



**LLC Scientific Production Association  
«Volgograd Energy-efficient Technologies»**

## **Alternative Central Heating**

**«The new strategy of heat supply – an effective solution of heat supply problems, the reduction of the social tension’s growth»**

### **Tubingless heating system**

**Unique heating electric mini boiler of steam-dripping type – SDH**

### **Heating and hot water supply**

**A mechanic heater of the liquid heat-transfer – HT**



# Part 1. Heat supply problems and solution schemes

**The centralized heat supply strategy finally became out of date**, exhausted all its constructive and social resources and cannot develop further efficiently. Huge materials consumption, constructive complicity of the centralized heat supply systems and, as a result, a constant growth of the excessive running costs for such complex heat supply.

## SPA VEET tasks

To create an alternative for the centralized heating systems

To work out the new strategy of heat supply

## Principle

The heating must be generated in the place of its consumption and used only in case of specific need.

## The choice of the utilities

Electric power is a universal energy capable of being easier generated from everything: gas, coal, other hydrocarbons, the sun, wind, biomass, the energy of the moving liquid, etc.

## The choice of the constructions

**A heating electric mini boiler**, which is at the same time a heating appliance.

**A mechanic heater of the liquid-based heat-transfer**, which combines at the same time the work of the rotary pump and the heater of the different liquids at the expense of the liquid's compulsory rotary flow.

## The aim

At the simple construction of the mini boiler-heater the heat is generated directly in each room of the corresponding building, in quality not worse than from the central heating and lower at its cost. The system must not become unfrozen, form a leak, must be ecologically clean and safe, on the rims for its further exploiting.



# District heating OBSOLETE

A lot of work and time spend appropriate services to maintain the health of the huge thermal economy of the country is very large funds are spent on its content. Questions provide residents with heat is constantly monitored , but the situation does not improve, but rather worsens, an increasing percentage of networks and equipment depreciation , rising rates , deteriorating the quality of services , etc. And it is time to think about all that we can make mistakes in the strategic , technical terms ? We have confidence that if nothing changes , you can once again invest heavily in the rehabilitation of existing thermal farms , but also in 20 - 25years will be the same result , but on the subsequent recovery of funds will need to be three times more.



**Global wear trubosistem  
High accident rate**



**Heat loss  
defrosting pipes**



**dangerous  
landslides  
soil and roads**



**permanent  
service**

The main reasons for this is the huge consumption of materials, structural complexity of heating systems, and as a result, a steady increase in the unbearable cost of maintaining such a complex thermal management. Improve the situation with heating by conventional methods (replacements, overhauls, preparation for the heating season, etc.) will not work.

**Strategy the district heating finally outdated exhausted its constructive resource and can not continue to develop effectively.**

## Part 2. Analysis of the electric heating systems and electric radiators' market

Everything presented should be divided into four groups:

**The 1<sup>st</sup> group** – electric heating systems on the base of electric, electrode, inductive, etc. boilers with the water system of the inner heating of the building with the natural or forced circulation.

Electric systems of the door-to-door heating with the water heating system inside the flat, house, with the natural or forced circulation, on the base of using electric boilers such as "Evan", "Galan", etc. Such constructions have increased energy consumption in comparison with the centralized heating; acquire definite running costs, bringing for work highly qualified specialists, become unfrozen, form a leak, water tubular heaters burn out from time to time, as a result – some complicity, unsafeness of such systems.

**The 2<sup>nd</sup> group** – domestic and imported electric heaters, heat guns, etc., in the base of which air and ceramic tubular heaters, nichrome or other spirals are used. The surface of the heating in such heater is +400-600C and even higher, on such burned out surface air dust burns, microflora, the air is getting dry. There is odour in the rooms, different harmful substances from combustion, what affects negatively the health of people who live or work in such rooms, especially children.

**The 3<sup>rd</sup> group** - oil heaters are highly explosive, non-fire-rated and not ecologically clean, in term of exploiting, beginning with the 2<sup>nd</sup> year of exploiting leaks form, this pollutes the air by burning in the room, constant exploiting from 3 to 7 years, it is not possible to be repaired, energy-consuming spending of electrical energy.

**The 4<sup>th</sup> group** – electric infra-red radiator, its use is prohibited.

SanPiN 2.4.2.2821-10 part VI ch.6.1. In buildings of general education it is prohibited to use transportable heating appliances and heaters with infra-red radiator.

**The 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> groups** of heaters cannot be used for heating residential or public rooms, because it is connected with the **negative impact on the people's health and their safety**. Setting up such appliances a client, builder, developer, etc. take responsibility for people's health, who live in such rooms. If a person lives or works in the room with heat supply on the base of such heaters, it is risky to get chronic disease. A person, responsible for taking up the corresponding decision, then should pay the aggrieved person serious compensation.



## Part 3. The market of heat energy can be divided also in three groups

**1 – Private households, small-scale business.** A private householder and also a small-scale business constantly aim at the optimization of running costs of the consumable heat. They produce heat themselves and use it themselves. Constant improving of the rooms' heat insulation, replacement on the more effective devices, applying energy-efficient technologies, etc. directly, automatically stimulate them in reducing the spending of utilities, that means also reducing of payment the used heat. These are the most active users of heat supply.

**2 – Householders, tenants.** A householder in a block of flats is a passive user of heat supply. A householder does not have any technical possibilities, mechanisms, financial stimulus for decreasing losses of heat, economize heat in the flat, because nobody will compensate the costs for improving heat supply of the flat, applying energy-efficient technologies, what considerably would reduce heat losses in the flat, etc., by this nobody and by no means will reduce even a part of the costs of the used heat in comparison with the other such users. Nowadays he/she is in charge of all the productive and nonproductive costs for getting and giving heat, etc. He/she has no opportunities and real rights in any way somehow influence this process. He/she has only to be patient and pay without complaint for the constantly growing costs for the heating of the flat, but also to appeal to the budget money in the sense of different subsidies. Today this is a hostage of completely out-of-date strategy of the centralized heat supply. **We should promptly decrease the social tension of such users.**

In order to make a householder an active user, we should give him/her technical opportunities and, as an option, in the form of door-to-door **pipeless system of heating on the base of applying a steam-dripping heater - a SDH with electrical control**. It will give him/het the opportunity to regulate any heat condition in each room of the flat, without being afraid to form leaks and flood the neighbors, unfrozen or burn the heat system.

A tenant him-/herself, an owner of the corresponding ultimately safe and simple equipment should influence the quality, quantity and timeliness of giving heat, have a possibility to economize it and as a result, produce an impact on its cost, fairly pay by the ultimate payback.

It is very important to run a mechanism of the maximal economy of the energy resources, by this effectively use the interests of the users, giving them the corresponding technical opportunities. **It is necessary to break the connection between the provider of the heat and its user.**

**3 – Manufacturing firms.** Nowadays a production department represents the whole set of rooms with different heat conditions, these are workshops with manufacturing centers, offices, cloakrooms, showers, the main department, storage facilities, etc. The necessary temperature in different rooms varies from 0° C up to +25° C and even higher. To regulate such temperature regimes by the central source of heating through the system of water heating or steam is impossible, as it is impossible just to cut off heating in those rooms where it is not necessary in some moments.

Ineffectiveness of the centralized system of water heating for production departments contains also in that, that after starting the heat it is exploited in the maximal possible regime the whole heating season on the reason of cutting off heating the system can be unfrozen. But there are weekend and holidays, periods of forced outage, when the technological process stops because of the absence of requests or on the other objective reasons. Impossibility of the operative regulation of the heat regimes inside of the department, cutting off the system if necessary, all these are the case for huge exploiting and energy costs.

Great problems of heating of the production departments in square more than 1000m<sup>2</sup>, in height more than 6-10m. Huge heat range, where it is practically necessary in the zone of 2m above the floor, in the zone where people and equipment are, the left range is not necessary to provide with heat. In great production departments it is economically profitably not to pay the departments, but locally to heat working places with applying energy-efficient equipment of the SPA VEET, including air heat flows, directed air heating systems on the base of applying calorifiers, reconstructed to steam-dripping heaters SDH.

## Part 4. The solution of the heating problems – applying energy-efficient technologies

Position with the heat can be stabilized, improved only by using energy-saving technologies in heating, which require little or no future operational costs in operation for such heating systems from 30 years.

During the last 15 years LLC SPA "VEET" managed to work out and implement a **unique heating electric mini boiler of steam-dripping type – SDH**, which can be set up directly in each room of the residential, office or other buildings, at the same time it is a device for heating, and it is also a **heater with the liquid heat-transfer - HT**.

A steam-dripping heater – SDH, licence №63038 of 11.12.2006.



**The principle of work:** closed circular transformation from electric energy into heat by means of small calculated amount of water, being boiled transforms into steam in the waterproof cistern of the heater. Giving heat, steam condenses, the condensate flows down through the inner surface to the heat element and again transforms into steam.

Steam-dripping heaters are the modern heat exchanging instrument, having unique features. The SDH construction differs from present traditional heating appliances in their compiling on the base of unify elements – heat pipes.

A heat pipe represents a device for passing heat from one zone (hot, warm) into the other (cold, heat) with the low gradient of temperature. Its effective heat conductivity is thousand times more than heat conductivity of such metals as silver, copper. A heat pipe in many senses is the most perfect from all other different devices for heat supply (more than 90% from the evaporation zone into condensate zone).

The quantity of heat which can be given in the form of heat steam transformation, is usually more higher than the quantity, which can be given in the form of working liquid in the usual convective system.

So the heat pipe can pass the bigger quantity of heat by the smaller size of the plant. The size of the SDH does not usually surpass the size of the traditional heat appliances. In the result of applying such a technology electric heaters in SDH do not burn for a long time, what gives the increased reliability of such devices.

The SDH construction allows to broaden in comparison with the heaters on air, ceramic boilers and spirals, the surface of the heat irradiation on 1kW of power to 1m<sup>2</sup>-2,0m<sup>2</sup>, and reduce the temperature in these rooms up to +90-120C, as a result the air dust does not burn on its surface, microflora, the air is not dry. SDH really works out comfortable heat, which in quality is not worse than the central heating and lower in its cost. The SDH efficiency factor is close to 98%. The SDH is a perfect heat accumulator, impulsive regime of its work supports the extended in time stage of the steam condensate.

**A steam-dripping heater is the basis for the pipeless heating system with electric control.** Such heating systems do not need exploiting costs; the term of exploiting is 30 years and even more. The expense of the electric energy for 1m<sup>3</sup> of the heated room in general for a season comprises 5-7W/h. The SDH do not become unfrozen, do nor form leaks, non-explosive, non-fire-rated and ecologically clean.

**A mechanic heater of the liquid heat-transfer – HT**, licence № 209471 1 of 17.08.1995 licence №55104 of 30.08.2004.

**The principle of work:**

Transformation of the electric, mechanic energy into the heat energy by means of forming heat by forced whirling flow of liquid inside the heater. HT works at the same time as a rotary pump and a heater of any liquid.



HT is non-explosive, non-fire-rated and ecologically safe. The efficiency factor of such plants is close to 100%. HT is a serious alternative to different plants for water heating and other liquids with applying water boilers and other electric transfers.

The field of application: is used for heating and hot water providing for various buildings and constructions, also concerning technological processes connected with heating and swap of different complex washing, galvanic solutions, different petroleum products, emulsions and other burnable and aggressive liquids and heat-transfers. It is used also for preparing specially low-grade masout for its burning in different boilers, mechanically heated up to 120C, homogenizing and transforming it into a masout-water emulsion with adding some water up to 15-20%.

Application of the given technologies is approved and recommended for the broad use by PI "Volgograd Center of Energy-efficiency", the Ministry of fuel, power engineering and regulation of Volgograd region. Now there are more than 150 objects of different functions: schools, kindergartens, block of flats, productive departments, etc. Work on the basis of this technology, proving its reliability and economical effectiveness.

# Part 5. Competitive advantages SDH

- Simplifying the preparation of the space for new buildings, they should only be provided with electric power, cold water and sewerage;
- Simplicity and high speed of installation of such systems, especially by building low housing, blocks of flats, reconstructions of tumbledown housing, etc. solve more effectively the present questions with the heat supply of such objects;
- Working out safe surroundings for living of our citizens – the systems do not become unfrozen, are non-explosive, non-fire-rated and ecologically safe;
- More balanced investment for getting heat in different regions of Russia depending on their climate;
- Real possibility of stabilization and reducing the level of payment of the used heat for the citizens and other uses;
- Equity of the payment, because the responsibility for the quantity, quality of the heat, the opportunity to economize, in the end influence its cost, will be given to the householder, the user. The government should only fairly regulate the rate of the electric power and cold water. Today the setting of the heat counter for the blocks of flats is a enforced action, in the end the situation concerning the equity of payment for the heat by householders of such block of flats is not simple and very scandalous.
- A considerable increasing of the coefficient of electric power's use, planned for blocks of flats and other objects, because electric power used for the work of cooling systems, split systems, it is used in winter for heating;
- Application of the SDH completely distributes the electric load in every room of the corresponding building, what gives an opportunity to stable work of computers, radio and television, household appliances, etc.;
- Increasing of the exploiting term of such heating systems to 30 years and even more with minimal costs for their exploiting;
- The opportunity to economize the gas, masout, solid fuel, applying in the centralized heating systems two-contoured systems, where the 1<sup>st</sup> contour supports the minimal temperature inside the building, the 2<sup>nd</sup> contour, containing from the SDH, easier regulates the temperature regime only in two rooms, which are mostly used at the moment.



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## Part 5. Competitive advantages SDH

- Exclude the cost of construction and the repair of centralized boiler and heating mains . NT installed in field of thermal energy , reducing heat loss ;
- High fire , explosion , electrical safety;
- Installation does not require constant maintenance staff, possible full automation and computerization of the process;
- NT operating modes that are not within the control zone supervisory authorities require special licensing ;
- Ease of fabrication , repair and maintenance , the minimum the cost of their content ;
- Reduced price per unit of heat consumption ;
- Ability to significant savings in electricity using night rates : given the fact that the very building is a good heat storage , up to 70 % of the heat can be supplied at night;
- Installation is effectively used in complexes with solar panels for heating and hot water supply of buildings;
- There is a matching government Energy supervision for the operation of mechanical liquid heater coolant is also a positive conclusion of public service and environmental state sanitary-epidemiological service. SES number 34.12.03.510.p. 003626.07.02 from 29.07.2002g.;
- A mechanic heater of the liquid heat-transfer – HT, licence № 2094711 of 17.08.1995 licence №55104 of 30.08.2004.



**Application of the given technologies is approved and recommended for the broad use by PI "Volgograd Center of Energy-efficiency", the Ministry of fuel, power engineering and regulation of Volgograd region**

# Part 6: economic efficiency unique heating electric mini boiler of steam-dripping type – SDH

Comparative characteristics of various start-up costs heating systems  
(\$ = 150m.kv. house)

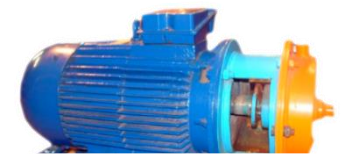


Technical characteristics	Way to heat a room				
	gas boiler	Boiler on liquid fuel	electric boiler	heat pump	steam-dripping type
Thermal energy source	gas	Heating Oil	electricity	Heat of the earth, electricity	Electricity / steam
Expenditure on domestic equipment, materials and labor	114 000	103 000	120 000	224 000	128 000
Cost of external equipment, materials and work	60 000	24 000	1 000	430 000	0
Construction costs	140 000	140 000	140 000	340 000	0
Total cost of installation and start-up heating systems	314 000	267 000	261 000	994 000	128 000
Boiler area, sq. m.	10	10	10	10	not required
Operating costs of the heating system for heating season (7 months) Dollars	11 340	71 820	68 040	18 400	18 900
Total expenses 1 year	325 000	338 820	329 040	1 012 400	146 900
Total expenses 2 years	11 340	71 820	68 040	18 400	18 900
Total expenses 3 years	11 340	71 820	68 040	18 400	18 900
Total expenses for the first three years (in rubles)	347 680	482 460	465 120	1 049 200	183 700
Total costs per 1 m2 of living space	2318	3 216	3 101	6995	1 225

**Tubingless autonomous heating system on the basis of all other PKN economical.**

**CONCLUSION: FAST payback period, a high index of profitability, low risk.**

# Part 7. Comparison of different heat sources with HT



## Comparative characteristics of heat sources

	Fossil energy gas, coal, oil burning		Electrical energy		Innovative mechanical heat transfer fluid heater
Capital investments? Building boilers, heating mains, etc.	centralized boiler	Autonomous boiler. Special premises. Gasification. Ventilation.	Tubular electric boilers Special premises. Enhanced grounding	electrode boilers Special premises. Enhanced grounding	Not required, is installed directly in the ground connection of heat on objects, outhouses, thermal cameras, etc. During construction directly on the floors Tepljakov for heating temporary structures for heating the frozen soil.
Cleaning Equipment coolant	required	of necessity	of necessity	required	not required
Equipment for forced circulation	required	required	required	required	Not required. Including works as a centrifugal pump
Electric safety	dangerously	moderate risk	increased risk	increased risk	absolutely electrical safety
Explosion safety	increased risk	increased risk	moderate risk	moderate risk	completely flameproof
Level ecology	low	low	average	average	Environmentally friendly technology
Permanent obsauzhivanie teplosistemy	required	periodic servicing	periodic servicing	periodic servicing	Periodic maintenance, with fully computerized process control is required.
Accountability supervisors	yes	yes	yes	yes	not required
Coefficient of performance	70%	90%	To 90% and during operation is reduced as fouling and burning filaments up to 45% and burn, giving a huge overrun electricity		Efficiency 90-98% thermal power installation
Project work and coordination	required	required	required	required	not required
Heating and pumping flammable liquids, oil and oil products, including bitumen	Warming up steam - drawback is the periodic use of boilers and systems can freeze in the winter Warming up in fire-tube boilers - the downside is burning bitumen U20% and change binding properties to 10%. Risk of explosion and fire hazard.		Burning bitumen to 20%. Changing the binding properties to 10%. highly explosive	not	Perfectly safe and environmentally clean. When heating burnout and change binding properties occurs.

**CONCLUSION: High efficiency, safety, except CONSTRUCTION COSTS, ECONOMY**

## Part 8. Relevance of the new strategy. Jobs serezdnye replenishment

Today, the market is no electric heaters , which could in their operation to meet the requirements of existing SanPin residential and public premises . Represented on the Russian market of domestic and imported electric heaters with ceramic heating elements and air , fan heaters have a heating surface , where the temperature reaches +350-600 , and more . During the operation on such overheated surfaces occurs :

combustion air dust , flora , air dried and residents instead of pure comfort ,  
warm air produced  
"poisonous smog" .

**The use of such electric heaters causes great harm to the health of our population.**

At a certain reorientation of industrial construction sector , housing, the use of new energy-saving technologies in heating , it is possible to develop the production of its energy-saving equipment , use spare capacity and , ultimately , complete quality thermal energy-saving products market , all this could **give thousands of workers places to create a strong tax base and significant replenishment of the respective budgets .**

Very simple production of energy-saving equipment, small manufacturing shops can be opened in any settlements , organizing additional jobs , solving the problem of heat supply in these settlements , replenishing their budgets . If such organize production at industrial plants , they will be well disposed wastes of various waste metals , electrical materials , etc.



## Part 9. Output

The heat supply system is an important and energy-intensive sector of economy, in which approximately 40% of energy resources of the country are used, and consequently, the task of increasing energy-efficiency of economy cannot be solved without increasing energy-efficiency of heat supply.

The new strategy of heat supply should consist in that, that all the energy-transfers (gas, coal, petroleum products, etc.) with application of modern technologies, be ecologically clean and to a greater extent transform into electric energy. All free powers should be utilized to the maximum, non-traditional and renewed resources of electric energy, etc. electric energy should directly be transmitted to the corresponding objects (houses, public offices, industrial premises, etc.) where considering the needs in every premise, room of the flat due to worked out technologies it is transformed into comfortable, safe and not expensive heat. In order to a householder or the owner of the corresponding equipment could influence the quantity, quality, timeliness of the heat supply, economize it and influence its cost. It is necessary to implement the setting of the combined manufacture of heat and electric energy, where the secondary heat could be used as a centralized heat supply for nearby objects, residential, public or industrial buildings, and electric energy after the reconstruction for heat supply of the distant objects. All these generations on the territory of the residential settlements should be combined into one electric mains. By the lack of electric power it is necessary to oblige electricity organizations to organize the production of additional electricity for heat supply of the houses or other objects, applying gas-plant settings, sun collectors, wind plants, etc.

Implementing a new strategy heating, we can solve many additional issues, such as reducing the threat of terrorism, corruption component in the residential complex, a gas explosion, improvement of the environment, import substitution energy-saving equipment, reducing the deficit of highly skilled workers employed in the service of traditional heating systems, creating thousands jobs in small factories, workshops for the production of simple energy-saving equipment, etc.



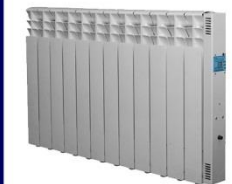
**For today the point is that we should put the centralized heating into the individual one, and housing into door-to-door electricity in the form of pipeless heating systems on the basis of applying the SDH. The heat should be worked out in place of its use and be used only in case of necessity.**

Today in a city two-room flat in square 50m<sup>2</sup> counting on 12 months the heat loading is determined approximately as 1Gkal of heat. By the cost Gkal – 1308 rub., constantly without depending on nothing, the householder pays approximately 1250 rubbles/month + the cost of the condominium costs. By the setting of the pipeless heating systems the cost of electric energy will comprise 600-800kW/h, the cost of 1kW/h by the use of electric heat comprises today 2.1 rub., so a householder without losing the quality of heat, will pay 800-1000 rub/month, but gaining a **very flexible, safe heating system, without being afraid to explode it, form leaks and flood the neighbor, unfrozen the system, and applying any options of exploiting, economize electric energy, and eventually, by the complete payback of the costs to economize the money.**

In country districts in connection with reduction of the tariff for electric energy, 1.77 rub for 1 kW/h, the heat will cost cheaper.

If the gas fits the district, especially country districts, it should be transformed into electric energy, applying piston-gas and gas-plant settings. Counting all the costs for today the prime cost of the produced electric energy will be approximately 2 rubles. Legislating the corresponding reconstruction of electric mains, the residents of settlements will get cheap electric energy, and setting pipeless heating systems in houses is a safe, reliable, not expensive heat, hot water, etc. The Internet, computers, complex domestic appliances, network, video and television will work safer, it will really make young people stay in the country.

The most important for implementing such technologies is that we do not need great costs. Firstly, they should be given for the objects, where in the 1<sup>st</sup> season the payback is and which give profits, being the base of the further implementing more expensive energy-efficient technologies. The funds for implementing the technologies which will be paid back during one season are the planned money for buying energy-transfers (oil, coal, electric energy) including the planned running costs for replaced traditional heating systems.



## The income should be gained from such measures and decisions as:

Prohibition for the planning, building, reconstruction of the heating systems, which do not correspond to the new strategy of heat supply;

Completely useless heat network, boiler-rooms, heating systems should not be repaired, the funds for these aims should be directed to improving the electricity and corresponding reconstruction of the objects, connected with these network;

The income may be considered as a difference in levels of exploiting running costs for traditional and replaced heating systems;

In the income should be included also delivery of hundreds of thousands tons of metal scrap; a secondary use of metal instruments, equipment, building materials, use of free boiler-rooms, CHP, pumping stations, etc.

### All these should become an additional financial base for the fundamental rebuilding of the heating system.

To date, SDH and HT technology fully meet all requirements Sanitary for residential and public buildings. Ease and speed of installation more quickly solve complex issues existing heating facilities. Most importantly, the people will get comfortable warmth on quality not worse than from centralized sources and have minimal maintenance costs of heating systems, as well as the minimum consumption of electric power. Simplifies the preparation of sites for new construction.



One more time I would like to draw your attention on that fact, that by deterioration of network and equipment in districts on 65%, and in cities even more, trying to reanimate the old heating system is not real, and it is doubtful, whether it is necessary to invest the regions with such great funds which in the result will turn out to be expensive to run such "new" heat supply. The money should be invested into working out and implementing the new innovative technologies, implementing the new strategy of heat supply.

By improving heat-insulated characteristics of buildings and applying energy-efficient technologies it is possible to achieve the ultimate economic effect and considerably decrease expenses of the budget for heat supply of the corresponding residential settlements.

With increasing the grade of energy-efficiency of the buildings it will be unpractical to apply the water heating system with its heat points, network and systems of pumping the heat-transfer. For energy-efficient buildings the solidity of heat loading in heat network may be minor, the running costs for exploiting such a system can surpass the effect of its application.

**Hard implementing the new strategy of heat supply in several years it will be possible to put to rights the heat supply of the residential settlements, make it absolutely safe, flexible, liquidate the investors, save for the country many trillions of rubles, planned for spending the reanimation of the traditional, centralized heating systems.**



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