

Annex 11: Demand-Side Management Program

VIETNAM: SYSTEM ENERGY, EQUITIZATION & RENEWABLES

Background

In 1997, EVN, with World Bank assistance, commissioned the “Demand-Side Management Assessment for Vietnam,” to determine the potential for demand-side management (DSM) to assist the power sector to meet the country’s future power resource requirements. The DSM Assessment concluded that DSM had a potentially significant role to play in managing the growth of electricity demand in Vietnam and identified important opportunities for cost-effective electricity savings in a number of sectors and end-use applications. It recommended a two-phased approach for implementing DSM, which would save an estimated 770 MW of capacity and more than 3,550 GWh/yr by the year 2010. Under the first phase, supported by a SEK 29 million (about US\$3.0 million) Swedish Sida grant and coordinated by MOI, a DSM Cell within EVN has been established to build its load research capability, implement a pilot load management and several pilot DSM programs, develop audit capability within EVN, and develop a policy framework for initial and future DSM activities; MOC is now developing an energy efficiency (EE) building code, and MOSTE is establishing EE lighting and industrial motor standards. It was recommended that Phase II: (i) expand DSM program implementation and evaluation; (ii) develop and introduce DSM regulatory measures for EVN’s subsidiary power companies (PCs); (iii) expand the load management program; (iv) enforce the building code and appliance standards and develop an expanded standards regime; (v) develop financing mechanisms for future DSM activities; (vi) build local capacity to perform full-scale industrial energy audits and investment plans; and (vii) promote private sector participation in providing EE services.

Status of DSM/Energy Efficiency Programs

DSM: Since the completion of the DSM Action Plan, EVN has experienced increasing peak demand shortages, making the need for targeted load management and other DSM measures more critical. These system capacity constraints occur during evening peak hours (6-10pm), with daily peak loads 2-3 times off-peak hours, which has resulted in low system load factors and major investment requirements to meet demand for only 1-2 hours of the day. Ongoing efforts to increase grid-based electrification to remote areas will only exacerbate the situation. EVN has instituted a few programs, primarily focused on time-of-use (TOU) metering for large consumers. However, EVN and its PCs lack the investment capital required to fully implement TOU metering for production, commercial, service and agricultural (irrigation) customers with transformer capacity over 100kVA, as the existing tariff regulations allow, and have experienced some customer resistance to TOU metering. A number of customers have even responded by installing stand-by generation units and disconnecting from the grid during peak times to avoid peak pricing and to ensure consistent and reliable power supply. Some of the PCs have recently procured load control equipment (ripple control technology) to test their viability during peak hours and critical shortages, but have been unable to offer any incentives to customers to encourage them to participate in any pilot load control programs. Some of these measures are important first steps but the DSM efforts need to be developed on a more systematic basis, which Phase I efforts are helping to address.

While progress with the first phase of the DSM program is generally satisfactory, it has experienced an estimated two-year delay, due to a delay in IDA Credit effectiveness, finalization of

the grant agreements, and procurement of the four consulting contracts.¹ As a result, Phase I was only launched in late 2000; thus a substantial expansion of the DSM program (as was recommended in the DSM Assessment report) cannot be justified at this stage. However, a number of key outputs from the Phase 1 program have become available this year, such as a policy framework for utility DSM, various DSM program assessments, and a DSM business plan for EVN, which have offered specific DSM investment options that can be implemented now. Since SEIER will likely only become effective after Phase 1 has been completed, a modest investment under SEIER would ensure that there is no gap in support to the DSM Cell and that viable programs can be launched earlier. It was thus agreed that the DSM Action Plan originally recommended be redesigned as a 3-4 phase program, with a smaller second phase under SEIER. It is expected that subsequent phases would be supported by substantially more IDA/GEF support under future IDA energy projects, based on progress achieved over the next two years.

Complementary Activities: In addition to the IDA/Sida-supported DSM project, there are a number of complementary programs that have been initiated by other development agencies to further support Vietnam's DSM/EE programs. Through bilateral support, largely from Dutch and German sources, the Master Plan for Energy Conservation & Efficiency (EC&E) Program is under implementation under MoSTE. This program has proposed a broad national level framework to promote energy efficiency, with supporting policy frameworks, mandated energy audits and public auditors, creation of provincial energy conservation centers, a range of technical assistance activities, and creation of a public fund to provide investment support to end-users. The program has already worked to develop an impressive grass-roots network of energy auditors and capability, within MoSTE and its provincial DoSTEs and has initiated several pilot efforts in industries. The program has contributed positively to the overall energy efficiency activity over its five years of operation. However, GOV has only provided modest funding to date and the program has been unable to attract the estimated \$20 million required to launch all of its proposed programs. The proposed UNDP-GEF Energy Efficiency Public Lighting Project (PDF B under implementation) would seek to remove barriers to EE in the public lighting sector in Vietnam. Japan, along with the French and other bilateral donors, have made a number of energy audits and EE investments in specific factories, but these audits have not been developed on a programmatic basis and are not at present capable of being replicated or expanded without continued international assistance.

Barriers to Energy Efficiency

While substantial opportunities clearly exist for EE improvements, there are a number of key barriers that have prevented the development of any meaningful commercial EE investments in Vietnam to date. These include: (i) *inadequate information*, from end-users, equipment manufacturers/suppliers and service providers (including EVN) on potential EE improvements, costs and benefits of EE equipment, potential low-cost measures, and new technologies/practices; (ii) *lack of technical expertise*, by end-users, manufacturers/suppliers and potential service providers on modern efficient technologies and practices, efficiency potentials, energy audits and inspections, actual performance of EE measures, limited understanding of third party EE services (e.g., ESCOs); (iii) *high capital investment costs*, due to prevailing higher costs of EE equipment as well as limited local manufacturing capability, which currently discourage end-users from selecting high-efficiency equipment despite their overall lower life-cycle costs, particularly given limited abilities of households to purchase EE lighting and current short-term priorities among many Vietnamese firms; (iv) *high project development costs*, due to audits and technical studies required to properly determine investment requirements and ensure appropriate project design, perceived risks of projects developed by auditors with limited track record and technologies/ equipment with limited tested performance under Vietnamese conditions; (v) *lack of affordable financing*, due to a

¹ The delay in procurement was partly due to the approximate 20 percent devaluation of the Swedish Kronor, which significantly reduced the available budget for consulting contracts.

lack of commercial lending culture in Vietnam, weak banking sector and very limited term lending, restrictive lending terms, dominance of SOEs and dependence on public budgets for project investment capital, foreign capital requirements for imported EE equipment, relatively small investment sizes for EE, and limited credit available to residential sector; (vi) *poor customer creditworthiness*, due to the poor financial status of many of the SOEs; (vii) *limited interest of end-users*, due in part to a production or core business priority bias, the sometimes limited financial significance of the operating cost reductions from energy savings and the ownership of savings benefits from SOEs/municipal agencies; and (viii) *limited local EE equipment*, given the current manufacturing capability within Vietnam and low domestic demand for high-efficiency products. Collectively, these issues have discouraged any sizeable investments in efficiency measures.

Strategy for Future IDA/GEF Support

Based on the systematic analysis of local conditions and opportunities, market and other barriers, and models to support EE programs, IDA/GEF will support a phased, 12-year (1998-2010) programmatic approach to efficiency activities in Vietnam. This program has begun with the IDA/Sida DSM project and would continue to build upon initial program results and efforts in 2-3 additional operations. The rationale is to provide a longer-term vision for development assistance, scale-up mechanisms and business models tested in earlier operations, and develop timely intervention mechanisms as programs, markets and reforms develop (see Attachment 1). While the spirit of the original two-phase DSM program will be maintained, it is clear that there also exists scope for supporting efficiency programs outside EVN, particularly where there are potential conflicts with EVN's financial interests and/or activities clearly beyond EVN's mandate. Thus the IDA/GEF assistance program would also include measures to catalyze service companies and manufacturers to provide more EE equipment and services to energy end-users through a variety of business models.

Project Description (Phase 2)

The DSM/EE component under SEIER represents the second phase of the program and would consist of two components: (i) a second phase DSM component under EVN; and (ii) implementation of a pilot commercial EE program by MOI. For the EVN component, US\$8.6 million would be sought (\$5.7 million IDA, \$2.1 million GEF, \$0.8 million EVN) to support the continuation of EVN's DSM activities initiated under the IDA/Sida project. The pilot commercial EE component, which would require an estimated \$8.5 million (\$3 million GEF, \$5 million private sector, \$0.5 million MOI), would be managed by MoI. The program will consist of the following elements:

- (i) Phase II DSM Program under EVN: The main focus of this component would be to build upon Phase I DSM results and expand the use of DSM as a tool to help EVN and its PCs better manage loads, load curves and improve load factors. The second phase would seek to achieve about 123 MW in system peak reduction through the implementation of several DSM measures. The program would be managed by EVN and implemented with support from the PCs. (Attachment 2 contains a summary of programs costs, sources of funds, savings and cost/benefit analyses.) Future phases, which would seek to develop a large-scale portfolio of DSM measures by EVN and its PCs and may include support to create an ESCO unit under EVN, would be included in subsequent IDA/GEF energy operations. Phase 2 would include:
 - a) TOU Metering: EVN would install time-of-use (TOU) meters in about 4,000 large- and medium-sized customers. EVN currently has a tariff schedule that allows TOU tariffs for customers with loads over 100 kVA or monthly consumption in excess of 10,000 kWh. EVN has already installed about 4,000 TOU meters and the IDA credit would allow them to procure and install additional meters in remaining customers that

meet the above criteria. The IDA funds would also support program marketing and management.

- b) Pilot DLC Program: Under this program, EVN, in collaboration with PC HCMC, would introduce a pilot direct load control (DLC) program using ripple control systems to curtail demand in about 2,000 customer end-use loads (e.g., air conditioning and water heating systems). This would allow EVN to shut-off the equipment for up to a pre-specified number of hours each year (15-minute periods per hour during peak periods for a total not to exceed 30 hours) during system shortages and seasonal peaks. The equipment (central stations, receivers, communication systems) would be purchased with the IDA credit and EVN would use its counterpart funds to pay for program administration and incentives to the program participants (\$25 per receiver/year).
- c) CFL Program: EVN would promote sales of 1 million compact fluorescent lamps (CFLs) to reduce peak loads from rural and urban household lighting end-uses. Under this program, EVN would distribute coupons to households in areas of high loads and network congestion in collaboration with the PCs. (Implementation of a pilot CFL program is now underway in Phase I and results and lessons learned would be reflected in the detailed design of this program.) Customers would then use these coupons to purchase CFLs from distributors (which may include lighting retailers, PC branch offices, and/or NGOs) at a discount, with the subsidies decreasing over the program period (\$1.50 for the first year, \$1.00 in year 2, \$0.60 in year 3). EVN would also set-up a small revolving fund to allow customers that require financing to receive the CFLs and payback the costs over a 6-12 month period through their electric utility bills. GEF funds would be sought to test the program design and delivery mechanisms for the first year of the program, including subsidies, as well as capitalize the revolving fund; IDA funds would be used to support program implementation (coupons and administration) in the second and third years.
- d) FTL Program: Under this initiative, EVN would promote the use of high-efficiency 36 W T-8 fluorescent tube lamps (FTLs), which have about the same lumen output and retail price as conventional 40 W T-12 lamps but consume about 10 percent less electricity. Given the small number of manufacturers of FTLs in Vietnam, EVN would provide a marketing grant to participating manufacturers to support their costs in actively marketing the more efficient lamps and EVN would launch a parallel campaign to educate consumers about efficient FTLs and ballasts. GEF funds would provide for the incremental cost of the marketing efforts to both the manufacturers and EVN and EVN's internal funds would support project management and administration.
- e) Ballast Program: This program is designed to promote low-loss electronic ballasts and would be designed similar to the FTL program, with incentives offered to participating manufacturers. In this case, there is about a 40 percent incremental cost for the more efficient ballasts, so EVN would require the participating manufacturers to pass on the subsidy to the consumers (6000 VND in year 1 and 3000 VND in year 2). The subsidy in year 1 would represent about 60 percent of the cost differential. As with the FTL program, a marketing effort would support the program and the FTL and ballast programs would be implemented in parallel, to allow customers to benefit from using the more efficient lamps with the ballasts. Participating customers could also make use of the revolving fund, if needed. The IDA credit would support the manufacturer incentive payments, GEF funds would help support marketing costs, and EVN's internal funds would support project management and administration.

- f) Complementary Programs: In addition to the five DSM programs noted above, EVN will initiate complementary activities to support these efforts. Such activities will include load research (both facility and end-use levels) to determine customer class and end-use profiles, DSM program planning and evaluation, 1-2 new pilot DSM programs and assessments of other DSM business opportunities (e.g., fee-for-service audits, utility-based ESCOs, etc.). IDA funds would support the purchase of meters, computer equipment and software and GEF funds would be used to provide needed technical assistance, evaluation of DSM program impacts and consultant studies.
- (ii) Pilot Commercial EE Program: This stand-alone GEF component would seek to test appropriate business models and mechanisms and catalyze and small and sustainable service market to support EE investments in Vietnam. This would be achieved by supporting a small group of commercial service providers or 'project agents' to assist in all phases of EE project identification, development and implementation. These 'project agents' could include energy auditing and engineering firms, equipment leasing companies, equipment suppliers, installation and construction contractors, and ESCOs. Given the state of the industrial sector at present, it has been agreed that the pilot program will initially focus on private commercial buildings, hotels and other office buildings that are able to access financing on their own and the pilot would be restricted to 4 major cities (Haiphong, Hanoi, Da Nang, and HCMC), in order to better manage and focus market development, training, and project monitoring/administration efforts. EE measures would also be limited to lighting, motor drives and pumps, cooling/heating and electrical supply systems in order to develop simple and replicable technical investment lines, gradually build-up competence among project agents, facilitate the development of technical program standards to help ensure equipment performance and support project evaluation/monitoring, and stimulate the market for EE equipment in these initial areas. (Future phases would seek to build upon successful business models from Phase II, expand the geographical and technical boundaries of the pilot phase, test new and more complex models {e.g., performance contracting}, and develop appropriate local financing mechanisms to support larger-scale investments and pipelines.)

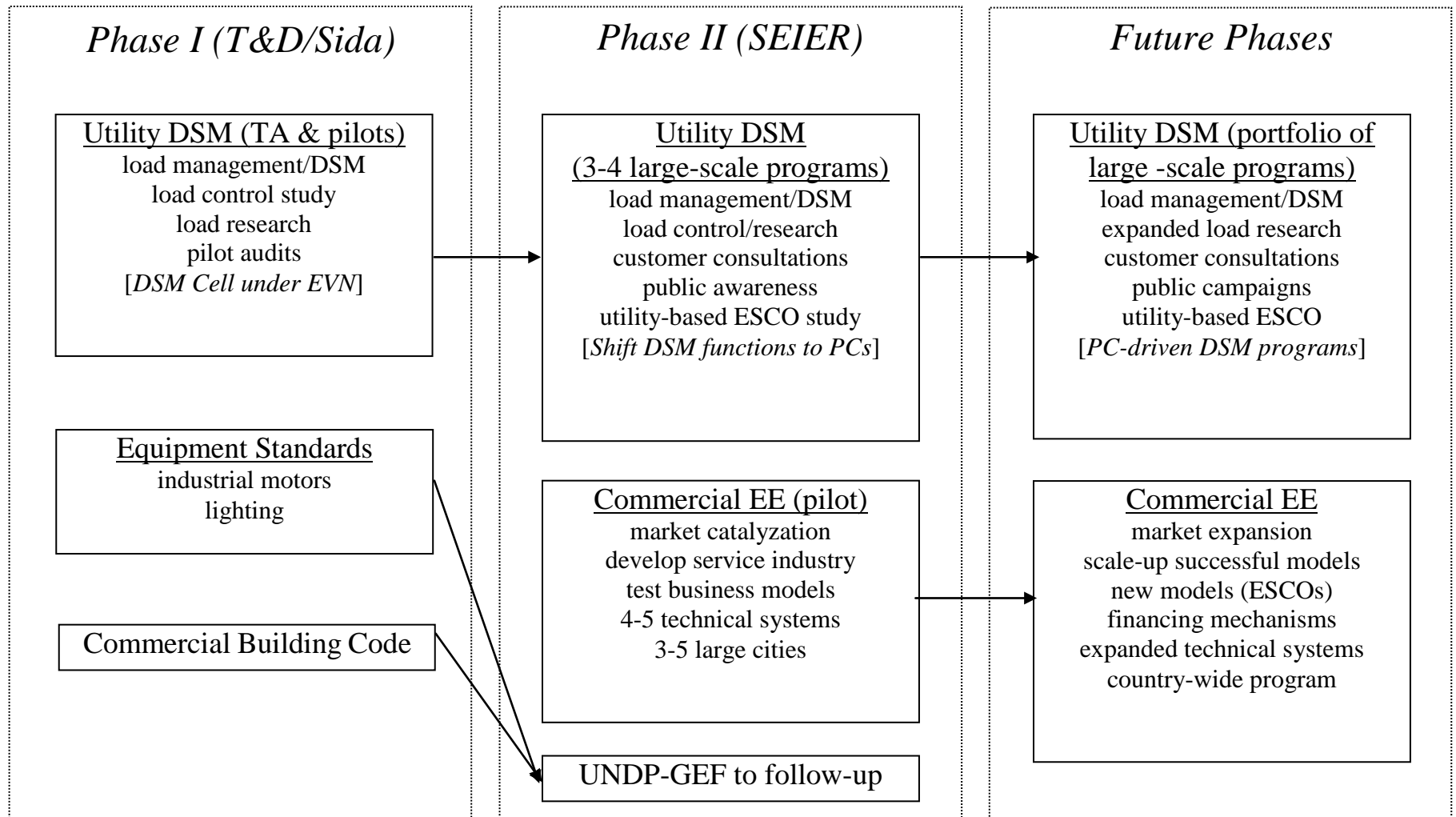
It has been agreed that MOI would manage this 4-year pilot program, which is expected to require about \$3 million in GEF funds and mobilize about \$5 million in private financing. An Administrative Unit or AU (a commercial bank) would be responsible for managing and disbursing the audit and investment grants and MOI would hire a Technical Advisor to assist the AU in assessing the proposals. Through ongoing audit programs within EVN and MoSTE, it is expected that an initial pipeline of investment proposals could be developed over the next 6-12 months. Specific activities are expected to include:

- a) Comprehensive Project Agent Training Program: The program would support a major training program to provide basic technical, financial and business knowledge to project agents to facilitate the development and implementation of project proposals as well as some customized technical assistance to develop marketing and business plans. Technical training would be provided for energy auditing, technical system analyses and recommended efficiency improvements in the four end-use systems targeted, financial analyses of EE investments and technology options, various contractual options for EE services, project management, energy savings verification, etc.
- b) Audit and Investment Grants: The program would also provide grant support for energy audits and investment bonuses to project agents and their customers. Once project agents are able to recruit customers, the program would offer full or partial grant reimbursements for energy audits. To ensure that the project agent and customer have incentives to implement the recommendations of the audit report, a portion of the audit payment may be held until the project is under implementation. The grant funds would also be used to offer some bonus (e.g., % of investment amount, % of energy

saved, or other options) for customers and agents that have fully implemented EE investments and submitted commissioning certificates subject to AU/MOI inspection.

- c) Program Marketing, Monitoring and Administration: The program would also offer support for: (i) program marketing (e.g., identification and recruitment of project agents, raising awareness of potential customers of EE services, case study development and dissemination, etc.); (ii) program administration and monitoring (e.g., AU management fees, technical support, program monitoring, post-installation inspections, evaluation and reporting); (iii) technical assistance to MOI and the AU; and (iv) feasibility studies for expanding successful business models, developing more complex models, establishing various financial mechanisms and instruments (e.g., credit lines, dedicated funds, guarantees, supplier credit/leasing arrangements, etc.) to support project pipelines, and further market expansion.

Framework for IDA/GEF DSM/EE Program



Phase 2 DSM Program Cost and Benefits

Program Components	Estimated Costs (USD million)	IDA (USD million)	GEF (USD million)	EVN (USD million)	Peak Reduction (MW)
<i>Main DSM Programs</i>					
Expanded Time-of-Use (TOU) metering	2.25	2.25	0	0	69.7
Direct Load Control (DLC)	0.72	0.60	0	0.12	3.1
Compact Fluorescent Lamps (CFLs)	1.79	0.99	0.80	0	33.4
Fluorescent Tube Lamps (FTLs)	0.74	0	0.70	0.04	14.1
Ballasts	0.40	0.28	0.08	0.04	2.9
<i>Supporting Activities</i>					
Expanded load research	0.90	0.90	0	0	
DSM business opportunities	0.35	0.15	0.20	0	
DSM planning, monitoring and evaluation	0.75	0.35	0.35	0.05	
Staff, facilities and equipment	0.70	0.16	0	0.54	
TOTAL	8.60	5.68	2.13	0.79	123.2

Benefit/Cost Analyses for All DSM Programs (Including Supporting Programs) (All Costs/Benefits are in million USD)

Perspective	Economic Analysis			
	Benefits	Costs	NPV	B/C ratio
EVN (Financial)	75,496	21,015	54,480	3.6
PCs (Financial)	28,607	22,985	5,622	1.2
Customers (Financial)	21,717	3,131	18,586	6.9
National (Economic)	71,546	8,123	63,423	8.8

Assumptions: The avoided cost of DSM programs were determined based on construction and operation costs for a gas turbine plant for peak periods (US\$54/kW/year and 7.82 USc/kWh at generation level). Other assumptions include: LRMC of 3.904 USc/kWh at generation level, ave. BST of 3.33 USc/kWh, economic BST of 5.17 USc/kWh, ave. retail tariff of 3.33 USc/kWh, discount rates of 12% (economic) and 7% (financial), 10% VAT, exchange rate of US\$1.00 = 15,000 VND.