# Prospects for Enhancing the Efficiency of Green Innovations and Investments in Cable Industry Enterprises

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**Abstract.** This paper examines the economic and organizational aspects of enhancing the efficiency of green innovations and investments within cable industry enterprises. It systematizes the impact channels of energy efficiency, cable waste recycling, the share of secondary metals, the adoption of environmentally safe products, and green financing instruments. Based on available data from "Uzkabel" JSC, the study analyzes the transparency and targeted management of green indicators and proposes a phased implementation approach for the 2026–2030 period.

**Keywords:** green innovation, green investment, cable industry, energy efficiency, secondary metal, circular economy, green taxonomy, environmentally safe cable, return on investment.

Ensuring competitiveness in the cable industry is increasingly linked to the efficient use of energy and raw materials, compliance with environmental standards, and the development of new products. Metal conductors, polymer insulation, extrusion and testing equipment, electricity, and production waste play significant roles in the cable manufacturing process. Therefore, green innovations should be viewed not merely as environmental protection measures, but also as tools for reducing production costs, minimizing raw material losses, and improving investment returns [1; 2].

Uzbekistan’s policy on transitioning to a green economy outlines objectives for enhancing energy efficiency and reducing greenhouse gas emissions within industrial enterprises. Resolution No. PP-436, dated December 2, 2022, sets targets to reduce specific greenhouse gas emissions per unit of GDP by 35 percent relative to 2010 levels, increase renewable energy capacity to 15 GW, and improve industrial energy efficiency by at least 20 percent [3]. The law on energy efficiency adopted in 2024 strengthens energy management and periodic energy audit requirements for relevant entities [4].

For cable manufacturing enterprises, these requirements bring practical opportunities. Energy-efficient drives and equipment can reduce electricity costs; recovering copper and aluminum from cable waste can decrease the demand for virgin raw materials; and halogen-free, fire-resistant products can open access to specialized market segments. However, labeling such projects as "green" does not automatically imply proven effectiveness; for each project, energy, raw material, waste, and financial outcomes must be measured against a baseline.

The objective of this paper is to substantiate priority areas for enhancing the effectiveness of green innovations and investments in cable industry enterprises and to develop practical proposals for their phased implementation, using "Uzkabel" JSC as a case study.

The first area is energy efficiency. Since electricity costs are a component of the production cost of cable products, investments in energy-saving drives, high-efficiency motors, the reduction of equipment downtime, the optimization of production modes, and energy monitoring directly impact the cost structure. Project efficiency should be measured not merely by installed capacity, but by the kilowatt-hours consumed per unit of product, production volume, and energy costs.

The second area involves cable waste recycling and the circular economy. Separating and reusing metal scraps generated during the cable manufacturing process can reduce the need for purchasing primary metal, lower waste volumes, and improve resource efficiency. In this context, it is advisable to track the proportions of recycled copper and aluminum separately, as their market values and lifecycle environmental impacts differ [5; 6]. For a recycling project, key metrics to record include the mass of recovered metal, its purity, the energy consumed during recycling, and the extent to which it replaces primary metal.

The third area focuses on environmentally safe and specialized products. Developing halogen-free, fire-resistant, and specialized cables for energy transmission systems requires technological innovation, testing, certification, and staff training. If these costs are not factored into the total cost of the investment project, the projected return on investment may be artificially inflated. Furthermore, the success of a new product should be evaluated not merely by the number of units produced, but also by its market share, profit margins, the volume of certified products, and entry into new markets [1].

The fourth area is green financing. The national green taxonomy provides criteria for classifying projects financed through green bonds and loans [7]. For cable manufacturing enterprises, projects focused on enhancing energy efficiency, recycling, waste reduction, and the production of eco-friendly products may open up opportunities to secure green loans or other financing instruments, provided they meet the relevant criteria. However, compliance does not automatically guarantee the granting of a loan; factors such as project documentation, the measurement baseline, financial returns, and the borrower's creditworthiness are subject to separate evaluation.

**Table 1. Indicators for evaluating green innovation and investment projects[1]**

| Focus Area | Key indicator | Expected impact channel | Measurement method |
|---|---|---|---|
| Energy efficiency | kWh per unit of product; share of energy costs | Cost and profitability | Pre- and post-project comparison |
| Metal processing | Share of recycled copper/aluminum; mass of recovered metal | Raw material costs and waste | Mass balance, quality, and processing consumption |
| Environmentally friendly product | Share of new/certified products | Market entry and product margin | Sales, margin, and certificate registry |
| Waste reduction | Waste volume and recycling rate | Environmental impact and resource conservation | kg of waste per unit of product |
| Green finance | Financing cost; NPV; IRR | Capital cost and project return | Financial model and credit terms |

According to available data, Uzkabel JSC possesses a cable waste recycling facility, and its corporate strategy for 2022–2025 includes a project to manufacture halogen-

[1] Muallif ishlanmasi

free, fire-resistant cables [8]. This indicates that the enterprise has a foundational technological basis for initiatives aligned with the circular economy and the production of environmentally safe products. However, a comprehensive assessment of the overall green performance of these initiatives is limited because public reports do not disclose consistent quantitative targets regarding the share of recycled copper, energy consumption, waste reduction, or greenhouse gas emissions.

A comparison with the publicly stated goals of international cable manufacturers highlights the importance of such disclosures. Nexans aims to increase the share of recycled copper from 5% in 2023 to 25% by 2028 and to reduce direct and energy-related emissions by 46% by 2030. Meanwhile, Prysmian has set a target to reduce relevant emissions by 47% by 2030 compared to 2019 levels [8; 9]. These indicators do not represent a fixed standard for Uzkabel, but rather serve as a benchmark for the quantitative management of green activities and their disclosure in annual reports.

**Table 2. Transparency of green indicators: international practice vs. "Uzkabel" JV JSC[2]**

| Indicator | Nexans | Prysmian | "Uzkabel" JV JSC |
|---|---|---|---|
| Share of recycled copper | 2023: 5%; 2028 target: 25% | 2025 target: 20% | Not disclosed in public reports |
| Direct and energy-related emissions | 46% reduction by 2030 | 47% reduction by 2030 compared to 2019 | No quantitative target announced |
| Recycling of cable waste | Quantitative figures in company reports | Quantitative figures in company reports | Presence of processing equipment noted |
| Environmentally safe product | Sustainability and product portfolio targets | New products and carbon neutrality targets | Halogen-free fire-resistant cable project noted |

The key takeaway from the comparison is that the disparity in green development cannot be explained solely by equipment or technology. Unless an enterprise measures

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baseline levels for energy, recycled metal, waste, and environmental product attributes, neither the return on investment nor the eligibility for external financing can be adequately justified. Therefore, the primary task for "Uzkabel" is not to immediately incur massive capital expenditures, but rather to establish a system for measuring green indicators and identify projects that offer the greatest economic impact.

A three-stage approach is proposed for integrating green investments into the enterprise's strategy. The first stage involves conducting an energy audit and assessing waste and metal balances, equipment condition, and energy consumption per unit of product. Simultaneously, a baseline indicator, target, cost, responsible department, and data source are defined for each green project. This stage enables investment decisions to be based on measurable issues rather than assumptions.

In the second stage, priority is given to projects such as energy-efficient drives, equipment modernization, metal recovery from cable waste, and energy consumption monitoring. When selecting a project, factors such as energy savings, the mass of recovered metal, and reductions in defects and waste are calculated alongside NPV, IRR, and the payback period. If green financing is utilized, the project's compliance with national taxonomy criteria is documented.

In the third stage, the portfolio of energy-efficient and environmentally safe products is expanded, halogen-free and fire-resistant cables are certified, and entry into new markets is considered. At this stage, commercial outcomes—such as market share, margins, exports, and customer demand—must be evaluated alongside environmental impacts. Six to twelve months after the investment is implemented, planned results are compared with actual outcomes, and subsequent project decisions are updated.

When assessing investment efficiency, environmental outcomes should not be separated from financial results, yet neither should they be artificially combined into a single indicator. For instance, if energy consumption drops but production volume also declines, a reduction in total energy usage does not necessarily demonstrate efficiency. Therefore, energy consumption per unit of product and total energy costs are measured in parallel. Similarly, while an increase in the share of recycled metal is positive, the energy and labor costs associated with the recycling process must also be taken into account. Managing working capital is also crucial for strengthening the financial foundation of the green investment program. Redirecting funds freed up by improving inventory turnover toward technological upgrades can reduce the need for external

borrowing. At the same time, it is essential to maintain the raw material reserves necessary for uninterrupted production; excessively reducing inventory levels could lead to supply risks and production stoppages.

Implementing the proposed approach will result in the creation of a unified database for green investments, the measurement of energy consumption and the share of recycled metal, and the comparison of projects based on economic and environmental criteria. These outcomes do not automatically guarantee specific levels of profit or emission reductions; effectiveness depends on the specific technology, production regime, raw material composition, and financing terms.

Practical recommendations include: first, introducing an annual KPI system for cable industry enterprises covering energy consumption per unit of product, the share of recycled copper and aluminum, production waste, and the proportion of eco-friendly products; second, prioritizing projects with the shortest payback periods and clearly measurable resource savings based on energy audit results; third, pre-verifying the alignment of recycling and energy efficiency projects with the national green taxonomy; and fourth, conducting post-audits 6–12 months after implementation to verify the results of green investments. For "Uzkabel" JSC, it is advisable to structure the green transformation in stages: the initial phase involves conducting an energy audit and establishing a performance indicator system; the subsequent phase focuses on technological modernization and enhancing waste recycling efficiency; and the third phase entails certifying environmentally safe products and developing new markets. This sequence directs investment resources toward quantifiable issues and integrates green innovations into the enterprise's overall innovation and investment strategy.

Enhancing the effectiveness of green innovations and investments in the cable industry requires integrating energy efficiency, secondary metal usage, waste recycling, environmentally safe products, and green financing into a unified management system. The outcomes of each area must be measured individually and subsequently linked to financial returns and the enterprise's strategic goals.

The existing waste recycling facility and the halogen-free fire-resistant cable project at "Uzkabel" JSC provide a foundational basis for the green transformation. However, the absence of publicly stated quantitative targets regarding the share of recycled metal, energy consumption, and emissions limits the ability to assess the overall effectiveness

of these projects. Therefore, the primary task is to measure and disclose performance indicators, followed by financing the most effective technological projects.

The sustainable impact of green investments must be validated not only by environmental outcomes but also by reduced costs and resource consumption, sales of new products, and the return on investment. A phased approach, alignment with the national green taxonomy, financial criteria, and post-project audits enable cable enterprises to transform green innovations into measurable economic results.

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