Thermoelectricity is a promising scientific and technical direction, which is based on the use of direct, conversion of thermal energy into electricity through the use of thermoelectric effects. Thermoelectric energy converters have a number of attractive properties. Among them - the lack of moving parts, the ability to operate without maintenance, the independence of work from orientation in space and in the absence of gravity, virtually unlimited service life, resistance to extreme loads. Such features of thermoelectric energy sources have ensured their successful use in information and measurement systems.

However, the output voltage generated by the thermoelectric generators (TEG) is usually relatively low and cannot directly serve as a power source for many electronic devices. Therefore, it is advisable to use DC-DC converters to increase the voltage to the desired values, in addition, the DC-DC converter itself can act as a control element in case of temperature differences [1].

Modern manufacturers offer DC-DC converters of various topologies and circuitry, but most of the main problems of DC-DC converters that can be used in TEG systems are reduced to the main question of matching the internal resistance of the $R_{\text{teg}}$ module and the input resistance of the DC-DC converter.

There are three possible approaches for comparing TEG resistance and DC-DC converters: (1) improving the input resistance of the DC-DC converter, (2) reducing the internal resistance of the TEG, and (3) introducing a resistance adjustment circuit between the TEG and the DC-DC converter. Each of the proposed approaches has its advantages and disadvantages. But when using TEG, the principle of which is based on energy generation when reaching a sufficiently high temperature difference between cold and hot junctions, its internal resistance will change with the change of temperature difference.

Analyzing the work [2, 3], we can conclude that the equivalent input resistance of the DC-DC converter is partially determined by its duty cycle and depends on the PWM modulation frequency. Thus, the comparison of the resistance of the TEG and DC-DC converter can be achieved by adjusting the real-time duty cycle of the PWM signal. Among the possible approaches that can be used to implement this method of regulation is the method of remote control of maximum power (MPPT).

The MPPT method was first developed to work with photovoltaic panels, to increase their efficiency at their low efficiency. Because TEGs and photovoltaic
panels at their various commutations are similar in output voltages and currents, MPPT has been introduced with TEGs in recent years.

Basically, each MPPT algorithm is based on the principle of finding the maximum power point that is achieved when the resistance matching condition is met. Ideally, the power supplied to the input of the DC-DC converter should be 50% of the power generated by the TEG, 100% of the power compatible with the load of the TEG, which allows to increase the output power received from them.

Application of the offered system will allow to use the thermoelectric generator as a power supply for sensors, in places where it is impossible to use other power supplies.

References:

[1] Marian K. K, LaVern A. S (1999) Dynamic Performance of PWM DC-DC Boost Converter with Input Voltage Feedforward Control. *IEEE Transactions on Circuits and Systems*, (46).

[2] Kazimierczuk M. K., Massarini A. (1997) “Feedforward control of DC-DC PWM boost converter” *IEEE Trans. Circuits Syst*, (44), 143–148.

[3] Arbetter B., Maksimović D. (1997) Feedforward pulse width modulators for switching power converters. *IEEE Trans. Power Electron*, (12), 361–368.