2010, No.155-158, Article. 545), the Government

HAS DECIDED:

1. To approve the Energy Audit Regulation (**attached**).
2. The Ministry of Economy shall be in charge with the enforcement of this Decision.

PRIME MINISTER

Vladimir FILAT

Countersigned by:

Deputy Prime Minister,
Minister of Economy

Valeriu LAZAR

Energy Audit Regulation

I. General Provisions

1. Energy audits shall be carried out by Energy Auditors authorised by the Agency for Energy Efficiency (hereinafter referred to as the Agency), in compliance with the Regulation on the Authorisation of Energy Auditors.
2. The provisions of this Regulation shall define:
 - a) The energy audit basic objectives;
 - b) The sequence of energy audit stages in all sectors of the National Economy;
 - c) The stages for preparing, performing and presenting the energy audit findings.
3. For the purpose of this Regulation:

Energy consumption shall mean the process, which reflects the consumption value of fuels and energy resources;

Consumer of energy resources shall mean the natural or legal person that uses fuel, electrical power or thermal power;

Specific fuel consumption shall mean the quantity of fuel used within a time unit for the manufacturing of a unit of output, service, etc.

Specific thermal/electrical power consumption shall mean the ratio between the amount of energy consumed during the process/activity and the volume of production expressed in physical or economic units;

Degree of recovery of re-used energy resources shall mean the ratio between the recovered energy and the total re-used energy resources available in their equivalent expressed in units of energy;

Energy resource shall mean the energy carrier used directly or after certain transformations to meet the energy demand;

Primary energy resources shall mean the energy carriers embodied in natural resources due to the geological evolution of the Earth, which could be extracted and then used directly or after certain transformations to meet the energy demand.

Energy audit report shall mean an essential energy audit component representing the audit performing procedure, the main energy characteristics of the audited facility, the energy renewal or upgrading measures, and the conclusions referring to the economically efficient measures.

II. Energy audit objectives, actions and stages

4. The energy audit objectives are as follows:
 - a) Defining the types of energy resources used and the costs incurred;
 - b) Analysing the ways of energy use, having identified and quantified energy losses;
 - c) Identifying and analysing the possibilities to implement some organisational and technical solutions and/or to purchase certain technologies, equipment, which could contribute to the substantial reduction of energy consumption and the costs incurred;
 - d) Carrying out an economic analysis to determine whether the proposed technical solutions are feasible.
5. Energy audit prior actions:
 - a) Develop the scope of work;
 - b) Assess the energy audit costs;
 - c) Conclude a contract for rendering the energy audit service;
6. Energy audit stages:
 - 1) Conducting the energy audit:
 - a) Briefing on occupational safety and health;
 - b) Collecting the information, devising and filling in the questionnaires;
 - c) Collecting the information assisted by measuring and control equipment (means).
 - 2) Analysing the outcomes/findings:
 - a) Defining and analysing the energy efficiency indicators;
 - b) Designing energy efficiency measures;
 - c) Estimating the potential of making the energy consumption more efficient;
 - d) Assessing the environmental impact;
 - e) Drawing up the energy audit report.
7. Implementing the energy audit recommendations.

III. Energy audit prior actions

Develop the Scope of Work

8. The Scope of Work for the public sector shall be developed by the Recipient in coordination with the Energy Manager employed by the Local Public Administration Authorities.
9. The Scope of Work for the private sector shall be developed by the Recipient alone or jointly with the energy audit Executor.
10. The Scope of Work shall include all types and methods of measurements necessary to carry out the energy, depending on the requirements, practical applicability and added value of measurement outputs.
11. The Scope of Work shall comprise the following chapters:
 - a) The rationale for performing the energy audit;
 - b) The energy audit goal;
 - c) The energy audit facilities;
 - d) The work contents and sequence;
 - e) The work commissioning manner and sequence;
 - f) The list of documentation and its filling in.

Evaluation of energy audit costs

12. The energy audit costs shall be determined under free competition and transparency conditions.
13. The energy audit costs depend on the volume and complexity of works specified by the Scope of Work, and shall meet both the Recipient's and Executor's expectations.
14. The Agency shall determine the energy audit costs for the energy efficiency projects implemented with the financial support provided by the Energy Efficiency Fund and for the energy efficiency improvement programmes unrolled at the account of Local Public Authority budgets, having applied the appropriate methodology.

Concluding the contract on rendering the energy audit service

15. The Recipient shall sign a contract with the Energy Auditor certified/authorised as per the legislation in force.

IV. Energy audit stages

Conducting the energy audit

a) Briefing on occupational safety and health

16. Compliance with the provisions of the Occupational Safety and Health Law No.186 dated 10.07.2008, and with the secondary field-related regulatory framework is mandatory for the energy audit works.
17. Conducting an introductory briefing for the audited facility is mandatory to prevent any type of human and technical accidents. The briefing shall be conducted, upon case, by the staff authorised by the Recipient, which issues an order in this regard, prior to the cycle of measurements.

b) Collecting the information, devising and filling in the questionnaires

18. Both the Energy Auditor and the energy audit Recipient shall be involved in collecting the information.
19. The information can be collected from the following sources:
 - a) reports comprising commercial and technical records on energy resources;
 - b) contracts with energy suppliers;
 - c) energy supply and record-keeping schemes ;
 - d) energy utility bills;
 - e) construction execution projects;
 - f) daily, weekly and monthly load schedules;
 - g) data on production volumes, prices and tariffs;
 - h) technical documentation on technological and ancillary equipment (technological schemes, diagrams, schedule maps, operation specifications, regulations, etc.);
 - i) reports on repairing, putting into operation, testing, and energy efficiency measures;
 - j) perspective long-term programmes on making the energy consumption more efficient, project documentation aimed at improving technological or organisational processes/flows, enterprise development plans.
20. The collected information shall be entered in the questionnaires prepared by the Energy Auditor, who is supposed to randomly check the reliability of information supplied by the Recipient.
21. In the process of preparing the questionnaire the following benchmarks can be used along with other pillars:
 - a) overall scheme (emergency plan) of facility or plant location, the number of buildings subject to auditing, their location, the space volume, size, area, etc.;
 - b) information on the monthly volume of manufactured output, estimated specific consumptions and reports on energy and water consumption;
 - c) information on prices for fuel, thermal power, electrical power, prices on domestic or technological water and sanitation;

- d) information on monthly payment for fuel and energy consumption, for the use of water and sanitation during the last three years;
- e) information from the existing reports (production units) on the output, consumption of raw material, energy, water, etc., specific indicators regulated and reported to energy consumption, data on plant and equipment failures and out-of-order periods, etc.;
- f) energy consumption regulation documents;
- g) programme aimed at implementing energy efficiency measures and employing renewable energy sources;
- h) information (reports) on assessing the outcomes resulting from the implementation of energy efficiency measures and employment of renewable energy sources.

22. The questionnaires shall be devised and filled in separately for each audited facility, upon case.

23. The authorised Energy Auditors shall derive general information on the audited facility, get acquainted with the technological flows and prepare a list of plants currently under the Recipient management.

24. Any natural or legal person, energy audit Recipient, shall grant the Energy Auditor with access to facilities subject to auditing, to submit, upon the Auditor's request, the technical and operation documentation, other information strictly necessary to determine the indexes and measures intended to improve the energy efficiency.

25. The energy audit Recipient shall supply the Energy Auditor with all documents strictly necessary to conduct the energy audit and with the available information for the last three years of activity.

26. The collected data shall be generalised, having classified and assigned them to the main systems of production, distribution and energy consumption.

27. *Data on building envelopes may include:*

- a) data about the building elements exposed to their direct contact with the outdoor environment, respectively: external doors, windows, walls and roof.
- b) considering the building construction elements by having reviewed the construction design and carrying out the building visual inspection to gather information on the construction materials used and on the level of wear-and-tear of the building;
- c) data about the tenants and their activity schedule specific for the type of the building.

28. *Data on heating, ventilation and air conditioning systems may include:*

- a) inventory data on all components of the heating, ventilation and air conditioning systems, having stated: the equipment type, model, size, age, consumption of electricity, equipment power, type of fuel used, fuel consumption and operation hours.

- b) analysis of heat supply contracts;
- c) information on commercial and technical records of heat consumption, the main scheme of commercial and technical records;
- d) information on heat costs;
- e) information on heat consumption, the heat consumption structure, thermal loads and load curves;
- f) information on the technical status, characteristics and operation modes of the main heat consumption equipment;
- g) summary heat consumption reports;
- h) heating schemes.

29. Data on steam production, distribution and consumption systems may include:

- a) data on the annual consumption of fuel for steam production;
- b) the quantity of steam produced and used by equipment and technologies;
- c) working hours set for steam boilers and equipment;
- d) information on commercial and technical records on steam;
- e) information on prices and monthly utility bills issued for the steam used;
- f) summary reports on the steam used (for the last three years, with monthly breakdown);
- g) information on the structure, technical status, characteristics and operation schedule of the main steam-operated equipment (technological regulations, guidelines);
- h) information on the regulated and reported indicators on steam consumption for the production of one unit of output.

30. Data on fuel supply system may include:

- a) analysis of fuel supply contracts;
- b) information on fuel commercial and technical records;
- c) information on the prices and monthly utility bills issued for fuel consumption;
- d) information on fuel consumption and its structure;
- e) summary fuel consumption reports;
- f) information on the composition, technical status, characteristics and operation schedule of the main fuel consuming equipment (technological regulations, guidelines);
- g) information on the regulated and reported indicators on fuel consumption for the heat production and for the production of one unit of output.

31. Data on electrical power supply system may include:

- a) analysis of electrical power supply contracts;
- b) information on tariffs and monthly utility bills issued for electrical power;
- c) linear electrical power supply schemes;

- d) the main scheme on electrical power commercial and technical records, having pointed out the location of power metering devices, power and voltage transformers, and their types;
- e) summary electrical power consumption reports;
- f) information on the parameters and equipment used for inner power grids (types of transformers, the year of putting into operation, cross-sectional area, overhead and cable power lines, their length);
- g) information on the regulated and reported indicators on power consumption for the production of one unit of output.

32. Data on compressed air supply system may include:

- a) information on the structure, technical status, characteristics and operation schedule of compressor plants (Machinists' work schedules);
- b) information on the operation period/schedule of each compressor;
- c) information on the monthly consumption of electrical power for each compressor or for the compressor plant;
- d) data on the compressed air networks;
- e) reports on the monthly production/consumption of compressed air;
- f) information on the regulations concerning the use of compressed air.

33. Data on domestic and technical water supply may include:

- a) information on prime costs, consumption of water and sanitation, monthly utility bills issued for the water supply and sanitation;
- b) information on pumping stations (structure, technical status, main characteristics derived from the technical cards and operating guidelines);
- c) information on monthly consumption of energy per pump or monthly consumption of energy per pumping station;
- d) information on water flows;
- e) the pump operation schedule (number of pumps in operation, variations of pressure on exit, fluctuations of flows), hours per day, hours per week, hours per month, hours per year;
- f) water supply scheme (domestic, technological, recirculation water), having indicated the water duct length and diameter;
- g) information on the technical status of water consumption recording system;
- h) information on water consumption structure and on monthly utility bills issued for domestic, technological water;
- i) information on water specific consumption regulations.
- j) information on the volume and quality of disposed water, characteristics of water receiver.

34. Data on cooling system may include:

- a) structure, technical status, plant characteristics and operation schedules;
- b) electrical power consumption, production of cooling and regime rules;
- c) monthly operation schedule of each cooling plant during summer or winter time;
- d) data on coolant users;
- e) monthly reports on coolant production/consumption;
- f) information on coolant consumption regulations.

35. The Energy Auditor shall:

- i. Carry out the energy audit in an impartial and qualitative manner, having met the deadline in conformity with the Scope of Work and Contract signed with the Recipient;
- ii. Notify the Recipient about the impossibility to continue the energy audit if the Recipient refuses to disclose relevant information, creates impediments and/or does not remove them;
- iii. Renounce conducting the audit if he/she is interested in the economic operator activity, otherwise this status may serve as ground to withdraw the Energy Auditor authorisation as per Article 13 paragraph (2) d) of the Energy Efficiency Law No. 142 dated 12.07.2010;
- iv. Ensure non-disclosure of information relating to the economic operator activity relating to market competition.

c) Information gathering assisted by measuring and control equipment (means)

36. Measuring equipment (means) used during the energy audit shall be appropriate, legalised, subjected to metrological verification according to the applicable legal metrology regulations.

37. Measuring the operation parameters of the main energy production and consumption equipment and machinery is important for:

- a) Controlling the real operation parameters under different loads;
- b) Verifying the efficiency and effectiveness of operating technologies and appliances;
- c) Determining the energy losses and the causes leading to such losses;
- d) Accurate sizing of new appliances and equipment.

38. In order to measure specific parameters of each application type one can use:

- a) Fixed measuring appliances, mounted on plants if they are appropriate, legalised and with valid metrological verification term at the time of conducting the measurements;
- b) Portable laboratory appliances (means), if they are appropriate, legalised and with valid metrological verification term at the time of conducting the measurements.

39. The Energy Auditor shall measure the parameters during the working visits in the field.

40. The necessary measuring equipment (means) shall be selected depending on the type of energy consumed, the type of appliance/equipment, etc.

41. *Examination of building envelopes may include:*

- a) examination of construction elements of the building;
- b) estimation of heat losses through the building envelope.

42. *Examination of heating, ventilation and air conditioning system may include:*

- a) examination of the heating duct thermal insulation status;
- b) conducting specific measurements of temperatures, humidity, air flow velocity, level of noise, vibrations and energy consumption in different operation modes.

43. *Examination of heat production, distribution and consumption system may include:*

- a) examination of heat production, distribution and consumption system;
- b) measurement of plant operation parameters for different thermal loads.
- c) analysis of combustion gases in steam boilers equipped with gas analyser;
- d) measurement of water supply and steam flows;
- e) measurement of condensate flows;
- f) measurement of pressures and temperatures of the main heat flows;
- g) measurement of surface temperatures of equipment and heat distribution ducts;
- h) verification of proper operation of condensate pots.

44. *Examination of hot water production, distribution and consumption system may include:*

- a) Gathering statistical data and measurement of the main boiler operation parameters;
- b) Estimation of the real thermal power and fuel demand;
- c) Determination of the hourly and annual maximum demand for thermal power necessary to produce domestic hot water.

45. *Examination of compressed air production, distribution and consumption system may include:*

- a) measurement of electrical power consumed by air compressors in different operation modes, temperatures of coolants, pressure drops in the distribution network and the air flow within the network;
- b) identification of network air leaks.

46. *Examination of electrical power supply system may include:*

- a) verification of cooling conditions, protection against humidity and dust;
- b) verification of switchboard connections;
- c) verification of transformer loading level.

47. *Examination of natural and artificial lighting may include:*

- a) determination of natural and artificial lighting level;
- b) determination of qualitative indicators of outer lighting;
- c) analysis of light fitting location to illuminate the working places, the light fitting mounting height, etc.

48. The table presented below shall be filled in during the examination of the lighting system.

Space for illumination	Type of illumination	Installed power (W per light bulb)	Number of light bulbs	Total power (kW)	Operation hours (hours per day)	Operation days (days per year)	Consumed energy (kWh per year)
Inner							
Outer							
Total							

49. Upon the examination of drive electric motors it is advisable to carry out the inventory of electric motors from units or workshops, having specified: the motor type, nominal power (P_n), speed (n), input voltage (U_n), nominal current (I_n), efficiency (η), power factor ($\cos \varphi$), annual working hours (T_f) and driven machinery, as per the sample table inserted below.

Item	Motor type	P_n (kW)	N (rotations per minute)	U_n (V)	I_n (A)	n (%)	$\cos \varphi$	T_f (hours per year)	Involved equipment
1									
2									
...									
n									

50. Any equipment specific for some processes not defined by this Regulation, but involved in the technological processes consuming thermal or electrical power shall be examined in a way similar to the ones described above.

Analysis of results

51. Analysis of results involves:

- a) Dynamic analysis of energy consumption (consumption structure; large consumers; energy saving potential) and cost analysis for three years preceding the audit period;
- b) Analysis of contracts with energy suppliers and with energy consumers (subcontractors);
- c) Preparation and analysis of actual energy balance for all types of energy and for each building, production unit and other structural entities;
- d) Analysis of actual energy costs used to produce a unit of output;
- e) Calculation and analysis of targeted and actual energy performance indicators.

a) Setting and analysing energy efficiency indicators

52. Energy efficiency indicators shall be used when assessing a process or plant operation, both quantitatively and qualitatively; the indicators shall be set up based on the energy balance data.

53. The following indicators shall be analysed for the energy transformation processes:

- a) gross energy efficiency;
- b) net energy efficiency;
- c) specific consumption of energy X to produce Y-type of energy.

54. For the processes of energy end-use the following indicators shall be considered:

- a) specific consumption of fuel;
- b) specific consumption of thermal power;
- c) specific consumption of electrical power;
- d) specific consumption of thermal power for heating one unit of surface;
- e) recovery level of energy reused within or beyond the circuit;
- f) share of electrical power consumption in the total energy consumption;
- g) energy costs for the production of one unit of output.

55. Energy efficiency indicators shall be computed per total energy with the determination of energetic equivalent in kWh, tep.

56. Economic analysis of measures aimed at upgrading an existing facility shall be performed on the basis of economic and financial efficiency indicators of investments, i.e.:

- a) Total updated savings [*MDL*];
- b) Investment payback period [*years*];
- c) The cost per unit of energy savings [*MDL/kWh*].

57. In the course of energy audit it is advisable to determine and analyse additionally and upon case the energy efficiency indicators specific for the audited facility.

b) Development of energy efficiency measures;

58. The energy balance analysis would enable developing an action plan comprising all the technical measures necessary to eliminate or reduce energy losses and employ renewable energy sources.

59. During the development of the action plan it is necessary to:

- a) Determine some technical solutions for the targeted improvements;
- b) Calculate the potential energy savings, expressed in physical and monetary units;
- c) Identify the materials and/or equipment necessary to implement the recommendations, the estimated cost, the cost of shipment, mounting and putting into operation;
- d) Evaluate all the possibilities to reduce the investment costs, having involved own production resources/forces for mounting and putting into operation;
- e) Identify the eventual secondary impact resulting from the implementation of measures, which may affect the real economic efficiency;
- f) Evaluate the overall economic impact of the proposed measures.

60. The economic efficiency indicators for the proposed measures shall be computed separately for each measure and for the whole package.

61. Measures involving economic efficiency shall be classified, depending on the investment level, into the following categories:

- a) measures with no investments, which could be implemented during the current activity;
- b) measures with medium investments (with simple payback period less than five years), which could be implemented at the account of own funds;
- c) measures involving large investments (regeneration, upgrading, technological changes), which require additional investments by attracting investment loans.

62. The prepared plan of measures shall be presented as follows:

Item	Measure	Estimated savings			Investment costs, MDL	Return on investment, MDL per kWh	Simple payback period, years
		Tep per year	kWh per year	MDL per year			
1							
2							
...							

n							
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c) Estimation of energy consumption efficiency potential

63. Analysis of energy balances will enable identifying energy losses, determining and classifying their causes, and defining measures aimed at optimising the technical and economic indicators. Likewise, data on reused energy resources will be derived, having ranked them by categories and energetic potential.

d) Evaluation of environmental impact

64. Pollutant emissions, SO₂ and NO_x (with synergetic effects at the regional level), particulate emissions – fly ash (with effects at the local level) and CO₂ emissions (with worldwide effects) shall be determined based on the measurements assisted by specialised equipment (means) mentioned by this Regulation.

65. If such equipment is not available, the evaluation of emissions shall be performed according to the operative evaluation methodology for SO₂, NO_x, particulate (fly ash) and CO₂ emissions based on the use of emission factors applicable in the EU Member States for post-evaluations covering different time-frames, including the drawing up of statistical reports, for verifications of compliance with the established norms, as well as for devising some forecasts.

66. If more types of fuel are used, then the quantity of pollutants shall be determined by summing up the quantities estimated for each category of fuel.

f) Drawing up energy audit reports.

67. The energy audit report shall be drawn up based on the technical and economic analysis of energy regeneration/upgrading solutions for the audited facility.

68. The energy audit report shall comprise the components necessary for picking up energy upgrading solutions for the facility in question.

69. Drawing up an energy audit report is an essential element of the energy audit procedure, describing the manner it was conducted, the main energy characteristics of the facility, the energy upgrading measures suggested for this facility and its adjacent plants, and conclusions relating to economically efficient measures.

70. The energy audit report format, its presentation, wording, clarity and easiness of its content interpretation are essential for the Recipient of this report.

71. The energy audit report on the audited facility shall be written in the state language and comprise, but be not limited to, the following points:

- a) Data for the identification of the facility subject to energy audit and on its Owner/Administrator;
 - Full name of the Owner (for a natural person) or the name of the enterprise (for a legal person) and the name of the facility Administrator;
 - Address of the audited facility;
 - Contact information of the facility Owner or Administrator (in charge).
- b) Identification data on the authorised Energy Auditor who conducted the energy audit of this facility:
 - The Name of the authorised legal person, address, contact information, authorisation number;
 - The Name of authorised Energy Auditors – natural persons, authorisation number;
 - The date of conducting the thermal and electric analysis;
 - The number of the energy audit case/file;
 - The date of drawing up the energy audit report.
- c) General description of the audited facility:
 - The rationale of conducting the energy audit, its objectives and goals;
 - The general layout of the facility;
 - Data on buildings and premises (location, destination, volume, useful areas, data on the building envelope, operation mode, data about tenants, etc.);
 - Data on the main energy and technological installations/plants (technical characteristics from the technical passport, operation mode, etc.);
 - Data on the energy supply and energy use systems (supply schemes, data on measurement and control equipment (means), etc.);
 - Data about the annual energy consumption, tariffs and settled energy utility bills.
- d) General presentation of the energy audit report and summary of technical measure packages with high economic efficiency proposed for the energetic upgrading of the facility:
 - Brief description of the documentary data collection results and of its fitting with measurement and control equipment (means);
 - Brief description of the analysis performed based on the collected data;
 - Presentation of actual and optimal energy balances;
 - Brief description of each envisaged measure and of the measure package;

- Estimated cost of each measure and of the whole package of measures;
 - Fuel savings estimated for each package;
 - Economic efficiency indicators of each measure and of the envisaged package of measures;
 - Suggestions on upgrading works and their financial coverage.
- e) Detailed presentation of packages with technical measures proposed for the energetic upgrading of the facility – as an energy audit technical file:
- Summary of the energy analysis report having presented the current status of the facility and the main energy characteristics describing the current energy performance of buildings and of energy and technological plants;
 - Input data for the economic analysis of the envisaged technical measures: energy prices, energy annual price increase rate, annual depreciation rate of the currency used, etc.;
 - Detailed description of the envisaged energy upgrading measures and the results of technical and economic analysis of each measure and/or package of measures.

V. Implementation of energy audit recommendations

72. After having drawn up the energy audit report, having completed the analysis of energy consumption and costs, having recommended solutions to enhance the efficiency of energy consumption and their economic analysis, it is necessary to get the consent/agreement of the audited facility Recipient with the purpose to implement these solutions.

73. The following stages shall be defined in order to ensure optimal conditions for programme implementation:

- a) The Owner/Manager of the audited facility jointly with the Energy Manager shall define and ensure due access to different funding sources and systems for the envisaged measures/projects;
- b) Working groups shall be created and their responsibilities relating to the implementation of the proposed solutions shall be outlined;
- c) The objectives/targets of each working group shall be defined;
- d) The suggested technical solutions will be started to be implemented, while the Coordinator of this activity shall monitor the way the works are performed and the observance of the work schedule;
- e) Upon the completion of works, the Energy Manager shall initiate a programme to monitor the resulting savings.

VI. Keeping the Register of performed energy audits

74. Pursuant to the Energy Efficiency Law No. 142 dated 02.07.2010, the Agency shall be the empowered entity to set and keep the Register of performed energy audits.

- 75.** The Agency, as the entity empowered to issue Energy Auditor's authorisations, shall create and keep the Register of performed energy audits pursuant to the Law on Registers No. 71 dated 22.03.2007.
- 76.** The Register is the only official source of data about the energy audits performed. The information contained by the Register is considered to be accurate and reliable, unless a contrary statement is drawn up in the manner provided by the legislation in force.
- 77.** The Register of performed energy audits shall be kept in electronic and hard copy format.
- 78.** The Register shall be kept in strict compliance with the rules laid down by the Regulation on keeping the respective Register approved by the Agency.