CURRENT HURDLES OF IMPLEMENTING AFFORDABLE HEAT ENERGY SYSTEMS

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INTRODUCTION

This summary document is intended to capture some of the significant hurdles currently facing the residential heating sector in Armenia. These are potential barriers and constraints facing international donor organizations, various Armenian government, private sector, and civil society stakeholders in expanding affordable, high quality, sustainable heat in the Republic of Armenia.

The list of issues presented herein is not exhaustive and can be considered illustrative. It is intended to highlight some critical areas affecting the development of the heating sector. Many of these issues will be addressed within the scope of the Residential Heating Project and other donor supported efforts, including those under the World Bank and UNDP/GEF financing. Others can only be addressed by continual, and hopefully cooperative, efforts of current and future stakeholders in the Armenian heat sector.

The following barriers are presented in this report:

1. Lack of political will
2. Socio-Economic state of consumers.
3. Legal and Regulatory development
4. Lack of public education and low level of public awareness
5. Limited condominium capacity and capabilities
6. Lack of qualified managers and mistrust of communal services provisions
7. Dependence upon a single energy source (gas)
8. Technical issues

For a more detailed treatment of several of these issues, the reader is directed to other reports produced to date and yet-to-be-produced by the Residential Heating Project.

1. LACK OF POLITICAL WILL

A. ENERGY POLICY NOT ADDRESSING HEAT SECTOR PRIORITIES

The projects developed by the Ministry of Energy and later by several international organizations (Lahmeyer International, PA Consulting, ENEL/Sogin, etc.) since 1993, aiming at long term development of energy sector in the Republic of Armenia, either did not address heat supply sector at all or referred to it only partially and by implication of CHP development. The only exception is the document developed by the Ministry of Energy and approved by the Government of Armenia (GoA), entitled “Strategy for Energy Sector Development in the Context of Economic Development of the Republic of Armenia” which covers only the assessment of investment required for the sector and distribution into two time periods.

The estimated investment amounting to $100 million should be made in the first period (2005-2010) and is needed for the start up of heat supply sector rehabilitation. The second period (2011-2016) anticipates the completion of the heat supply sector rehabilitation project requiring another investment of $100 million. The strategy developed by the Ministry of Energy consists of thorough analysis of the current situation within the sectors of electricity

and natural gas supply, as well as an evaluation of development projects with minimal reference to heating issues and, just mentioning that the analysis of current situation in the heating sector was conducted within the framework of the "Outline of Urban Heating Strategy for Republic of Armenia" report developed by COWI in 2002.

The Government decree No.1384-N "Urban Heating Strategy" was developed on the basis of the COWI report, described the basic elements of the strategy and distributed a number of tasks to various ministries and other entities.

Phase 1 of the Strategy – the "Survival Phase" – suggested that minimal investment would be required to keep existing systems operational and to take first measures to offer affordable centralized heating supply. These general provisions were not specifically assigned to any government institution and, consequently, remained unaddressed during the two years of the "Survival Period". The result was the complete collapse of the last operational centralized heating systems.

The Strategy did not consider the possibility of financial insolvency of the system, the need for a gradual decommissioning of the aging centralized heating systems or the lack of financial resources for the construction of new heat supply systems. This circumstance contributed to the rapid market penetration of individual natural gas heating units into urban centers which used to be supplied by district heating and other forms of centralized heating. There is no doubt that expanded natural gas service allowed a growing fraction of the population to receive reliable heating at a reasonable price. But this so-called "affordable" heating source has its drawbacks due to the way that it has been introduced and installed. It cannot be considered safe, efficient, ecologically friendly or acceptable in terms of economic, political and architectural norms and standards. It is clear that restoration of gas supply in multi-apartment buildings and diffusion of individual gas heating devices made the re-commissioning of the centralized heating systems even more difficult.

Success in rehabilitation of the centralized heat supply systems can be achieved only through political support from the government and the regulator, given the fact that this area is still far from being attractive for entrepreneurship. Heat supply is just as important as other sectors of the energy system. It is lack of attention to the needs of the public related to the heat supply segment of the energy sector that must be considered in the overall energy policy.

B. TARIFF POLICIES

The existing two-part tariff system for natural gas has certain deficiencies that do not contribute to the rehabilitation of the heat supply system, especially in conditions of drastic increase in imported gas tariffs. Certainly disputable is the size of the 10 thousand cubic meter monthly consumption determining the margins for wholesale and retail sale. In particular, in case of the 230-250 kW installed thermal capacity of the one building-one boiler house system, the monthly gas consumption in conditions of the Yerevan City may fluctuate between the range of 9000-11,000 normal cubic meters. This means that the cost of gas used during the same heating season may fluctuate within $900 - $1,600, depending on the average ambient temperature during the month. If we take into consideration the fact that within the heat tariff structure the fuel component amounts to about 70%, then it will not be difficult to estimate the heat tariff fluctuations during the same period, which is a negative phenomenon itself and is in conflict with the general principle of tariff stability. Moreover, as demonstrated by the experience of the previous heating seasons, the two-part tariff system does not support energy efficiency. To the contrary, it sometimes even creates possibilities

for energy misuse. The consumer is encouraged by this tariff to exceed the 10 thousand cubic meters per month consumption point because in that case the payment for gas decreases by over 40%.

Probably, it is time to move towards a more flexible two-part or multi-part tariff system that would separate the fixed and variable costs associated with supply (maybe also the connection costs and customer service costs). The multi-tariff system will reduce to a certain extent the supplier's risks as a result of the reduction of consumption volumes. But the separation of the customer charge as an independent unit or as part of the fixed rate is fair because it takes into account the supplier's actual costs to serve a customer (meter reading, metering, billing, collection monitoring), which in the residential sector are much higher than in the public, industrial or other sectors.

The tariff-setting policies for gas in the sector of residential thermal energy supply should be reviewed fundamentally in order to promote the heat supply development in the country.

C. LACK OF MUNICIPAL HEAT PLANS

In order to implement the Government's Urban Heating Strategy it will be necessary to develop municipal heat plans as part of a municipality's overall integrated implementation activities to attract and sustain efficient heat solutions for its residents. Since there was no implementation plan and no assignment of clear responsibilities to key stakeholders (such as the municipalities) in the period after the issuance of the Heating Strategy, the heating sector has been market driven via the actions (or inactions) of heat consumers because:

- Governmental and municipal (financial) support for state-owned district heating systems was withdrawn, but the consumers were not able to pay the market price (fully supporting costs of fuel, operations and maintenance) for district heating.

- Those who could afford the price installed their own individual apartment or building heating systems (apartment/room gas heaters was predominant way to accomplish this goal).

- Those who could not afford apartment/room gas heaters used supplemental electric space heating or wood fuel.

This approach did not fulfill the goals of the Urban Heat Strategy and, in fact, caused new problems. In contrast to this approach, municipal heat planning would allow a controlled development of the local heating sector. Municipal level planning is a well proven and tested tool applied in many cities in Western, Central and Eastern Europe. In the Armenian context, municipal heat plans can be seen as an important tool within an integrated plan to revitalize the existing heating strategy focusing on the development of sustainable least-cost heating for the urban population, promotion of the rational use of energy and reduction of environmental stress. Effective mobilization of public, private, commercial, and financial resources must accompany the implementation of a well-designed plan.

For preparing municipal heat plans, a zoning approach is proposed which divides municipal areas in a number of zones (according to parameters representative of a zone - construction type, social structure of residents, usage of buildings, etc). For each zone the least cost heat supply system is determined based on cost-benefit analysis of various heating options, (e.g., centralized heating, decentralized heating, technological options, fuel options, financing etc) and the optimal mix of heating options is determined in this step-by-

step manner for the whole city. Investment cost, heating costs for final consumers and environmental impacts are considered in a manner consistent with the structure from which the original heating strategy was formulated.

D. LACK OF URBAN HEATING STRATEGY IMPLEMENTATION PLAN

Some provisions of the implementation plan were already included in the Government Decree on Urban Heating Strategy by addressing the necessary contribution of various government entities. However, a more comprehensive plan is necessary because the actual implementation of the strategy is still missing.

An implementation plan should present a comprehensive approach to determining the most appropriate options. It should describe the alternative courses of action, including assumptions, implementation process organization, stakeholder communication, milestone schedule, quality and safety provisions, critical success indicators, etc. Key elements of an implementation plan were already included in the Government Decree on the "Heating Strategy". These elements focus on the contributions of various governmental entities. However, a more comprehensive plan is needed that included all relevant stakeholders, including the effective mobilization of the private sector.

As in the past, the implementation of the heat plan will have to rely to a major extent on the private sector. The government and municipalities can create a favorable framework and foster an enabled environment to promote the appropriate activities by:

- Improving planning security for investors by developing the municipal heating plans
- Solving relevant ownership problems
- Implementing appropriate consumption-based tariff systems.

E. LACK OF COMMUNAL HEAT ENERGY SECTOR ENTITIES

After the collapse of the former communal heat energy management system, the government left this sector largely unattended as opposed to the attention given to other public utilities (water, gas, electricity) although the heat sector's vital importance for public well-being and building maintenance should have received equivalent consideration. Currently there is no state entity coordinating these activities and assuming the overall responsibility for the heat energy sector. To cover this void, one possibility is that a heat energy advisory center for Yerevan and Marzes could be developed to serve both heat energy producers and consumers. The principal functions of this entity would be to house regularly updated data relevant to heat sector stakeholders, to provide focused public awareness services in the area of heat supply rehabilitation, cooperation with private investors and donors in the sector, analysis of customer complaints, assistance in the establishment of metering systems, and to advise interested parties on improving heating system efficiency.

2. SOCIO-ECONOMIC STATE OF CONSUMERS

The economic crisis of the 1990s led to the rapid mass impoverishment of the population in Armenia and to drastic deterioration of social conditions. Despite the fact that during the recent years, the poverty and the social inequality decreased to a certain degree, it still remains widespread in Armenia, with approximately 40% of the population being poor and

the income concentration Gini coefficient continuing to stay on a low level - 0.43.[1] As in almost all transition economies, poverty and social inequality in Armenia are preconditioned by material (income) factors. Poverty has specific features depending on territorial, seasonal, gender and age differences as well as on the size of families, their education level and vulnerability.

In terms of the territory, the highest level of the poverty has been registered in the areas of Gegharkunik, Aragatsotn and Tavoush. The basic poverty groups in Armenia are represented by the large families, the unemployed or the low-salary employees, the refugees, the single pensioners and the disabled. Given the present socio-economic circumstances, utility services (electricity, water, heat and gas supply) are not affordable for a large scale of population.

Notwithstanding the fact that those services are meant to meet the basic needs of the population, the benefits are not adequate to cover these family expenses, especially for heating. During Soviet years payment for utility services constituted 6-8% of family income. According to international experience on nonpayment-related issues, payment for overall utility services should not exceed 10% of the family income. Analysis of recent customer surveys conducted by the Residential Heating Project shows that heating payments (usually non-sufficient heating) exceed 10% of annual family income. In fact, in some instances on a monthly basis during periods of high heat demand, this exceeds 45% of monthly family income. Different subsidies are available in most of countries. The social allowances paid in Armenia do not currently include the appropriate means for the minimum level of utility services for vulnerable social groups, and there are no current mechanisms to levelize monthly heat costs for residents over a full year period.

Socio-economic state of consumers is a serious impediment for the process of rehabilitation of the heat supply systems. Even if the rehabilitation of the centralized heating systems is carried out with financial assistance from investors or under grants[2], the insolvent consumers either decline central heating or they find themselves unable to pay for the energy consumed. The low level of collection rate affects the sustainable operation of the heat supply system instigating reasonable resentment from the paying customers and a tendency of apartment level individual heating development. As a result, debts accumulate in the balance of the heat supply company, which may eventually lead to the collapse of the entire system. Moreover, if the number of the insolvent customers in many typical multi-apartment buildings is substantial, then the rehabilitation of heat supply system in such buildings becomes unattractive for investors.

3. LEGAL AND REGULATORY DEVELOPMENT

The legal and regulatory framework applicable to heat sector activities needs further development, clarification and enforcement in order to facilitate rehabilitation and growth of heat supply activities. That is not to imply a return to centralized state planning and operations, but to suggest a robust legal and regulatory framework within which both public and private sector heat initiatives can find technical and economic success. Several matters are identified, that if not resolved, will continue to be institutional barriers.

1 „Human poverty and pro-poor policy in Armenia" UNDP-2005

2 R2E2 fund is planning to fund (up to $3 million to purchase and install) multi-apartment level boiler projects to support socially vulnerable population (those receiving family benefits) based upon their level of vulnerability.

A. STANDARDS AND TECHNICAL REGULATIONS

There is a lack of sufficient standards and technical regulations governing safety, efficiency and operational specifications for heating appliances, natural gas appliances and for heat supply services in the heat and natural gas sectors. Safety standards are needed to ensure protection for both safety and health hazards, as well as for the protection of property against fire and explosions. Efficiency standards are recommended to provide for efficient use of limited energy resources. Other technical standards will serve to establish standardization for commercial practices and compatibility of equipment and services. For the limited existing standards and technical regulations, they are administered haphazardly by several State agencies. In some cases there is overlapping and conflicting authority which results in confusion for manufacturers, ESCOs and end users.

Natural gas and heat supply sectors lack heat-related technical regulations, including:

- Installation/operation rules for modern gas heat and hot water supply appliance in multi-apartment buildings
- Safety requirements to gas appliances
- Modern gas appliance and central heating boiler related standards equivalent to international standards
- Gas and central heating system design, construction and operation norms/standards. Current standards of the Republic of Armenia listed in this point are based on similar Russian norms and do not meet international safety and efficiency requirements
- Safety and efficiency requirements to CHPs already being inculcated in the Republic of Armenia

The lack of an effective technical regulation system hinders establishment of efficient heat market because the use of current technologies will be either limited or prohibited as they likely will not meet requirements set by existing out-of-date standards and technical regulations.

B. MODEL CONTRACTS OF HEAT SUPPLY

The regulatory framework should provide for the minimum requirements for contractual relations (model contracts) among the several parties in the heat sector. The framework should specify appropriate rights, liabilities, and obligation of residents (end users), ESCOs, multi-apartment management bodies (particularly condominiums) and municipalities. Several model contracts should be specified, including the need to develop (1) a sample contract for heat supply that regulates contractual relations between ESCOs and Residents (ESCO's acting as heat suppliers and residents as heat consumers); (2) a sample contract of heat supply that regulates contractual relations between ESCOs, condominiums[3] and Residents (ESCO's acting as heat suppliers, condominiums providing guarantees of payments, access to apartments, etc., and Residents being heat consumers). ESCO representatives signaled initially the need for model contracts for the provision of heat supply services. The basis for this need is that model contracts will serve to standardize and optimize commercial relations

3 Note that the term "condominium" is used according to the wording of Armenian legislation, which is identical to the term "condominium association" used in the USA

between heat suppliers and consumers, thanks to clear and specific separation of rights and responsibilities of contractual sides.

C. THE ROLE OF LOCAL SELF-GOVERNMENT BODIES

The legislative and regulatory framework pertaining to the particular role of local governments in the establishment of autonomous heat supply systems needs to be examined, revised and enforced. Specific issues include optimization of lease conditions of boiler houses owned by the municipalities and clarification of the responsibilities of municipalities for providing heating service to the public. Thus a large portion of lessees has expressed a protest against the effective period of the agreement, since according to their estimates it does not allow for the return of investments in such a short period of time. If the municipality does not authorize an extension of the agreement period, then their efforts and investments become ineffective. Clarification and enforcement of applicable legal and regulatory framework will facilitate the best redevelopment and utilization of these assets for the provision of heat supply.

D. THE NEED OF DRAFTING THE LAW OF HEAT ENERGY

The legislative framework should be reviewed for the need for a separate and new Law on Heat Supply. Recent energy sector legal reform in Armenia has specifically addressed the electricity and natural gas sub-sectors while only giving ancillary attention to the heat sector reform. A new Law on Heating could serve to establish the bases for state policy in the heat energy sector, licensing for establishment and operation of boiler houses, setting goals for the commercial framework for decreasing the costs of heat energy production (e.g. preferential pricing for natural gas users in heat energy sector, preferential taxation of heat energy companies), establishing the roles and responsibilities of communities and multi-apartment management bodies in the heat supply sector, the provision for social assistance to vulnerable groups in order to promote the use of heat energy by these groups. The corresponding regulatory framework should address the technical regulation of heat sector supply (compulsory certification requirements, minimal safety requirements for operation of the equipment of boiler houses, etc). Of particular interest, this law should seek to remove all overlapping, conflicting, or void legal or regulatory oversight from the various disparate agencies and entities which are currently ineffectual.

E. SERVITUDE RIGHTS

The regulatory framework for the establishment and use of compulsory servitude rights in the heat sector should be developed consistent with the applicable legal framework. The legal framework for servitude rights in the heat sector is adequately developed. A recent amendment to the Civil Code[4] states that free, compulsory and permanent servitude is established on any land parcel (irrespective of the ownership rights) for the infrastructure, which serves the public needs, including for electricity, gas, water and heat supply systems[5]. The Energy Law also includes a provision[6] which specifies that compulsory and free of charge servitude is established for the state-owned lands used for the safety zones and structures of the existing energy facilities, including gas regulation joints, gas and thermal

4 Article 212.3 (1) of the Civil Code

5 The order N 205-N of State Committee of the Real Estate Cadastre of January 12, 2003 lays down the rules of state registration of free, compulsory and permanent servitude designed by the Article 211 of the Civil Code

6 Article 7.2 of the Energy Law, March 7, 2001

energy pipelines, etc[7]. However, the regulatory framework needs to be developed for cases involving the establishment of compulsory servitudes. Development of guidance and criteria for the need for compulsory servitudes and the scope and conditions associated with their creation in the heat sector can serve to address situations when parties cannot otherwise agree to the servitude essential terms and conditions. The legal or regulatory framework should also be clarified for situations involving the establishment of servitudes on property with unauthorized or illegal improvements.

F. COMMON SHARED PROPERTY IN MULTI-APARTMENT BUILDINGS

The regulatory framework for registration should be clarified. The existing legal framework is somewhat ambiguous on this matter but effective resolution could be found through further development of the corresponding regulatory framework. The legal framework provides in Article 224.1 of the Civil Code that, by the right of common shared ownership, the mechanical, electrical, technical and sanitary, and other equipment outside or within the apartment that serve more than one apartment belong to the owners of apartments of a multi-apartment building. Similar provisions are found in Article 6 of the Law on Management of Multi-Apartment Buildings. However, there is some uncertainty with the interpretation of the current applicable law. One body of opinion interprets the word “equipment” to include internal network piping, while other parties do not share this view. Clarification of the legal framework will support the development of private participation in the heat sector insofar that heat supply companies will have increased certainty for secure access and use rights over internal networks through legal contracts principles.

4. LACK OF PUBLIC EDUCATION AND LOW LEVEL OF PUBLIC AWARENESS

Low level of public awareness and understanding of efficient heating options is perceived to be one of the barriers to the implementation of heating projects. This is the case despite that the energy issues have always been on the public agenda mostly with a focus on gas and electricity tariffs – the issues which also have important public and political implications in Armenia. For example, the public is generally unaware of the Government’s initiatives (Urban Heating Strategy or the R2E2 Fund) to restore the heating system in country.

Consumers treat the assurances of the investors about the effectiveness and reliability of the newly built heat supply systems with skepticism due to prior negative experience with previous heat supply entities. This kind of attitude is associated with a low level of public education and awareness since never before was the public thoroughly informed about the causes of the poor quality of heat supply or the reasons of the breakdown of the systems, which had acceptably operated previously. Due to their lack of awareness of the government heat sector policies, the specific conditions of the regulatory and legal frameworks, potential heat supply options and their advantages, consumers face serious difficulties in making informed decisions concerning their heat supply options. Consequently they often make decisions dictated by short term priorities of a specific situation, without considering all the potential issues. Subsequently, such short term focused decisions reflect negatively on issues concerning safety, and technical, economic renovation and appropriateness. It is also the situation that, neither the residents at multi-apartment buildings nor the entrepreneurs or condominiums are educated on the tariff structure of central heating systems, methodologies for tariff calculation and other such operational issues. Many consumers are unable to

7 Government Decree N 313 of May 26, 1998

choose between the variety of options proposed by investors, given the fact that consumers are generally uninformed as to the particular features of these systems.

Over time, people got used to surviving on their own by resorting to various available options based on their income level. Some install individual gas boilers, others use either electricity or gas heaters. In general, issues such as efficiency or safety do not have a high priority or are not considered at all in the heating choices made by the consumers.

5. LIMITED CONDOMINIUM CAPACITY AND CAPABILITIES

Before the collapse of the Soviet Union multi-apartment buildings were considered to be in the state ownership, with their maintenance and management to have been carried out by the state through ZEKs. The communal payment by the residents did not compensate for the costs related to the management and maintenance of multi-apartment buildings. After the independence of the Republic of Armenia (RA), housing resources were privatized and maintenance costs were shifted to residents. During the transition period maintenance costs of housing resources frequently were not covered either by state or by owners of apartments. The lack of necessary investments resulted in the rapid deterioration of housing resources, which forced the state officials to carry out legal reforms for management and maintenance of multi-apartment buildings by allowing the creation of associations of apartment owners – condominiums (new management bodies of the shared property for common use). The goal of this change in the form of apartment ownership was to eliminate the state's obligations for the management and maintenance of multi-apartment buildings. However, these reforms could not be successfully carried out given the country's poor socio-economic condition at that time.

Unfortunately, up to this day the majority of registered condominiums either functions inefficiently or not at all. This creates a barrier in the maintenance and management of multi-apartment buildings including provision of affordable heat services. Condominiums do not function effectively due to a variety of circumstances, such as:

- Psychological background of the residents - during several decades, the issues of management and maintenance of multi-apartment buildings as well as public utilities were addressed by the state;
- Lack of the market-based system established on the principle of mandatory and full payment for services provided;
- Lack of enthusiasm in making collective decisions: the majority of residents prefer individual decisions mistrusting collective decisions;
- Economic conditions in RA, unemployment and insolvency of poor families does not allow residents to pay for communal services;
- Lack of qualified managers as a result of which condominium activities are not properly organized and implemented and residents mistrust the manager and respectively the condominium;
- Lack of educational institutions for professional managers, lack of awareness of the residents in pricing and tariff formation, as well as lack of relevant information and methodological literature;

- Large number of empty apartments as a result of which the burden of management and maintenance of the multi-apartment building falls on the rest of the residents thus increasing their share of costs;
- Lack of communication between condominiums and private services providers.

Weak status of condominiums is one of the major hurdles for heat energy market creation. The role of condominiums is very important in heat supply sector commercialization especially in addressing questions like collective decision-making, construction/reconstruction of new heating systems, operation of autonomous heating systems, introduction of metering, billing and collection issues.

Except for several more or less advanced condominiums, the majority of them don't have enough credibility among the residents that they serve to operate or manage a heating system/service.

To gain the trust of the members, they should see tangible results of the condominium's work such as the maintenance of the building, the regular clean-up of the territory, etc. Since by and large the condominiums are weak in practice, their potential to mobilize the residents and to be a viable communication liaison between the donors and the residents or the heat service provider is not a reasonable expectation. Another factor is that the condominiums themselves do not recognize, accept or act effectively on their roles in delivering or mediating the delivery of utility services to their members. Therefore, one of the long-term challenges to the sector is to address the issue of the institutional development of the condominiums (internal management, communication with residents, understanding of their responsibilities and roles, "marketing" of the value the condominium provides to its members, etc.) to enable them to function at their full potential.

6. LACK OF QUALIFIED MANAGERS AND MISTRUST OF UTILITY SERVICES PROVISONS

Prior to the collapse of the centralized residential heating system in Armenia, a number of big specialized companies operating under the auspices of various ministries and ministerial departments carried out management, operation, tuning and service operations of the centralized heating system. In parallel with the gradual deterioration of the centralized heat supply systems, many of such organizations were liquidated and lost part of their proficient managers and experts. In addition, specialists slowly lost their skills and became unaware of the new technologies utilized within the sector, including concepts of modern marketing, management and pricing principles.

Lack of qualified managers is a serious barrier in developing affordable heat projects because just having a well-equipped energy system is not sufficient. It needs to be operated and maintained in a proper manner. For sustainable and effective operation of the heat supply systems, the organizational and professional capacity of the entity operating that system is extremely important. Managers should be able to do energy audits, comparative analysis of the audit results and the development of long-term and short-term operation plans. Managers should be able to develop a long-term approach focusing on energy efficiency improvements, reduction of operational costs, improvement of technical performance of the systems in terms of adjustable water temperatures and increased availability, and reduction of emissions to the environment. Managers should have a thorough knowledge of the system and be able to make timely decisions on a variety of issues and bear responsibility for all technical and administrative operations, including

technical operations (regular equipment maintenance, current and emergency repairs, timely ordering and availability of spare parts, materials and chemicals), administrative functions, commercial operations (metering, billing and collection), and financial management/controls (financial planning, cost analysis, tariff calculations, accounting). Further, they should be able to transparently justify their earning sufficient profit on their investment to ensure sustainable operation and provision of heat to customers.

In order to ensure adequate billing and collection for consumed heat and hot water, it would be necessary to set a justified and reasonable tariff and create an environment of mutual trust between the system operators and the customers. The customers must be confident that the manager is proficient and does everything to ensure the normal operation of the system and to provide high quality service to its customers. The customers need to be certain that the entire process of metering and billing of supplied heat (and where used - hot water) is transparent. The system operators should create an opportunity for the consumers to view the readings of the metering devices and the calculations for the heat and hot water bills. As they currently are operated, very few condominiums could function to perform these management and service-related tasks. The solution is to assist condominiums in their ability to take responsibility for common areas and operations in multi-unit apartment buildings and to assist in the development of dependable and reliable heat service suppliers (including municipalities) for the proper operation and maintenance of heating systems in multi-apartment buildings.

7. DEPENDENCE UPON SINGLE ENERGY SOURCE (GAS)

The latest development of natural gas tariff furthermore emphasizes the sensitivity of heat supply sector in relation to the tariff fluctuations of primary energy resources. It is an open secret that non-diversified heat supply based solely on natural gas will be the most vulnerable sector of energy and the first to suffer in case of fuel shortages due to unforeseen circumstances or dramatic price increases. The recently negotiated price increase for gas is not a long-term solution and as long as the gas price paid by ArmRusGasprom to Russia's Gasprom is significantly lower than the international market price, this potential for dramatic tariff increases will continue to exist. In addition, thermal power and combined heat and thermal power stations may also accordingly increase their tariffs to offset the price of gas. This means that electricity costs may also rise for the general public as long as the power from thermal plants using gas make up a significant percentage of the power production in Armenia. Arguably, this makes the goal of taking Armenia's nuclear power plant off-line in the near future more remote and makes its lower cost of fuel per megawatt produced more and more valuable in keeping the cost of electricity lower.

Seemingly a good long-term solution for diversification of gas supply in the current geopolitical situation of Armenia, the Iranian gas imports should nevertheless take into account the outstanding international issues associated with Iran that may hamper the dependence on Iran for such a vital energy resource.

The need to diversify energy sources and develop alternative energy (hydro, solar, wind, etc) and increase the energy efficiency is a very important component of energy sector development in Armenia. The more unpredictable the leaps in gas prices, the more competitive will the energy efficient and alternative energy source technologies become in these market conditions because the fuel saved by such technologies will have greater economic value.

8. TECHNICAL ISSUES

A. PROBLEMS ASSOCIATED WITH THE REGULATION OF HEAT SUPPLY INSIDE THE BUILDING

The central heating installations in multi-apartment residential buildings are usually single-pipe systems with vertical risers feeding the radiators in series. If the risers in such buildings are not equipped with bypass systems, then each successive radiator on the pipe works in series with the previous radiators. If the riser has suitable bypass systems, then it may be possible to bypass some of the radiators. When a consumer intends to leave his/her apartment for a short or a long period the service would have to be disconnected or "valved off". This is highly inconvenient and hinders the promotion of centralized heating.

B. PROBLEMS ASSOCIATED WITH INDIVIDUAL DISCONNECTIONS

The central heating systems in multi-apartment residential buildings do not provide for easy disconnection of individual non-paying or absent consumers.

If a customer does not pay, disconnection may cause serious technical and organizational problems. The system operator may have to obtain the owner's permission to disconnect the radiators from the riser if provision or access to external valving is not available. If the owner does not give consent, then the only way to resolve this issue is through a court order, a process that may take months during which time the losses, both economic and thermal continue to mount. Even of the apartment owner gives consent to disconnect or the court rule in favor of operator, it will need some investment to technically implement the procedure.

C. PROBLEMS ASSOCIATED WITH DISCONNECTED CUSTOMERS

After the disconnection a number of problems could arise. The disconnected apartment may still use 5-10% of its heat load from the bypass riser and this cost will be passed on to other paying consumers. Further, customers that have not been connected to the system at all also inadvertently receive a small amount of "free" heat. These conditions cause general resentment amongst the residents who pay.

D. PROBLEMS ASSOCIATED WITH THE POOR CONDITION OF INTERNAL HEATING NETWORKS

Many of the central heating systems in residential building have been in place for about 25-40 years. Such systems may be no longer fit for further operation. The rehabilitation costs of such systems are very high (at least $250 per apartment) and it may take a long time to do the work. Owners of newly renovated apartments very often refuse to have central heating installed in their homes because of the perception of the damage it may cause.

E. POOR DESIGN CAPABILITY

During the Soviet period all design works for residential, public, administrative buildings, as well as industrial buildings and construction were carried out by design institutions such as: "Haypetnakhagits" (Armenian State Design Institute), "Yerevannakhagits" (Yerevan Design Institute) and "Hayardnakhagits" (Armenian Industrial Design Institute), as well as small capacity institutes, design and construction offices/bureaus operating within the structure of individual ministerial departments. Following the collapse of the Soviet Union, the workload of the three major design institutes drastically decreased due to an unprecedented decline of

construction activities in the country. Several of the specialists (designers) that once worked in these design institutes have left the institutes and formed their own private design companies.

All the currently functioning design institutions and companies have one common deficiency: shortage of information about modern equipment, metering/control devices, regulating devices and automated systems.

Since energy efficiency and energy conservation were not paid much attention during the time of the Soviet Union and hydraulic balance and control regulations were not used in heating systems, and metering systems didn't exist at all, current design institutes should be improved to meet the current and developing technologies, standards, and practices.

CONCLUSION

As can be seen by this brief overview of the hurdles facing current and potential stakeholders in the heating sector, the extent and the complexity of the situation in the heat sector has contributed to constraining the ability of this sector to move forward consistently with the economic and social needs of the population. The Residential Heating Project will be addressing those hurdles which are under the purview of its contract with USAID, while facilitating and encouraging other entities to address hurdles over which they can exert an impact.