PD-ABR-117
100431

Russia Demand-Side Management Demonstration Work Plan

Submitted to

U S Agency for International Development

Under

Contract No CCN-0002-Q-00-3152-00
Delivery Order No 9, Project No 110-0002
Energy Efficiency and Market Reform

By

Hagler Bailly Consulting, Inc
1530 Wilson Boulevard
Suite 900
Arlington, VA 22209-2406

July 19, 1996

CONTENTS

Abstract

1 0 Introduction and Summary Overview

2 0 KalugaEnergo Time-of-Use Tariff Design and Load Management Demonstration

3 0 RostovEnergo Industrial Energy Services End-Use Efficiency Demonstration

4 0 Pilot Time Lines and Budget Estimates

ABSTRACT

- The pilots described in this Work Plan represent 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

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

  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 demonstrations 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 the energos, local municipal government agencies and Regional Energy Commissions (RECs) as pro-active agents of market change
  - build upon earlier USAID-sponsored activities that have laid the conceptual foundation for DSM and Integrated 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
  - 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

1.0 INTRODUCTION AND SUMMARY OVERVIEW

1.1 Purpose of This Report

- This report is submitted in fulfillment of Sub-Task 1, "Define Activities and Prepare Work Plan," Delivery Order No 9, Project No 110-0002, issued by the U S Agency for International Development (USAID) to Hagler Bailly Consulting, Inc for the design, development and implementation of a Russia Demand-Side Management Demonstration

- The report outlines a proposed Work Plan to demonstrate practical, near-term contributions which demand-side management (DSM) can make as an important energy resource and service strategy and emerging market opportunity for Russian utilities (AO Energos) 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

- Care has been taken to ensure that any initiatives recommended as part of the proposed regional pilots be consistent with other concurrently ongoing efforts in Russia relating to overall economic and regulatory reform, power sector restructuring, industry modernization and new commercial and public service infrastructure development, and the desire to rationalize prices and remove subsidies across a broad spectrum of energy and non-energy goods and services

1.2 Demonstration Intent and Goals

- The Work Plan delineates a "first-of-its-kind" opportunity for two energos to work cooperatively with their customers to implement various forms of enhanced end-use efficiency and load management

- The demonstrations focus upon 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

- One pilot would focus on innovative tariff design at both the retail and wholesale levels as a mechanism for customer load shape modification in a manner consistent with time-of-use marginal cost principles and evolving regional and federal price regulation and policy formation in Russia

- A second pilot would focus on the customized application of efficient end-use technology, information and technical assistance to improve the operating cost-effectiveness of medium-sized manufacturing facilities

- Both demonstrations would involve significant internal staff capability-building within the cooperating energos, the use of innovative financing approaches, and the development of new metering and monitoring procedures and protocols to verify the physical magnitude and economic value of effected change

- The demonstrations have been chosen to represent activities which, if successfully accomplished, could be readily replicated elsewhere in Russia, and whose "lessons learned" could be transferred to other DSM applications and program types

- The demonstrations will not artificially separate energy efficiency from other important facility operating and investment decisions that customers must make Instead they would be designed to package and deliver DSM to customers in a way which reinforces the role of improved energy efficiency as an integral element of overall facility modernization, increased resource productivity, product quality and through-put, and the need to focus on financial performance and cost containment as levers for Russian industry to profitably survive in domestic markets and effectively compete in world markets abroad

- The demonstrations will provide energos the opportunity to become pro-active agents of market change and to function as "systems integrators" to facilitate and influence the actions of customers, equipment vendors, financial institutions, regulatory agencies, technical assistance and information providers, and the power supply system, itself, in a way which (a) creates considerable added value for the electric consumer, and (b) offers the possibility for profitable future new business diversification by the energo in a rapidly changing market environment

  - This will be increasingly important as a more formal technology development and commercialization infrastructure evolves in Russia, as new sources of project financing emerge, and as foreign investors and joint venture partners lead Russian industry into the global economy
  - As important regional institutions, the demonstrations will stress close liaison and coordination between the energos and local and oblast level government agencies and the new Regional Energy Commissions (RECs), especially, (but not exclusively) related to matters of regional economic development, taxation, tariff design and rate regulation
  - The demonstrations will help stimulate the local economy and create new employment opportunities by competitively procuring services from local technical specialty firms and in creating a market environment which will sustain and expand the demand for the services which such local companies can provide

1.3 Choice of Pilots and Energo Partners to Host Demonstrations

- The following pilots have been tentatively selected for the recommended demonstrations

  (1) **RostovEnergo Industrial Efficiency Services Program** Key features include

- an advertisement to identify US Energy Service Companies (ESCOs) prepared to serve as a source of technical expertise and project financing, and an entree to continuing joint business development and collaboration possibilities with Russian organizations
- continued discussions with other donors toward the creation of a multi-sponsor, local energy capital investment fund (ECIF) as a project screening and financing facility
- identification and analysis of efficiency improvement opportunities for "healthy" medium-sized manufacturing and industrial enterprises
- recruitment, training, certification and quality control of local Russian private sector energy service and technical specialty firms
- significant capability-building within the energo with respect to DSM metering and monitoring, load research, market research and end-use data development, and an expanded capacity to interface with customers, technology vendors and independent service providers
- developing a framework and platform for continuing interaction among customers, senior energo management, local and oblast government officials and REC commissioners and staff
- verification and impact and process evaluation of results accompanied by aggressive experience sharing and information dissemination efforts during and following the pilot

(2) **KalugaEnergo Time-of-use Tariff Design and Load Management Program**
Key features include

- quantification of customer opportunities for load shifting/load-shape modification in response to time - differentiated pricing signals
- focus on both technology-enabled actions and those resulting from altered operating, scheduling or maintenance practices
- use of access to customer facilities to identify other efficiency-related opportunities
- three-stage metering and monitoring to (1) establish baseline patterns, (2) examine changes in operation during a break-in, "learning period" wherein rate impacts to the customer and energo are simulated, and (3) track post-tariff-activation "steady-state" behavior and the role of information in providing adaptive feedback to fine-tune operations capability-building within the energo in load and market research, tariff design and customer and vendor relations
- experimental interface with wholesale market pricing design to match retail tariff time periods and rate differentials to actual marginal cost patterns associated with wholesale power provision
- interaction among customers, senior energo management, local and oblast level government officials and REC commissioners and staff

- These energos have been selected for participation as host sites based upon several criteria

- their knowledge of, receptivity to, and interest in increased end-use efficiency and load management
- their demonstrated ability to work with local Russian organizations involved in promoting efficiency, and their self-initiative in undertaking preliminary analyses and investigations related to proposed pilot content
- their deficit-supply market conditions which elevate near-term electricity savings realization to immediate priority status
- their reputation among other energos for innovation and "new direction" leadership
- the representativeness of their customer base and market infrastructure to other areas of Russia
- the possibility for synergies between proposed pilot activities and other donor assistance efforts concurrently ongoing and planned in these regions so as to reinforce the local enthusiasm, commitment and political momentum created by these multiple efforts
- their reasonable proximity to Moscow and the resident staff facilities of Hagler Bailly and its sub-contractors so as to avoid the incurrence of undue travel costs and lost time in transit

1 4 Intent to Conduct a Three-Tier Competitive Solicitation-of-Interest to Identify Prospective Participants Capable of Providing Important Contributions to the Demonstrations

- Hagler Bailly will conduct three competitive "solicitations-of- interest' to ensure that all parties which have significant value to add to the demonstration process are given the opportunity to present their qualifications and indicate the nature and benefits to USAID of their prospective involvement and contribution These include

  - US energy services companies ("US ESCOs")
  - AO Energos
  - Russian research and consulting organizations
  - Russian technical services providers (local and regional)
  - Russian banks and financing organizations

- **Engagement of US ESCO Participation**

  (1) Planned Role We presume that one, or more, US ESCOs can be identified who would be willing to undertake projects at multiple participating customer host facilities located within the cooperating energo regions The ESCO will be expected to underwrite the entire cost of any up-front engineering audits or engineering feasibility studies and then assume the development of those projects with its own combined equity-debt financing, or financing it would arrange through some third-party The ESCO is also expected to operate and maintain any installed equipment over the course of the equipment's useful life

  (2) What Hagler Bailly Will Do Hagler Bailly will

- develop a notice detailing the nature of the planned ESCO involvement and the mandatory commitments which the ESCO must make in order to be considered for participation
- contract with the National Association of Energy Services Companies (NAESCO), for them to directly circulate the notice to its entire membership, and receive responses
- contact large process and building control firms with energy services divisions and electric utilities with energy services subsidiaries and affiliates (most of which are not members of NAESCO) regarding their prospective interest
- place a broadcast notice on the INTERNET through the auspices of the Association of Energy Services Professionals (AESP)

(3) Likely Outcome Hagler Bailly will only consider expressions of interest from qualified ESCO's that meet all requirements, especially the ability to self-finance projects or bring committed lines of third-party financing into Russia

(4) Contingency Plan If an ESCO is retained, then its financing capacity will be rolled into the ECIF (see Chapter 4 0), and it will assume the afore-referenced technical responsibilities for audits, procurement of equipment, recruiting local services, quality assurance, etc If a US ESCO cannot be engaged

- greater stress will be put on securing other resources of in-country seed money to launch the ECIF
- the cost of audits and other technical functions to have been provided by the ESCO would then have to be financed through the ECIF directly However since the ESCO would certainly have wanted to recover these costs anyway, the ultimate cost to the participating customers should not be marginally affected
- recruiting and payment of local Russian technical services personnel should largely be unaffected since the ESCO is unlikely to bring installation and O&M resources from abroad to Russia, and energonadzor rules for certification and licencing of such personnel would likely exclude the use of non-Russian technicians

◘ Recruitment of Local Russian Private Sector Engineers

Equipment installation, O&M and other in-plant services would be provided by local Russian engineers A training program will be delivered to orient them to work procedures and specifications associated with the particular types of retrofits, replacements and modifications embodied in the program

1.5 "Value" of Proposed DSM Demonstrations

- The term "DSM", in the context of this Work Plan and the proposed demonstration, really connotes a near-term strategy for implementing and financing

  - enhanced energy end-use efficiency, service and productivity, and
  - load management

  in a way which will establish their level of market acceptance and value to Russian consumers

- DSM can perhaps best be viewed as an "enabling strategy" to help objectives for re-structuring in the power sector energy sector and overall Russian economy be achieved at a higher level of effectiveness, greater rapidity and lower cost than would otherwise be possible For example, the value of load management is to permit a national (or regional) economically dispatched power system function more flexibly, at higher levels of reliability and at lower costs That is, its overriding purpose is really to enable the more cost-effective operation of a restructured power sector The specific goals and targets for load management must, therefore, (a) derive form the objectives established for power system operation under competitive wholesale and retail market conditions, and (b) reflect the value this creates for Russian society

  - In the U S considerable effort was expended trying to measure just how big DSM's benefits really might be Methods were developed using such notions as "avoided supply-side investment", "avoided externality damages", and "consumer surplus" measures of increased "customer utility associated with obtaining the same or superior service at a lower cost
  - In the final analysis, no one really believed these benefits estimates, even the people producing them, yet everyone was convinced that some estimate was necessary to justify the undertaking

- In the case of our proposed pilots, we take a more pedestrian approach which is based on two simple propositions

  - "pay-as-you-go" demonstration of value created
  - ultimate value established by free market acceptance or rejection of the products and services that "DSM" offers

- With respect to the former proposition, if one assumes that our pilots will

  - attract 24-30 participants each with a peak load factor between 0 5 and 0 6,
  - all with year-round, atleast 2-shift operations,
  - each paying a current tariff of between 250-300 rubles per kWh and
  - each with the potential to reduce consumption by atleast 10-15 percent at a cost per kWh no greater than two-thirds of existing electricity price, then

- the pilot-produced electricity bill savings alone will be more than 150 percent of total project cost

- With respect to market acceptance, we view these demonstrations as "Phase I" of a continuum of DSM-related implementation activities likely to occur in Russia over the next 2-5 years In each succeeding "phase" it will be unambiguously determined if a non-subsidized, customers-pay-for-all-value-received approach to marketing efficiency and load management does or does not work

  - While Russian utilities and the newly-formed regulatory commissions are expected to play an important proactive role in assisting this process, it is not necessary (or even preferable) that they be the dominant agents of implementation as was the case in the U S
  - The process should instead emphasize the role of existing and evolving institutions, private businesses and other commercial market entities best equipped to mainstream consumer energy services over the long-haul
  - Our pilots incorporate these features from the outset

2.0 TIME-OF-USE TARIFF DESIGN AND LOAD MANAGEMENT DEMONSTRATION
— KALUGAENERGO —

2.1 Pilot Overview

- This pilot would demonstrate the feasibility of using a time-differentiated tariff as a means to facilitate load shape modification for various types of manufacturing and other industrial sector customers

- A simple multi-time-block tariff would be designed for which the rate differentials across the time periods would reflect the actual marginal cost of providing retail power to customers based on the corresponding cost of wholesale purchases of power by KalugaEnergo from RAO, plus transmission and distribution costs

- A primary objective of the demonstration is to gain (a) an understanding of the way in which customers adapt their consumption behavior in response to continuing time-of-use price signals, and (b) to determine what part of this response is technology-enabled by making physical changes to the process or facility, and what part results from altering operating, maintenance and other resource scheduling practices

- We will also examine the feasibility of future extension of TOU rate design to areas such as interruptible rates, real time pricing and even certain forms of direct load control

- A three-stage metering and evaluation plan will allow us to develop profiles of "baseline," "learning period" and "steady state" response and to determine how transferable this experience might be to similar customers elsewhere, and the most effective means by which to accomplish that transfer

- It is anticipated that the costs of end-use, whole-facility and sub-station/feeder line metering will be shared among the participating customers, KalugaEnergo, RAO and the project The exact formula for this cost sharing will be negotiated by Hagler Bailly among the affected various parties and will also depend on decisions made by the FEC and REC regarding how, if at all, they may permit RAO and KalugaEnergo to recover their cost shares

2.2 Activities

Exhibit 2-1 summarizes the key steps in the overall work flow anticipated in this pilot These steps are briefly described below

Step 1· Establish Coordination Procedures

The pilot will involve many different parties including the technical team, the energo and several of its large customers, regional and federal regulatory commission staff, and possibly even local and regional government agency personnel While formal contractual agreements will be negotiated between some of these parties, a first task for Hagler Bailly will be to establish overall procedures for coordination, communication information sharing, and a work product review and approval process

Step 2 Review Current Survey and Analysis Results

The rationale for selecting KalugaEnergo is the pre-existing base of energy interest and customer-specific information development in the region regarding time-of-use (TOU) rate design The earlier surveys conducted by the ENIN Institute on load shifting opportunities, techniques and costs will be carefully reviewed along with energy customer records and billing data for both these surveyed facilities and other non-surveyed customers in the same industry/business sectors

Step 3 Identify Pilot Candidates

Based on the Step 2 review, a set of perhaps 12-16 customers would be selected as pilot candidates These should include at least three (3) customers for which the earlier analysis did not reveal a high degree of technical or economic feasibility for load shifting The remainder of the candidates should represent a cross-section of industry types able to modify load using different approaches at varying degrees of operational difficulty and cost

Step 4 Secure Pilot Participants

A standard contractual agreement will be developed and discussed in site visits to prospective participants The agreement will give the team permission to audit and meter the facility to establish baseline and change conditions, and would confirm the willingness of the customer to be bound by the new tariff for the duration of the pilot

Step 5 Estimate Load Shape Modes, Costs and Levels

This step will synthesize all earlier survey and analysis results to form "testable hypotheses" regarding how each pilot participant will attempt to effect a change in load shape ("mode" of change), the economic costs and benefits likely to accrue to the customer from employing that approach, and the customer's ultimate ability to achieve a certain magnitude of load shift and resulting new load shape It is presumed that customers would use a mix of changes in process technology, production scheduling, and operating and maintenance (O&M) practices to respond to TOU price signals

Step 6 Preliminary TOU Tariff Design

The design of the preliminary TOU tariff must be based upon estimated marginal wholesale power supply costs which the energo would experience in the future from an economically-dispatched system that could presumably include new energo-owned generation The design must also consider T&D-system-related costs The two-part (energy - demand) wholesale tariff now being considered by RAO and the FEC is directly relevant to this step provided that it establishes time-of-day and season-of-year differentiation to the extent that the underlying elements of supply cost really vary during those times That is, the motivation to use TOU retail rates to modify customer load shapes must logically be linked to the proposition that (a) electric service in any time period will be charged at a rate which truly represents the cost of supply in that time block, and that (b) altered load shapes result in response to those rates because customers believe they can lower overall operation costs by reducing electricity expenses more than the cost incurred to effect and sustain the change

This step will define both the time blocks and rate levels in each block and should involve input from RAO, KalugaEnergo, FEC and REC staff

Step 7 Confirm Baseline Load Profile

Before implementing any tariff change, it is necessary to confirm the characteristics of the electric load profile under current reference or "baseline" conditions of operation and the existing tariff The team will demand meter whole-facility consumption (to the extent it is not already being demand metered) and use short-interval repetitive metering of selected end-uses within the facility that (in Step 5) we believe will be affected as part of the method of load shift we think the customer will employ Baselines will be developed for all participating customers including the three (3) or so "control group" customers The use of the term "control group" is not intended in the evaluation sense of a comparison or peer group Rather, the intent is to determine if price induced ingenuity to change load patterns can be revealed which may have appeared infeasible or non-intuitive during the screening process Further, baselines will be "indexed" to various "activity measures" such as factory production volumes to avoid incorrect inferences being drawn later from tariff effects For example, we do not want to associate lowered demand level in a particular time period to TOU rate effects if that lower demand is instead really a function of the plant producing less output due to reduced orders or business volume

Step 8 Measurement of Adaptive "Learning Effects"

As with any major change in technology or operating practice, it often takes facility personnel some time to "perfect" or optimize their response to a new set of conditions To measure how long this adaptation takes and how effectively it is accomplished, we will implement a trial learning period The facilities will be instructed to initiate their load shifting procedures as if they were being billed under the new TOU tariff We would then analyze their new consumption profile and compute the corresponding financial impacts on them, KalugaEnergo and RAO just as if both the retail and wholesale time-

differentiated rates were actually in effect These results would be documented, analyzed and discussed with all parties

Step 9 Adjust Initial Tariff Design

Based on the results of Step 8, we would determine if any change is justified in the initial tariff design with respect to either time blocks or block rates Changes in design would likely occur only if actual response substantially exceeded expected response in a way such that underlying supply costs in turn change measurably It is doubtful that anything other than minor tariff adjustments would be required in this step More complex TOU rate designs, however, sometimes involve several adjustment steps to converge to final block rate levels

Step 10 Activate Revised Tariff

This third stage of implementation involves real activation of the revised TOU tariff and all parties would be billed under the terms and conditions of the new retail and wholesale rates Once again whole-facility load shapes and selected end-uses would be monitored over a period of 2-3 months to examine "steady state" behavior Recall that the monitoring of end-uses is done using short-interval recursive metering and that all profiles are indexed to avoid the effects of seasonality, business cycles, labor stoppages or other events from distorting rate-induced impacts

Step 11 Examine Impact Sustainability

By monitoring steady-state response over a multi-month period and by understanding exactly what end-uses have been changed in what way (i e , technology enabled or revised operating practices), an assessment can be made as to the ability of the customer to sustain this form of load change over time, the actual costs incurred to do so, long-term impacts on electricity bills, and the likelihood that other enterprises in the same industry/line-of-business could replicate these actions

Step 12 Examine Other Rate and Direct-Load Control (DLC) Opportunities

TOU rates are a first step on the path to real-time pricing (RTP) and other more complicated forms of dynamic pricing Even in well-established markets, RTP has been shown to have limited but, (when appropriate) high cost and energy savings impact potential This step will examine the feasibility of extensions of TOU to areas such as interruptible/curtailable rates and options for various forms of utility-dispatched direct load control Based upon the knowledge gained of customer operations from the facilities involved in the pilot, a technical and economic assessment would be made of these options including issues like software development, remote sensing of loads and telecommunications linkages required to implement these options

Step 13 Extrapolation to Other Energos

It is important that the pilot results be relevant to and replicable by energos elsewhere Energy system load shapes are different because the underlying mix of customer types that contribute to those load shapes are different To the extent that customer types participating in the pilot are commonly represented in other energy service areas, we can estimate the impact on other energos if these customer types served by them undertook similar load change actions Further, both the FEC and REC can assess to what extent rate making practices and regulatory policies could be transferable elsewhere and determine the most effective way to disseminate pilot learning experiences to other regions

2.3 Benefits

- Major benefits to be gained from a successful pilot would include the following
  - demonstrated effectiveness of time-differentiated rates on load shape modification
  - application of simple cost-of-service principles to estimate time blocks and block rates for matched retail-wholesale tariffs
  - significant training and experience transfer in metering, monitoring and general load research procedures
  - possible use of access to customer facilities for load management analysis to identify quickly implemented low cost/no cost efficiency measures and to develop data useful for later design and implementation of a more encompassing program of efficiency improvement
  - ability to use knowledge of customer operations to assess the longer-term feasibility of other dynamic pricing and direct load control systems approaches
  - ability to better understand (and influence) the way in which customers trade off electricity cost with other energy and non-energy related costs in order to minimize the overall unit cost of output ("resource cost optimization")

2.4 Risks

- Factors which could undermine pilot success include
  - customer unwillingness to effect substantive operating practice and facility load management changes in what they perceive may be only a limited-life experiment
  - insufficient diversity of customer types to draw valid conclusions regarding the broader issues of intra- and cross - service territory experience replicability
  - confounding influences of bill "non-payment" on both the rate and level of price response especially if participants have a chronic history of payment-related problems

- Remedies are available to mitigate all these risks through avenues such as
  - Obtaining REC assurance that pilot participants will be allowed to remain on TOU rates for some extended period following pilot conclusion

- Unique or "oddball"facility types are to be avoided even if they exhibit significant load shift potential They can simply be offered the TOU rate outside the pilot, minus all the expensive metering and monitoring effort associated with evaluating pilot participant response
- Satisfactory payment histories will be included as a prime factor in the pilot participation acceptance criteria, unless this would essentially disqualify all meaningful participants

3.0 INDUSTRIAL ENERGY SERVICES END-USE EFFICIENCY DEMONSTRATION
— ROSTOVENERGO —

3.1 Pilot Overview

- This pilot focuses on electric end-use efficiency improvement in manufacturing and other industrial sector facilities
  - The pilot will concentrate on "medium-sized" (1-15 MW of electric demand) facilities, although these plants may be run by companies which control multiple facilities in several industrial and non-industrial sectors
  - Most applications will relate to motors, controls and motor driven equipment and systems, compressed air production and distribution systems, lighting, heating and smaller scale refrigeration, process heating and other electrical process applications It is unlikely that projects will involve electrochemistry applications such as in aluminum production
  - Thermal applications, in general, will not be pursued except for quickly identified "no cost-low cost" measures More complicated forms of waste heat recovery and reapplication, thermal cascading, or various types of cogeneration are beyond the pilot scope
- The pilot will involve the use of audits, surveys, and site assessments as a means of primary data acquisition and opportunities identification Metering equipment obtained through previous USAID Programs will be used for this purpose as well as for subsequent measurement and verification of savings impact
- Perhaps, the most important feature of the pilot is the attempt to create innovative financing mechanisms to underwrite a diversified portfolio of small-to-mid cost range efficiency improvement investments

3.2 Activities

Exhibit 3-1 summarizes the key steps in the overall work flow anticipated in this pilot These steps are described below

Step 1 Establish Coordination Procedures

Hagler Bailly will be responsible for establishing day-to-day coordination, communication, information sharing, progress reporting, problem resolution, and quality assurance procedures for the entire implementation team and those parties with which the team must frequently interface

Step 2 Establish Financing and Management Oversight and Control Procedures

As stated earlier, the ECIF may be structured differently depending on (a) whether or not a US ESCO partner is involved (and hence whether or not the fund will have any foreign or local equity participation), (b) how the third-party lines of credit are secured, and (c) whether or not the energo will need to function as a "collection agent" through the mechanism of an "added facilities tariff" This structure needs to be determined as soon as possible so that the management oversight and control procedures can be appropriately designed

Step 3 Establish DSM Project Team at RostovEnergo

A DSM cell will be established at RostovEnergo, to analyze the findings of already-conducted audits, walk-throughs and site assessments of industrial facilities in RostovEnergo service territory This information would be matched to customer billing records and payment histories in an attempt to better understand patterns of energy consumption, technical savings potential and economic viability within and across industrial market segments Customers would be segmented into various classes dimensioned by business/process type, "size" (level of demand and energy use), growth/decline pattern in energy usage profile over time, and bill payment stability

Step 4 Develop Preliminary Program Design, Scope and Features

Based on the results of Step 3, an initial program design would be developed together with the RostovEnergo DSM Project Team to emphasize those end-use technology retrofits/replacements and changes in O&M practices revealed to be major areas of opportunity in the earlier conducted audits and assessments A companion cost and financial analysis would be performed to bracket the likely range of required investment for specific facility types and to highlight quick payback options which appear to have reasonably generic applicability across the multiple industrial market segments

Step 5 Site Visits, Focus Groups and Round-Table Meetings with Candidate Facilities

Together with the RostovEnergo DSM Project Team, the results of Steps 3 and 4 would be discussed individually with selected senior executives and administrators in each target segment and in focus groups and round-tables with plant operating and technical personnel who have the greatest first-hand knowledge of the facility, its process equipment and systems, energy and other resource inputs, and product outputs A major goal of this step is to better understand how efficiency improvements can be integrated with other forms of facility modernization, automation, etc that are already planned and for which financing sources may have already been identified by management This will determine the extent to which efficiency improvements can be justified on an incremental versus full-capital-cost basis or "cost blended" to obtain acceptable composite pay backs

Step 6 Design Standard Contract and Secure Commitments to Participate

To avoid ambiguity and to ensure that all parties to the project are clearly informed of their respective responsibilities, commitments and risk exposures, simple standardized contract pro forms would be developed to effect the necessary legal relationships among the project participants Candidate customers would be presented a companion document which would outline the sequence of activities, milestones and events necessary to involve them as pilot participants beginning with initial meetings and fact-finding, through the audit stage to determine the economic and technical feasibility of potential measures, and subsequently through the formal proposal, equipment procurement and installation, financial covenants, monitoring and evaluation stages The intent is to clearly "telegraph in advance" the step-by-step process and commitment their participation would entail so as to avoid later misunderstandings and to reinforce the fact that they are entering into a formal agreement which is expected to result in specific types of benefits and costs to them

Step 7 Competitively Procure and Certify Local Technical Services Providers

A competitive procurement would be conducted together with RostovEnergo to secure local private energy service firms to perform the audits, assessments and metering functions and to also identify service providers capable of later supporting equipment installation and related continuing O&M functions Capable firms and individuals would be "certified' to work on ECIF-financed projects Additionally, certification would also confirm that necessary licenses from the energonadzor and cognizant local government agencies had also been secured and approved At the appropriate time we would hope to transfer this certification activity to REMA and its regional affiliates

Step 8 Conduct Site Audits and Engineering Assessments

For candidate sites which have agreed to enter the pilot qualification process, site audits would be scheduled and conducted by the private energy service firms to identity the potential scope of cost-effective actions and measures which might be undertaken As discussed earlier, the cost of this initial audit would be borne by the ECIF as part of its administrative and management surcharges If required, more detailed engineering assessments would be conducted on a ECIF/customer, cost-shared basis wherein the customer would be responsible for a share of the study cost should it not continue on to the next step of the qualification process If it did proceed, study costs would be rolled into the project financing Audit results would include both technology enabled and altered O&M practice-related measures, their corresponding costs, and calculations of simple payback and related financial figures-of-merit

Step 9 Analyze Audit Results

The results of all the audits and assessments would be individually analyzed by the RostovEnergo DSM Project Team, and then collectively synthesized to identify frequently recurring types and categories of measures and actions within and across industry

segments These patterns would suggest common program features and implementation procedures which if adopted, would capture the bulk of cost-effective savings potential identified The analysis would determine which thermal conservation measures might also be considered along with electric end-use measures as well as any beneficial linkages of efficiency improvement to other forms of productivity enhancement related investment

Step 10 Determine Final Program Scope and Features

Based on the results of Step 9, a final program scope ("offering") would be defined to include all the features and actions which could be included in the formal project financing proposal brought to the Fund for approval The intent is to include a sufficient diversity of measures and actions so that customers feel projects are being "customized" to their specific facility and operating conditions without going so far as to include highly specialized applications which have little experience transferability value and which might place too high a demand on limited Fund resources The pilot may, however, help the customer obtain parallel or piggy-backed financing for these special applications

Step 11 Specify Site-Specific Project Scope and Financial Package

For each facility analyzed a prioritized schedule of measures and actions would be developed ranging from the lowest cost measures to those incrementally more expensive until all cost-effective opportunities have been exhausted This process is diagrammatically illustrated in the top portion of Exhibit 3-2 This prioritization would conceptually be equivalent to developing a plant-specific savings "supply curve" in which both the incremental and cumulative costs of securing various amounts of savings is compared to the equivalent unit cost of meeting those requirements through conventional electricity supply This analysis would define the range of financing and breadth of physical modification required by each candidate facility

Step 12 Prioritize Candidate Projects

It is unlikely that the Fund will be able to underwrite the entire slate of measures collectively across all potential sites which the audits suggest as being cost-effective Therefore, a second level of prioritization must be made across all facilities to define (a) packages which individually yield a sufficiently visible and significant level of savings for each customer, and which (b) collectively across all customers finance as many of the most cost-effective, quickest payback measures the Fund can accommodate given its total credit limits with cooperating financial institutions and credit backers The bottom portion of Exhibit 3-2 shows how funding limits may constrain the ability to underwrite all cost-effective investment opportunities

Steps 13 and 14 Obtain Final Customer Commitment and Sign Contracts for Each Project

Final proposals for each facility would be prepared and presented to the customer for review and discussion At this stage adjustments would be made within and across proposals For example, certain customers may want to add or drop measures that alter

the mix and cost of actions we recommend It may be that a customer "drops out" at this point and decides not to continue on in the qualification process This, of course, "frees up" resources to do more at other sites where investment was constrained

Step 15 Place Contract with the ECIF and Initiate Re-Payment Arrangements

Once the customer agrees to the original or revised project proposal for its facility, the next step is to conduct a thorough assessment of credit-worthiness and determine a schedule and means of re-payment consistent with the customer's financial capacity and business outlook In no case, of course, are monies transferred directly to the customer by the Fund, but are instead channeled to equipment vendors and service providers by the Fund on the customer's behalf In cases where the credit-worthiness of the customer is marginal and the nature of the investment is such that a collateralized mortgage on equipment that can be repossessed is infeasible, the pre-payment arrangement may take the form of an "added facilities tariff" by the energo which would have to be generically approved by the REC The intent is not to get RostovEnergo in the middle of a transaction best consummated directly between the customer and the Fund However, the special tariff allows the customer a longer re-payment window RostovEnergo is "protected" in the same way it would be for any bill payment default which it might experience in terms of the way the REC would examine its revenue requirements and set rates to reflect the recovery of bad debts resulting from a variety of causes

Step 16 Procure Equipment and Place Job Orders with Local Services Providers

Once the project is approved by the Fund, it would give the go ahead to procure any needed equipment and to place job orders with local service providers for the installation and maintenance of that equipment Again, the financing includes the overall installed cost of the equipment and other changes made to the facility These are not services whose cost would come out of the Fund's operating and management surcharge

Step 17 Establish Performance Baseline

Before any changes are made, it is necessary that the RostovEnergo DSM Team establish a reference baseline of end-use consumption for all systems affected by the planned modifications and equipment retrofits/replacements The use of metering and statistical regression techniques to establish this performance baseline have been developed and extensively applied in the course of North American DSM program evaluation and widely reviewed in regulatory proceedings associated with the verification of program impacts An important element of the baseline is the correlation of consumption to physical activity measures and flows which may vary over time in a way that could confound simplistic "before-after snapshot" approaches to estimate savings and other changes The baseline also incorporates directly the notion of "service level," which could be important for measures such as lighting retrofits under conditions where the facility was inappropriately underlit, burned out lamps not replaced, etc

Step 18 Install Equipment and Complete All On-Site Modifications

Once the equipment is received and installed and all other facility modifications performed, a comprehensive on-site inspection will be conducted by the RostovEnergo DSM Team to ensure that all measures are in compliance with the terms of the approved project proposal This inspection is in addition to the normal quality assurance procedures applied during the course of installation and earlier checks to ensure equipment has been shipped and received in proper condition

Step 19 Confirm "Post-Treatment" Performance Patterns and Operating Profile

After an initial "shake-down" period of, perhaps 6-8 weeks, additional metering and analysis will be conducted to examine the impact of changes made This monitoring would be performed repetitively in successive time periods, at randomly chosen intervals, to maximize the likelihood of exposure to a broad range of operating levels and conditions Recall that the baseline will allow us to establish fixed and variable levels of expected consumption under various activity regimes, production volumes, etc before any changes were made so as to provide the basis for the necessary post-treatment comparisons

Step 20 Monitor Steady-State Operating Regime

Through completion of the pilot, periodic monitoring will be performed by RostovEnergo under longer-term "steady-state" conditions of facility operations To the extent that (a) a US ESCO is involved and (b) the customer wishes to purchase any performance guarantees pursuant to the original project investment proposal, the Fund may perform specialized monitoring to ensure compliance with those guarantees

Step 21 Perform Continuing O&M and Quality Assurance Checks

All equipment and other services will convey to the customer standard those warranties and protections commonly offered by manufacturers and vendors However, part of the pilot scope is to ensure that facility personnel are trained in the proper continued operation and maintenance of these equipment and devices Further, to ensure the reliability of the impact evaluation and savings estimates, it will be necessary to periodically reconfirm that the equipment is being used and maintained in accordance with manufacturer specifications and instructions

3.3 Benefits

- The pilot combines and extends the DSM/IRP related efforts in the North Caucasus region sponsored under earlier US AID funding including the imminent acquisition of almost one-half million dollars worth of metering equipment under the Commodity Import Program

- It reinforces and brings a system of structure to local capability for performing audits and engineering assessments and providing equipment installation and O&M services Further,

it helps create a market environment wherein future demand for such services can be sustained Current efforts may have identified only a fraction of the cost-effective electric, thermal, water and other resource savings available

For example, some plant audits estimated electric savings potential at 7-11 percent of current consumption -- a level significantly below that considered to be technically feasible and economic for similar plants elsewhere and at the prevailing rate of almost $0 07 per kWh

- It establishes the nucleus of a new load research/customer services cell within the energo and provides an entree into broader applications of DSM outside industry in a growing urban area with a population already in excess of one million

- It will test the efficacy of using funding facilities such as TUSRIT and World Bank ESP for efficiency improvement projects and, more broadly, to use innovative financing as a lever to ultimately

  - mitigate risk by pooling project performance
  - bootstrap the creation of local energy services companies and thereby attract equity capital into project development

3.4 Risks

- By far, the primary risk involves being able to establish viable and sustainable lines of project financing given the current market and commercial lending conditions in Russia It is unlikely that US ESCOs will be prepared to make equity investments in a Russian energy services venture or bring to Russia sufficient amounts of U S or foreign debt financing If linkages to TUSRIT or World Bank ESP do not work out financing directly through Russian commercial banks will be extremely difficult

Exhibit 3-1 Rostov Energo Industrial Efficiency Demonstration Major Activity Flow

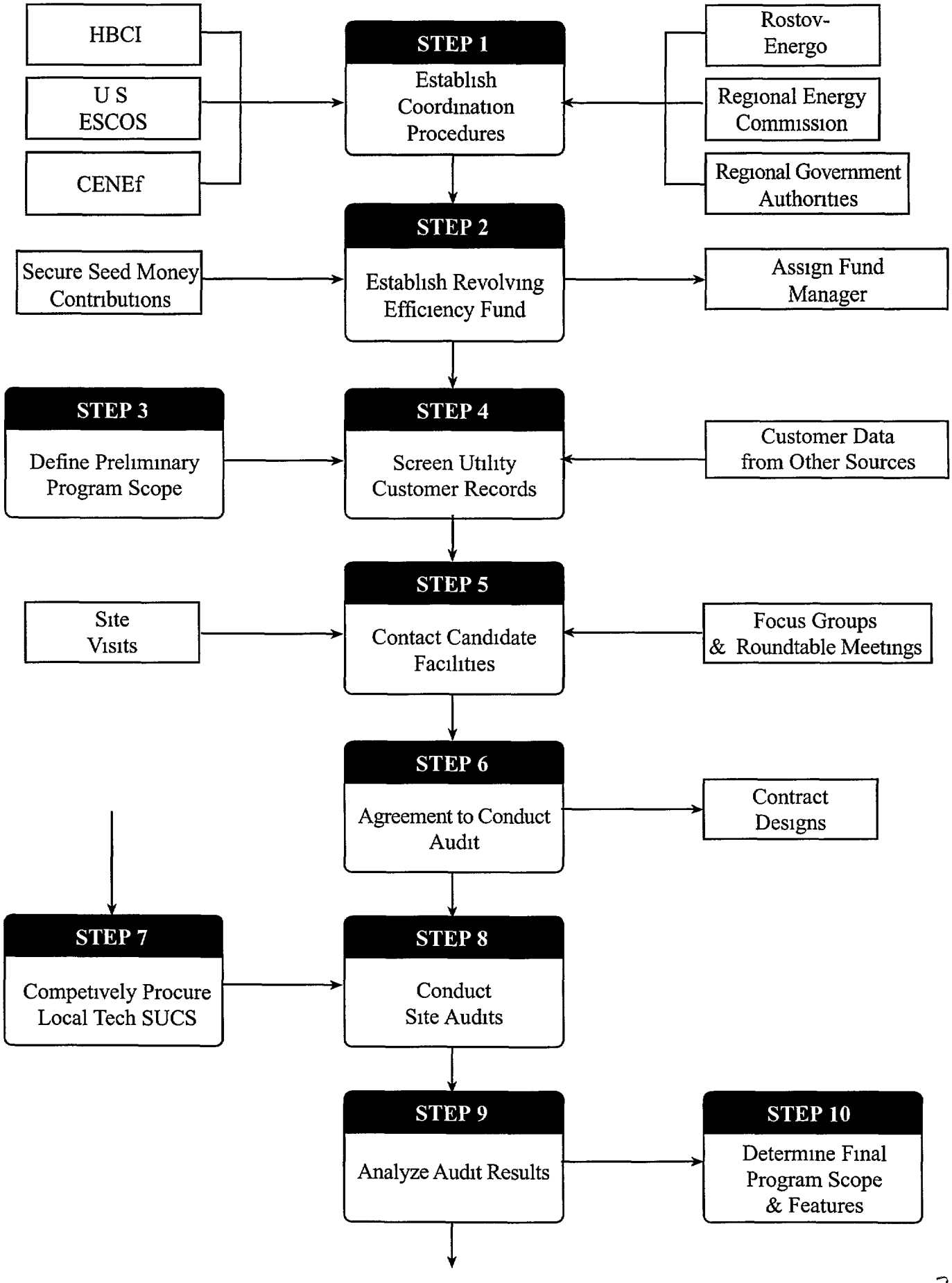


Exhibit 3-1 (cont'd)

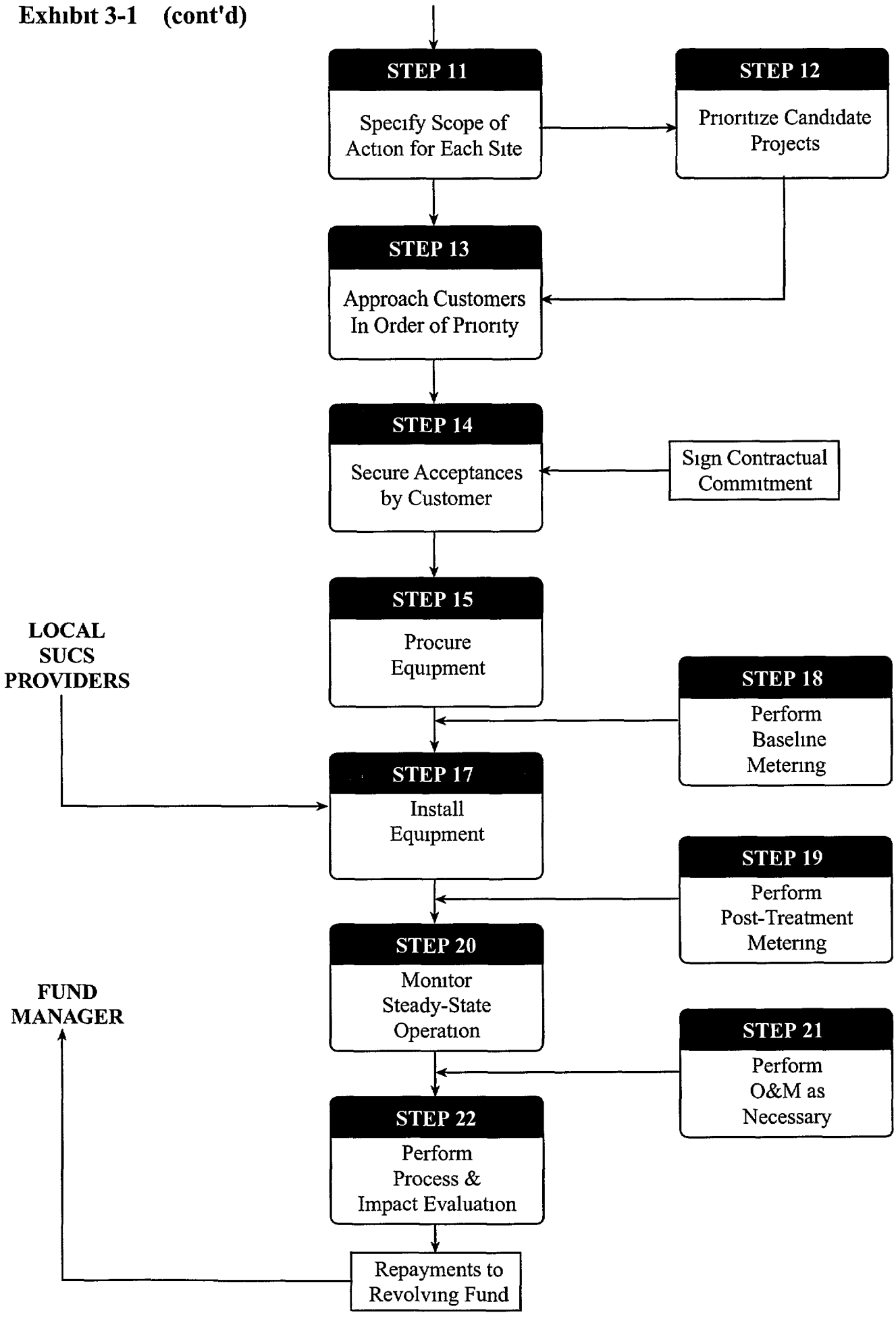


Exhibit 3-1 Kaluga Energo TOU Tariff Design and Load Management Demonstration Major Activity Flow

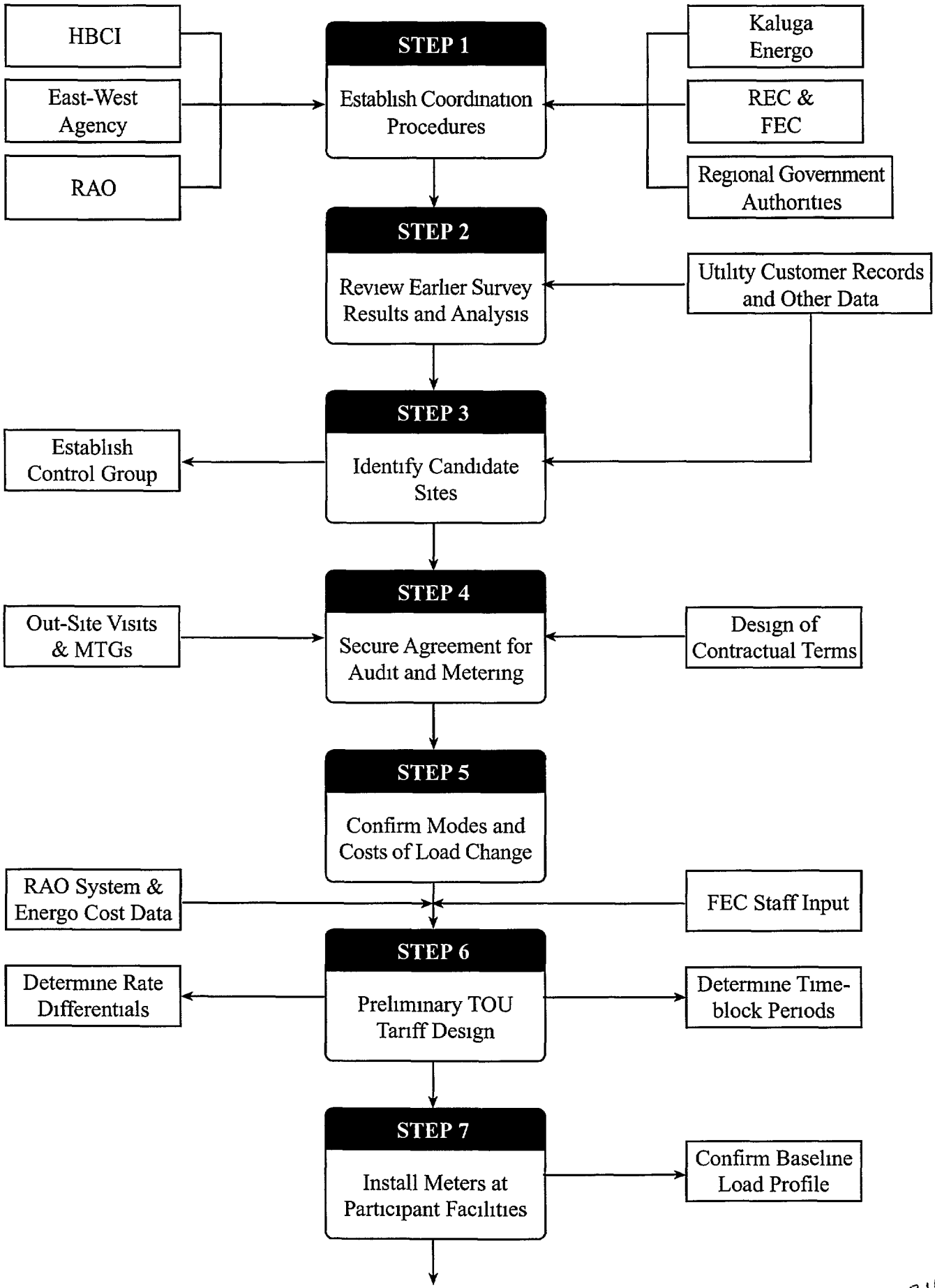


Exhibit 3-1. (cont'd)

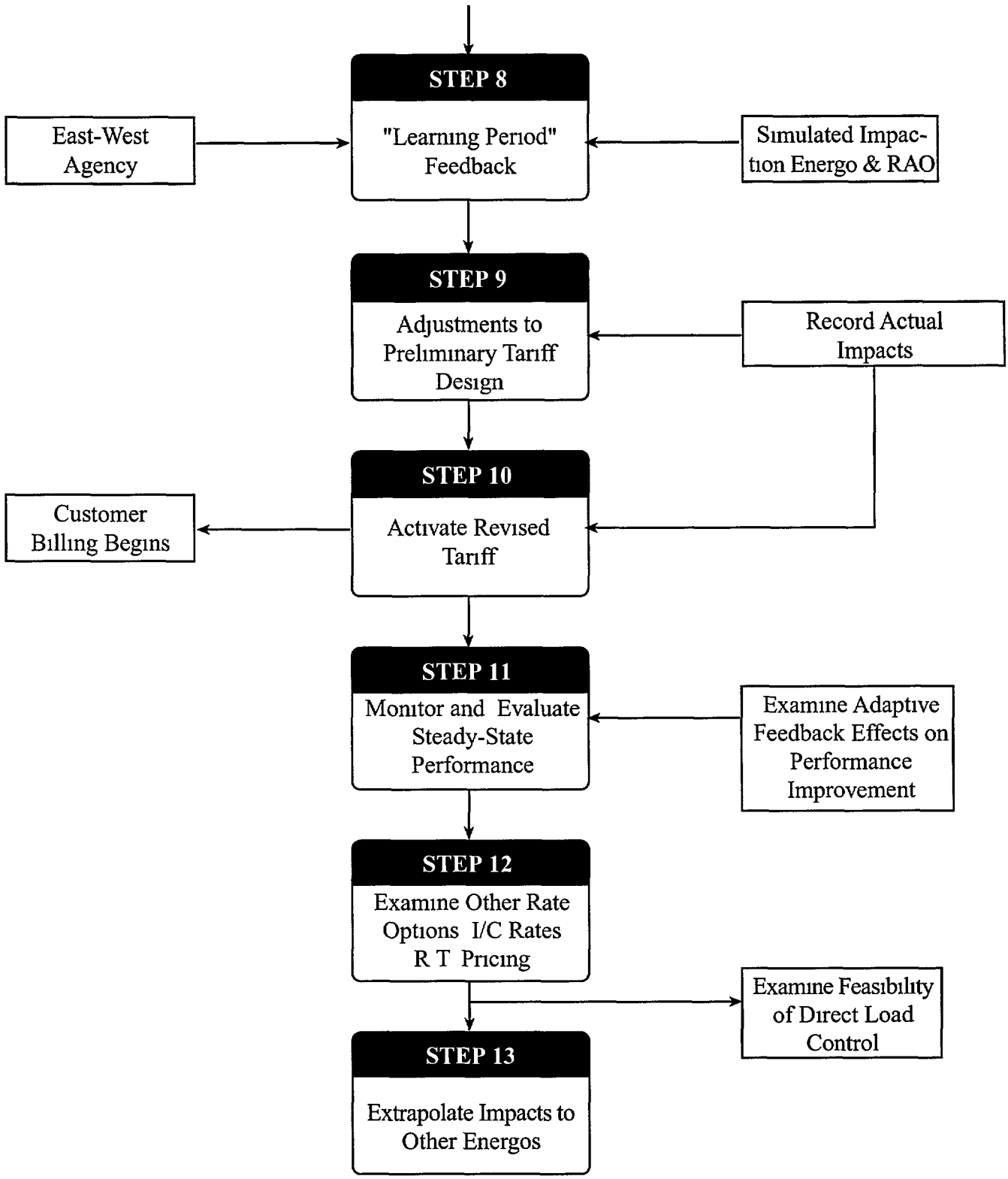
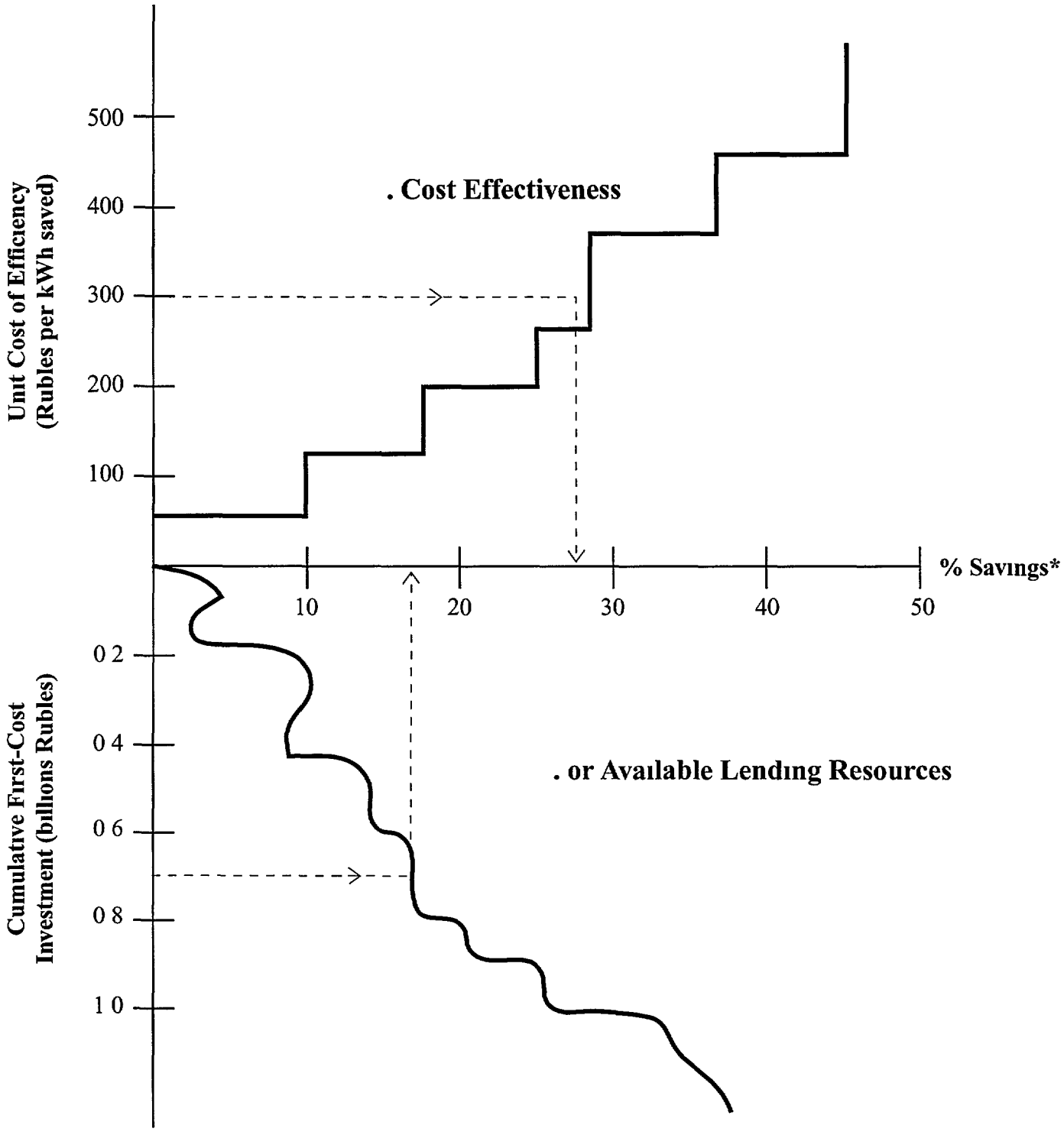


Exhibit 3-2. Investment in a Particular Facility May Be Limited by Either



* *percentage of the facility's current reference electricity consumption which is saved*

4.0 PILOT TIME LINES

4.1 Pilot Time lines

- Exhibits 4-1 and 4-2, respectively, show the anticipated time lines and schedule of reporting milestones for the demonstrations
- It will be very difficult to compress activities, many of which by their very nature must be performed sequentially There are few opportunities to accelerate activities by simply applying additional manpower
- The intricate scheme of metering and monitoring proposed also dictates that certain sets of activities remain clearly separated in time to avoid obtaining confused and incorrect inferences
- These demonstrations represent "Phase I" of a continuum of efficiency/load management implementation activity likely to occur in Russia over the next 2-4 years

Exhibit 4-1. Estimated Timeline and Milestones: Kaluga Energo TOU Rates

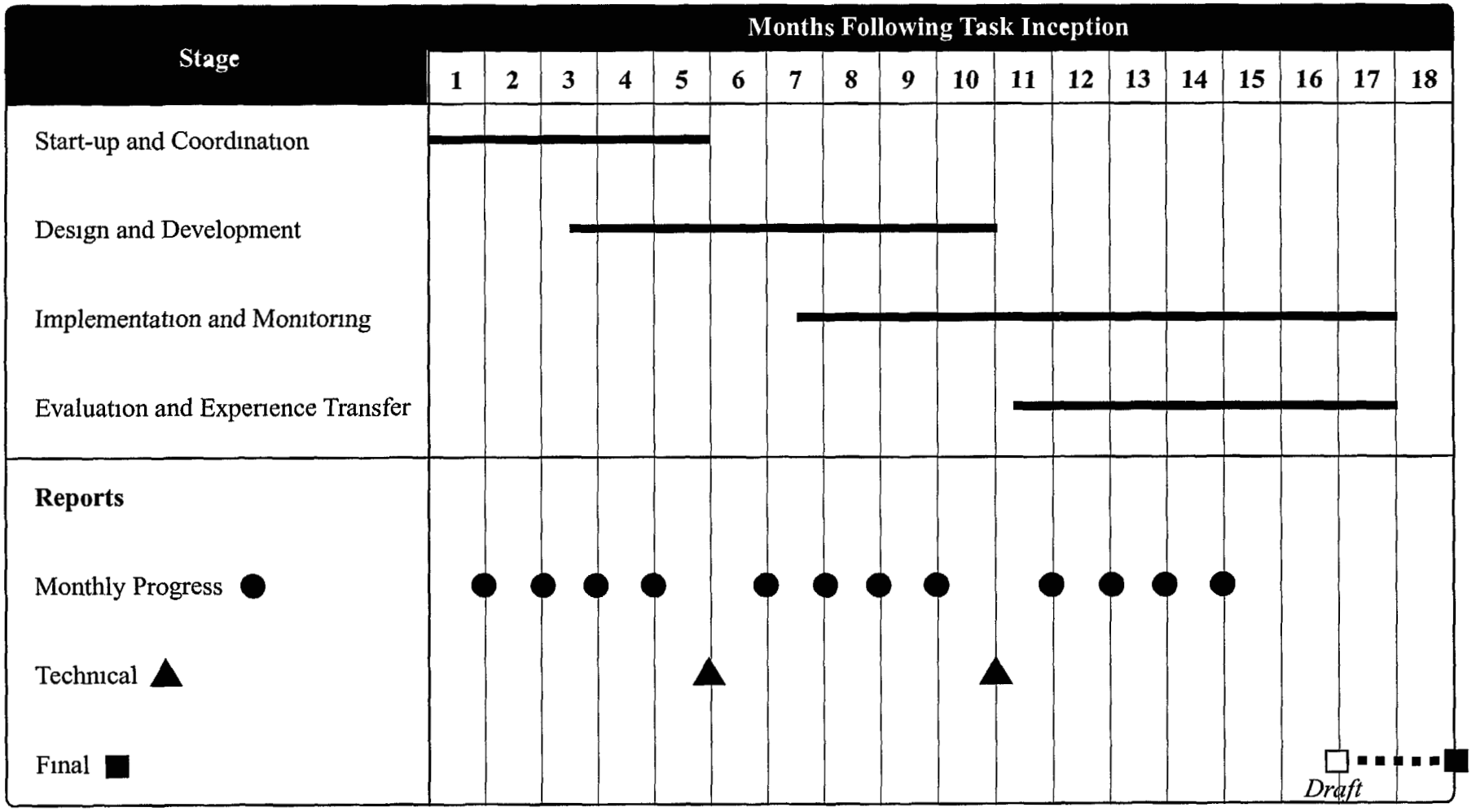
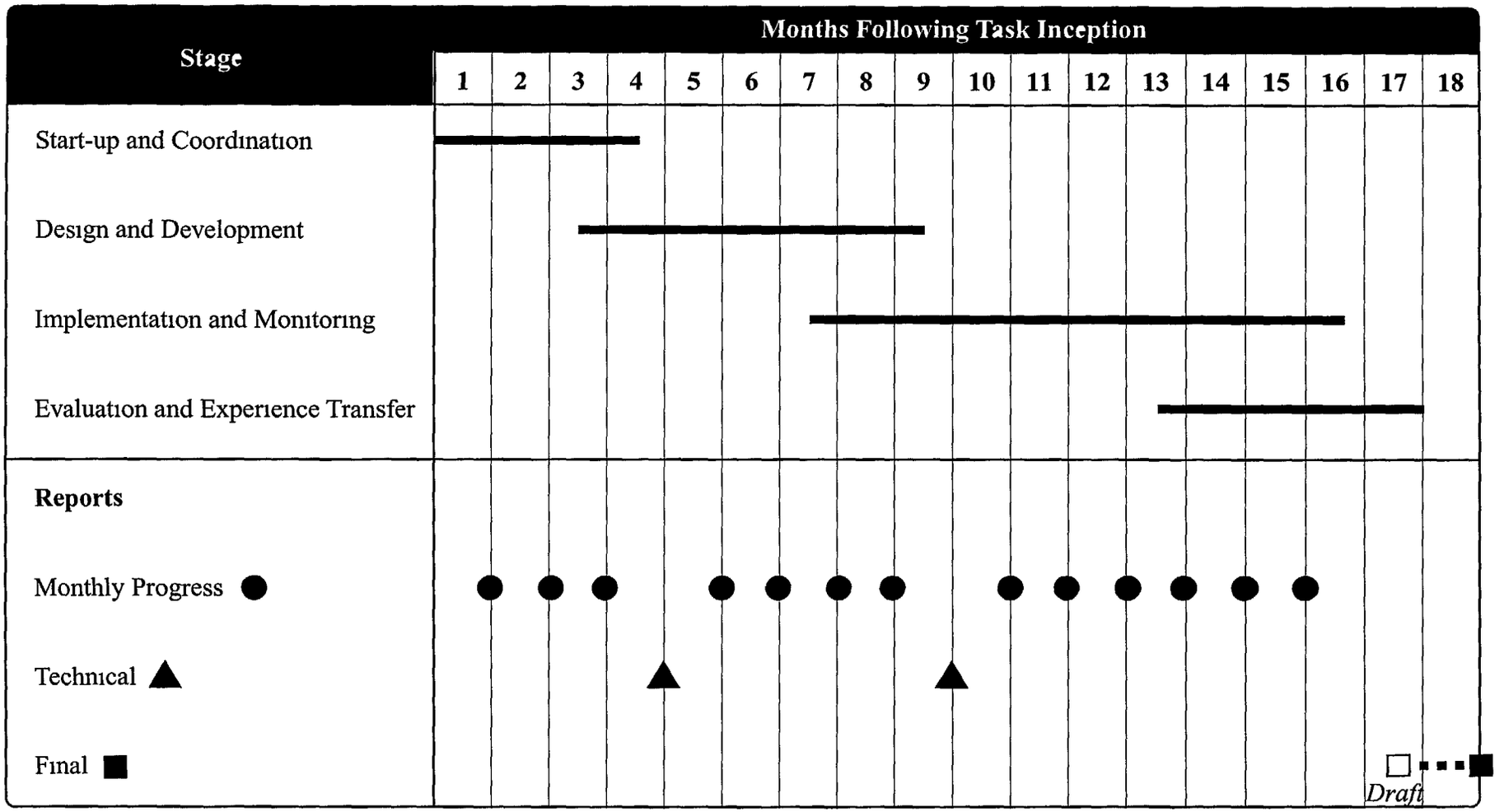



Exhibit 4-2 Estimated Timeline and Milestones: Rostov Energo Energy Efficiency Pilot