

**RUSSIA ENERGY EFFICIENCY DEMONSTRATION
WORKPLAN**

Addendum

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U S Agency for International Development

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Energy Efficiency and Market Reform

Prepared by

Hagler Bailly Consulting, Inc
1530 Wilson Boulevard
Suite 900
Arlington VA 22209-2406
(703) 351-0300

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Contents

Abstract

1 0 Introduction and Summary Overview

2 0 Project Description

2 1 Participating Agencies and Entities

2 2 Project Schedule

3 0 Project Stages and Timeline

4 0 Charts

Chart No 1 Participating Organizations, Entities and Agencies

Chart No 2 Time Line

Chart No 3 Energy Efficiency Project Process

Abstract

The pilot described in this Work Plan Addendum represents a first attempt to demonstrate the viability of in-field implementation of demand-side management (DSM) programs in Russia. The two areas chosen for demonstration are the

- application of high-efficiency, end-use technology and modification of operating and maintenance (O&M) practices to produce both energy and capacity savings and
- use of innovative rate design to enable load-shape management

These are basic concepts which represent the backbone of any effective DSM strategy and which must be demonstrated to have practical application in actual customer facility environments if DSM is to be taken seriously in Russia.

The demonstration will

- focus on manufacturing and other industrial facilities wherein the vast bulk of electric savings potential is presumed to reside,
- create innovative financing mechanisms that synergistically build upon existing commercial lending practices in Russia
- involve Stavropolenergo, Ivenergo, local municipal government agencies and Regional Energy Commissions (RECs) as proactive agents of market change
- build upon earlier USAID-sponsored activities that have laid the conceptual foundation for DSM and Integrate Resource Planning (IRP) in Russia and have established a strong network of capable technical organizations committed to future market-oriented solutions for efficiency and load management,
- help establish and support a local private sector energy services infrastructure
- create DSM expertise within the two participating energos to carry on the work
- position efficiency as an integral element of overall industrial modernization and productivity improvement and
- position DSM as an effective energy resource and service strategy which can be entirely justified on its own technical and economic merits and financial feasibility

Russian Energy Efficiency Demonstration

1.0 Introduction and Summary Overview

This report and work plan outlines the overall energy efficiency demonstration program that will be completed within the Russian Federation at two local distribution companies (AO Energos). The project will provide a demonstration of the contributions that such projects can make to improve the productivity and energy efficiency of industrial facilities. The program will also demonstrate practical, near-term contributions which energy efficiency can make as an important energy resource, a service strategy and an emerging market opportunity for Russian utilities. The plan is designed to identify, develop and implement new initiatives to help accelerate the rate at which increased energy efficiency and end-use productivity can be realized throughout various sectors of the Russian economy. The pilot will focus on innovative tariff design as well as efficient, end-use technology, information and technical assistance to improve the operating cost-effectiveness of medium-sized manufacturing facilities.

2.0 Project Description

The Russian Energy Efficiency Demonstration Project (REED) is an eighteen month project sponsored by the U.S. Agency for International Development (USAID) within the Russian Federation. It will involve Russian national and local utilities as well as industrial customers in Russia to demonstrate how improved energy efficiency, coupled with innovative rate design, can enhance the productivity and future viability of the participating industrial customers. Rate design that reflects the time-differentiated costs of providing electrical service will enhance the success of the energy efficiency measures taken by the industrial participants. REED will involve the cooperative efforts of the Joint Stock Company (RAO) of Power and Electrification (EES Rossiya), two local AO Energos (distribution companies) and several industrial plants located within the service areas of the Energos.

The demonstration will focus on medium-sized manufacturing enterprises and related activities within the industrial, agricultural and large commercial services sectors which prior studies and assessments (including the US/Russia Joint Electric Power Alternatives Study (JEPAS) Final Report) have consistently identified as prime targets for improved electric end-use efficiency and in which the bulk of estimated savings potential is presumed to reside. At the project outset each participating Energo will identify potential industrial customers (40 to 50) as candidates for the project. This list will be reviewed and evaluated to determine which customers meet the minimum criteria for participation. The lists are expected to generate between 10 to 12 bankable projects (5 to 6 at each Energo) under actual marketable conditions that provides a model for others to follow.

The industrial customers will be provided technical energy audits to identify measures that will not only improve the energy efficiency of the plants, but which will also improve the overall productivity and enhance the future economic viability of the plants. Russian technical experts will be contracted to perform these audits. Metering equipment will be installed at each of the facilities and at key end-uses within the facilities to measure the actual energy usage and to provide load profile data. This will provide data to help evaluate the potential for energy savings and baseline data to verify savings after the proposed efficiency measures are installed.

Once the efficiency measures are identified, an economic analysis will be performed to further identify those measures which are both energy efficient and economically sound. Recommendations for new or replacement equipment will follow and the industrial customers will make plans to implement the recommendations. To facilitate this, the industrial customers will apply for loans, either through local banks or through funding organizations that have been established in Russia (e.g. World Bank, U.S. Russian Investment Fund, etc.) to make funding available for such projects. Equipment will then be purchased and installed.

One of the project's goals is to ensure the sustainability of such projects. By working with the participating Energos' staff, the project will build on the newly formed customer service staffs to enhance the skills and capabilities to carry on the activities after the demonstration project ends. This could be done either as a business activity of the Energo, or the Energo could be an integral part of an energy services network which includes Energy Services Companies (ESCOs), the Regional Energy Commissions, and others within the energy community.

Once the equipment has been installed and tested, measurements will be taken to evaluate the efficiency gains, cost reductions, and productivity improvements. The metering equipment will provide the actual energy usage and the load profile data used in the impact evaluations.

The results of the project will be made available to other Russian AO Energos and industrial customers to show how improvements in energy efficiency are beneficial.

2.1 Participating Agencies and Entities

The project will involve several U.S./Russian national and local agencies and entities. Chart No. 1, entitled "Participating Organizations, Entities and Agencies," shows the anticipated interaction between each of these entities throughout the project. Those involved in the project include:

- 1 US Agency for International Development (USAID) - Project sponsor
- 2 Hagler Bailly Consulting, Inc - Consultant for USAID which will provide overall project management, technical oversight and quality control

- 3 Russian Joint Stock Company (RAO) of Power and Electrification EES Rossi - Generation and transmission company for all of the Russian Federation that also provides coordination and planning for local distribution companies (energос) throughout the Federation
- 4 Regional Energy Commissions (RECs) - Regulatory commissions recently created to provide energy regulatory functions within each of the Russian regions
- 5 Regional Administrations - Governmental entities within each of the Russian regions to oversee economic development and other governmental functions not done by local (city) government organizations
- 6 Stavropolenergo - The participating local distribution company headquartered in Pyatigorsk
- 7 Ivenergo - The participating local distribution company headquartered in Ivanovo
- 8 East West Energy Agency - A Russian technical services and energy efficiency consulting firm which will oversee the energy audits done by local Russian experts, and to assist in the coordination of financing arrangements
- 9 CENef - Russian energy efficiency organization which will assist the industrial participants in business planning and funding applications
- 10 Funding Organizations - Organizations which will provide loans for the energy efficiency measures at each of the industrial sites These organizations include but are not necessarily limited to
 - World Bank Enterprise Support Program
 - Russian U S Investment Trust Fund
 - Local Banks
- 11 Industrial Customers - local industrial plants located within the service areas of the participating energос These will be identified in Stage I of the work

2.2 Project Schedule

This is an eighteen month project that has five stages

- I Project Initiation
- II On-site Energy Audits and Financial Analysis
- III Funding

- IV Equipment Procurement and Installation
- V Program Evaluation

Chart No. 2 is the timetable proposed for each stage of the project. There will be some overlap since all of the individual projects can not be done simultaneously (e.g. energy audit work can not all be accomplished within the same time period). Work will progress at each industrial site somewhat independent of the other sites.

While the project is scheduled to be completed in five stages, the process for each of the individual projects involving the end-use industrial customers is a twelve-step process. Chart No. 3, entitled "Energy Efficiency Project Process", consists of twelve pages showing the steps involved in the process of identifying the industrial candidates, selecting the final participants and carrying out the remainder of the projects for those participants. The chart shows the interaction between each of the entities involved in the projects and the responsibility each has for the success of the projects. The actual steps shown in these charts transcend the overall stages of the project since each individual project will be independent of the others.

3.0 Project Stages

This project will be completed in five stages. The following is a description of the planned work activities at each stage of the project.

Stage I Initial Market Analysis and Customer Screening - Setup administrative procedures and make initial industry contacts

The first stage of the project should take about three months and will involve the project kick-off, the initial screening of candidate facilities and the final selection of industrial consumers to participate in the project. The Regional Energy Commissions and Regional Administrations will also be apprised of the project and encouraged to participate to the extent they want and are able. It may also involve the necessary training of energy staff who will carry out future work in energy efficiency. The tasks involved in Stage I include:

- A The Project Work Plan and Budget will be finalized. The final Work Plan and Budget will be written and developed by HBCI and submitted to USAID. Copies of the Work Plan will be made available to all entities involved in the project.
- B Operational logistics for all parties involved in the project will be developed and finalized. Although there are numerous details, the primary logistics first are contracts with consultants and the utilities and the payment procedures as work is completed.

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- 1 Contract procedures will be established and contracts signed with the primary agencies involved in the project. These include
 - a East West Energy Agency
 - b Stavropolenergo
 - c Ivenergo
 - d RAO
 - e Technical consultants

 - 2 Payment procedures will be established in order to provide accurate accounting, quality control of work products and timely payment for work that is completed. Details will be developed on the following items
 - a Quality control check-off of work products
 - b Time sheets
 - c Procedures for paying subcontractors

 - C Initial visits to Energos, the RECs, and potential industrial participants will be completed in early November to kick off the projects
 - 1 Meeting with Energo management will be accomplished as soon as possible with the HBCI Project Manager. These meetings will
 - a Confirm the project purposes and objectives and make any modifications deemed necessary to accomplish the overall purposes of the project
 - b Identify and confirm those Energo staff members which are assigned to work on the project
 - c Potential participating industrial customers will be identified by the Energo and/or REC. The list of candidates should include
 - 1) Name of Business
 - 2) Type of Industry
 - 3) Historical energy usage
 - 4) Historical payment records
 - 5) Forecast of future market prospects and products
 - 6) Rates (historical and current)
 - d Obtain rate information for the Energo which will include
 - 1) Current Rates
 - 2) Rate design criteria (historical)

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- 3) Cost-of-Service Data (if available) for TOU Rate design
- 2 Meeting with Regional Energy Commissions (RECs) are planned to involve them in the project and keep them informed of the project work plan and activities. These meetings are scheduled to
 - a Review of the project purposes and objectives and answer any questions that members of the REC may have regarding the plan. Also, input from the REC will be welcome to ensure the success of the project
 - b Provide revised project work plan to each member of the REC and requested copies for staff. The work plan provided will include
 - 1) Project Schedule
 - 2) Participants
 - 3) Discussion of possible TOU Rate Design
 - 3 A meeting with the potential participating industrial customers to discuss the project will be arranged by the energy at the earliest date possible. The purposes of the meeting are
 - a Describe the program purposes and objectives and answer questions raised by the industrial customers
 - b Describe the Energy audits and what will be provided to them following the audits and analyses of the data gathered by the audit engineers
 - c Discuss the potential results from increasing overall productivity through the measures that are recommended in the energy audit reports
 - d Describe the financing arrangements that must be accomplished in order to install the recommended measures from the energy audits
 - e Describe possible TOU rate design and the potential savings from load shifting and energy efficiency measures

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- f Describe the competitive nature of the process and the two-step procedure to select the final candidates for participation. This will include a description of some of the criteria (see Part D, 1 below) that will be used to evaluate the initial list.
 - g Ask for interested parties to submit an application to the Energo for participation. The application should include some information and data that can be used to make initial financial screening for the funding institutions.
- D The list of industrial candidates will be finalized to determine those that meet the initial criteria for involvement in the process. Criteria for selection of the final list of candidates will be accomplished jointly with the energo management. The process of finalizing the list will also include an analysis of the customer's operations and a short site visit. The tasks for this step include:
- 1 Determination of the criteria for selection of final participants in the project. The criteria will likely include:
 - a Financial stability of the industry sector (e.g. how likely is the industry sector to grow and prosper and will the industry qualify for a bank loan?)
 - b Forecasted sales/revenues, if available for the industrial customer to assist in the determination of the viability of the future of the organization.
 - c Payment record with energo and other suppliers of materials to the industrial customer.
 - 2 A brief visit to the sites of potential industrial candidates will be intended to provide important information that will be used to evaluate the candidates for final participation in the project. The visit will be used to:
 - a Collect data on each site including the industry's products, processes involved, energy uses and potential for efficiency gains.

- b Gain initial impressions of the economic future for each site (e.g. attempt to ascertain the future viability of the industry and the plant involved)
- 3 Finalization of the list of participants in the project to be done following the site visits and the analyses of the initial data and other information obtained
 - a The candidates will be ranked in order of likelihood of technical and economic benefits from the project
 - b An initial financial analysis will be performed to eliminate those candidates who are unlikely to qualify for bank loans or who may not appear to be financially sound
 - c The final list of candidates will be notified and schedules will be established for the energy audits to be performed

Stage II On-Site Energy Audits and Financial Analysis

Stage II of the project will involve the actual on-site energy audits and analysis. Each of the candidate facilities will receive an in-depth audit of energy usage which will also include an evaluation of the industrial process to determine if changes could be implemented that will result in increased efficiency. The specific tasks involved in this stage include

- A On-site energy audits at each industrial site to be performed by qualified energy engineers and experts. These will be complete audits focused on energy efficiencies and productivity gains that are within the financial scope of the project. More specifically, the audits and analyses will focus on
 - 1 Energy Usage for both the electrical and thermal use within the facilities
 - 2 Process efficiency improvements (e.g. modifications in industrial processes to improve energy efficiency and productivity)
 - 3 Metering for baseline measurements in order to evaluate the benefits of the efficiency/process improvements
- B An economic analysis for each of the proposed measures at each site to be performed and to focus on

- 1 Costs/Benefits Analyses for each of the proposed measures
 - 2 Payback period to show the candidate the time frame necessary for them to begin showing increased benefits from their investments in energy efficiency
- C A financial analysis for each industrial participant to be performed to assure that the proposed measures are viable and to provide necessary information for the lending institutions. The analysis will focus on
- 1 Determining the financial criteria for loan approvals,
 - 2 Forecasting the sales/revenues of the industrial customer
- D Preliminary TOU Rate design for the Energo to be done to evaluate the potential for savings by the industrial participants. The rate design will also examine the potential for overall efficiency improvements of the Energo through load shifting opportunities. This initial evaluation will require an analysis of the energo's marginal costs and load shapes, if available. The steps included in this process are
- 1 Data analysis including the load shape and cost analysis for the energo
 - 2 Rate design of time-of-use rates that will benefit the utility by improving the daily load factors and reducing costs and for the industrial customers by making it less costly to purchase energy during off-peak hours thus reducing their energy bills
 - 3 Approval of the TOU rates by the Energo management and the local RECs. Prior to the application to the REC for approval of new tariffs, the local Energo management will review and approve the proposed tariffs

Stage III Funding of Proposed Measures at each site and Rate Design Approval

Stage III of the project will involve the funding of the measures proposed in Stage II. It is anticipated that project funding will come from lending institutions such as the World Bank and/or local banks. Successful projects will demonstrate that investments for energy efficiency are cost-effective through lower energy bills and increased productivity. It is intended that future projects may receive loans from local banks and the demonstration projects should provide the examples for others to follow.

Approval and implementation of TOU rates are also planned for this stage of the project. The tasks involved in this stage of the project include

- A Funding of the proposed measures at each site to be done through local banks and/or with other funding institutions. However, in some cases the funding may come directly from organizations such as the World Bank
 - 1 Each industrial site will receive assistance in preparing the documentation of its Financial Status necessary to meet the standards established by the lending institutions for loans
 - 2 The Credit Worthiness of each site must be established to have loan approval assured
 - 3 Funding Institution Involvement will be essential to assure that projects will meet their standards
 - 4 Local Bank Involvement will be encouraged for all projects to provide loans, if possible, or guidance on loan approval standards. For some projects, the local banks may team with the large lending institutions (e.g. World Bank) for loan arrangements
 - 5 In some cases the loans may come directly from the lending institutions such as the World Bank
- B Rate Design approval will be necessary before implementing new TOU rates by the local energos. The process will involve the following
 - 1 Approval of the rate design by the Energo management
 - 2 Application documents for Regional Energy Commissions which will be prepared and submitted
 - 3 Hearings (whatever is necessary) with REC to answer questions regarding the proposed rate design and tariffs
 - 4 Approval of the rate design and tariffs by the REC
 - 5 Implementation schedule of the new rates by the Energo to be agreed upon with the Energo management and appropriate staff within the Energo

Stage IV Equipment Procurement and installation

The fourth stage of the project will involve the actual purchase and installation of the energy-saving equipment at each site. The tasks involved include

- A Procurement of equipment to be done in a manner to ensure that quality will be maintained at the lowest costs possible
 - 1 Specifications for the equipment at each site will be accomplished by the energy engineers and plant officials. They will be reviewed by the Project Management and the lending institutions.
 - 2 Bids will be solicited for all equipment to be used for the project to ensure that lowest prices are obtained.
 - 3 Purchase Orders will then be issued for the actual purchase of the equipment.
 - 4 Payment for the equipment will be made by the lending institution upon agreement by the industrial customer and approval by the project manager.
- B Installation of Equipment to be done by local contractors and/or plant employees
 - 1 Local contractors and/or plant employees will do the actual installation of the new equipment. Technical experts will oversee these installations.
 - 2 Testing of individual equipment (e.g. motors, etc.) will be performed by the local contractors with oversight and approval by the technical experts.
- C Testing of overall equipment/processes to be performed to verify the energy savings and/or increased productivity of the industrial site
 - 1 Measurements of energy usage, load factor and other parameters will be done following the installation of the equipment.
 - 2 Plant output will be measured to verify any increases in productivity and/or efficiency improvements (e.g. plant output/kwh, etc.)

- D Installation of metering equipment to be installed for billing purposes and verification of the energy savings from the installed measures
 - 1 TOU metering equipment for the entire facility will be necessary in order to bill on the TOU rates that will be implemented
 - 2 End-use metering of the installed measures will be necessary to verify the energy savings of the equipment

Stage V Program Evaluation

The final stage of the project will be the evaluation of the impacts and the processes involved in planning and implementing the program. The final report for the project will be based upon careful evaluations of the impacts from the measures taken and the processes involved in the project. Verification of energy savings, cost reductions and productivity improvements will provide important information for future projects. Also important is an analysis of the processes that were involved in the project: the selection of candidates, the funding processes, installation processes, rate design processes, and all other aspects of the project. Specific tasks involved include:

- A Perform Impact Evaluations of the measures taken at each of the industrial sites. These will measure the actual energy usage at each measure taken and compare with the baseline measurements to determine energy savings accomplished. Also an evaluation of the entire facilities energy usage will be measured to determine energy reductions, load shape changes and load factor improvements. An evaluation of the change in the plants productivity (e.g. output/energy input) will be done to report on changes resulting from the measures taken. Further evaluations will be done to determine whether improvements in the facilities financial condition have changed as a result of the measures taken.
 - 1 Energy savings include reductions in electrical and/or thermal energy usage within the facility. Also, changes in the overall daily load shapes will be evaluated to determine if load shifting and load factor improvements have been accomplished.
 - 2 Production improvements will be measured to determine if the measures taken changed the productivity of the facility and if so, the extent to which these have occurred.
 - 3 Financial evaluations will be done, to the extent that savings in energy usage and/or productivity improvements can be measured. This evaluation will provide important information to show the

plant manager and other plant managers how improvements in energy efficiency and productivity can benefit the overall financial condition of the facility

- B Process Evaluations will be conducted to determine how the overall process(es) involved in the project contributed to the success/failure of the project. It will also provide important information for future projects on how where modifications in the process might improve the outcome of such projects. The process evaluations are subjective evaluations that will be done through the following process
- 1 Interviews with plant managers to determine their views on what processes were successful and what modifications they believe could have made the project better
 - 2 Interviews with Energo personnel to obtain their input on the process and what improvements could be made for future projects
 - 3 Contractors' input on methods of contracting, QA/QC methods that could be improved upon, the purchasing and installing of equipment, and other aspects of the projects where they were involved
- C A Final Report will be written to document the project's successes and failures and to provide the results of the impact and process evaluations

Chart No 1

Participating Organizations, Entities and Agencies

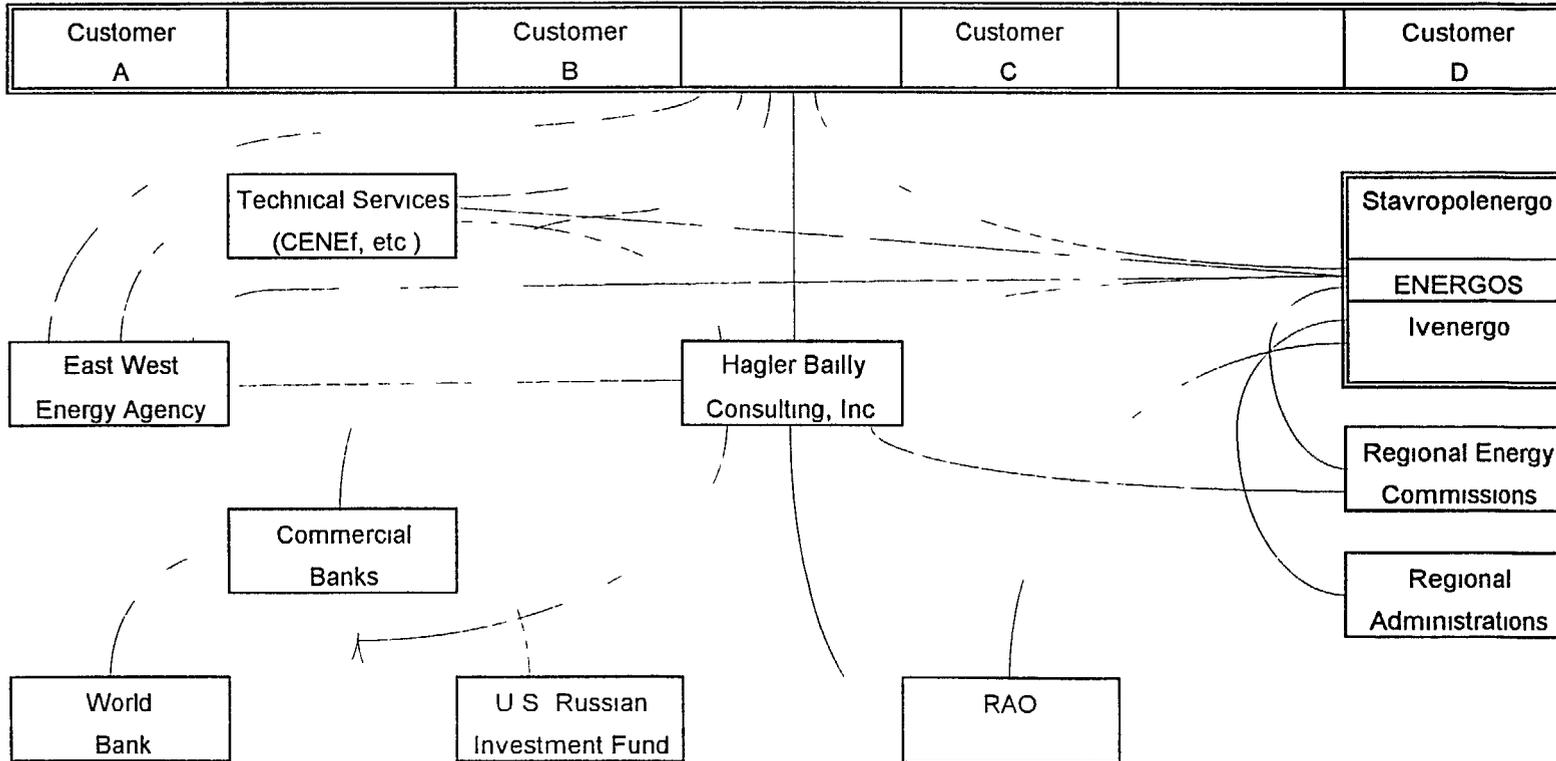


Chart No 2

Timeline for Russian Energy Efficiency Demonstration Program

| Project Phases | | Month | | | | | | | | | | | | | | | | | |
|----------------|--|-------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|
| No | Description | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| I | Initial Market Analysis & Customer Screening | ■ | ■ | ■ | | | | | | | | | | | | | | | |
| II | On site audits and Financial Analysis | | | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | |
| III | Funding of Proposed Measures & Rate Design | | | | | | ■ | ■ | ■ | ■ | ■ | | | | | | | | |
| IV | Equipment Procurement/Installation/Testing | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| V | Program Evaluations | | | | | | | | | | | | | | | ■ | ■ | ■ | ■ |

Chart No 3
Energy Efficiency Project Processencies
Step 0

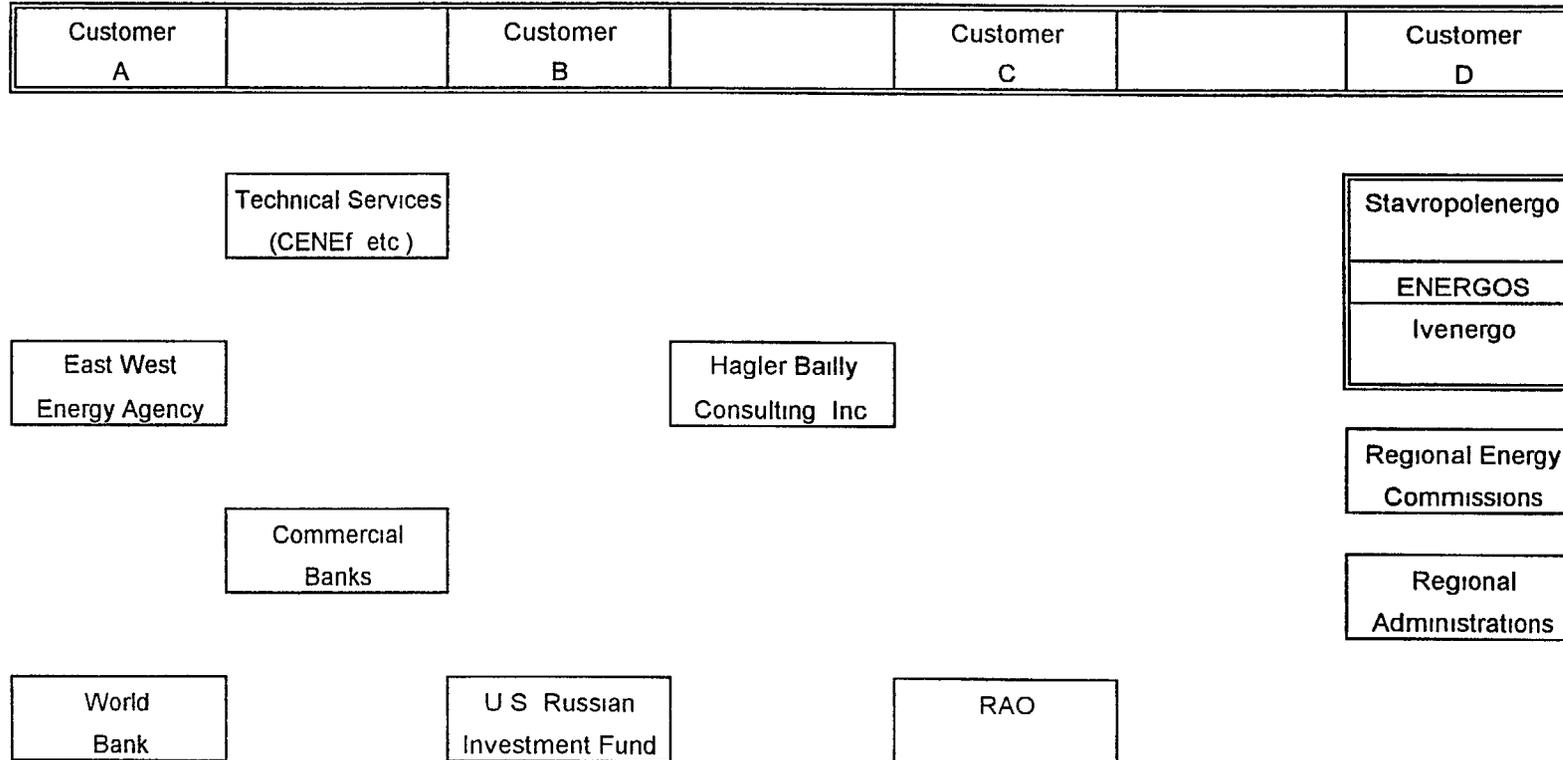


Chart No 3

Energy Efficiency Project Process
Step 1

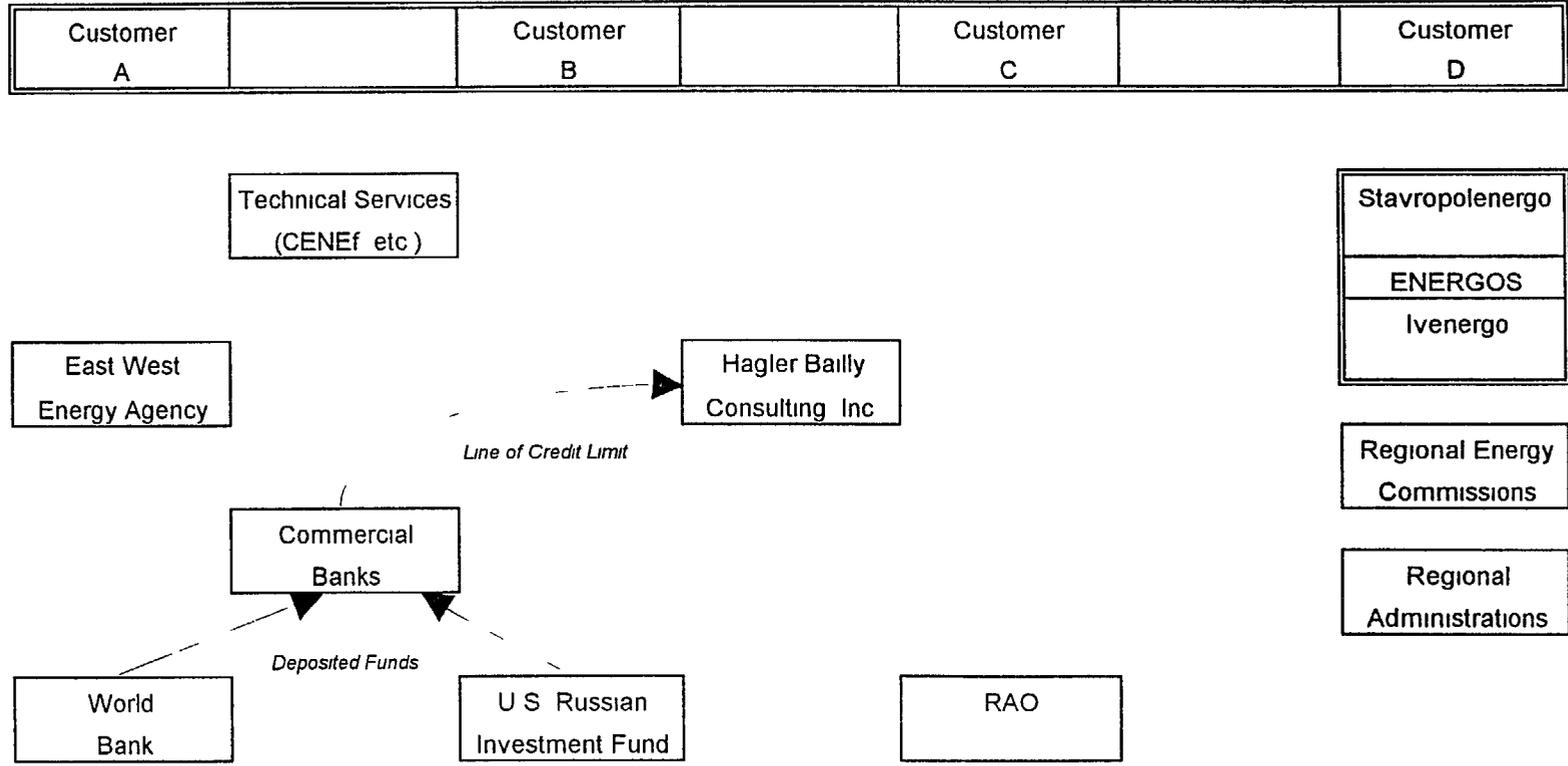


Chart No 3
Energy Efficiency Project Process
Step 2

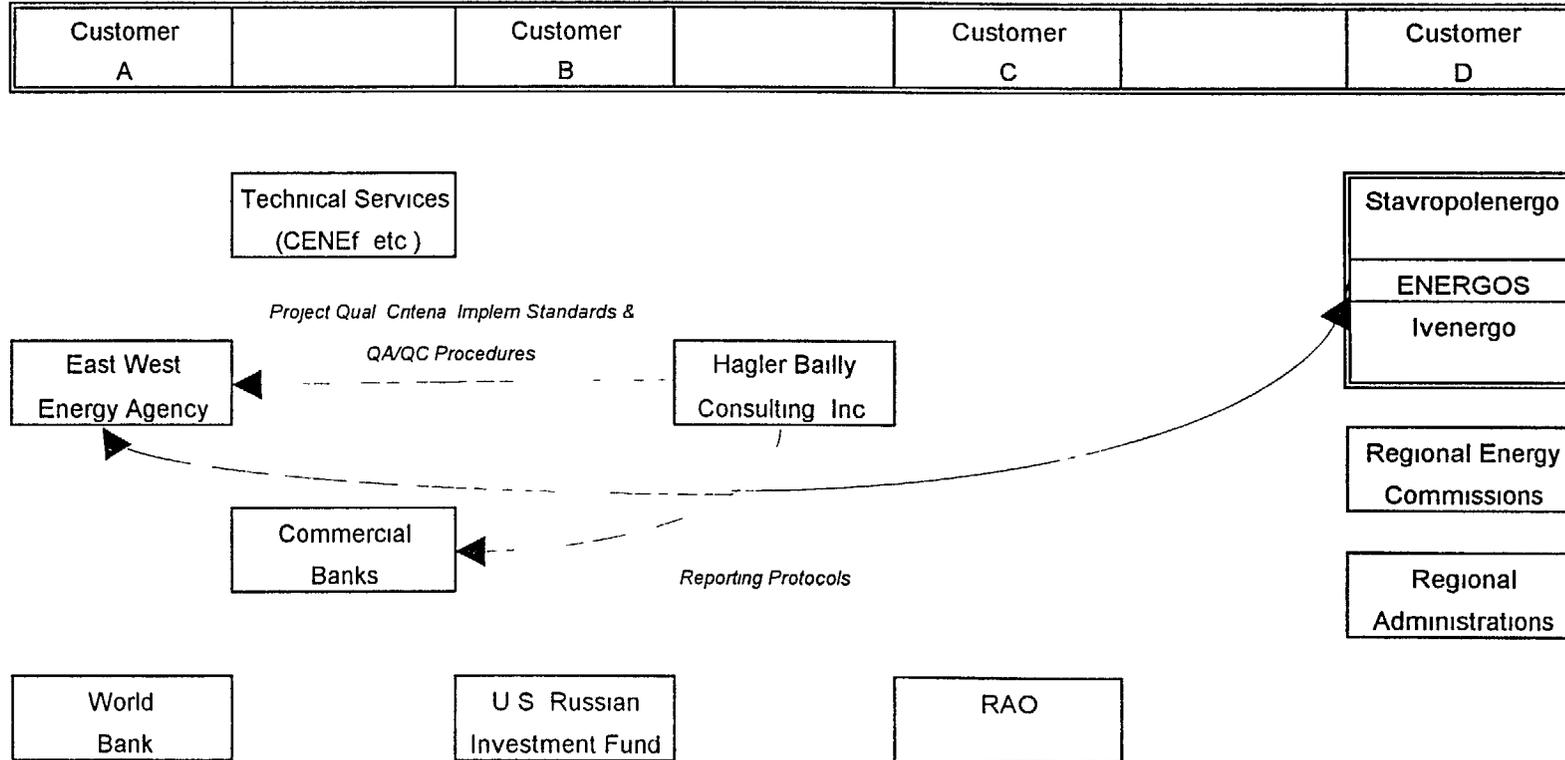


Chart No 3

Energy Efficiency Project Process Step 3

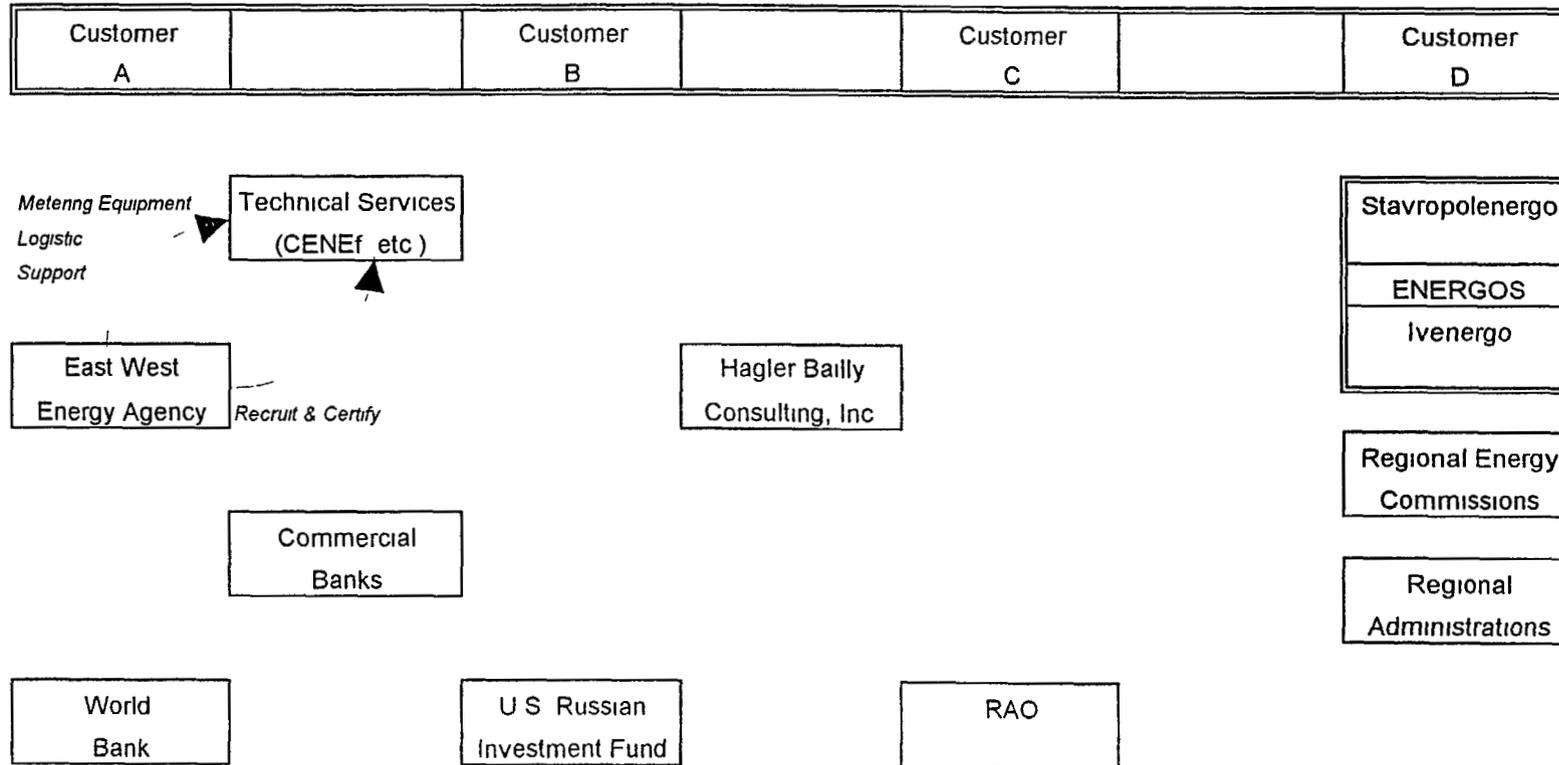


Chart No 3

Energy Efficiency Project Process
Step 4

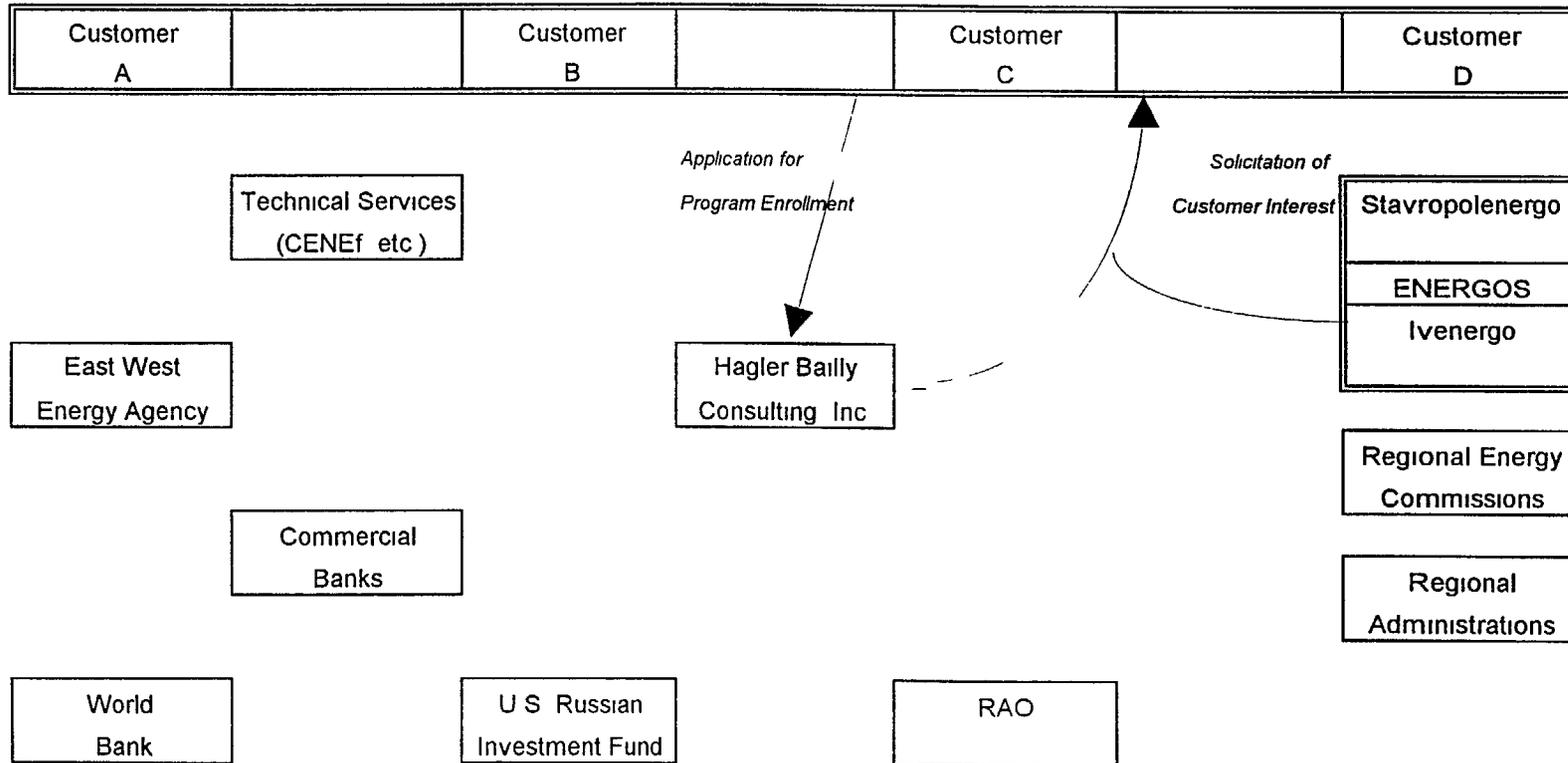


Chart No 3

Energy Efficiency Project Process
Step 5

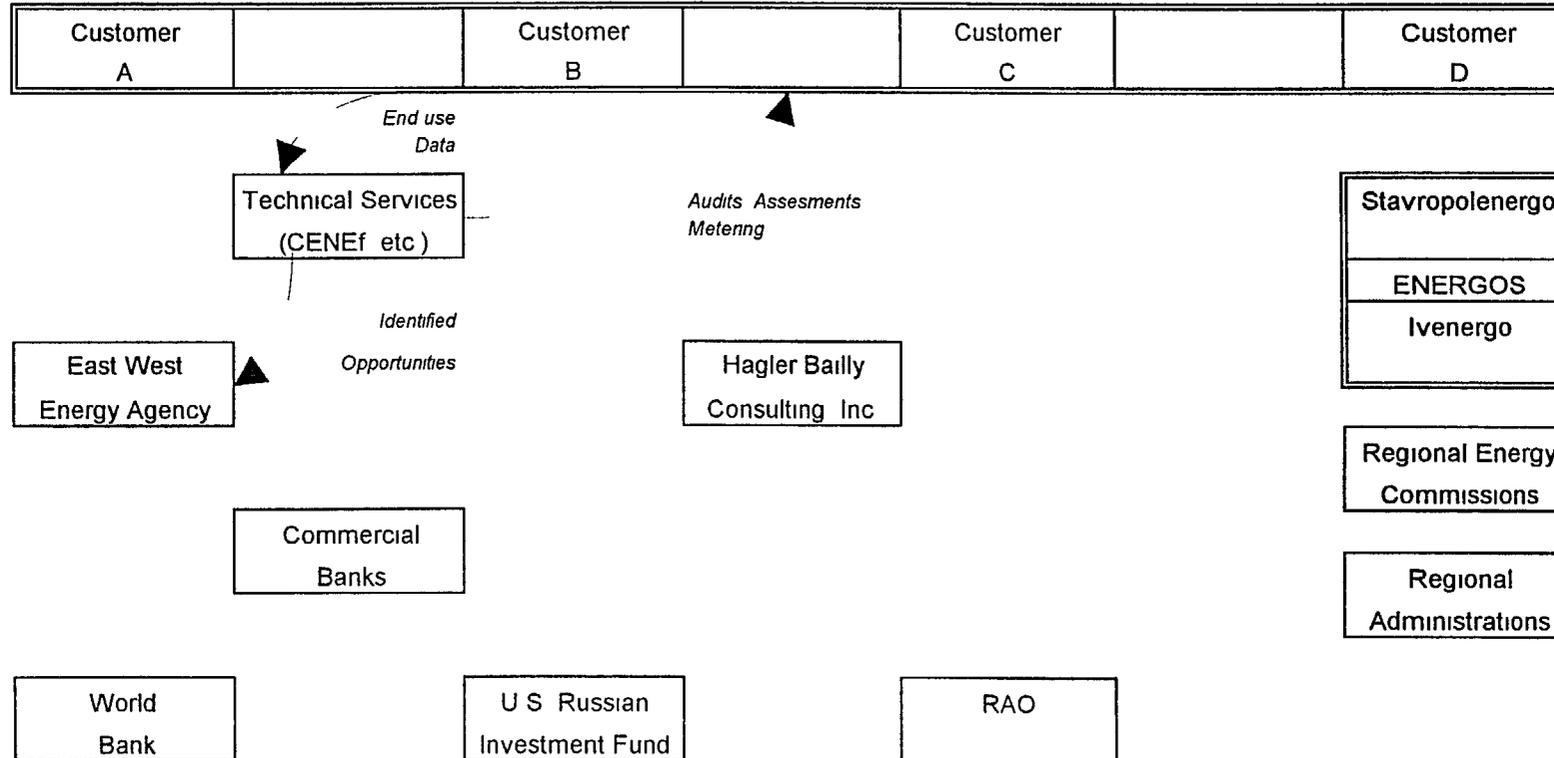


Chart No 3

Energy Efficiency Project Process
Step 6

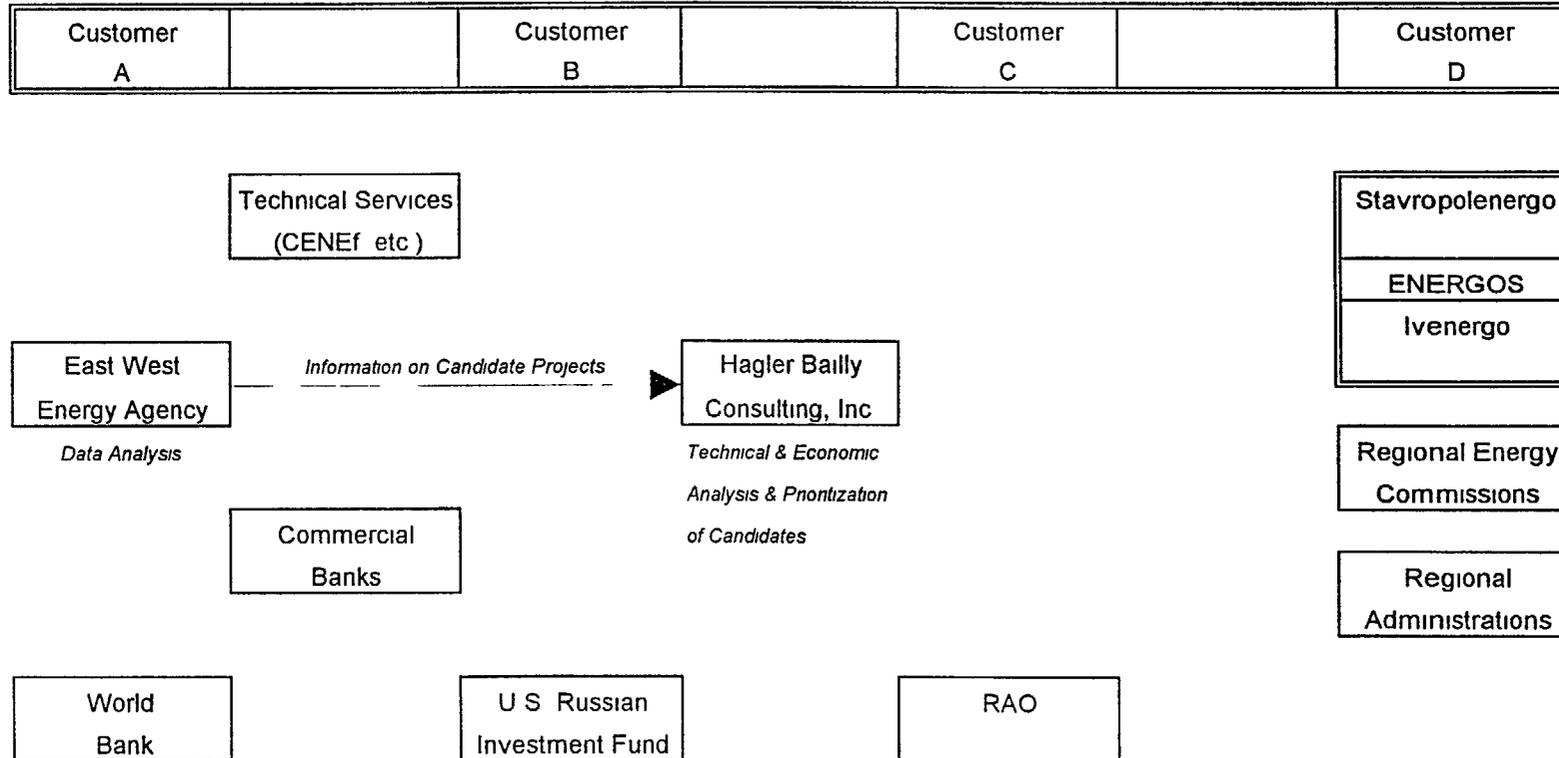


Chart No 3

Energy Efficiency Project Process
Step 8

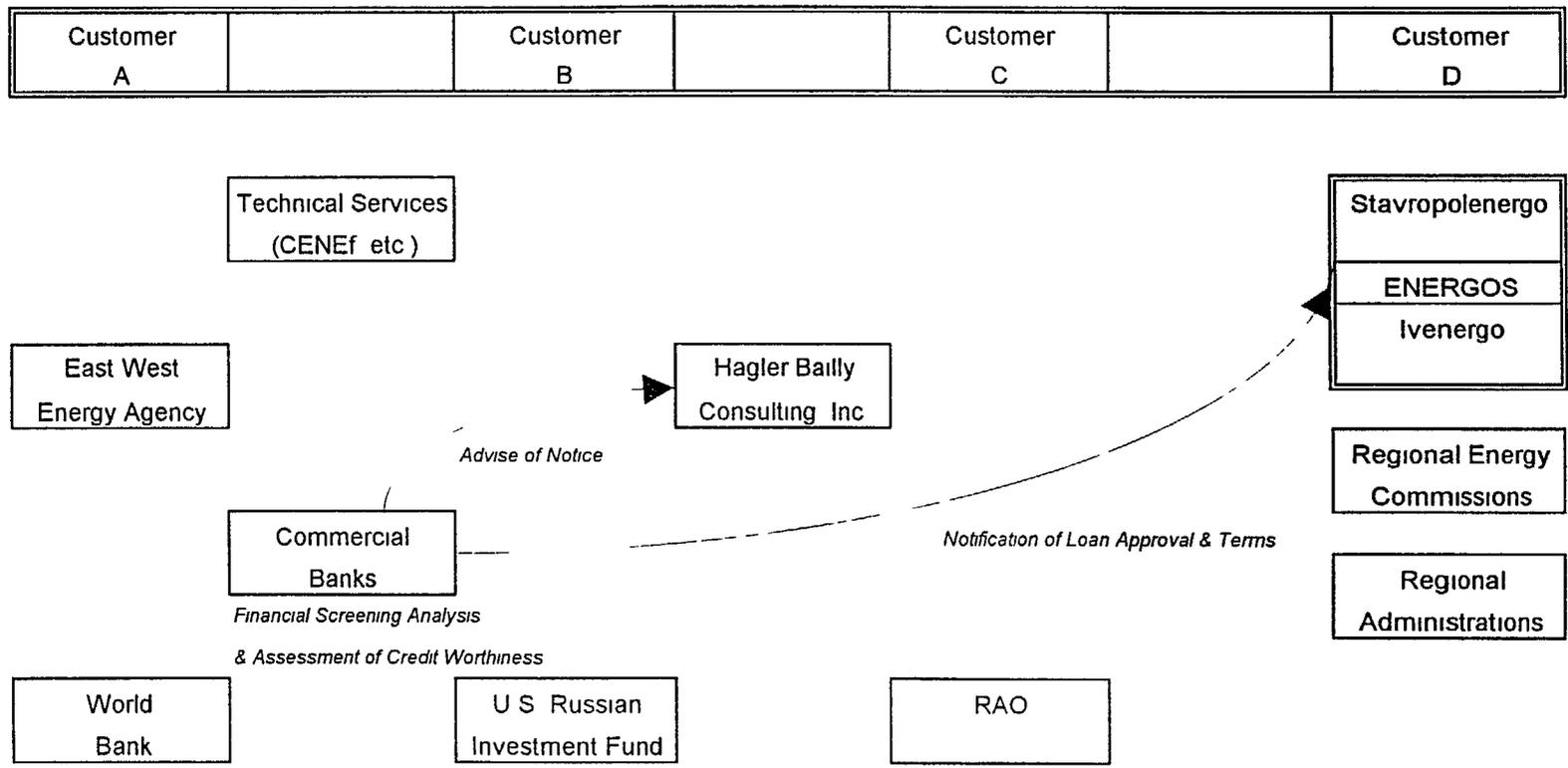


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Energy Efficiency Project Process
Step 9

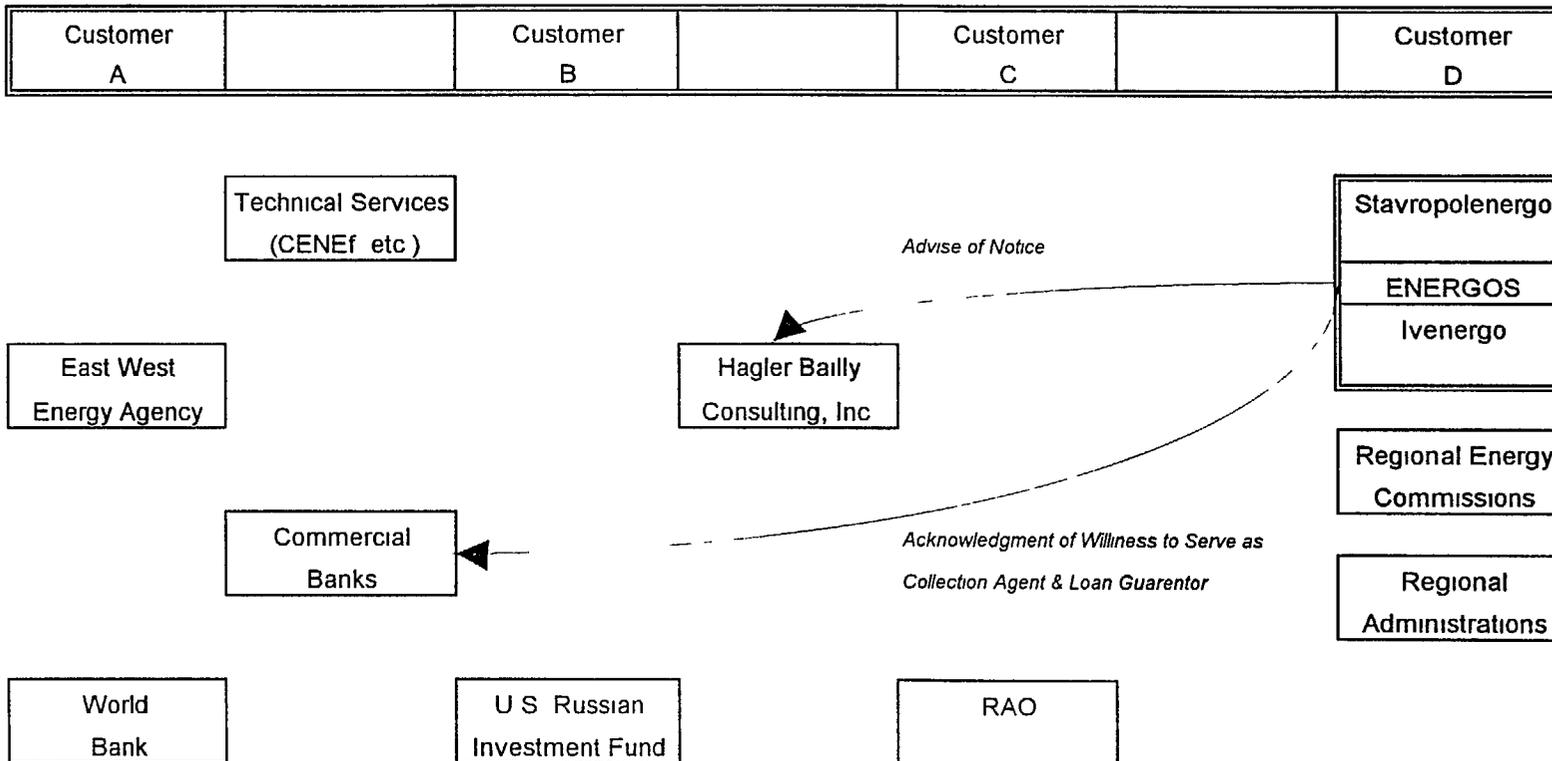


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Energy Efficiency Project Process
Step 10

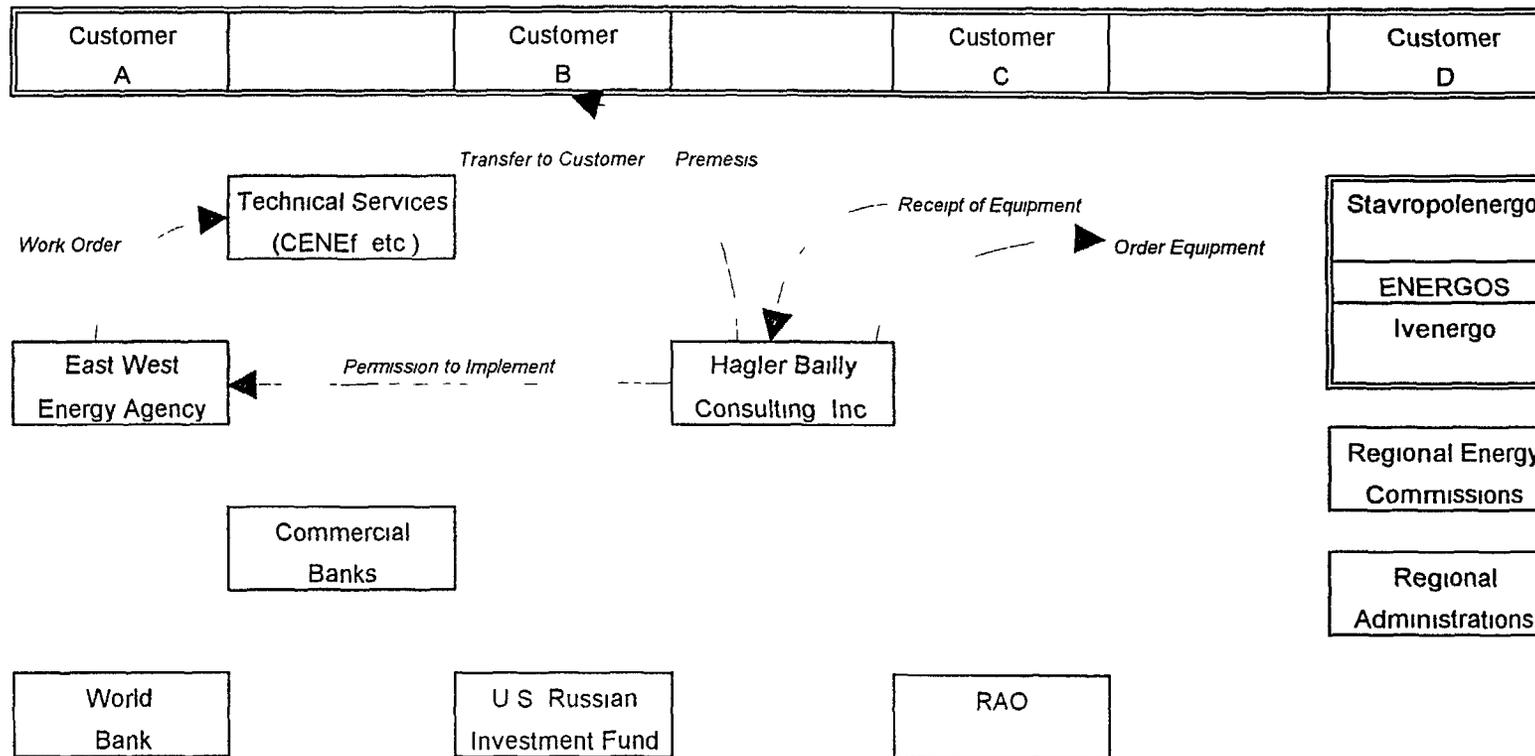


Chart No 3

Energy Efficiency Project Process
Step 11

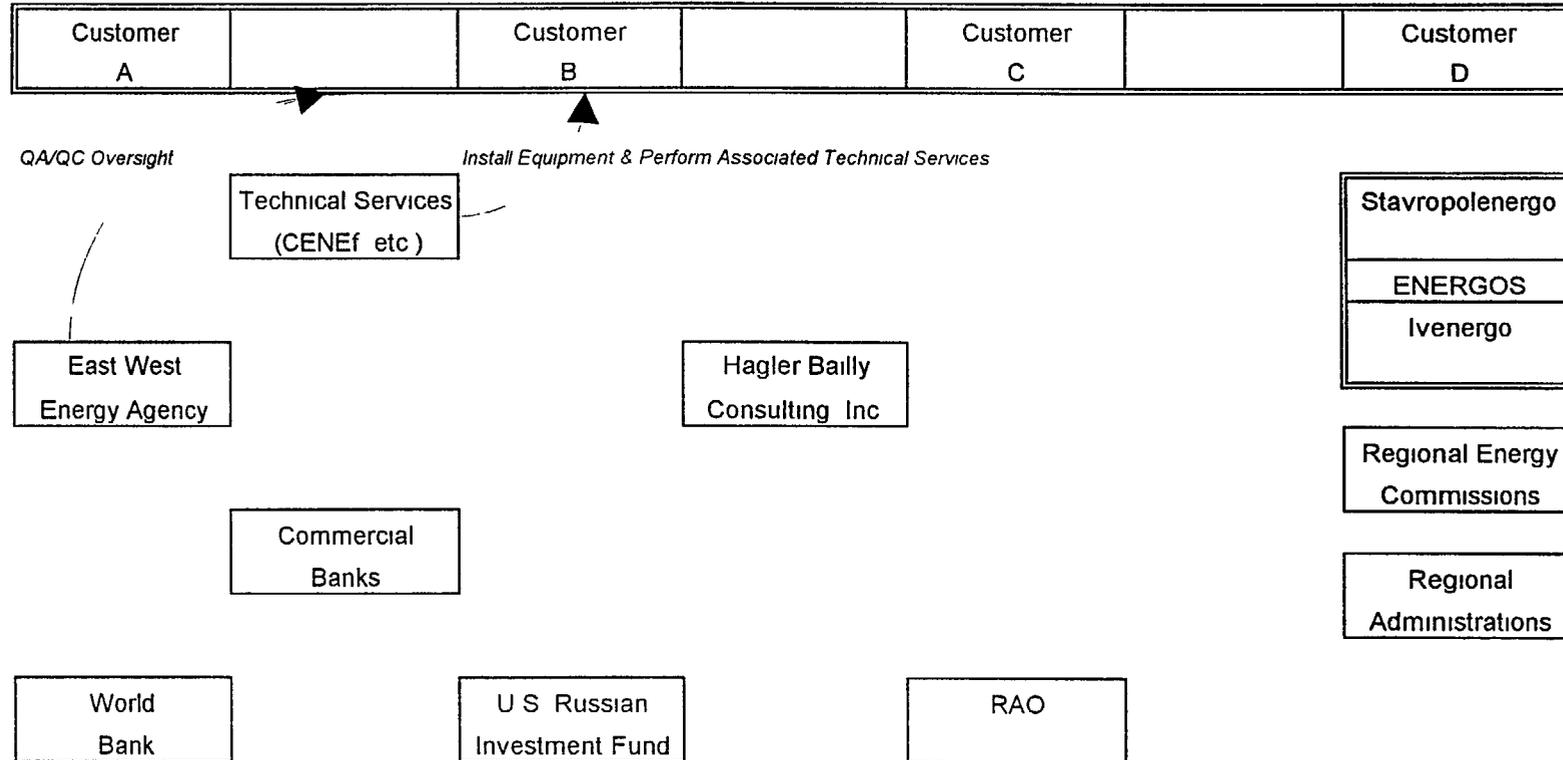


Chart No 3

Energy Efficiency Project Process
Step 13

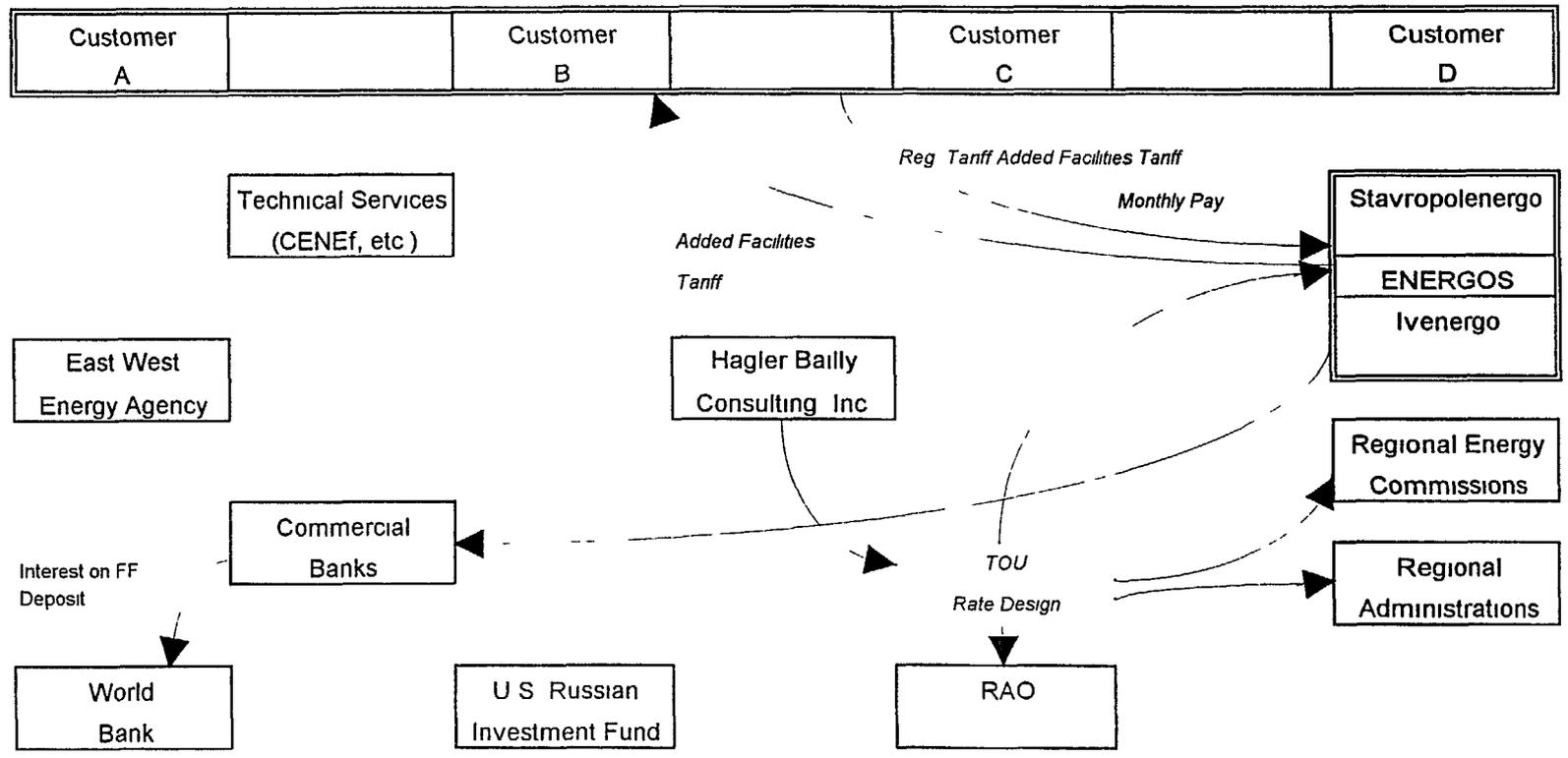


Chart No 3

Energy Efficiency Project Process
Step 13 (Contingent)

