Russia DSM and Energy Efficiency Demonstration

Sponsored by
United States Agency for International Development
(USAID)

Project Work Plan
for
Permenergo

Perm, Russia

By

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Contents

Abstract

The pilot described in this Work Plan represents a an attempt to demonstrate the viability of in-field implementation of demand-side management (Energy Efficiency) programs in Perm, 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 Energy Efficiency strategy and which must be demonstrated to have practical application in actual customer facility environments if Energy Efficiency 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 AO Permenergo and the Perm Regional Energy Commission (REC) as proactive agents of market change,
- build upon earlier USAID-sponsored activities have laid the conceptual foundation for Energy Efficiency 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 Energy Efficiency expertise within Permenergo to carry on the work,
- position efficiency as an integral element of overall industrial modernization and productivity improvement, and
- position Energy Efficiency 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 and 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 Permenergo in Perm, Russia 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 DSM/Energy Efficiency Demonstration Project is sponsored by the United States Agency for International Development (USAID) and involves Russian national and local electric utilities and their industrial customers It is designed to demonstrate that improvements in 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

The project will involve the cooperative efforts of Permenergo, the Joint Stock Company (RAO) of Power and Electrification "EES Rossii", the Perm Regional Energy Commissions and several industrial plants located within the service area of Permenergo The project also involves Russian energy efficiency and technical services organizations and funding organizations (e g World Bank Enterprise Support Program, Russian U S Investment Trust Fund, Local Banks, others) The project is managed by Hagler Bailly Services, Inc

The Demonstration Project focuses on medium-sized manufacturing enterprises and related activities within the industrial, agricultural and large commercial services sectors Prior studies and assessments, including the US/Russia Joint Electric Power Alternatives Study (JEPAS) Final Report, have consistently identified these customers as prime targets for improved electric end-use efficiency and in which the bulk of estimated savings potential is presumed to reside

One of the project's goals is to ensure the sustainability of such projects The project will build on the newly-formed staff organizations at Permenergo to enhance the skills and capabilities to carry on the energy efficiency activities after the demonstration project ends This may be done either as a business activity of Permenergo, or Permenergo could be an integral part of an energy services network which includes Energy Services Companies (ESCOs), the Perm Regional Energy Commission, and others within the energy community

2 1 Participating Agencies and Entities

The project will involve several U S , Russian national and local agencies and entities including

1 US Agency for International Development (USAID) - Project sponsor
2 Hagler Bailly Services, Inc - Contractor for USAID which will provide overall project management, technical oversight and quality control
3 Russian Joint Stock Company (RAO) of Power and Electrification "EES Rossii"
4 Perm Regional Energy Commissions (REC)
5 Perm Regional Administration
6 Permenergo
7 Russian technical services and energy efficiency consultants and organizations
8 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
9 Industrial Customers - local industrial plants located within the service areas of Permenergo These will be identified in Stage I of the work

2 2 Project Schedule

This has five stages including

I Project Initiation
II On-site Energy Audits and Financial Analysis
III Funding
IV Equipment Procurement and Installation
V Program Evaluation

The chart shows 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

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 1) the project kick-off, 2) the identification of potential industrial participants, 3) the initial screening of candidate facilities, and, 4) the final selection of industrial consumers to participate in the project The Perm Regional Energy Commission and the Regional Administrations will also be apprised of the project and encouraged to support it The tasks involved in Stage I include

A Operational logistics for all parties involved in the project will be developed and finalized The first objective is to sign agreements with Permenergo to participate on the project and carry out their responsibilities as outlined by the Project Manger

B Initial visits to Permenergo, the Perm REC, and potential industrial participants will be

completed as early as possible to kick off the projects Follow up visits, of longer duration, will be planned at that time

1 Meet with Permenergo management to

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 Permenergo staff members which are assigned to work on the project,

c Potential participating industrial customers will be identified by Permenergo and/or the Perm 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 from Permenergo which will include
1) Current Rates
2) Rate design criteria (historical)
3) Cost-of-Service Data (if available) for TOU Rate design

2 Meet with the Perm Regional Energy Commissions (REC) 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 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

3 Meet with potential participating industrial customers to discuss the project to

a Describe the program purposes and objectives

1) Energy audits
2) Potential results from increasing overall productivity through the measures that are recommended in the energy audit reports
3) Financing of the recommended measures
4) TOU rate design and the potential savings

b Describe the Application Form and the competitive nature of the process to select the final candidates for participation The application must include some information and data that can be used to make initial financial screening for the funding institutions

C 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 management of Permenergo 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 Determine the criteria for selection of final participants in the project which willl 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 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 Russian energy engineers and experts

   1 These will be complete audits focused on energy efficiencies and productivity gains

that are within the financial scope of the project The audits and analyses will focus on

- Energy Usage for both the electrical and thermal requirements within the facilities
- Process efficiency improvements (e g modifications in industrial processes to improve energy efficiency and productivity)
- Metering for baseline measurements in order to evaluate the benefits of the efficiency/process improvements

2 Energy uses within each facility will be measured and/or monitored using an Energy Auditing Kit obtained by HBCI and which will be contributed to Permenergo for future energy efficiency studies

3 The data collection for the audits will be accomplished in two phases

a Initial Walk-through at each site
1) Determine energy loads
2) Plan for metering, measurements and monitoring

b Metering and Measurements
1) Electrical loads
2) Thermal loads
3) Building characteristics
4) Occupancy
5) Other

B An economic analysis for each of the proposed measures at each site will be performed and will focus on

1 Costs/Benefits Analyses for each of the proposed measures,

2 Payback period for each measure

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

3 Report on the findings and a Business Plan for the loan applications

D Preliminary TOU Rate design for Permenergo 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 Permenergo through load shifting opportunities This initial evaluation will require an analysis of Permenergo'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 Permenergo,

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 Permenergo management and the Perm REC Prior to the application to the REC for approval of new tariffs, Permenergo 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 EBRD and/or local banks and, in some cases, internal funding from the participating enterprise may be used Successful projects will demonstrate that investments for energy efficiency are cost-effective through lower energy bills and increased productivity This project does not include funds for providing loans to industrial participants for equipment

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 such as the EBRD Where possible, internal funding from the enterprises will be used

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

6 Other sources of funds may come from the enterprise's internal funding for capital project

B Rate Design approval will be necessary before implementing new TOU rates by Permenergo The process will involve the following

1 Approval of the rate design by the management of Permenergo,

2 Application documents for Perm Regional Energy Commissions which will be prepared and submitted,

3 Hearings (whatever is necessary) with the Perm 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 Permenergo to be agreed upon with the Energo management and appropriate staff within Permenergo

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 These tasks will follow the successful funding approvals from Stage III 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 show 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 where 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 involve

C A Final Report will be written to document the project, its successes and failures, and to provide the results of the impact and process evaluations

3 0 Responsibilities of Permenergo Management and Staff

Stage I - Initial Market Analysis and Customer Screening

I Personnel
- A Identify Key personnel for the project
  - 4 Primary contact person for Project Manager
  - 5 Technical staff for learning energy audit work
  - 6 Rate personnel
  - 7 Economic analysis personnel
- B Commitment to dedicate staff time for the project

II Recruit the Industrial program participants in the region

- A Meet with potential participating Industrial customers to discuss the project and ask for participation
  - 1 Describe the purposes of the program
    - a Enhancements to Energy efficiency
    - b Reduce energy costs, free-up roubles for other purposes
    - c Possible increase in productivity
  - 2 Describe the energy audits and the data/recommendations that will be provided
    - a New equipment (replace old inefficient equipment)
    - b Change to new innovative technology
    - c Possible modifications to operations for efficiency improvements
    - d Audit reports will provide cost and benefit estimates of energy efficiency measures
  - 3 Discuss the potential results from increasing efficiency and productivity
    - a Cost reductions
    - b Increase production efficiency
  - 4 Discuss the financing arrangements
    - a Bank loans
    - b Internal financing

- B Ask for interested parties to submit an Application to participate
  - 1 Data with the applications
    - a Describe facility
    - b Energy Uses
    - c Revenues/Costs
  - 2 Commitment by the industrial to Participate
  - 3 Hagler Bailly will sign an agreement on what it will provide to the participating industrial customer

- C Send Applications to Hagler Bailly Project Manager (Hutchinson)

III Finalize list of participants by Project Manager with concurrence from Permenergo

A Criteria for selection
1 Financially stable
2 Good potential for success
3 Willingness to participate and install recommended efficiency measures

B Final list of participants will be notified of selection by Permenergo

C Industrial enterprise Agreements with Hagler Bailly will be signed

Stage II - On-Site Energy Audits and Financial Analysis

I Energy Audits at each of the participating industrial sites will be scheduled and completed by Russian energy efficiency experts Hagler Bailly will sign contracts with these experts to complete the tasks

A Permenergo staff to schedule audits with industrial participants
1 Date/time for energy auditors to do on-site work
2 Coordinate with Project Manager (Hutchinson)

B Staff from Permenergo will participate with the energy efficiency engineers to learn how to install and use energy audit equipment
1 Electric measurements (energy use, load shapes, motor efficiencies, etc)
2 Thermal measurements (combustion analysis, heat losses, etc)
3 Other monitoring (air/water quality, etc)

II Economic and Financial Analysis

A Staff from Permenergo to participate in learning the economic analyzes for recommended efficiency measures

B Staff from Permenergo to participate in learning the financial analyzes for recommended efficiency measures

III Preliminary Rate design will be done by Hagler Bailly and Permenergo staff and will include the following activities

A Data acquisition
1 Costs (functional, classification)
2 Load shapes
3 Forecasts

B Data analysis
1 Load shapes
2 Cost of service

C Preliminary rate design
1 Time-of-use
2 Other

D Approval process outlined for Hagler Bailly by Permenergo staff
1 Who approves
2 Documentation Requirements for rate approval defined

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

II Permenergo and Hagler Baily will explore Energy Service Company (ESCO) options

C Solicit ESCO's for projects
D Explore the creation of ESCO at Permenergo or within the Region

III Funding will be accomplished by the participating industrial plant with Hagler Baily assistance
A International funding institutions
B Local Banks
C Internal sources

III Rate Design Approval will require the assistance of Permenergo staff and will include the following tasks

A Approval of rate design by Permenergo management

B Application documentation for the Perm Regional Energy Commission

C Approval of rate design and tariff by Perm REC

D Implementation of new rates and tariffs

Stage IV - Equipment Procurement and Installation

I Installation of metering equipment at each of the participating industrial plants to measure the energy uses of the new equipment

II Data acquisition from metering equipment includes

A Electrical
1 Load shapes
2 Energy use
3 Peak Demand
4 Efficiencies (i e motors, etc)

B Thermal
1 Combustion analysis
2 Heat Losses

C Other
1 Water usage
2 Other

Stage V - Program Evaluation