# The Forecasting Express-Model of the Energy Companies' Financial State

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**Abstract.** The paper focuses on a forecasting express-model of the financial state of an enterprise. This model includes forecasting the Profit&Loss statement and the Balance Sheet of the organization. The combination of these documents allows forecasting cash flow in an indirect form. We use open data on the financial statements of individual organizations. Estimates of the cash flow deficit have been carried out both for the power generation sub-sector as a whole and for the largest power generating organizations in Russia.

## 1 Introduction

A large-scale economic crisis has broken out due to the coronavirus COVID 19. Normal activities have been disrupted; many enterprises have stopped working or abruptly reduced business activity; the population is in self-isolation and does not consume goods and services in the same volume. Some researchers compared this crisis to the Great Depression in the late 1920s.

As a result, there was a decrease in energy consumption, and anyone can expect a deterioration in the financial and economic situation of energy companies. "The uncertainty of the future conditions for the development of the energy sector has considerably increased, and there have been significant changes in financial policy and pricing in the energy sector" [4].

The paper presents an express model for forecasting the financial and economic state of enterprises, which allows:
- predicting the financial forms of the enterprise due to a coronary crisis;
- assessing the lack of cash flow;
- evaluating the consequences of anti-crisis measures and enterprise support for normalizing financial condition and preventing bankruptcy.

## 2 Mathematical Model

An express model for a forecast of the financial and economic condition of the enterprise is used [1, 2]. This model provides links to the projection of the Balance Sheet and the Profit&Loss report.

Let us describe the enterprise balance model as a set of Balance Sheet items *BS*

$$BS = \{FA_j, CA_l, CL_k, D_m, Eq_n\}, \qquad (1)$$

where *FA* is fixed assets, *CA* current assets, *CL* current liabilities, *D* debt, *Eq* equity, and $j$, $l$, $k$, $m$, $n$ are indices of articles of balance sheet sections.

Similarly, we could describe the model of the Profit&Loss statement as a set of income and expense items *PL*

$$PL = \{S_p, C_r\}, \qquad (2)$$

where *S* is revenue, *C* expenses, and $p$, $r$ item indices.

Note that there is a key link between the two main financial documents: the balance sheet and the profit&loss statement. It consists of increasing equity by the amount of retained earnings (net profit without dividends) according to the formula

$$\Delta Eq = \pi = (S - VC - FC - Am - k_D\, D)(1-\tau)(1-u), \quad (3)$$

where *VC* stands for variable costs, *FC* fixed costs (without depreciation), *Am* depreciation, $k_D$ the debt rate, $\tau$ the income tax rate, and $u$ the share of profit on dividends.

The forecast of the financial state (reflected in the forecast and planning documents - the balance sheet and the Profit&Loss statement) is carried out using the forecasting model

$$(B, P)^F = M(B, P, U, C_U), \qquad (4)$$

where *F* is the forecast index, *U* is the control of income/expense items, $C_U$ is the cost of controlling income/expense items.

With independent (directly unrelated) forecasting of various items, the rule that assets are equal to liabilities may be violated. That is, a "financing deficit" (negative

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cash flow) arises, index 0 denotes a lack of control (initial forecast option).

$$CF_0 = -FA^F - CA^F + CL^F + D^F + Eq^F, \qquad (5)$$

where $CF$ is cash flow.

Cash balance at the end of period $t$ must be non-negative

$$Cash_t = Cash_{t-1} + CF_0 \geq 0, \qquad (6)$$

## 3 Initial data

As initial data, we used open data on energy companies:
- open data of the Federal State Statistics Service of Russia on the financial statements of legal entities [5]. In this paper, we consider the sub-sector of electricity generation, according to OKVED-2[a] codes "35.11. Power Generation". The list of large and medium-sized companies included 116 legal entities more than 800 million rubles revenue. We will call the summary reporting of the aggregate of these organizations the "Consolidated Energy Company". The technological basis that made it possible to carry out these calculations is the construction of a hypercube or OLAP (On-Line Analytical Processing), implemented in Excel;
- short-term economic indicators for providing electric energy [6];
- financial statements of separate public joint-stock companies for the year 2019.

Unfortunately, the Russian Agency for Statistics provides open data with a long delay (about ten months). The inertial forecast of reports for 2019 was formed using a linear method for three years based on the reporting for the previous year. For the 26 largest companies, actual reports for 2019 were examined, and an adjustment factor of 0.97 is used.

The accumulated retained earnings in the balance sheet were increased by retained earnings of the last year. The proportion of dividend payments of the previous year was used to estimate dividends of the current year.

The difference in forecast assets and liabilities has been adjusted in short-term loans.

## 4 Analysis of past growth

Russia's largest energy companies successfully developed until 2019. Revenue of large and medium-sized energy companies grew with a compound annual growth rate (CAGR) of 10.2% per year, which is higher than consumer inflation and GDP growth.
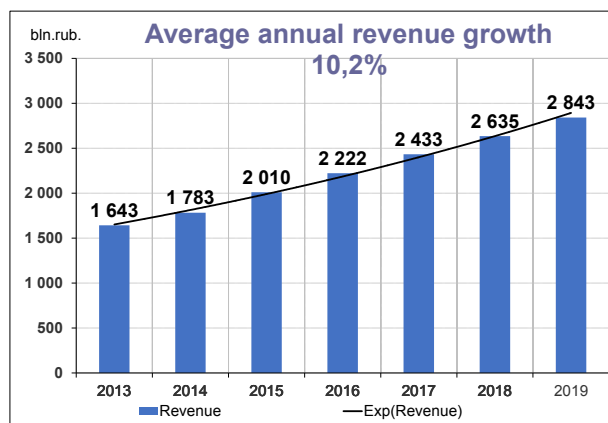
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[a] All-Russian classifier of economic activities.



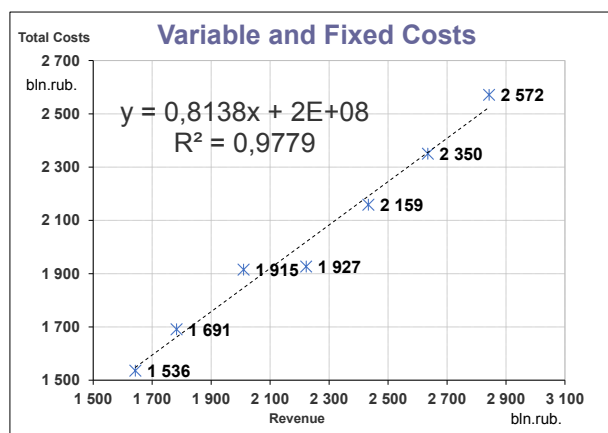**Fig. 1.** Revenue of power generating organizations in Russia



**Fig. 2.** Variable & Fixed Costs vs. Revenue of power generating organizations in Russia

The dependence of total costs on revenue is characterized by a regression relationship with a variability coefficient of 0.8138, that is, on the increase in revenue per 1000 rubles, full costs increase by 814 rubles. The "Consolidated Energy Company" had the profitability of about 11% in 2018, estimation 12% in 2019, which is noticeably higher than the average Russian figure.

## 5 Calculation results

The revenue change scenario is an external factor for the express model for forecasting the financial and economic situation. There will be a decrease in energy consumption during the crisis due to COVID-19 and a decrease in economic activity.

According to short-term economic indicators for the supply of electricity [6, sheet 1.2], in May 2020, there was a drop in the supply of electricity, gas, and steam by 4.1% compared to May of the previous year.

According to the UES System Operator [7], for May 2020, electric energy consumption fell by 5.4% compared to the previous year, in June – by 5.9% (see Table 1). Let us estimate the change in the average annual electricity consumption -3%.

**Table 1.** Power generation and consumption according to UES System Operator data.

| Period | Consumption 2020, GWt*h | Consumption 2019, GWt*h | Deviation Generation, % |
|---|---|---|---|
| **Total** | **564 563** | **580 639** | **-2,77%** |
| Jan | 98 419 | 101 739 | -3,26% |
| Feb | 92 655 | 91 376 | 1,40%[b] |
| Mar | 93 095 | 94 599 | -1,59% |
| Apr | 82 474 | 84 949 | -2,91% |
| May | 75 879 | 80 230 | -5,42% |
| Jun | 72 590 | 77 140 | -5,90% |
| Jul[c] | 49 452 | 50 605 | -2,28% |

Let us estimate the increase in tariffs by +3% according to inflation. So let us consider the case of the average annual decline in the consolidated energy company's revenue by -0.1%. But we will consider this value as an input parameter for calculations.

The calculation is shown in the table (Fig. 2). While maintaining the same proportions, profit will remain at almost the same level of 271 billion rubles.

In the industry as a whole, the main requirement for financing is to grow fixed assets. For the "Consolidated Energy Company," the estimate is 192 billion rubles. This value is close to the forecast of retained earnings of 187 billion rubles. Considering a slight optimization of expenses and current assets/liabilities by 0.1%, the impact of changes in current assets is insignificant, about 1 billion rubles.

For the authors who have studied many forecasts for the development of companies, this situation looks unusual and rare: retained earnings almost wholly cover the investment program.

The parametric calculation of the estimates of the final cash flow showed a weak dependence on the change in revenue. When the revenue changes from -5% to + 5%, the cash flow changes from +4.3 to -12.6 billion rubles. We hope that operational management can replenish this cash flow.

Express assessments for separate organizations show some differentiation in cash flow (see Table 2). But we note that almost all estimates of the cash flow for the largest organizations are above 0. That is, there should be no difficulties in financing this year.

Note. We carried out the express assessments according to the reports of the head legal entities. For consolidated reporting of groups of companies, estimates may be different.

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[b] 29 days in 2020 versus 28 days in 2019.

[c] 20 days of July were available at the moment of this paper preparation.

| Income and Expenditure | Income forecast | Income growth |
|---|---|---|
| Revenue | 2 839 916 | -653 |
| Cost of revenue | -2 185 160 | 2 187 |
| Selling and administrative expenses | -108 611 | 0 |
| Income tax | -100 357 | -413 |
| **Net income** | **272 380** | **1 121** |
| **Retained earnings (current year)** | **174 711** | |
| **Assets & Liabilities** | **Balance sheet forecast** | **Cash flow growth** |
| Non-current assets | 5 500 897 | -192 475 |
| Inventory | 185 854 | 186 |
| Receivables | 692 293 | 693 |
| Other current assets | 17 258 | 0 |
| Cash & short-term investments | 635 240 | 0 |
| Accounts payable | 378 322 | -379 |
| Other current liabilities | 54 836 | 0 |
| Long-term debt | 1 258 895 | 0 |
| Short-term debt | 349 901 | 0 |
| Common stock | 2 020 903 | 0 |
| Retained earnings | 1 928 417 | 174 711 |
| Other equity items | 1 023 005 | 0 |
| **TOTAL surplus (+) / deficit (-)** | **-17 263** | |

**Fig. 3.** The state forecast of the Consolidated Energy Company

**Table 2.** Express assessment of cash flow for individual organizations.

| Organization | Cash flow, billion rubles |
|---|---|
| PJSC "T Plus" | 5 756 |
| PJSC "Mosenergo" | 22 546 |
| JSC INTER RAO-Electrogeneration | 30 776 |
| PJSC "Federal Hydrogenerating Company – Rushydro" | -13 315 |
| PJSC "Second Generating Company of the Wholesale Electricity Market" | 10 893 |
| PJSC "Territorial Generating Company No. 1" | 6 856 |

## 6 Measures to improve the financial and economic situation

Negative cash flow is a sign of the unworkability of plans. Management should offer a project for the non-negativity of funds.

Management measures divided into the following categories:
- external: attraction of external financing (taking loans), tariffs increase;
- internal: increasing efficiency by reducing costs, introducing technologies with higher efficiency, optimizing assets and liabilities. The impact of new technologies has significant potential for reducing costs, but projects with long payback periods are virtually unrealizable in a crisis.

The authors' consulting experience with power generation organizations shows that internal management measures have little potential than external

actions. In many other industries - interior projects play a much more significant role in improving overall performance and development.

An assessment of financing a cash shortage using external loans shows no substantial change in the structure of liabilities. It is a good scenario in the assumptions and initial data of the current model.

Optimization of investment programs in fixed assets and long-term financial investments will significantly reduce the dependence on external financing in case of a "hard" scenario of the crisis, which is considered as one of the strategic threats to the development of the energy sector [3].

# 7 Conclusion

An express assessment shows that an abrupt deterioration in the financial and economic condition of energy generating companies in Russia in this economic crisis is unlikely to happen.

On the one hand, this ensures the stability of the industry. On the other hand, a large-scale economic crisis will most likely not be used as an incentive to change and increase domestic efficiency.

The low energy efficiency of Russian energy companies is an obstacle to their capitalization, but this is a topic for separate work.

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