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# PILOT HEATING PROJECT REPORT: AMIRYAN

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**This publication was produced for review by the United States Agency for International Development. It was prepared by the Residential Heating Project's team.**

Residential Heating Project  
USAID Contractor  
75 Hovsep Emin Street  
Yerevan Armenia  
(374)-10-268982 (tel.)  
(374)-10-210882 (fax)  
[www.heat.am](http://www.heat.am)

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## **DISCLAIMER**

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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## **PROJECT SUMMARY AND EXPECTED RESULTS**

To promote the development of the heat market in Armenia, the Residential Heating Project (RHP) sought to provide initial financial and technical assistance and other advisory services to various heat sector stakeholders to make the heat supply business more attractive for private investors. RHP collaborated with Euroterm and ACBA Bank to make apartment-level space heat and hot water for domestic consumption available to participating apartment owners in one building on Amiryman Street in central Yerevan.

The Amiryman pilot project has two distinctive characteristics: support for individual apartment-level heating solutions through the installation of double-loop, gas-fired boilers and the option for participating residents to obtain up to seventy percent of financing through a local bank. These characteristics are distinctive in that this type of project represents the “other end of the continuum” of possible space heating solutions historically deployed in Soviet and post-Soviet era Armenia, namely centralized district heating.

Euroterm, a local heating systems and services supplier, originally proposed the pilot project concept for the Amiryman 15a building in Yerevan to RHP in May 2006. From the original household surveys conducted by RHP subcontractors, it was believed that 55 apartments would be a reasonable target participation level. On May 26, 2006, the RHP proposed the Amiryman project to USAID. This proposal submission envisioned heating 55 apartments in the Amiryman 15a building, which has a total of 94 apartments, 67 of which are occupied, through individual apartment solutions. On August 2, 2006, USAID approved the project with the USAID-funded portion of the project capped at 30 percent.

As the subcontractor/installer began seeking firm commitments from residents only 12 of the possible 67 apartments, or about 18 percent, ultimately were able to commit to participate in the pilot project. Approximately one-third of the participating apartments were able to take advantage of the bank financing. However, many residents who desired to participate were unable to meet the income demonstration requirements of the funding institution, ACBA Bank.

## **PROJECT PARTNERS AND SUBCONTRACTING**

RHP partnered with Euroterm, the Amiryman project initial supporter, for the supply, installation, and long-term service of the boilers and related equipment in the participating apartments. Euroterm is a local supplier of boilers assembled in Armenia and of various supplies and equipment (valves, piping, design and installation services, etc.) related to space heating and hot water supply for both residential and commercial clients.

ACBA bank also partnered with RHP and Euroterm on this endeavor. As a result of the reduced perceived and actual risk to ACBA due to partial USAID funding, ACBA agreed to provide up to 70 percent of the funding to qualifying participating residents, based on a 3-year loan at 13.5 percent with no money down.

The Amiryman pilot project brought together three entities (the resident, the equipment supplier, and the financing institution) for the ultimate supply of space heat and hot water for domestic consumption. RHP envisions that this “private sector” model can be easily replicated to support continued expansion of such heating projects, particularly in Yerevan.

## PROJECT PLANNING AND EXECUTION

As the RHP was scheduled to close by the end of 2006, the installation schedule was critical for this pilot project. The original subcontract with Euroterm included a schedule for activities as follows:

<b>Task</b>	<b>Start date</b>	<b>End date</b>
Contract signed	25.09.06	25.09.06
Purchase equipment	11.10.06	31.10.06
Facilitate loan applications and approval or provide copies of cash receipts for 56 apartment owners	26.09.06	30.10.06
Begin installations	11.10.06	11.10.06
Complete installation in a minimum of 20 apartments	11.10.06	21.10.06
Test and obtain acceptance of the heating systems in 20 apartments	22.10.06	25.10.06
Complete installation in remaining 36 apartments	21.10.06	18.12.06
Test and obtain acceptance of the heating systems in remaining 36 apartments	19.12.06	22.12.06
Completions and obtain final acceptance of Work	27.12.06	27.12.06

Difficulties in obtaining and sustaining a level of quality communication with residents led to an extended sign-up phase for project participation. In one particular instance several influential residents voiced opposition to the project based on their initial understanding of its parameters. Also, having a third party (the bank) involved in the project required a triangle of transactions which exacerbated the approval schedule.

After repeated individual apartment visits by both RHP and Euroterm representatives, group meetings with multiple residents, and the inability of certain residents to qualify for financing, the anticipated participation level and schedule was amended as follows:

<b>Task</b>	<b>Start date</b>	<b>End date</b>
Contract signed	25.09.06	26.09.06
Purchase equipment	11.10.06	31.10.106
Facilitate loan applications and approval or provide copies of cash receipts for 10 apartment owners	26.09.06	15.11.06
Begin installations	11.10.06	11.10.06
Complete installation in a minimum of 10 apartments	11.10.06	20.11.06
Test and obtain acceptance of the heating systems in 10 apartments	01.12.06	03.12.06
Complete installation in any remaining apartments beyond the original 10 apartments	21.11.06	12.12.06
Test and obtain acceptance of the heating systems in any remaining apartments beyond the original 10 apartments	12.12.06	15.12.06
Obtain final acceptance of Work	18.12.06	18.12.06

In addition to the previously mentioned communications and sign-up activities, RHP representatives assisted the subcontractor in determining the proper technology and placement of piping for both air intake and chimney exhausts for the individual apartment boilers. These technologies and placements sought to assure compliance with local laws and with industry best practices for similar situations.

By November 13, 2006, Euroterm had completed installations in 7 apartments, and by November 20, 2006, 10 apartments as scheduled. Progress payment for this work was made in accordance with subcontract requirements. By December 14, 2006, installation activities in all 12 apartments had been completed, and final payment to Euroterm was made in December 28, 2006, in accordance with subcontract parameters.

In response to conditions identified in the conduct of completing the Environmental Checklist as required by USAID, the RHP procured dual sensing (carbon monoxide and methane) alarms with battery-backup for installation in each apartment to provide monitoring oversight to operations of the individual boilers.

Oversight by the RHP pilot project team included taking photographs of project progress, engaging residents in discussions about the work on their apartments, and physical inspections of the subcontractor's work. An exemplary Site Visit Reports is attached in Annex A, a tabulation of participating apartments is attached in Annex B, a summary of pilot project costs is attached in Annex C, and a copy of the Environmental Checklist documentation is attached in Annex D.

## **PROJECT RESULTS AND SUSTAINABILITY**

Though the percentage participation level did not meet initial expectations, technical assistance provided by the RHP to Euroterm has created additional installation possibilities for the future in compliance with Armenian environmental regulations and industry best practices. Additionally, those apartment owners who can meet minimum income demonstration requirements should now be able to obtain access to consumer financing for such heat system installations.

Euroterm's rapid increase in sales as a result of pilot project referrals and targeted advertising efforts demonstrate the popularity of these types of individual apartment-level dual-loop boiler installations. While apartment-level solutions do place the primary financial burden directly on the individual apartment owner, these solutions are essentially independent of influences from neighbor, condominium, or building political or economic environments.

The more affluent citizens of Armenia will likely choose these types of heating solutions as they become more available and the total cost of ownership begins to decline in comparison to other options for space heat and hot water supply. In certain situations, it may be possible for apartment owners to receive partial funding for apartment-level solutions through social assistance programs such as R2E2 or Armenia's social services program.

## **RECOMMENDATIONS**

Recommendations that build upon the activities related to this project include:

- a. Assure sound technical feasibility of any project being attempted. Extensive technical assistance and time was required to support the subcontractor's design efforts to assure compliance with local laws and best practices regarding the placement of chimneys and inlet air piping required to support individual apartment gas-fired boiler equipment.
- b. Assure that financial resources are sufficient (from investors, donors, financial institutions, residents, etc.) to fund quality projects that will provide quality sustainable heat to the participating apartments.
- c. If financial assistance for disadvantaged populations is considered, it is recommended that this assistance flow through the apartment owner to the supplier/installer so as to (a) preserve/elevate the social standing of the apartment owner vis-à-vis the supplier/installer, and (b) not divert the allegiance of the supplier/installer from its client to the "provider" of the financing – i.e., the social services funding institution or program. This will support the development of a market economy by having the respective "buyers" and "sellers" operate in a more transparent manner.
- d. Demonstrate a commitment to any project by quality workmanship, timely progress, active participation by the principals, and deliberately sought communications with and personal involvement of the residents – they, after all, are the ones who will ultimately "pay the bill" for the heat.
- e. Perform as promised: holding all participating organizations to their promises of performance.

## **ANNEX A: SITE VISIT REPORT**

**Project Name & Contract No.:** Armenia Residential Heating Project,  
Contract No. 111-C-00-05-00040-00

**Date of visit:** November 27, 2006

### **Overview**

This USAID-funded pilot project was initiated in Yerevan in the residential section of Amiryan 15a by the USAID-funded Residential Heating Project (RHP). The technical solution for these apartments differs from the autonomous boiler house supply in that each participating apartment is provided an individual gas-fired boiler which provides both space heating via radiators located in the apartment and hot water for domestic use.

Originally envisioned as a pilot project with 55 owners out of the 67 occupied apartments interested in participating in the project, difficulties with diffusion of accurate information among the residents and the lack of ability of some residents who desire to participate to be able to qualify for the pre-arranged bank financing have resulted in a projected 19 of 67 (or some 28%) apartments being part of the pilot project.

### **Purpose of Trip**

The purpose of this site visit was to inspect the progress of installations, and to discuss completion of the paperwork necessary to initiate payment for the first 10 apartments per the subcontract documents.

### **Progress Made**

The following tasks, as part of the subcontract with Euroterm, were completed:

- Installations of the integrated systems were completed in eleven apartments.
- It was noted that certain apartments, having internal radiators from previous systems, will not require the addition of new radiators; however, certain apartments have additional rooms requiring radiators to be installed. It is expected that these differences will essentially be off-set in the costs of the fixed-price subcontract.
- Signage will likely be placed at the outside entrance to the elevator and stairs lobby of the residential portion of the building.
- Euroterm reports that one of the remaining planned apartment owner may not be able to secure financing as planned.

### **Concerns**

The potential inability of an apartment owner to secure financing, in light of multiple others who were able to do so, further highlights the need for engagement of the heat sector stakeholders with the financial sector.

**Next steps**

It was agreed that Euroterm would deliver all necessary paperwork supporting the installation of the first 10 apartments to the Heating Projects Leader on Tuesday, November 28, 2006, for his review and processing for payment.

**Attachment**

Selected photos indicting progress noted above.

**Amiryan**  
**Apartment installations – 27Nov06**



Mr. Haik Sahakyan shows the Euroterm unit installed in his kitchen.



Close-up of the annulus intake air with internal exhaust piping.



Mr. and Mrs. Qalburyan enjoy the warmth in their living room from one of the radiators served by their newly installed Euroterm double loop boiler system.



## ANNEX B: PARTICIPATING APARTMENTS

Control #	Name of the apartment owners	Apartment number	Number of rooms	Signed	Financing
1	Ispiryan Alexander	9	2	1	cash
2	Harutiunjan Galina	17	3	1	cash
3	Qalburyan Ara	21	3	1	ACBA credit
4	Sahakyan Margarit	14	3	1	ACBA credit
5	Petrosyan Gagik		3	1	cash
6	Pailaco Shmavonyan	22/23	3	1	cash
7	Petrosyan Boris	84	3	1	cash
8	Galstyan Shmavon	35	3	1	ACBA credit
9	Qerobyan Roland	1a	3	1	cash
10	Aloyan Hovhannes	37	2	1	cash
11	Ghazaryan Irina	61	2	1	cash
12	Sarmen Baghdasaryan	40	2	1	ACBA credit

## ANNEX C: COST SUMMARY

Item	Actual	
	AMD	\$
Subcontract with Euroterm	1,776,258	4,699
Insurance	1,311,435	3,469
Alarms for each apartment	n/a	965
Signage	64,000	170
<b>Sub-Total</b>	<b>3,151,693</b>	<b>9,303</b>
<b>Number of apartments</b>	12	
<b>Est. private sector investment</b>		<b>10,965</b>
<b>Amiryan Total</b>		<b>20,268</b>

# ANNEX D: ENVIRONMENTAL CHECKLIST



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**Project Name:** RESIDENTIAL HEAT PROJECT  
**Project Number:** 111C00-05-00040-00

**ENVIRONMENTAL REVIEW (ER) AND ASSESSMENT CHECKLIST**

**Location:** Yerevan, 15A Amiryan str.

**Type of Activity:** Individual gas heating system installation

The USAID-funded Residential Heating Project, implemented by Chemonics International is project aimed at providing assistance to the Republic of Armenia in implementing the Government of Armenia (GOAM) heat strategy and in particular to demonstrate the full range of heat supply alternatives that will be required in addition to heating rehabilitation and modernization. The Project will focus on implementing various alternatives to promote the developing heat market in its ability to realize least cost solutions that enhance effective management and reduce environmental costs. The Project will work closely with the Subcontractor to rehabilitate the residential heating systems supporting apartments at Amiryan 15a in Yerevan, Armenia. The Subcontractor is one of the leading heating companies in Armenia and a local producer of apartment level boilers.

The Subcontractor shall implement the required construction/installation work on the building as follows:

Specifically, the funds for this Subcontract will be used toward the purchase of boilers, radiators and other NIS-origin equipment as well as occasional labor for the apartments that have elected to participate in the rehabilitation project and have received loan approval or paid cash.

The project will include installation of individual heating systems in each of the targeted apartments. This technology will allow customers to have proper control over the heating system, easier measurement systems as well as hot water supplies. ARG is currently undertaking gasification of the building.

Euroterm LLC will install for each apartment one double circuit boiler with separate air intake and chimney, install metal-plastic pipes for internal heat and hot water system, and install convectors for each room.

**Name of reviewer:** Hovhannes Kantuni

**Date of Review:** September 19, 2006

**A. CHECKLIST FOR ENVIRONMENTAL CONSEQUENCES:** Check appropriate column as Yes (Y), Maybe (M), No (N) or Beneficial (B). Briefly explain Y, M and B checks in next Section, "Explanations". A "Y" response does not necessarily indicate a significant effect, but rather an issue that requires focused consideration.

Y. M. N or B

**1. Earth Resources**

- a. grading, trenching, or excavation > 1.0 hectare \_N
- b. geologic hazards (faults, landslides, liquefaction, unengineered fill, etc.) \_N
- c. contaminated soils or ground water on the site \_N
- d. offsite overburden/waste disposal or borrow pits required > 1.0 ton \_N
- e. loss of high-quality farmlands > 10 hectares \_N

2.	<b>Agricultural and Agrochemical</b>	
	a. impacts of inputs such as seeds and fertilizers	_N
	b. impact of production process on human health and environment	_N
	c. other adverse impacts	_N
3.	<b>Industries</b>	
	a. impacts of run-off and run-on water	_N
	b. impact of farming such as intensification or extensification	_N
	c. impact of other factors	_N
4.	<b>Air Quality</b>	
	a. substantial increase in onsite air pollutant emissions (construction/operation)	_B
	b. violation of applicable air pollutant emissions or ambient concentration standards	_N
	c. substantial increase in vehicle traffic during construction or operation	_N
	d. Demolition or blasting for construction	_N
	e. substantial increase in odor during construction or operation	_N
	f. substantial alteration of microclimate	_N
5.	<b>Water Resources and Quality</b>	
	a. river, stream or lake onsite or within 30 meters of construction	_N
	b. withdrawals from or discharges to surface or ground water	_N
	c. excavation or placing of fill, removing gravel from, a river, stream or lake	_N
	d. onsite storage of liquid fuels or hazardous materials in bulk quantities	_N
6.	<b>Cultural Resources</b>	
	a. prehistoric, historic, or paleontological resources within 30 meters of construction	_N
	b. site/facility with unique cultural or ethnic values	_N
7.	<b>Biological Resources</b>	
	a. vegetation removal or construction in wetlands or riparian areas > 1.0 hectare	_N
	b. use of pesticides/rodenticides, insecticides, or herbicides > 1.0 hectare	_N
	c. Construction in or adjacent to a designated wildlife refuge	_N
8.	<b>Planning and Land Use</b>	
	a. potential conflict with adjacent land uses	_N
	b. non-compliance with existing codes, plans, permits or design factors	_N
	c. construction in national park or designated recreational area	_N
	d. create substantially annoying source of light or glare	_N
	e. relocation of >10 individuals for +6 months	_N
	f. interrupt necessary utility or municipal service > 10 individuals for +6 months	_N
	g. substantial loss of inefficient use of mineral or non-renewable resources	_N
	h. increase existing noise levels >5 decibels for +3 months	_N
9.	<b>Traffic, Transportation and Circulation</b>	
	a. increase vehicle trips >20% or cause substantial congestion	_N
	b. design features cause or contribute to safety hazards	_N
	c. inadequate access or emergency access for anticipated volume of people or traffic	_N
10.	<b>Hazards</b>	
	a. substantially increase risk of fire, explosion, or hazardous chemical release	_M
	b. bulk quantities of hazardous materials or fuels stored on site +3 months	_N
	c. create or substantially contribute to human health hazard	_N
11.	<b>Other Issues</b>	
	a. Substantial adverse impact	_N
	b. Adverse impact	_N
	c. Minimal impact	_N

**B. EXPLANATION OF ENVIRONMENTAL CONSEQUENCES:** explain Y, M and B responses

4.a "B" Operation of installed gas- fire boilers will result in some onsite air pollutant emissions, not substantial, but on the other hand emissions reduction at the power plant will be approximately 3.5 times as much as emissions added at the site (due to fuel substitution from electricity to natural gas at the site).

(Efficiency of electricity production at TTP is 32%, losses at distribution line is 20%, efficiency of installed boilers are 90% and local distribution losses are 5%.  $(0.9 \times 0.95 / 0.8 \times 0.32 = 3.4)$ ).

10.a "M" Burning of natural gas always contains some potential risk of fire and explosion.

**C. RECOMMENDED ACTION (Check Appropriate Action):**

1. The project has no potential for substantial adverse environmental effects. No further environmental review is required.
2. The project has little potential for substantial adverse environmental effects; however the recommended mitigation measures will be developed and incorporated in the project design. No further environmental review is required.
3. The project has substantial but mitigatable adverse environmental effects and required measures to mitigate environmental effects. Mitigation and Monitoring (M&M) Plan must be developed and approved by the BEO and/or REO prior to implementation. M&M Plan is to be attached to the Scope of Work.
4. The project has potentially substantial adverse environmental effects, but requires more analysis to form a conclusion. A Scoping Statement must be prepared and be submitted to the BEO for approval. Following BEO approval an Environmental Assessment (EA) will be conducted. Project may not be implemented until the BEO approves the final EA.
5. The project has potentially substantial adverse environmental effects, and revisions to the project design or location or the development of new alternatives is required.
6. The project has substantial and unmitigable adverse environmental effects. Mitigation is insufficient to eliminate these effects and alternatives are not feasible. The project is not recommended for funding.

**D. IDENTIFIED SIGNIFICANT ENVIRONMENTAL IMPACTS (including physical, biological and social), if any: (Use ER tools such as Leopold Matrix to identify significant environmental impacts)**

N/A

**E. RECOMMENDED MITIGATION MEASURES:**

Given the above assessment, Chemonics International and its partners will monitor and ensure that the environmental procedures are implemented, potential impacts mitigated.

**Standard and General Mitigation Measures:**

- Comply with safety regulations, considering all workers employed on the site, including those employed by all partners, as well as general public;
- Installation of natural gas and CO gas leakage alarm sensors at every apartment where boilers are installed to control gas leaks.
- Install boilers with automatic shut off valves to prevent gas leakage in the apartments.
- Use environmentally safe materials of the best quality consistent with the character of the works and specifications;
- Materials will be handled, stored, used and processes carried out, in strict accordance with manufacturer's instructions and recommendations;
- No explosives shall be used at the site;
- Comply in general with USAID, Armenian standards, and local regulations, and the best engineering practices.

**F. RECOMMENDED MONITORING MEASURES:**

Chemonics International and its partners (during the project's planning and design, construction, and operation and maintenance phases) will ensure that:

- Monitoring activities and environmental procedures are carried out as required;
- Recommended mitigation measures, if required, are considered and incorporated into the work;
- No asbestos-based materials is used or handled within the project's scope of work;

**G. LIST OF ATTACHEMENT:**

- Site Photos

**APPROVAL:**

Implementer Project Director/COP: Henry Gilbertson Date: 11 Dec 06  
USAID/ Project CTO: Clayton Date: Dec 13, 2006  
USAID Mission Environmental Officer: Boz Date: 21.12.06

**PROJECT SITE PHOTOS**

