



ATTITUDE SURVEY TOWARDS ENERGY CONSERVATION

by

Ms. Inthira Sajjakul

A Final Report of the Three - Credit Course
CE 6998 Project

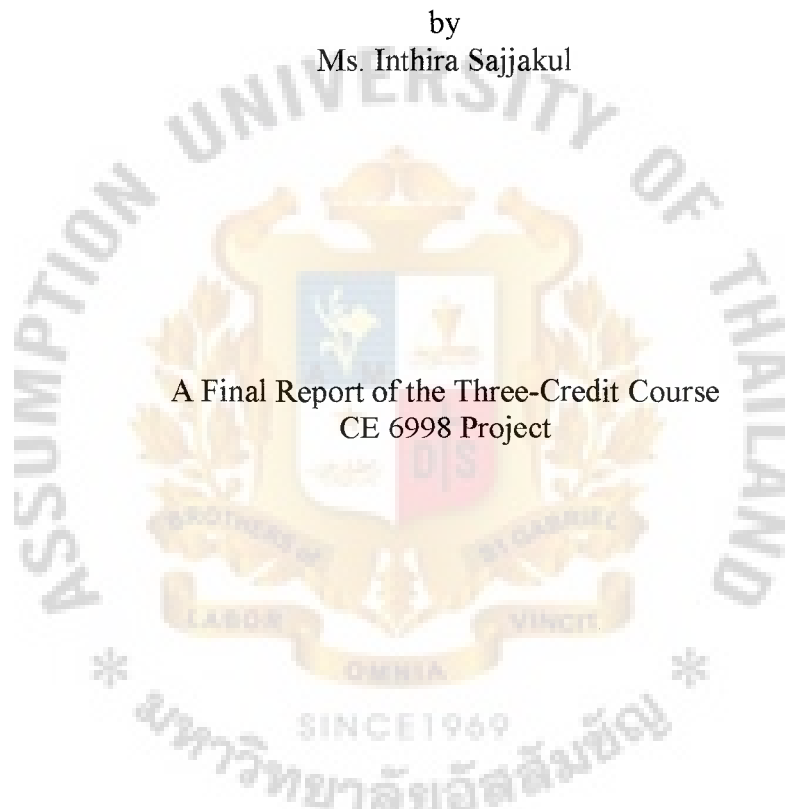
Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science
in Computer and Engineering Management
Assumption University

November, 2001

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The Graduate School of Assumption University has approved this final report of the three-credit course. CE 6998 PROJECT, submitted in partial fulfillment of the requirements for the degree of Master of Science in Computer and Engineering Management.

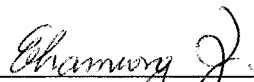
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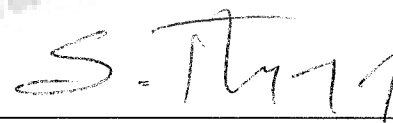
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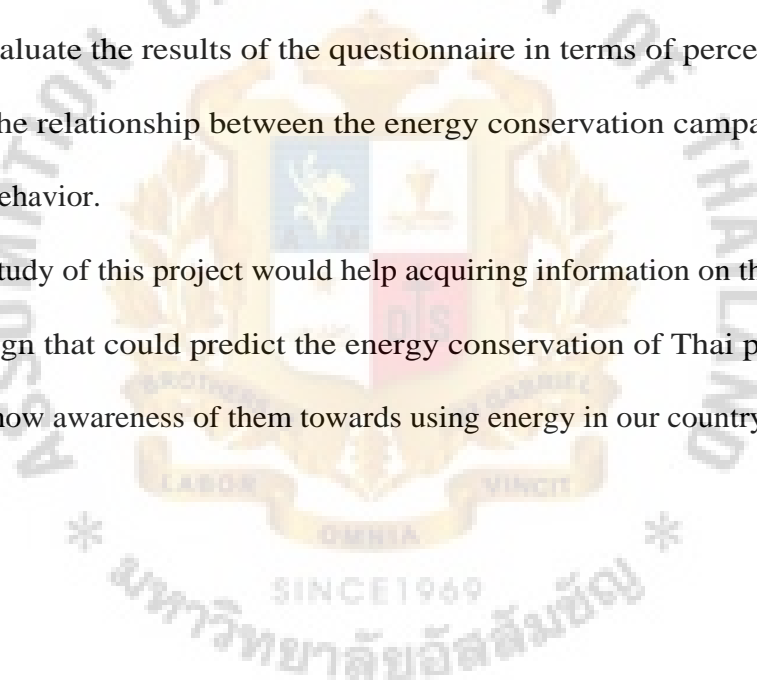
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ABSTRACT

This study primarily focuses on energy conservation of Thai people and the energy conservation program, which was the government's policy to foster energy conservation habits among Thai. Changing consumer behavior was an important factor with regard to the achievement of energy savings objectives.

The research instrument on this study was the questionnaire with four hundred sampling population of Thai people who had different background from various places in Bangkok and Nonthaburi. SPSS software program was employed to analyze data in order to evaluate the results of the questionnaire in terms of percentage. The result indicated the relationship between the energy conservation campaign that effected consumer behavior.

The study of this project would help acquiring information on the effectiveness of the campaign that could predict the energy conservation of Thai people in the near future and how awareness of them towards using energy in our country.



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I owed an incalculable debt to all 400 people who spent their valuable time in answering the questionnaires. This study could not have been completed without their kindness.

Finally, I dedicated this study to my family for their continuous encouragement and support. I was forever grateful to my parents whose willingness to invest in my future had enabled me to achieve my educational goal.

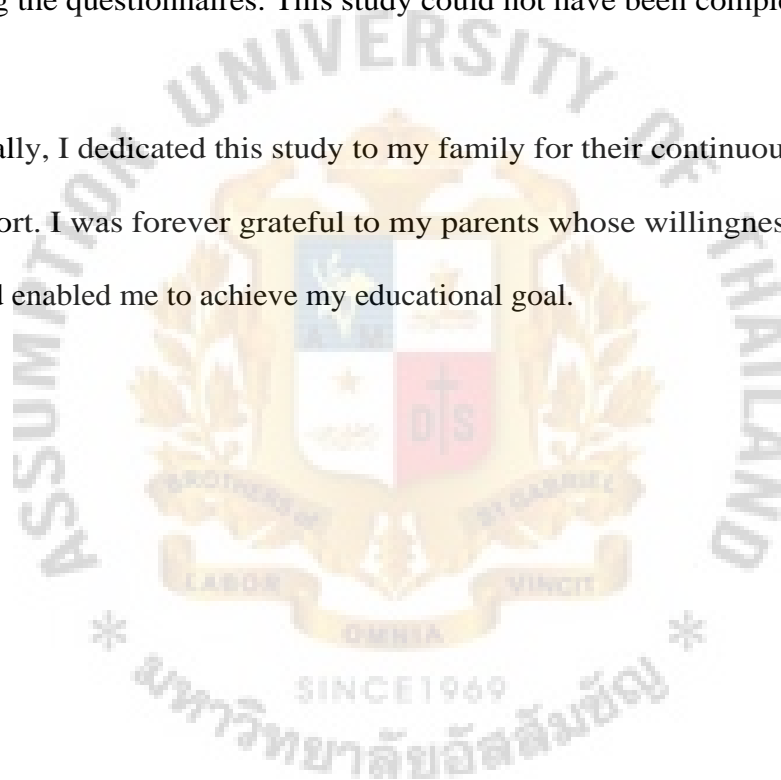


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I. INTRODUCTION

1.1 General Background

Thailand's quantum leap in economic growth during the last two decades had fuelled the demand for energy to grow every year. A solution to the challenge rested with concept of energy efficiency and load management, which could contribute to a reduction in consumer demand for energy as well as lower production costs.

Despite the abating demand for electricity, a result of the country's prolonged economic meltdown in the last 2-3 years, the efforts to enhance energy efficiency could not be dismissed. As the price of imported fuels had been under upward pressure due to the weak baht, inevitably having an impact on power generation costs. Energy efficiency had to be promoted to keep up with the hike in demand once Thailand's economy was back on track. This would assure sustainable economic development well into the future.

In the Seventh National Economic and Social Development Plan (1992-1996), the Government defined short- and medium-term targets and strategies for the development of the energy sector, including the reduction of the annual growth rate of energy consumption from 13% to less than 10% per year.

To this end the Government had embarked on a comprehensive Energy Conservation (ENCON) Program, adopting the Energy Conservation and Promotion Act in 1992.

Changing consumer behavior was an important factor with regard to the achievement of energy saving objectives. Individual consumers had to be aware of the need, the benefits they could gain, and the ways how to save energy in their specific situation. In order to create awareness and to achieve changes in consumer behavior,

consumers had to be addressed by specific campaigns. Alongside with the general message to conserve energy, such campaigns were supposed to draw the public's attention to the government's Energy Conservation Program and to the incentives and benefits it offers to them. The creation of a general energy-consciousness would broaden the basis of support for the program as a whole.

1.2 Significance of the Study

The study could find the alternative solution campaign of reducing power use and protection of scarce resources. And it enabled Thai people to be aware of the importance and sufficiency of energy.

1.3 Statement of the Problem

The campaign ever depended on the thought of Thai people in the awareness of insufficient energy in the future. The success of the campaign lay with the voluntary collaboration of everyone through the use of high efficiency appliances and efficient utilization of energy. Moreover, mass media was also important for energy saving program because it played a proactive role in promoting the efficient use of power.

The problems would be founded as follows:

- (a) Do Thai people aware of the lack of energy?
- (b) Are Thai people interested in energy saving program?
- (c) How much the media effect on the use of energy?
- (d) Do gender, age and education relate to the use of energy among Thai people?

The collected data from the designed questionnaires would be able to answer the above questions.

1.4 Scope of the Study

This study surveyed the attitudes of people in Thailand among different age, sex, education and other backgrounds in order to get the variable data for corrective action. But it did not cover the industry sector.

1.5 Objectives of the Study

- (1) To survey the attitude of the power consumer.
- (2) To analyze and improve the energy conservation.
- (3) To utilize the questionnaire as a tool available data for the analysis towards energy users.
- (4) To provide the campaign opportunities information in order to encourage Thai government and private sector in making Thai people and younger generation became more aware of energy efficiency.

1.6 Methodology

(a) Determining Research Populations

The researcher is interested in the 400 respondents in state enterprise, business enterprise and students in Bangkok and Nonthaburi.

(b) Determining Research Sample

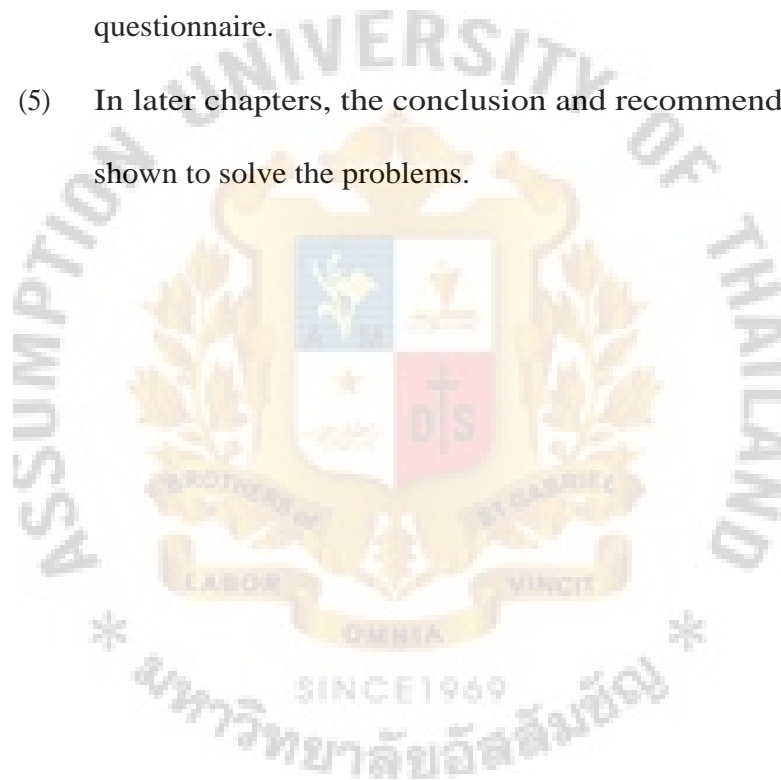
The researcher tried to determine sampling population with different sex, age, occupation and areas.

(c) Determining Data Collection

The researcher employed the questionnaire survey as a way to collect data.

(d) Determining Data Analysis

- (1) Questionnaire had been designed to ask 400 respondents about their interesting and behavior on energy saving (by using a designed fixed alternative question, open-ended and closed-ended questions).
- (2) Raw data as the frequency of each choice turn to be percentage (%).
- (3) The researcher presented the findings by using tables and graphs for clear understanding.
- (4) The existing problems would be found from the result of questionnaire.
- (5) In later chapters, the conclusion and recommendations would be shown to solve the problems.



II. LITERATURE REVIEW

2.1 Energy Conservation Program of Thailand

The Energy Conservation Act stated that the energy conservation program should contribute to "saving of energy, the sustainable use of natural resources and protection of the environment". Specifically the objectives of the program included:

- (1) Promotion of energy conservation,
- (2) Promotion of the efficient use of energy,
- (3) Promotion of the sustainable use of natural resources,
- (4) Promotion of the development and use of renewable energy sources,
- (5) Promotion of the development of ENCON technology, and
- (6) Promotion of environmental protection.

The target groups in the ENCON program had to follow procedures with several common element, as shown briefly in the following table:

Table 2.1. Main Features of Programs and Target Groups.

Type of Programs and Target Groups	Main Procedural Features Steps to Be Followed	Implementing Organization
<p>2.1.1 Compulsory Programs:</p> <p>(1) Designated Factories & Buildings</p> <p>(2) New Factories & Buildings</p> <p>(3) Government Facilities</p>	<ul style="list-style-type: none"> • Appoint energy manager Make assessment study • Identify ENCON projects • Apply for subsidy • Contract for execution • Compulsory save energy 	DLDP
<p>2.1.2 Voluntary Programs:</p> <p>(1) Rural and Small Industry</p> <p>(2) New & Renewable Energy</p> <p>(3) Research & Development</p> <p>(3) Industrial Liaison</p>	<ul style="list-style-type: none"> • Open tender procedure • Voluntary application • Contract implementing organization • Support of groups 	Any government institution or non-profit NGO
<p>2.1.3 Complementary Programs:</p> <p>(1) Public Relations</p> <p>(2) Human Resources</p> <p>(3) Training</p>	<ul style="list-style-type: none"> • Terms of Reference • Tendering on invitation • Contract with private sector consultants 	NEPO and DEDP

The Expenditures from the Fund under the three categories in the table during the six-year period 1994-1999 have been estimated as follows:

Compulsory programs budget 12,900 Million Baht

(Government facilities, designated factories and buildings, and new facilities)

<u>Voluntary programs budget</u>	2,400 Million Baht
(Rural & Small Industry, New & Renewable Energy, R&D and Industrial Liaison)	
<u>Complementary programs budget</u>	2,000 Million Baht
(Public Relations, Training, Fund Management and Monitoring)	
Total Fund Expenditures Period 1994-1999	17,300 Million Baht

2.1.1 Compulsory Program

The compulsory program addressed the following target groups and issues:

- (1) Designated Factories and Buildings: retrofitting with energy conservation measures,
- (2) New Facilities (factories and buildings): improving their design before construction,
- (3) Government Buildings (and Factories): retrofitting with energy conservation measures,
- (4) Other Factories and Buildings, who applied voluntarily.

For the Energy Conservation Promotion Act, Designated Facilities were factories and buildings with the installed electrical capacity of more than 1 MW or a total consumption of more than 20 TJ/year useful energy. Approximately 3500 designated facilities (factories and buildings) would have to comply with the duties defined in the Act.

Energy conservation in designated facilities was the largest and in short term most important program in the Energy Conservation Promotion Act. The owners of designated facilities (factories and buildings) were assigned the following duties:

- (1) to assign an energy manager (full-time position);
- (2) to keep records on energy consumption and other energy-related items;

- (3) to submit information on energy production, consumption and conservation;
- (4) to set targets and plans for energy conservation;
- (5) to audit and analyze operations to achieve such targets and plans for energy conservation;
- (6) to submit information on the performance of energy conservation measures.

The Department of Energy Development and Promotion (DEDP) of the Ministry of Science, Technology and Environment would be the main executing agency for the compulsory program. Owners of designated facilities should be responsible to identify themselves and to submit their information to the DEDP.

2.1.2 Voluntary Program

While the compulsory program was implemented by DEDP, the handling of voluntary programs would be contracted to accountable organizations such as: municipalities, university institutions, research facilities, non-profit organizations, religious organizations, and other approved groups.

There would be two types of financial support for the implementation of the voluntary program:

- (1) Support for the Project Implementing Organization, or "contract owner", for the operational cost for managing, administration, and providing assistance, for research, for dissemination, for pilot or demonstration projects related to energy conservation and environmental protection.
- (2) Incentives to the individuals, facility owners or organizations, targeted in the project, to entice them to invest in energy conserving equipment or to produce renewable energy.

The voluntary Implementing Organizations would be engaged by open tender procedures addressing target groups under the following programs:

- (1) Rural and Small Industries program;
- (2) Renewable (alternative) Energy program;
- (3) Research and Development program;
- (4) Industrial Liaison program.

The organizations would be evaluated for their capability to manage and counsel the proposed activities of their project on the basis of their proposed plan of operation, the efficiency of the proposed program in terms of energy conservation and the effective capability of the organization in achieving the declared goals.

In the case of dissemination projects, the proposed (investment) projects with the target group would be judged on the basis of their comparative contributions to the energy conservation program and subsidies for investments in energy savings should be calculated along criteria similar to those established for designated facilities.

Rural Industries Program

A special sub-program had been created for small and rural industries. Rural industries under the energy conservation program were manufacturing facilities located in non-urban areas that had an installed electric capacity below 300 kW or an energy consumption below 6TJ equivalent (130 TOE, or 400 tons of fuelwood) per year.

Taking into consideration the high number (estimate 20,000) of rural industries in Thailand, it was impossible to cover the whole range of small and very small factories from a Government office. So the program would employ the services of Voluntary Implementing Organizations, such as government institutions, universities and non-profit NGO's.

Opportunities to improve energy efficiency included not only straight energy conservation but also measures like fuel substitution and application of renewable energy technologies, or technologies to use renewable energy sources more efficiently.

A typical example of use of renewable energy in large-scale industries was the burning of agro-industrial waste products like sugarcane bagasse and rice husks. This fuel substitution could be combined with energy efficient technologies, like co-generation or the use of energy efficient process equipment.

NEPO would be the responsible agency for this program. Those who were interested can submit their request to NEPO, who would screen and analyze the proposals before submitting them to the Fund Committee. NEPO was also responsible for the monitoring and evaluation of the activities undertaken.

New & Renewable Energy Program

The New and Renewable Energy program would focus on the introduction and dissemination of renewable technologies, which used and/or produced renewable energy. Included were full scale demonstration projects of proven technologies and promotion on economic of the results of research project, with emphasis on non-industrial applications.

The New and Renewable Energy Program would focus on special sub-programs, such as the introduction and dissemination of efficient cooking stoves, and the introduction and/or use of renewable energy (bio-gas, sun-heat, photo-voltaics, etc).

NEPO would be the responsible agency for this program.

Research & Development Program

R&D projects were those projects which aimed at the development of new or the improvement of existing technologies, including small scale demonstration projects as well as information dissemination by publications and workshops.

Examples of fundable R&D projects could include:

- (1) General and policy studies, e.g. studies on energy saving potentials in different (sub)-sectors and for specific technologies; optimal strategies for

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market-introduction of energy-efficient and renewable energy technologies;
training needs; know-how transfer; etc.

- (2) R&D on energy-efficient and renewable energy technologies, e.g. small-scale cogeneration, absorption cooling, energy-efficient process-equipment (like kilns, ovens, etc.), solar heating and drying, etc.
- (3) Transfer and adaptation to Thailand conditions of proven technologies from elsewhere, including collaboration for joint research with institutions abroad;
- (4) Information dissemination on results of (applied) research, through small-scale demonstration projects, workshops and seminars, conferences, publications, brochures, etc.

Research and development projects could be proposed by well-reputed research institutions, universities or non-profit organizations, or could be initiated by agencies such as DEDP or TISI or NEPO. NEPO would be the responsible agency for this program.

Industries Liaison Program

The purpose of the Industrial Liaison Program was to enhance the capacity of the industrial sector to produce energy efficient and renewable energy equipment in Thailand by providing technical and financial support to establish their market. In general, the following services should be considered under the program:

- (1) Assistance and financial support for market expansion for energy efficient or renewable energy equipment in Thailand.
- (2) The following areas of support were envisaged:
 - (a) Market research and formulation of a marketing plan;
 - (b) PR activities or the energy efficient material or equipment;

- (c) Support for the producer/distributor to reduce his price to the consumer;
 - (d) Support to the users of energy efficient equipment;
 - (e) Execution of activities in the scope of an equipment labeling program.
- (3) Support for centers for the dissemination of information on energy conservation, such as the Thailand Energy Conservation Center, and for establishing centers at universities;
- (3) Communications, training and incentives to appropriate service industry firms to ensure that they become proficient in installing equipment in a manner that guarantees efficient operation, and also to encourage them to make efficiency improvements a part of their service and maintenance business;
- (4) Support for demonstration projects of energy conservation technologies in buildings and factories;
- (5) Dissemination of general technical information about technological options and ideas developed elsewhere (energy database).

NEPO would be the responsible agency for this program.

2.1.3 Complementary Program

NEPO, being the secretariat of the National Energy Policy Council, would provide support to the Energy Conservation Program in the areas of policy development, program and project management supervision, efficiency monitoring, account auditing, and trouble shooting. The operational support would be mainly provided by contracted Service Organizations, under supervision of the Energy Conservation and Renewable Energy Division of NEPO.

Supervision and monitoring of the complete program was performed at three levels:

- (1) At the policy level, by NEPO's energy conservation office.
- (2) At the program implementation and management level, by the DEDP and the voluntary implementing organizations;
- (3) At the execution level of project implementation by the designated facilities and voluntary applicants who conserve energy, and their consultants;
- (4) The design of the monitoring systems at each level shall be coordinated by NEPO in order to ensure that they are compatible with each other.

It was essential that all capability and potential expertise in Thailand was mobilized towards the development, management and implementation of the energy conservation program. Project proposals might be initiated by private sector and government organizations. In particular the program seek cooperation with individual experts, consulting firms, service organizations and other non-government organizations who could contribute to the operations, management and monitoring work.

- (1) Public Relations and Marketing

Changing consumer behavior was an important factor with regard to the achievement of energy saving objectives. Individual consumers had to be aware of the need, the benefits they could gain, and the ways how to save energy in their specific situation. In order to create awareness and to achieve changes in consumer behavior, consumers had to be addressed by specific campaigns. Alongside with the general message to conserve energy, such campaigns were supposed to draw the public's attention to the government's Energy Conservation Program and to the incentives and benefits it offered

to them. The creation of a general energy-consciousness would broaden the basis of support for the program as a whole.

Marketing & PR program would aim at two major objectives:

- (a) promotion of the Energy Conservation Program among the target groups (Marketing) for instance to Designated Facilities;
- (b) promoting the idea of energy conservation and creating awareness of and support for the program by the public at large (Public Relations).

The executing agencies of the program were primarily responsible for the execution of the Marketing & PR Program. This would be in particular the DEDP, and the Voluntary Implementing Organizations.

The PR program should comprise the following specific activities:

- (a) A general awareness campaign (a media strategy designed to sell the idea of energy saving and make the Energy Conservation Program visible to the public at large). This was a task for DEDP and other government organizations, in cooperation with media specialists and NGO's;
- (b) Specific information campaign with regard to energy efficient appliances (electrical and LPG) giving practical tips how to save energy in daily life. This was a task for DEDP with the public utilities (distribution companies);

- (c) Development and implementation of a labeling program by Thai organizations. Execution was preferably with the DSM office in cooperation with the industry;
- (d) Education and community-oriented activities, including the development of training material, educational activities at primary and secondary schools, at municipalities, and at religious communities. Should be carried out by NGO's, universities and government institutions.

(2) Human resources

To enable an effective implementation of the program sufficient human resources with the right skills and knowledge were required both for government administration and establishments as well as for the private sector. At present expertise in this particular field was in short supply, while the demand was high and in the very near future would increase among other things due to the effectuation of ministerial regulations which required designated facilities to appoint energy managers. Human resources mobilization and development were therefore major tasks under the Complementary program.

(3) Training Program

The implementation of the ENCON program would require a major national training effort of policy makers, policy implementers, energy managers of facilities, consultants, technicians and training institutions. The complexity of training targets, the variety of the training needs and the diversity of the training populations necessitated the preparation of a comprehensive Master Plan. After approval by the Fund Committee this

national policy plan became the basis for the energy training activities, training courses and programs for the various categories of actors involved in the implementation of the ENCON program for the coming years.

The following training target groups had been identified in the Master Plan:

- (a) government staff at NEPO
- (b) government staff at DEDP;
- (c) energy managers at the designated facilities.

At the universities in Thailand the formation of energy conservation studies should be encouraged with funding from the program, in order to increase the output of students in the field of energy conservation over time.

2.2 Thailand Energy Strategy and Policy

2.2.1 (Phase 1)

(1) Objectives and Approach

The main objectives of phase 1 focused to analyze energy demand and supply situations in Thailand during the period of 1995- 2025, and to assist Thai government in preparing plan for future energy development and updating the energy conservation plan.

A techno-economic approach was selected in forecasting energy demand, and supply for Thailand. In phase 1, three different long-term macroeconomics scenarios called Base, High, and Low, had been developed. The Base scenario used the economic growth targets of the government for 1997-2001, at average of 1.0-1.1% annually. The High and Low scenarios used the same growth assumptions of the NESDB scenario for the period 1997-2001, but different assumptions for the period beyond.

In the energy demand forecast, 5 sectors, comprising industry, transport, commercial, residential, and agriculture, were considered separately on the common projection of the demographic and macroeconomic scenarios, i.e. Base, High, and Low. With each considered macroeconomic environment, two scenarios, i.e. business-as-usual and energy conservation, were evaluated in forecasting energy demand for each sector.

Regarding to the energy supply development, a least cost approach was employed to analyze the long-term energy supply and environment, based on the obtained projected demand under the Base, High, and Low macro-economic scenarios and the available energy supply options.

(2) Demand Analysis and Forecasting

For each economics scenario, the energy demand analysis and forecasted was done for two particular cases, i.e. Business As Usual (BAU) and energy conservation cases (CONS). The energy conservation potential for each economic sector is then evaluated using the obtained results of these two cases.

(a) Total Energy Demand

The final energy demand of the BAU case for the phase 1 period derived from techno-economic analysis. Table 2.2 summarized the demand results by sectors for the milestone years.

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Table 2.2. Final Energy Demand in the BAU Case.

Unit: Mtoe

Sectors	1995	2000	2005	2015	2025
Transport	18.82	21.31	26.15	40.65	64.67
Residential	10.30	12.74	14.33	16.97	19.75
Industrial	15.98	17.56	23.85	39.57	65.25
Agricultural	1.58	1.75	1.9	2.49	3.47
Commercial	2.05	2.34	2.71	3.88	5.72
Total	48.74	55.71	68.94	103.56	158.87

(b) Total Energy Conservation Potential

Table 2.3 displayed the data on 1995 energy demand and 2025 projected total energy and electrical savings under the Conservation Scenario.

Looking forward to the Year 2025, the energy and electrical demand associated with the BAU Scenario was assumed to occur as a result of natural market forces, or the effects of currently adopted Thai energy policies and strategies. In terms of the projected level of energy savings that might be achieved in the Conservation Scenario, the greatest potential for total energy savings was 56% by estimated from transportation, followed by 30% from industry. The residential and commercial sectors each offered 6% and 7% of the total energy savings potential.

Table 2.3. Projected Sectoral Electrical Demand (BAU Case), and

Percent of Total Energy Conservation Potential (BAU-CONS Case).

Projected Sectoral Demand (BAU Case)					Projected Total Energy & Electric Savings from Conservation Scenario			
Sector	1995 Total Energy	1995 % Electrical	2025 ^{13/0} Total Energy	2025 % Electrical	2025 Total Energy (ktoe) say.	2025 % Total Energy Savings	2025 Electric say. (ktoe)	2025 Electric Savings
Transport	39%	0%	39%	0%	12,773	56%	0.4	0%
Industry	32%	46%	42%	51%	6,955	30%	2,828	54%
Residential	21%	28%	14%	25%	1,381	6%	878	17%
Commercial	4%	25%	3%	23%	1,638	7%	1,535	30%
Agricultural	3%	2%	2%	1%	252	1%	16	0%
Total	100%	100%	100%	100%	22,999	100%	5,289.4	100%

2.2.2 (Phase 2)

(1) Objective and Approach

The objective of this Phase 2 was to assess the progress with the current Energy Conservation Plan (ECP), and to use this information to recommend an update set of strategies and action plans for meeting the country's future energy requirements.

The Thai Energy Conservation Plan historically had placed most attention on demand-side energy technology and utilization issues, and to a lesser extent on small-scale renewable technologies. The ECP had traditionally addressed those activities supported by the Thai's Energy

Conservation Fund (ECF). For purposes of this Energy Strategy and Policy Study, EGAT's DSM program activities also had been included. This study also extended its assessment to include three additional areas of energy resource conservation which had not been given prominent. These were transportation energy use, renewable energy resource utilization, and increased efficiency in supply-side resource utilization (power generation, transmission, distribution), and energy fuel conveyance (e.g., oil and gas pipeline transportation).

The projected energy demand and supply for Thailand during the period of study (1995-2025), investigated in the Phase 1 study, were used in developing a plan for future energy development and revising and updating the ECP. A review of progress of the existing ECP strategies was conducted to determine their effectiveness and provide an additional basis for recommending additional strategies and action plans to meet Thailand's future energy requirements.

(2) The Potential for Resource Conservation

The magnitude of conservation potential was analyzed In Phase 1 of the Energy Conservation Strategy and Policy Study. This analysis assigned a set of efficiency assumptions about the future to a "business as usual (BAU)" case that represents the energy demand associated with natural market forces (reflecting level of continued efficiency improvements driven by economics and natural improvements in technology design) and the effects of currently adopted Thai energy policies and strategies. Beyond this degree of efficiency, a further set of possible technological efficiency gains

was analyzed to represent a "Conservation" case, which was comprised of four components:

- (a) CONS1 - for the appliance and lighting DSM in the residential and commercial sectors;
- (b) CONS2 - for the motors DSM program in the industrial sector;
- (c) CONS3 - for boiler efficiency program case in the industrial sector;
- (d) CONS4 - for transport fuel saving program case in the transport sector; and
- (e) CONS - for a comprehensive energy conservation program case combining all cases.

Table 2.4 displayed the Phase 1 findings regarding 1995 energy demand and 2025 projected total energy and electrical savings under the Conservation Case. If the BAU assumptions held true, the projected remaining potential energy savings was 56% by estimated from transportation, followed by 30% from industry. The residential and commercial sectors each offered only an additional of 6% and 7% savings potential.

Table 2.4. Projected Sectoral Energy and Electrical Demand (BAU Case),
and Potential Energy Conservation Savings (CONS-BAU case).

Sector	1995		2025		Potential		Potential	
	%	Energy	%	Energy	%	Energy	%	Energy
Transport	39%	14,100	41%	12,773	56%	12,773	0%	0
Industry	32%	6,955	6%	2,828	1%	2,828	51%	6,955
Residential	21%	11,381	28%	11,381	13%	11,381	25%	11,381
Commercial	4%	1,638	25%	1,638	23%	1,638	7%	1,567
Agricultural	3%	1,252	12%	1,252	2%	1,252	11%	1,252
Total	100%	22,999	100%	22,999	100%	22,999	100%	22,999

The majority (78%) of the conservation potential occurred for four energy sources: gasoline (28% of the total identified efficiency potential), electricity (23%), jet fuel (15%), and diesel oil (12%). Notably, three of the four energy sources were predominantly consumed in the transportation sector. Electricity was the greatest source of non-transportation energy conservation potential. For the identified electrical savings, 54% of the Conservation Case potential came from industry, followed by 30% from commercial buildings, and 17% from residential uses.

From a total energy perspective, transportation offered the greatest overall potential for conservation. This was followed by industry (for both total energy and electrical savings) and then the commercial/governmental sector (for electrical savings). This was in contrast to the conservation activities in Thailand over the last 5-6 years,

where emphasis had been directed at the residential and commercial/governmental buildings sectors. These sectors made sense as focal points for electricity conservation, especially if the energy savings potential was fairly easy to target through technological improvements to new sales of lighting, refrigerator, and air conditioner technologies. However, there had been relatively less attention paid to obtaining savings opportunities from the 33% of total energy and 46% of electricity used in industry.

(3) Recommended Strategies and Initiatives

(a) Overall Energy Strategy

An immense set of issues merit attention to permit Thailand to enjoy greater economic efficiency, resource management, and environmental benefits from the energy sector development required to support the country's economic growth. Several broad themes emerged from the collective strategies recommended below:

- (1) It would be valuable to establish focused and coordinated energy development and utilization plans that specifically targeted the achievement of measurable results from determined sectors.
- (2) Stimulating market-based solutions was the primary approach advised for the majority of strategies.
- (3) Reliance on compulsory approaches was advised only when actors and stakeholders were too diffuse and/or where their ability to individually captured the identified benefits of economic, resource, and environmental potentials were too unlikely to permit significant progress toward socially desired goals.

- (4) In parallel to the need for focused and coordinated plans, there needed to be a corresponding assignment of clear leadership and development responsibility to appropriate government agencies. Each designated leader's obligation should be to spur the policy, technical assistance, and R&D activities, which were required to ensure progress toward the many market-based solutions.
- (5) There was a distinct value for energy sector planning, decision-making, and goal-setting to consider the substantial local, national and global environmental effects of energy development and utilization.

(b) Demand-Side

Findings

- (1) Much greater emphasis was warranted for energy efficiency targeted at industry, which offered substantial opportunities for reducing demand and cutting environmental emissions.
- (2) A voluntary approach should be employed for most existing uses of energy (in existing buildings, factories and homes). Implementation approaches should increase their attention to featuring the benefits to end users and to broadening the involvement of stakeholders expected to benefit from increased investment in technologies and technical services for energy conservation.
- (3) A compulsory approach should be taken to upgrading the minimum efficiency of new buildings and equipment and to build this into the expanded investment in buildings, equipment

and appliances over the years to come. A market-based voluntary set of strategies could be employed to encourage additional efficiency beyond the minimum standards.

- (4) The achievement of these goals could benefit from greater consolidation in institutional responsibilities to bring more focus to working with end user markets to achieve conservation goals.
- (5) Concerted attention to improving the efficiency of rural cookstoves would offer substantial economic, resource, environmental, and social benefits.

(c) Renewable Energy

Findings

- (1) Even though firm evidence was limited, there was far greater potential for the use of renewable energy in the long term than being verified and modeled today. Targeted efforts already underway could better identify the magnitude of resource inventory and the feasibility of its commercial deployment.
- (2) There were substantial environmental benefits from renewable energy, both in the reduction of local pollutants and in reduction of such global emissions as Coe. Mechanisms needed to be identified to capture the social benefit from what were otherwise private investment decisions.
- (3) Renewable resource development required preparation of thoughtful and long-term commercialization plans that went beyond technology demonstrations to lay out a trajectory of

public and private activities that could lead to private sector investment in commercial operations.

- (4) Commercialization plans had to proceed with the premise that the government role would be to facilitate ultimate private development and investment.

(d) Conventional Energy Supply

Findings

- (1) The greatest priority should be to develop processes to support the wide range in potential oil and gas supply requirements. This would require investigation of facility investment planning processes; plant, refinery, and pipeline siting issues; and contractual mechanisms that could support greater flexibility in commitments and decisions than had been seen in Thailand in the past.
- (2) There would appear to be significant potential for fuel switching in the industrial and transportation sectors that could alter the current and projected balance of demand for coal and oil products, toward potentially greater use of gas and electric technologies. This would have implications for energy supply requirements, electrical demand, and environmental emissions. Greater attention to fuel substitution possibilities could add more options and flexibility to Thailand's energy development plans.
- (3) The single greatest source of CO₂ reduction in the supply sector would come 15 or more years down the road from nuclear

energy. Significant policy attention and public debate would be required to weigh the advantages, disadvantages, and desirability of this power supply technology.

2.2.3 (Phase 3)

Phase 3 of this study developed a recycling strategy for Thailand, and incorporated the impacts of the proposed recycling strategy into the energy conservation plan. Phase 3 involved four tasks:

- (1) Task 11 developed a description of the existing recycling infrastructure in Thailand;
- (2) Task 12 developed 25 case studies of recycling approaches throughout the world;
- (3) Task 13 analyzed the case studies to identify appropriate approaches on recycling in Thailand, and to develop an appropriate recycling strategy for Thailand from this work;
- (4) Task 14 incorporated the relevant impacts of the recycling strategy into the energy conservation plan.

Task 11: Description of the Existing Recycling Infrastructure

It was estimated that about 13 million tonnes of waste were generated in Thailand each year. Of this total, about half was generated in urban settings, and the remainder in rural. The estimate of rural waste might be high, but there was no confirmation by the available information. About 3 to 4 million tonnes of waste was generated in the Bangkok area each year. About 2.5 million tonnes from Bangkok were landfilled each year, and an additional 365,000 tonnes/year were composted. Therefore, waste in Bangkok and area accounted 15% to 30% of the waste in all of Thailand.

Waste was generally picked up by municipal staff in urban areas and disposed at one of a number of existing disposal sites. Some urban areas provided door-to-door service, whereas others located central bins in markets, etc., and waste was taken to these locations. Rural residents did not have collection service, or convenient disposal options.

Recycling was currently carried out by individuals and the informal sector in Thailand. Residents source separated some recyclable materials and sold them directly to street buyers, waste collectors separate additional recyclable material from garbage picked up from homes and businesses, and pickers recover additional recyclable material at the landfill. Larger businesses sold recyclable materials directly to junk shops and brokers. The current informal sector and various informal arrangements recovered an estimated 22% of the urban waste stream, or about 1.2 million tonnes in 1996 (the most recent available information). Urban waste approximately consisted of 40% of organic material (food, etc.), almost 20% plastic, and 10% paper. There were no significant attempts currently to recycle the organic fraction of the waste through composting or digestion.

Waste in rural areas was made up mostly of food scraps, with some other materials. Food waste was used to feed animals, and the remainder of the organic waste was composted, or dried for use as fuel. It was not clear how the remaining non-burnable waste was managed, as organized disposal options were not available. Littering had been reported as a problem in rural areas for this reason.

Waste management planning had reached a critical point in many areas of Thailand, as old landfills closed, and there was strong local resistance to construction of new landfills. Public involvement in the waste management issue had increased substantially in recent years. An incinerator had recently been constructed in Chiang

Mai which could burn garbage, but has not been operated to date for this purpose because of public resistance.

The Institute for Sustainable Cities had developed a model waste management program in Phuket, including proper operation of the landfill, charging tipping fees at the landfill, promotion and education, community composting and organization of landfill pickers. A new garbage incinerator had been opened in Phuket in April, 1998 (a separate project), therefore there were activities taking place which were good models for the future.

The waste management crises had led to the need to review options to increase waste diversion and decrease dependence on landfill. Numerous studies had been carried out on what should be done with Bangkok's waste, but the recommendations had not been implemented to date.

Task 12: Case Study Research

Twenty five (25) case studies were carried out of leading edge approaches to waste management in various parts of the world. The approaches studied included:

Different collection methods;

Technologies for processing waste, recyclables and organic material

Technologies for recovering energy from waste;

Approaches to source separation of recyclable and organic materials;

Policies;

Legislation;

Financing mechanisms;

Organizational approaches to improve the performance of the informal recycling economy which currently exists in Thailand;

(9) Market development approaches to ensure long term sustainability of recycling programs

The locations and topics studied included an aerobic digestion of source separated organic waste in Brecht, Belgium; landfill materials bans in Peel, Ontario; power generation from landfill gas and landfill mining in New York State; mixed waste processing in Zootermeer, Holland; process to build houses from garbage in Indonesia; scavenger training in Brazil; user pay for waste collection in Seattle, landfill tax in the UK, two-stream, four-stream and six-stream source separations of waste in Guelph, Quinte and Lemsterland, Holland; different approaches to waste management in Japan; incineration of garbage to produce steam in British Columbia; intensive drop-off recycling in Calgary, recycling, composting and mixed waste processing combined in Nova Scotia; community composting in Jakarta, Institute for Sustainable Cities project in Phuket; plastics recycling legislation in Oregon; Clean Washington Centre approach to market development; methods to incorporate plastic film into new products; mandatory source separation and recycling ordinances in cities in the US; deposit-refund systems for waste stream elements, the German Packaging Stewardship Ordinance, and experience with the DSD (Duales System Deutschland), Nova Scotia Resource Recycling and Recovery Fund.

Task 13: Recycling Strategy For Thailand

The recycling strategy for Thailand was developed to address three distinctly different sources of waste:

- (1) Urban waste;
- (2) Rural waste:
- (3) Industrial, commercial and institutional (IC&I) waste.

The approaches finally recommended were those which had proven successful elsewhere, and which the case study research had indicated were appropriate and could be successful in Thailand.

The Phase 3 work also addressed policies, legislation, financing and funding, administrative structures and human resources and training requirements to implement the proposed strategy.

The recommended recycling strategy included the following components:

- (1) Increased recycling of dry materials from residential, commercial and industrial waste;
- (2) Collection and composting or digestion of organic waste from residential, commercial and industrial sources;
- (3) Manufacture of a refuse derived fuel (RDF) from some portions of the garbage stream;
- (4) Mandatory source separation of recyclable, compostable and reusable material for commercial and industrial waste generators;
- (5) Mandatory source separation of recyclable and compostable material from urban waste collected by municipal crews;
- (6) Implementation of a user pay policy for waste collected by municipal forces;
- (7) Implementation of user fees (tipping fees) for waste disposal at landfills;
- (8) Recycling and community composting of rural waste;
- (9) Extensive and on-going public education campaigns targeting the requirements of the new source separation systems;
- (10) A national recycling target of 50%, to be achieved by the year 2008;

- (11) New legislation on mandatory source separation of materials by residents and businesses throughout Thailand;
- (12) New anti-litter legislation;
- (13) Consultation with the public and industry on long term financing of the waste management system, and an appropriate role for industry in providing financial support.

Task 14: Integration of Recycling Strategy into the Energy Conservation Plan

The recycling strategy had energy impacts in 3 areas:

- (1) Reduced energy demand for manufacturing of paper, glass, metals and plastic as a result of increased recycling of secondary materials used by these sectors;
- (2) Production of methane from anaerobic digestion, which could be used as a natural gas substitute;
- (3) Production of RDF from garbage, which could be used as a fuel source in the cement industry.

The estimated impacts of these three components could total 38 million GJ/year, if all were proven successful. The answer to this question would not be available for about 2 years.

All of the impacts of the recycling strategy should be assigned to the industrial sector.

HI. RESEARCH METHODOLOGY

3.1 Introduction

The objectives of this research on the topic "Attitude Survey towards Energy Conservation" is to study about the energy consumption of Thai people, their attitude toward energy conservation and their awareness of energy conservation programs launched by the government sector which effect their energy saving behavior in daily life. The secondary data were obtained from various sources such as bulletin, research reports and Internet while the primary data, a survey was used to collect data from the sampling unit.

3.2 Research Design

In this research, the quantitative research design has been adopted. A survey was used as the data collection method. The researcher decided to use questionnaire as a primary data collection instrument in this survey. Since this research was designed to reach all groups of people, the simple random sampling method was applied. The research took place in various places such as the public enterprises, the stated enterprises, and the universities to reach various groups of people. The questionnaires included 24 questions that are divided into 3 parts as follows:

- Part 1: The researcher used 5 closed-ended questions to gather the personal information of the respondents. It includes gender, age, marital status, education and level of income.
- Part 2: At the beginning of this part, the respondents are to be divided into 2 groups, the respondents who interested in energy conservation and the respondents who did not interested in energy conservation. The respondents who interested in energy conservation would continue on this part and skip Part 3, while the respondents who did not interested

in energy conservation would skip this part and continue on Part 3. In this part, the rank-order scales, closed-ended and opened-ended question are used to find out the attitude, awareness and behavior of the respondents who interested in energy conservation. This part is made of 15 questions.

Part 3: The questions used in this part are designed for the respondents who did not interested in energy conservation. In this part, only 4 of closed-ended and opened-ended questions were applied to find out their attitude and their awareness towards energy conservation. This part is made of 4 questions.

3.3 Data Collection

In this phase, 500 questionnaires were distributed to collect primary data. The researcher went to various places such as the public enterprises, the stated enterprises, and the universities to get data from various groups of people. The researcher distributes the questionnaires to respondents by asking them to fill out and waited for them to complete. Moreover, the researcher helped explain in some items in case the respondents did not understand the question. After the questionnaires were returned, the researcher checked for the errors and incomplete data and asked the respondents to complete it in order to get the correct data to analyze. However, there were some problems and obstructions during this phase. Some of the respondents don't have time to finish the questionnaire right away. Therefore, they took the questionnaire and promised to return to the researcher later but they didn't. The amount of this lost is up to 77 questionnaires (15.4%). 23 of which lost the questionnaire (29.9%), 35 of which ignore to fill and left the questionnaire (45.4%) and 19 of which were disappeared (24.7%). The amount of returned questionnaires was 423 from the total of 500 (84.6%).

After the questionnaires were checked for the errors and incomplete data by the researcher, it was certain that 23 (5.4%) of them contained incomplete data. These questionnaires were separated and excluded from the analysis. Therefore, only 400 completed questionnaires were analyzed and used to extract pertinent finding.

For the secondary data, the researcher used EGAT Bulletin, research reports and the Internet to gather information (see bibliography).

3.4 Sample Population

The researcher approached the public enterprises, the stated enterprises, and the universities for distribution of 500 questionnaires and finally got the total of 400 as the sample population. Simple random sampling were employed in this survey in the areas of Bangkok and Nonthaburi for distributing the questionnaire. The questionnaires were distributed as follow:

- (1) Ministry of Finance, Phayathai Road. 50 questionnaires were distributed and 43 of them were returned (86.0%).
- (2) Lumpini Tower, Rama IV Road. 50 questionnaires were distributed and 35 of them were returned (70.0%).
- (3) Dhurakijpundit University, Ngamwongwan Road. 100 questionnaires were distributed and 93 of them were returned (93.0%).
- (4) Assumption University, Ramkhamhaeng Road. 100 questionnaires were distributed and 95 of them were returned (95.0%).
- (5) Kasem Bundit University, Pattanakarn Road. 50 questionnaires were distributed and 40 of them were returned (80.0%).
- (6) The Electricity Generating Authority of Thailand, Charansanitwong Road. 100 questionnaires were distributed and 78 of them were returned (78.0%).

(7) Bamraj Naradune Hospital, Tiwanond Road. 50 questionnaires were distributed and 39 of them were returned (78.0%).

3.5 Data Analysis

The SPSS software program has been used to find out the attitude towards energy conservation of respondents in statistical methods. The steps in the analysis of data are as follows:

- (1) Set the variables and code for each question and choice in the program.
- (2) Level of importance that was ranked for traits was analyzed by SPSS program.
- (3) The results of each question were analyzed in tables and graphical format. Frequency, mean standard deviation and chi-square were calculated.
- (4) The level of agreement and the important of various features were:

Scale 5 means Very much

Scale 4 means Much

Scale 3 means Moderate

Scale 2 means Little

Scale 1 means At least

- (5) The researcher used Mean and Standard deviation for calculating the result of question no.9,12 ,13 and 22.

Mean Criteria for the question no.12 and 13 were:

4.56-5.00 means Most.

3.56-4.55 means Much.

2.56-3.55 means Fair.

1.56-2.55 means Little.

1.00-1.55 means Not at all.

(6) Mean Criteria for the question no.9 and 22 were:

4.56-5.00	means	A lot.
3.56-4.55	means	Enough.
2.56-3.55	means	Too little.
1.56-2.55	means	Get much more knowledge.
0.56-1.55	means	Get little more knowledge.
0-0.55	means	Not get any knowledge.

(7) A 95% level of confidence standard (<0.05) was used as a test for statistical significance. The researcher used Chi-square method to test relationship between independent variable and dependent variable that related to gender, age and education of the respondents with the following model.

$$\chi^2 = \sum_{i=1}^E \frac{(O - E)^2}{E}$$

Where: χ^2 - Chi-square
 - Observed frequency
 - Expected frequency
 - Number of sample group

The researcher selected 40 tables that were tested as dependent variable (<0.05) from all Chi-square test result 169 tables (other 129 tables were tested as independent variable). And put all dependent variable tables in appendix B.

IV. DISCUSSION ON THE FINDINGS

The results and summaries of 400 questionnaires from table no.3.1.-3.30. in appendix B which calculated by frequency and mean were as follows:

First Part (General Information)

Question no.1-5

- (1) It was found that most of respondents (63.5%: Table3.1) were female, single (70%: Table3.3), age between 20-30 years old (48.0%: Table3.2) holding bachelor degree (70.8%: Table3.4), who were young adults and the future of Thailand. Half of the respondents (50%: Table3.5) earned income below 10,000 baht.

Second Part (Questions toward General Idea and Behavior)

Question no.6-20

- (2) From Table 3.6 the results witnessed the idea of Thai people in energy conservation. Some of Group 1 (28.5%) were just interested in energy saving but they still did not start to do it in their life and family. More than half of the respondents of Group 2 (67%) realized that energy saving was interesting and necessary. They already started to save energy in their daily life. Only very few of them at 4.5% (Group 3) are not interested in energy saving and felt that it was not necessary to their life.
- (3) The respondents in group 1 and 2 answered the question in part 2. The respondents in group 3 answered only the question in part 3.
- (4) From Table 3.7, Most people in group 1 (68.7%) were interested in conserving energy in order to save resource for the future. Most people in

group 2 (71.9%) were interested in conserving energy in order to reduce the expense in family.

- (5) From Table 3.8, Most people in group 1 (93%) and group 2 (93.6%) realized that the energy resource was gradually running out so that it should be preserved. From Table 3.9, most of group 1(43.5%:mean 3.38) and group 2 (46.4%:mean 3.29) thought that they perceived too little information of energy saving from campaign at present.
- (6) From Table 3.11, 91.3% of people in group 1 knew most the program of Divide Energy by 2. But 93.3% of people in group 2 knew most the program of the Energy Saving Lable.
- (8) From Table 3.12, 98.3% of group 1 and 98.5% of group 2 knew energy saving campaign from T.V.. From Table 3.13, 60%(mean 2.97) of group 1 and 50.9%(mean 2.49) of group 2 feel that those campaigns fairly effected their energy saving concerns. Table 3.15 showed that 60.9% (mean 3.18) of group 1 and 62.9% (mean 2.65) of group 2 fairly used the program knowledge in daily life.
- (9) From Table 3.17, campaign on T.V. effects most 73% of group 1 and 75.7% of group 2. Table 3.18 showed that regular activity on energy saving were 89.6% of group 1 and 93.6% of group 2 who turned off lamp and any electric devices after working.
- (10) From Table 3.19, 41.7% of group 1 had been joining energy conservation for 1-2 years. 26.6% of group 2 had been joining energy conservation for more than 5 years.
- (11) Table 3.20 showed that 57.4% of group 1 and 59.9% of group 2 understood the meaning of octane value (81,91,95) and chose the suitable one with their

cars. From Table 3.21, most of group 1 (54.8%) and group 2 (50.9%) used cars less when fuel price rose higher.

- (12) From Table 3.22, most of respondents in group 1 (83.5%) and group 2 (86.1%) used energy efficient fluorescent tube. Table 3.23 showed that 89.6% of group 1 used it to save the expense for the leading reason. And most of respondents in group 2 (70.0%) used it because of saving energy for the leading reason. From Table 3.24, 68.4% of respondents in group 1 and 70.3% of group 2 did not use those kinds of tubes because the old ones were still working.
- (13) From Table 3.25, the main reason for most people in group 1 and 2 in choosing the electric devices was the price.

Third Part (Questions toward General Idea and Behavior)

Question no.21-24

- (14) From Table 3.26, 61.1% of people in group 3 felt that there were lots of energy at present such as sun energy, wind energy, biogas etc. Therefore they thought that energy saving was unnecessary.
- (15) From Table 3.27, most people in group 3 (44.4%) thought that publicizing the information of energy saving was too little (mean 3.11) at present like most people in group 1 and 2.
- (16) Table 3.29 showed that most people in group 3 (88.9%) knew the program of Divide Energy by 2 most like most people in group 1.
- (17) From Table 330, 94.4% of people in group 3 knew energy saving campaign from T.V. most like most respondents in group 1 and 2.

St. Gabriel Library,

The results and summaries of 400 questionnaires from table no.3.31.-3.71. in appendix B which answered the questions in second and third part of the questionnaire and calculated by Pearson Chi-square (<0.05) were as follows:

Second Part (Questions toward General Idea and Behavior)

Question no.6-20

- (1) From Table 3.31, age related to the interesting of Thai people (Chi-square 0.03). And Table 3.32 indicated that education related to the interesting of Thai people also (Chi-square 0.00).
- (2) From Table 3.33, age related to the respondents' idea in choice 3 of question no.7 that energy saving is necessary because it could help country (Chi-square 0.00). And Table 3.34 showed that education related to the respondents' idea in choice 4 that energy saving is necessary for them because of waste not the energy (Chi-square 0.05).
- (3) Table 3.35 indicated that gender related to the idea in choice 1 of question no. 8 that there is still plenty of energy (Chi-square 0.05). And Table 3.36 showed that gender related to the idea in choice 3 that energy resource is gradually running out so that we should save it (Chi-square 0.00). From Table 3.37, the education related to the idea in choice 2 that we could find other energy in the future although it is running out (Chi-square 0.04). And Table 3.38 indicated that education related to the idea in choice 3 that energy is gradually running out so that we should save it (Chi-square 0.00).
- (4) Table 3.39 indicated that Age related to choice 1 of question no.10 that focused on Divide energy by 2 program (Chi-square 0.00). Table 3.40 indicated that Age related to choice 4 that focused on Green learning room

program (Chi-square 0.02). From table 3.41, age related to choice 5 that focused on Green building program (Chi-square 0.02). Next, education related to the choice 1 that focused on Divide energy by 2 program (Chi-square 0.02) following the Table 3.42. And education related to the choice 4 that focused on Green learning room (Chi-square 0.03) following the Table 3.43.

- (5) From Table 3.44, age related to the choice 3 of question no.11 that focused on knowing energy saving campaign from friends (Chi-square 0.00). Table 3.45, age related to the choice 8 that focused on knowing energy saving campaign from Energy Saving Exhibition (Chi-square 0.04). Next, education related to the choice 4 that focused on knowing energy saving campaign from brochure (Chi-square 0.04) following Table 3.46. Table 3.47 showed the education that related to the choice 5 focusing on knowing energy saving campaign from newspapers (Chi-square 0.03). And Table 3.48 showed the education that related to the choice 8 focusing on knowing energy saving campaign from Energy saving exhibition (Chi-square 0.03).
- (6) From Table 3.49, gender (Chi-square 0.02) related friends to the choice 3 of question no. 14 that focused on effecting on the decision of energy saving. Age (Chi-square 0.00) related to friends to the choice 3 following Table 3.50. Next, age (Chi-square 0.00) related to parent to the choice 6 following Table 3.51. From Table 3.52, age (Chi-square 0.00) related to husband/wife to the choice 9. Following Table 3.53, education (Chi-square 0.02) related to radio to the choice 2. Next, Education (Chi-square 0.04) related to the Energy saving exhibition to the choice 8 following Table 3.54. And for Table 3.55, education (Chi-square 0.00) related to husband/wife to the

choice 9. Following table 3.56, education (Chi-square 0.02) related to teacher to the choice 11. And education (Chi-square 0.00) related to Brothers/sisters to the choice 12 following Table 3.57.

From Table 3.58, gender (Chi-square 0.00) related to activities on energy saving of choice 2 from question no. 15 that the respondents always check the wheels because the soft wheels would waste more fuel. From Table 3.59, gender (Chi-square 0.03) related to choice 5 that the respondents use electric fan instead of air conditioning when it is not too hot. And for Table 3.60, gender (Chi-square 0.00) related to choice 6 that focused on taking out the iron plug before finishing because there is still the left energy. Next, gender (Chi-square 0.04) related to choice 7 that focused on always check and repair the electric devices to be in good condition following Table 3.61. Age (Chi-square 0.00) related to choice 1 that focused on not start engine while parking including shut the engine while carry belongings and waiting for others following Table 3.62. Age, (Chi-square 0.00) related to choice 2 following Table 3.63. Next, age (Chi-square 0.00) related to choice 7 following Table 3.64. age (Chi-square 0.00) related to choice 9 following Table 3.65. From Table 3.66, education (Chi-square 0.00) related to choice 2. Education (Chi-square 0.01) related to choice 7 following Table 3.67. And education (Chi-square 0.04) related to choice 10 which respondents choose proper octane with their cars following Table 3.68.

Third Part (Questions toward General Idea and Behavior)

Question no.21-24

- (1) From Table 3.69, gender (Chi-square 0.00) related to the understanding of meaning octane value (87, 91,95) and chooses the suitable one with their cars.
- (2) From Table 3.70, gender (Chi-square 0.02) related to the idea of respondents that energy saving is unnecessary on choice 4. And age (Chi-square 0.05) related to choice 1 following Table 3.71



V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The research on "Attitude Survey towards Energy Conservation" was to find out concerns of Thai people on energy saving, and whether the campaigns effected on the use of energy among Thai people. The researcher had made an attempt to analyze the obstacle of energy saving in Thailand.

After data collection and analysis, it could be concluded as follows:

- (1) Most of Thai people realized the importance of energy saving and started implementing with interest. Moreover, they were aware of the lack of energy in the future.
- (2) Most respondents thought that there were too few issues of the information on energy saving to Thai people, and were not much interested in energy saving program and campaign.
- (3) The media and campaign just moderately effected on the use of energy among Thai people.
- (4) Age and education related to the interesting of Thai people on energy conservation, which were calculated by Chi-square test.

The most samples had positive attitude and concerns towards energy saving.

5.2 Recommendations

Energy was vital thing for human being. Thailand had to provide sufficient energy each year for Thai people with a lot of money. Although we tried to reduce the proportion of the energy using from other countries, but there was still the high rate of proportion. So the energy saving was the important matter and it was necessary for everyone including business enterprises and all Thai people to concern with energy conservation. Most Thai people used energy for their comfort in daily life. From the evaluation of the potential in energy saving, Thai people and their family could reduce much expense in consuming energy if they had more knowledge and understanding on the methods of consuming energy.

In the future, the government should launch more campaigns by using effective media. From the research, the important media were T.V. and radio which could be the tools for Thai government to motivate Thai people in different approaches to a rouse concerns on the lack of energy not only in Thailand but worldwide.

The campaigns should focus on the young generation who would be the future of our country. Those young people should learn more lessons about the shortage of energy resource and practically energy saving in their schools.

The government should provide more budgets on the campaign because the more people became aware of energy shortage, the more they would spare the use of energy. This would help our country to save more energy and money for the next generation.



APPENDIX A

SURVEY QUESTIONNAIRE IN THAI AND IN ENGLISH

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SINCE 1969

Questionnaire to study the attitude survey towards energy conservation

Part one: General personal information

- | | | |
|------------------|--------------------------|---------------------|
| 1.) Sex | 1. Male | 2. Female |
| 2.) Age | 1. Under 20 | 4. 41-50 |
| | 2. 20-30 | 5. Over 50 |
| | 3. 31-40 | |
| 3.) Status | 1. Single | 2. Married |
| 4.) Education | 1. Below than highschool | 4. Bachelor degree |
| | 2. High school | 5. Master degree |
| | 3. Vocational degree | 6. Doctorate degree |
| 5.) Income level | 1. Below 10000 | 3. 15001-25000 |
| | 2. 10000-15000 | 4. Over 25000 |

Part two : Questions toward general idea and behavior

- 6.) What is your idea about energy conservation?
1. It's interesting and necessary. But I don't start to do it yet. (Do only part 2)
 2. It's interesting and necessary and I started to do it. (Do only part 2)
 3. It's not interesting and not necessary. (Do only part 3)
- 7.) Why the energy conservation is necessary for you? (Can choose more than 1 choice)
1. To reduce the expense in the family.
 2. To conserve energy resource for the future.
 3. To help our country.
 4. To waste not the energy.
 5. Others (Please answer)

- 8.) What is your idea about energy resource at present? (Can choose more than 1 choice)
1. There is still plenty of energy resource.
 2. Although the energy is running out, but we could find others in the future.
 3. It is gradually running out so that we should save it.
 4. Others (Please answer)
- 9.) What do you think about publicizing the information of energy saving at present?
1. A lot.
 2. Enough.
 3. Too little.
 4. Get much more knowledge.
 5. Get little more knowledge.
 6. Not get any knowledge.
- 10.) Which program do you know? (Can choose more than 1 choice)
1. Divide Energy by 2.
 2. The Energy Saving Label.
 3. The Energy Efficient Fluorescent Tube.
 4. Green Learning Room.
 5. Green Building.
 6. Others (Please answer)

11.) Where did you know energy saving campaign ?(Can choose more than 1 choice)

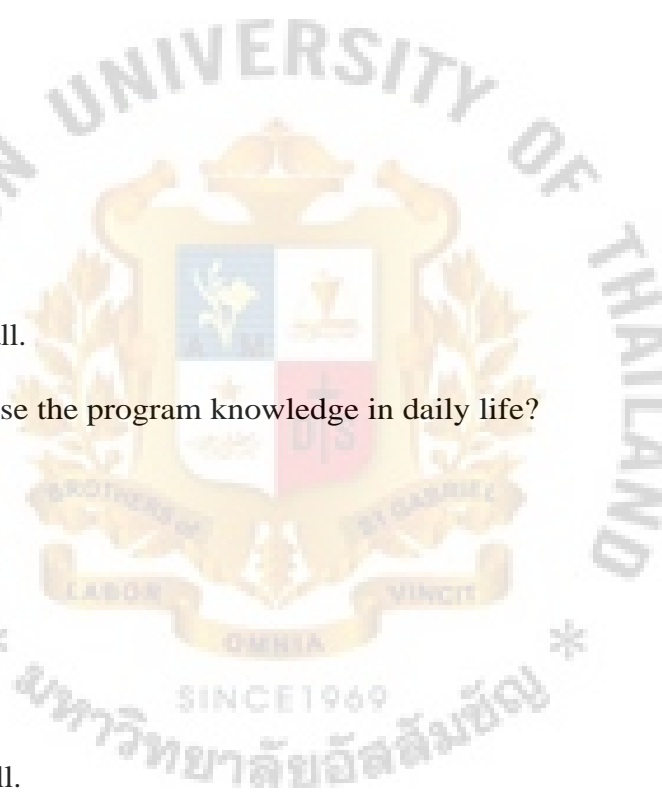
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| 1. On T.V. | 6. Family member. |
| 2. Radio. | 7. Magazine. |
| 3. Friends. | 8. Energy Saving Exhibition. |
| 4. Brochure. | 9. Others (Please answer)..... |
| 5. Newspaper. | |

12.) How do those campaigns effect your energy saving concern?

1. Most.
2. Much.
3. Fair.
4. Little.
5. Not at all.

13.) How do you use the program knowledge in daily life?

1. Most.
2. Much.
3. Fair.
4. Little.
5. Not at all.



14.) What is the effect on your decision of energy saving? (Can choose more than 1 choice)

- | | |
|---------------|---------------------------------|
| 1. On T.V. | 7. Magazine. |
| 2. Radio. | 8. Energy Saving Exhibition. |
| 3. Friends. | 9. Husband / Wife. |
| 4. Brochure. | 10. My self |
| 5. Newspaper. | 11. Teacher |
| 6. Parent. | 12. Others (Please answer)..... |

15.) Your activities on energy saving. (Can choose more than 1 choice)

1. Not start engine while parking. Shut the engine while carry belongings and waiting for others.
2. Always check the wheels because the soft wheels would waste more fuel.
3. Turn off lamp switches and any electric devices after working.
4. Check standard electric devices with energy saving label before buying.
5. Use electric fan instead of air conditioning when it is not too hot.
6. Take out the iron plug before finishing because there is still the left energy.
7. Always check and repair the electric devices to be in good condition.
8. Not waste the water during washing face, brushing teeth and taking a bath.
9. Separate the different garbage for reducing energy when destroy them.
10. Choose proper octane value with your car.

16.) How long have you been joining energy conservation?

- | | |
|----------------------|-----------------------|
| 1. Less than 1 year. | 4. 3-4 years. |
| 2. 1-2 years. | 5. 4-5 years. |
| 3. 2-3 years. | 6. More than 5 years. |

17.) Do you understand the meaning of octane value (87,91,95) and choose the suitable one with your car?

1. Understand and choose the suitable one.
2. Understand and choose the highest-octane value.
3. Not understand but can choose the suitable one.
4. Not understand and not know that the used one is suitable.

18.) How does the higher fuel price effect on using car?

1. Less using.
2. Normal using.

19.) Do you use energy efficient fluorescent tube? Why?

19.1 Use because

1. Saving energy.
2. Saving the expense.
3. More working life.
4. Others (Please answer).....

19.2 Not use because

1. More expensive than normal tube.
2. Cannot fit with old devices.
3. The old one is still working.
4. Others (Please answer).....

20.) What is your main reason for choosing the electric devices (Rank 1 the most, 5 least)

- | | |
|-------------------------------------|-------------------------------|
| Price |Brand name |
|Energy saving (Label number 5) |Discount and Promotion |
|Beauty | Durability |
|Easy to buy | Others(Please answer)... |

Part two : Questions toward general idea and behavior.

21.) Why do you think that energy saving is unnecessary?

1. Energy resource (crude oil, coal, water etc.) is plenty.
2. It makes daily life uncomfortable.
3. There are lots of energy at present such as sun energy, wind energy, biogas etc.)
4. Not have long life till the terminated energy occurs.
5. No need to conserve because we can acquire.
6. Others (Please answer)

22.) What do you think about publicizing the information of energy saving at present?

1. A lot.
2. Enough.
3. Too little.
4. Get much more knowledge.
5. Get little more knowledge.
6. Not get any knowledge.

23.) Which program do you know? (Can choose more than 1 choice)

1. Divide Energy by 2.
2. The Energy Saving Label.
3. The Energy Efficient Fluorescent Tube.
4. Green Learning Room.
5. Green Building.
6. Others (Please answer)

24.) Where did you know energy saving campaign ?(Can choose more than 1 choice)

1. On T.V.
2. Radio.
3. Friends.
4. Brochure.
5. Newspaper.
6. Family member.
7. Magazine.
8. Energy Saving Exhibition.
9. Others (Please answer).....





APPENDIX B

SURVEY RESULT IN TABLES

Table 3.1. The Result of Question No. 1.

Gender	Frequency	Percent
Male	146	36.5
Female	254	63.5
Total	400	100.0

Table 3.2. The Result of Question No. 2.

Age	Frequency	Percent
Under 20 years	68	17.0
20-30 years	192	48.0
31-40 years	54	13.5
41-50 years	62	15.5
Over 50 years	24	6.0
Total	400	100.0

Table 3.3. The Result of Question No. 3.

Status	Frequency	Percent
Single	280	70.0
Married	120	30.0
Total	400	100.0

Table 3.4. The Result of Question No. 4.

Education	Frequency	Percent
Below high school	7	1.8
High school	39	9.8
Vocational school	45	11.3
Bachelor degree	283	70.8
Master degree	24	6.0
Doctorate degree	2	0.5
Total	400	100.0

Table 3.5. The Result of Question No.5.

Income level	Frequency	Percent
Below 10,000 baht	200	50.0
10,000-15,000 baht	62	15.5
15,001-25,000 baht	67	16.8
Over 25,000 baht	71	17.8
Total	400	100.0

Table 3.6. The Result of Question No. 6.

Idea	Frequency	Percent
It's interesting and necessary. But I don't start to do. (Group 1)	115	28.5
It's interesting and necessary and I started to do it. (Group2)	267	67.0
It's not interesting and not necessary. (Group3)	18	4.5
Total	400	100.0

Table 3.7. The Result of Question No. 7.

Why the energy conservation is necessary for you? (Can choose more than 1 choice)

	Group 1	Group 2
Choice 1 : To reduce the expense in the family.	60.9 %	71.9 %
Choice 2 : To conserve energy resource for the future.	68.7 %	64.8 %
Choice 3 : To help our country.	40.0 %	41.9 %
Choice 4 : To waste not the energy.	47.8 %	56.6 %
Choice 5 : Others.	0 %	0 %

Table 3.8. The Result of Question No. 8.

What is your idea about energy resource at present? (Can choose more than 1 choice)

	Group 1	Group 2
Choice 1 : There is still plenty of energy.	5.2 %	1.5 %
Choice 2 : Although the energy is running out, but we could find others in the future.	19.1 %	10.5 %
Choice 3 : It is gradually running out so that we should save it.	93.0 %	93.6 %
Choice 4 : Others.	0 %	0%

Table 3.9. The Result of Question No. 9.

What do you think about publicizing the information of energy saving at present?

	Group 1	Group 2
Choice 1 : A lot.	4.3 %	3.7 %
Choice 2 : Enough.	14.8 %	15.7 %
Choice 3 : Too little.	43.5 %	46.4 %
Choice 4 : Get much more knowledge.	14.8 %	16.5 %
Choice 5 : Get little more knowledge.	20.9 %	17.2 %
Choice 6 : Not get any knowledge.	1.7 %	0.4 %
Total	100.0 %	100.0 %

Table 3.10. The Statistical Result of Question No. 9.

Descriptive Statistics	Group 1		Group 2	
	Mean	S.D.	Mean	S.D.
You think about public relations campaigns to support energy saving at present.	3.38	1.15	3.29	1.06

Table 3.11. The Result of Question No. 10.

Which program do you know? (Can choose more than 1 choice)

	Group 1	Group 2
Choice 1 : Divide Energy by 2.	91.3 %	92.9 %
Choice 2 : The Energy saving Label.	90.4 %	93.3 %
Choice 3 : The Energy Efficient Fluorescent Tube.	75.7 %	87.6 %
Choice 4 : Green Learning Room.	12.2 %	27.7 %
Choice 5 : Green Building.	20.0 %	34.5 %
Choice 6 : Others.	0 %	0%

Table 3.12. The Result of Question No. 11.

Where did you know energy saving campaign? (Can choose more than 1 choice)

	Group 1	Group 2
Choice 1 : On T.V.	98.3 %	98.5 %
Choice 2 : Radio.	55.7 %	60.7 %
Choice 3 : Friends.	11.3 %	17.6 %
Choice 4 : Brochure.	26.1 %	42.7 %
Choice 5 : Newspaper.	45.2 %	54.3 %
Choice 6 : Family member.	17.4 %	28.8 %
Choice 7 : Magazine.	27.8 %	34.1 %
Choice 8 : Energy Saving Exhibition.	28.7 %	41.9 %
Choice 9 : Others.	0 %	0%

Table 3.13. The Result of Question No. 12.

How does those campaigns effect your energy saving concern?

	Group 1	Group 2
Choice 1 : Most.	7.0 %	11.2 %
Choice 2 : Much.	13.0 %	33.0 %
Choice 3 : Fair.	60.0 %	50.9 %
Choice 4 : Little.	16.5 %	4.9 %
Choice 5 : Not at all.	3.5 %	0 %
Total	100.0 %	100.0 %

Table 3.14. The Statistical Result of Question No. 12.

Descriptive Statistics	Group 1		Group 2	
	Mean	S.D.	Mean	S.D.
Those campaign effect on your energy saving concern.	2.97	0.85	2.49	0.76

Table 3.15. The Result of Question No. 13.

How do you use the program knowledge in daily life?

	Group 1	Group 2
Choice 1 : Most.	1.7 %	6.0 %
Choice 2 : Much.	9.6 %	27.0 %
Choice 3 : Fair.	60.9 %	62.9 %
Choice 4 : Little.	24.3 %	4.1 %
Choice 5 : Not at all.	3.5 %	0 %
Total	100.0 %	100.0 %

Table 3.16. The Statistical Result of Question No. 13.

Descriptive Statistics	Group 1		Group 2	
	Mean	S.D.	Mean	S.D.
You use the program knowledge in daily life.	3.18	0.72	2.65	0.66

Table 3.17. The Result of Question No. 14.

What is the effect on your decision of energy saving? (Can choose more than 1 choice)

	Group 1	Group 2
Choice 1 : On T.V.	73.0 %	75.7 %
Choice 2 : Radio.	22.6 %	32.2 %
Choice 3 : Friends.	20.0 %	16.1 %
Choice 4 : Brochure.	6.1 %	11.2 %
Choice 5 : Newspaper.	19.1 %	19.1 %
Choice 6 : Parent.	30.4 %	31.5 %
Choice 7 : Magazine.	12.2 %	14.2 %
Choice 8 : Energy Saving Exhibition.	16.5 %	23.2 %
Choice 9 : Husband / wife.	1.7 %	8.6 %
Choice 10 : Myself	58.3 %	69.3 %
Choice 11 : Teacher	13.0 %	15.0 %
Choice 12 : Brother / sister.	0.9 %	3.0 %

Table 3.18. The Result of Question No. 15.

Your activities on energy saving. (Can choose more than 1 choice)

	Group 1	Group 2
Choice 1 : Not start engine while parking. Shut the engine while carry belongings and waiting for others.	38.3 %	44.2 %
Choice 2 : Always check the wheels because the soft wheels would waste more fuel.	18.3 %	33.0 %
Choice 3 : Turn off lamp switches and any electric devices after working.	89.6 %	93.6 %
Choice 4 : Check standard electric devices with energy saving label before buying.	43.5 %	52.4 %
Choice 5 : Use electric fan instead of air conditioning when it is not too hot.	53.0 %	65.5 %
Choice 6 : Take out the iron plug before finishing because there is still the left energy.	40.0 %	44.2 %
Choice 7 : Always check and repair the electric devices to be in good condition.	20.9 %	25.5 %
Choice 8 : Not waste the water during washing face, brushing teeth and taking a bath.	60.9 %	79.0 %
Choice 9 : Separate the different garbage for reducing energy to destroy them.	19.1 %	24.3 %
Choice 10 : Choose proper octane with your car.	40.9 %	38.2 %

Table 3.19. The Result of Question No. 16.

How long have you been joining energy conservation?

	Group 1	Group 2
Choice 1 : Less than 1 year.	21.7 %	7.1 %
Choice 2 : 1-2 years.	41.7 %	23.6 %
Choice 3 : 2-3 years.	11.3%	16.1 %
Choice 4 : 3-4 years.	6.1%	20.2 %
Choice 5 : 4-5 years.	3.5 %	6.4 %
Choice 6 : More than 5 years.	15.7 %	26.6 %
Total	100.0 %	100.0 %

Table 3.20. The Result of Question No. 17.

Do you understand the meaning of octane value (87,91,95) and choose the suitable one with your car?

	Group 1	Group 2
Choice 1 : Understand and choose the suitable one.	57.4 %	59.9 %
Choice 2 : Understand and choose the highest-octane value.	7.8 %	11.6 %
Choice 3 : Not understand but can choose the suitable one.	17.4 %	15.7 %
Choice 4 : Not understand and not know that the used one is suitable.	17.4 %	12.7 %
Total	100.0 %	100.0 %

Table 3.21. The Result of Question No. 18.

How does the higher fuel price effect on using car?

	Group 1	Group 2
Choice 1 : Less using.	54.8 %	50.9 %
Choice 2 : Normal using.	45.2 %	49.2 %
Total	100.0 %	100.0 %

Table 3.22. The Result of Question No. 19.

Do you use energy efficient fluorescent tube? Why?

	Group 1	Group 2
Choice 1 : Use.	83.5 %	86.1 %
Choice 2 : Not use.	16.5 %	13.9 %
Total	100.0 %	100.0 %

Table 3.23. The Result of Question No. 19.1.

Use because

	Group 1	Group 2
Choice 1 : Saving energy.	59.4 %	70.0 %
Choice 2 : Saving the expense.	89.6 %	58.2 %
Choice 3 : More working life.	49.0 %	52.2 %
Choice 4 : Others.	0 %	0 %

Table 3.24. The Result of Question No. 19.2.

Not use because

	Group 1	Group 2
Choice 1 : More expensive than normal tube.	36.8 %	37.8 %
Choice 2 : Cannot fit with old devices.	21.1 %	16.2 %
Choice 3 : The old one is still working.	68.4 %	70.3 %
Choice 4 : Others.	0 %	0 %

Table 3.25. The Result of Question No. 20.

What is your main reason for choosing the electric devices (Rank 1 the most, 5 least)

Group 1	Group 2	Main reason
First	First	Price
Second	Second	Energy saving (Label number 5)
Third	Third	Durability
Forth	Forth	Brand name
Fifth	Fifth	Beauty
Sixth	Sixth	Easy to buy
Seventh	Seventh	Discount and Promotion

Table 3.26. The Result of Question No. 21.

Why do you think that energy saving is unnecessary?

	Group 3
Choice 1 : Energy resource (crude oil, coal, water etc) is plenty.	22.2 %
Choice 2 : It makes daily life uncomfortable.	55.6 %
Choice 3 : There are lots of energy at present such as sun energy, wind energy, biogas etc.	61.1 %
Choice 4 : Not live longer till the terminated energy occurs.	22.2 %
Choice 5 : No need to conserve because we can acquire.	16.7%
Choice 6 : No ideas.	5.6 %

Table 3.27. The Result of Question No. 22.

What do you think about publicizing the information of energy saving at present?

	Group 1	Group 2	Group 3
Choice 1 : A lot.	4.3 %	3.7 %	11.1 %
Choice 2 : Enough.	14.8 %	15.7 %	16.7 %
Choice 3 : Too little.	43.5 %	46.4 %	44.4 %
Choice 4 : Get much more knowledge.	14.8 %	16.5 %	5.6 %
Choice 5 : Get little more knowledge.	20.9 %	17.2 %	22.2 %
Choice 6 : Not get any knowledge.	1.7 %	0.4 %	0 %
Total	100.0 %	100.0 %	100.0 %

Table 3.28. The Statistical Result of Question No. 22.

Descriptive Statistics	Group 1		Group 2		Group 3	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
You think about public relation campaigns to support energy saving at present.	3.38	1.15	3.29	1.06	3.11	1.28

Table 3.29. The Result of Question No. 23.

Which program do you know? (Can choose more than 1 choice)

	Group 1	Group 2	Group 3
Choice 1 : Divide Energy by 2.	91.3 %	92.9 %	88.9 %
Choice 2 : The Energy saving Label.	90.4 %	93.3 %	83.3 %
Choice 3 : The Energy Efficient Fluorescent Tube.	75.7 %	87.6 %	72.2 %
Choice 4 : Green Learning Room.	12.2 %	27.7 %	22.2 %
Choice 5 : Green Building.	20.0 %	34.5 %	5.6 %
Choice 6 : Others.	0 %	0 %	0%

Table 3.30. The Result of Question No. 24.

Where did you know energy saving campaign? (Can choose more than 1 choice)

	Group 1	Group 2	Group 3
Choice 1 : On T.V.	98.3 %	98.5 %	94.4 %
Choice 2 : Radio.	55.7 %	60.7 %	55.6 %
Choice 3 : Friends.	11.3 %	17.6 %	22.2 %
Choice 4 : Brochure.	26.1 %	42.7 %	33.3 %
Choice 5 : Newspaper.	45.2 %	54.3 %	55.6 %
Choice 6 : Family member.	17.4 %	28.8 %	22.2 %
Choice 7 : Magazine.	27.8 %	34.1 %	38.9 %
Choice 8 : Energy Saving Exhibition.	28.7 %	41.9 %	44.4 %
Choice 9 : Others.	0 %	0 %	0%

Table 3.31. The Chi-square Test Result of Question No. 6. Related to the Age.

Your idea about energy conservation.

Age	It is interesting and necessary, but I do not start to do.		It is interesting and necessary, and I start to do it.		It is not interesting and not necessary.		Total	
	Count	%	Count	%	Count	%	Count	%
Under 20 years	25	6.3	39	9.8	4	1.0	68	17.0
20-30 years	66	16.5	121	30.3	5	1.3	192	48.0
31-40 years	10	2.5	41	10.3	3	0.8	54	13.5
41-50 years	9	2.3	49	12.3	4	1.0	62	15.5
Over 50 years	5	1.3	17	4.3	2	0.5	24	6.0
Total	115	28.8	267	66.8	18	4.5	400	100.0

Pearson Chi-square 0.03

Table 3.32. The Chi-square Test Result of Question No. 6. Related to the Education.

Education	It is interesting and necessary, but I do not start to do.		It is interesting and necessary, and I start to do it.		It is not interesting and not necessary.		Total	
	Count	%	Count	%	Count	%	Count	%
Below high school	4	1.0	2	0.5	1	0.3	7	1.8
High school	9	2.3	27	6.8	3	0.8	39	9.8
Vocational degree	8	2.0	31	7.8	6	1.5	45	11.3
Bachelor degree	90	22.5	187	46.8	6	1.5	283	70.8
Master degree	4	1.0	19	4.8	1	0.3	24	6.0
Doctorate degree	-	-	1	0.3	1	0.3	2	0.5
Total	115	28.8	267	<u>66.8</u>	18	4.5	400	100.0

Pearson Chi-square 0.00

Table 3.33. The Chi-square Test Result of Question No. 7. Related to the Age. (Choice 3)

Why the energy conservation is necessary for you?

Choice 3: To help our country.

Age	Accepted		Unaccepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Under 20 years old	32	8.4	32	8.4	64	16.8
20-30 years old	103	27.0	84	22.0	187	49.0
31-40 years old	40	10.5	11	2.9	51	13.4
41-50 years old	40	10.5	18	4.7	58	15.2
Over 50 years old	9	2.4	13	3.4	22	5.8
Total	224	58.6	158	41.4	382	100.0

Pearson Chi-square 0.00

Table 3.34. The Chi-square Test Result of Question No. 7. Related to the Education. (Choice 4)

Choice 4: To waste not the energy.

Education	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Below high school	4	1.0	2	0.5	6	1.6
High school	23	6.0	13	3.4	36	9.4
Vocational degree	20	5.2	19	5.0	39	10.2
Bachelor degree	123	32.2	154	40.3	277	72.5
Master degree	6	1.6	17	4.5	23	6.0
Doctorate degree	-	-	1	0.3	1	0.3
Total	176	46.1	206	53.9	382	100.0

Pearson Chi-square 0.05

Table 3.35. The Chi-square Test Result of Question No. 8 Related to Gender. (Choice 1)

What is your idea about energy resource at present?

Choice 1: There is still plenty of energy

Gender	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Male	131	34.3	6	1.6	137	35.9
Female	242	63.4	3	0.8	245	64.1
Total	373	97.6	9	2.4	382	100.0

Pearson Chi-square 0.05

Table 3.36. The Chi-square Test Result of Question No. 8. Related to Gender.

(Choice 3)

Choice 3: It is gradually running out so that we should save it.

Gender	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Male	17	4.5	120	31.4	137	35.9
Female	8	2.1	237	62.0	245	64.1
Total	25	6.5	357	93.5	382	100.0

Pearson Chi-square 0.00

Table 3.37. The Chi-square Test Result of Question No. 8. Related to the Education. (Choice 2)

Choice 2: Although the energy is running out, but we could find others in the future.

Education	Accepted		Unaccepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Below high school	5	1.3	1	0.3	6	1.6
High school	32	8.4	4	1.0	36	9.4
Vocational degree	36	9.4	3	0.8	39	10.2
Bachelor degree	243	63.6	34	8.9	277	72.5
Master degree	17	4.5	6	1.6	23	6.0
Doctorate degree	-	-	1	0.3	1	0.3
Total	333	87.2	49	12.8	382	100.0

Pearson Chi-square 0.04

Table 3.38. The Chi-square Test Result of Question No. 8. Related to Education.

(Choice 3)

Choice 3: It is gradually running out so that we should save it.

Education	Accepted		Unaccepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Below high school	1	0.3	5	1.3	6	1.6
High school	3	0.8	33	8.6	36	9.4
Vocational degree	2	0.5	37	8.6	39	10.2
Bachelor degree	13	3.4	264	69.1	277	72.5
Master degree	5	1.3	18	4.7	23	6.0
Doctorate degree	1	0.3	-	-	1	0.3
Total	25	6.5	357	93.5	382	100.0

Pearson Chi-square 0.00

Table 3.39. The Chi-square Test Result of Question No. 10. Related to Age.

(Choice 1)

Which program do you know?

Choice 1: Divide energy by 2.

Age	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Under 20 years old	1	0.3	67	16.8	68	17.0
20-30 years old	8	2.0	184	46.0	192	48.0
31-40 years old	6	1.5	48	12.0	54	13.5
41-50 years old	8	2.0	54	13.5	62	15.5
Over 50 years old	8	2.0	16	4.0	24	6.0
Total	31	7.8	369	92.3	400	100.0

Pearson Chi-square 0.00

Table 3.40. The Chi-square Test Result of Question No. 10. Related to Age.

(Choice 4)

Choice 4: Green learning room.

Age	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Under 20 years old	60	15.0	8	2.0	68	17.0
20-30 years old	152	38.0	40	10.0	192	48.0
31-40 years old	39	9.8	15	3.8	54	13.5
41-50 years old	41	10.3	21	5.3	62	15.5
Over 50 years old	16	4.0	8	2.0	24	6.0
Total	308	77.0	92	23.0	400	100.0

Pearson Chi-square 0.02

Table 3.41. The Chi-square Test Result of Question No. 10. Related to Age.

(Choice 5)

Choice 5: Green building.

Age	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Under 20 years old	52	13.0	16	4.0	68	17.0
20-30 years old	142	35.5	50	12.5	192	48.0
31-40 years old	39	9.8	15	3.8	54	13.5
41-50 years old	33	8.3	29	7.3	62	15.5
Over 50 years old	16	4.0	8	2.0	24	6.0
Total	282	70.5	118	29.5	400	100.0

Pearson Chi-square 0.02

Table 3.42. The Chi-square Test Result of Question No. 10. Related to the Education. (Choice 1)

Choice 1: Divide energy by 2.

Education	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Below high school	1	0.3	6	1.5	7	1.8
High school	6	1.5	33	8.3	39	9.8
Vocational degree	8	2.0	37	9.3	45	11.3
Bachelor degree	16	4.0	267	66.8	283	70.8
Master degree	-	-	24	6.0	24	6.0
Doctorate degree	-	-	2	0.5	2	0.5
Total	31	7.8	369	92.3	400	100.0

Pearson Chi-square 0.02

Table 3.43. The Chi-square Test Result of Question No. 10. Related to the Education. (Choice 4)

Choice 4: Green learning room.

Education	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Below high school	6	1.5	1	0.3	7	1.8
High school	30	7.5	9	2.3	39	9.8
Vocational degree	34	8.5	11	2.8	45	11.3
Bachelor degree	224	56.0	59	14.8	283	70.8
Master degree	14	3.5	10	2.5	24	6.0
Doctorate degree	-	-	2	0.5	2	0.5
Total	308	77.0	92	23.0	400	100.0

Pearson Chi-square 0.03

Table 3.44. The Chi-square Test Result of Question No. 11. Related to the Age. (Choice 3)

Where did you know energy saving campaign?

Choice 3: Friends.

Age	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Under 20 years old	51	12.8	17	4.3	68	17.0
20-30 years old	168	42.0	24	6.0	192	48.0
31-40 years old	46	11.5	8	2.0	54	13.5
41-50 years old	56	14.0	6	1.5	62	15.5
Over 50 years old	15	3.8	9	2.3	24	6.0
Total	336	84.0	64	16.0	400	100.0

Pearson Chi-square 0.00

Table 3.45. The Chi-square Test Result of Question No. 11. Related to the Age. (Choice 8)

Choice 8: Energy Saving Exhibition.

Age	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Under 20 years old	42	10.5	26	6.5	68	17.0
20-30 years old	126	31.5	66	16.5	192	48.0
31-40 years old	37	9.3	17	4.3	54	13.5
41-50 years old	33	8.3	29	7.3	62	15.5
Over 50 years old	9	2.3	15	3.8	24	6.0
Total	247	61.8	153	38.3	400	100.0

Pearson Chi-square 0.04

Table 3.46. The Chi-square Test Result of Question No. 11. Related to the Education. (Choice 4)

Choice 4: Brochure.

Education	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Below high school	7	1.8	-	-	7	1.8
High school	27	6.8	12	3.0	39	9.8
Vocational degree	24	6.0	21	5.3	45	11.3
Bachelor degree	180	45.0	103	25.8	283	70.8
Master degree	12	3.0	12	3.0	24	6.0
Doctorate degree	-	-	2	0.5	2	0.5
Total	250	62.5	150	37.5	400	100.0

Pearson Chi-square 0.04

Table 3.47. The Chi-square Test Result of Question No. 11. Related to the Education. (Choice 5)

Choice 5: Newspaper.

Education	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Below high school	4	1.0	3	0.8	7	1.8
High school	21	5.3	18	4.5	39	9.8
Vocational degree	12	3.0	33	8.3	45	11.3
Bachelor degree	146	36.5	137	34.3	283	70.8
Master degree	10	2.5	14	3.5	24	6.0
Doctorate degree	-	-	2	0.5	2	0.5
Total	193	48.3	207	51.8	400	100.0

Pearson Chi-square 0.03

Table 3.48. The Chi-square Test Result of Question No. 11. Related to the Education. (Choice 8)

Choice 8: Energy saving exhibition.

Education	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Below high school	6	1.5	1	0.3	7	1.8
High school	21	5.3	18	4.5	39	9.8
Vocational degree	20	5.0	25	6.3	45	11.3
Bachelor degree	180	45.0	103	25.8	283	70.8
Master degree	19	4.8	5	1.3	24	6.0
Doctorate degree	1	0.3	1	0.3	2	0.5
Total	247	61.8	153	38.3	400	100.0

Pearson Chi-square 0.03

Table 3.49. The Chi-square Test Result of Question No. 14. Related to the Gender. (Choice 3)

What is the effect on your decision of energy saving?

Choice 3: Friends

Gender	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Male	105	27.5	32	8.4	137	35.9
Female	211	55.2	34	8.9	245	64.1
Total	316	82.7	66	17.6	382	100.0

Pearson Chi-square 0.02

Table 3.50. The Chi-square Test Result of Question No. 14. Related to the Age. (Choice 3)

Choice 3: Friends.

Age	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Under 20 years old	42	11.0	22	5.8	64	16.8
20-30 years old	154	40.3	33	8.6	187	49.0
31-40 years old	45	11.8	6	1.6	51	13.4
41-50 years old	56	14.7	2	0.5	58	15.2
Over 50 years old	19	5.0	3	0.8	22	5.8
Total	316	82.7	66	17.3	382	100.0

Pearson Chi-square 0.00

Table 3.51. The Chi-square Test Result of Question No. 14. Related to the Age. (Choice 6)

Choice 6: Parent.

Age	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Under 20 years old	32	8.4	32	8.4	64	16.8
20-30 years old	117	30.6	70	18.3	187	49.0
31-40 years old	44	11.5	7	1.8	51	13.4
41-50 years old	49	12.8	9	2.4	58	15.2
Over 50 years old	21	5.5	1	0.3	22	5.8
Total	263	68.8	119	31.2	382	100.0

Pearson Chi-square 0.00

Table 3.52. The Chi-square Test Result of Question No. 14. Related to the Age. (Choice 9)

Choice 9: Husband / wife.

Age	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Under 20 years old	63	16.5	1	0.3	64	16.8
20-30 years old	182	47.6	5	1.3	187	49.0
31-40 years old	45	11.8	6	1.6	51	13.4
41-50 years old	50	13.1	8	2.1	58	15.2
Over 50 years old	17	4.5	5	1.3	22	5.8
Total	357	93.5	25	6.5	382	100.0

Pearson Chi-square 0.00

Table 3.53. The Chi-square Test Result of Question No. 14. Related to the Education. (Choice 2)

Choice 2: Radio.

Education	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Below high school	4	1.0	2	0.5	6	1.6
High school	17	4.5	19	5.0	36	9.4
Vocational degree	25	6.5	14	3.7	39	10.2
Bachelor degree	203	53.1	74	19.4	277	72.5
Master degree	19	5.0	4	1.0	23	6.0
Doctorate degree	1	0.3	-	-	1	0.3
Total	269	70.4	113	29.6	382	100.0

Pearson Chi-square 0.02

Table 3.54. The Chi-square Test Result of Question No. 14. Related to the Education. (Choice 8)

Choice 8: Energy saving exhibition.

Education	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Below high school	6	1.6	-	-	6	1.6
High school	23	6.0	13	3.4	36	9.4
Vocational degree	26	6.8	13	3.4	39	10.2
Bachelor degree	226	59.2	51	13.4	277	72.5
Master degree	19	5.0	4	1.0	23	6.0
Doctorate degree	1	0.3	-	-	1	0.3
Total	301	78.8	81	21.2	382	100.0

Pearson Chi-square 0.04

Table 3.55. The Chi-square Test Result of Question No. 14. Related to the Education. (Choice 9)

Choice 9: Husband / wife.

Education	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Below high school	5	1.3	1	0.3	6	1.6
High school	33	8.6	3	0.8	36	9.4
Vocational degree	34	8.9	5	1.3	39	10.2
Bachelor degree	264	69.1	13	3.4	277	72.5
Master degree	21	5.5	2	0.5	23	6.0
Doctorate degree	-	-	1	0.3	1	0.3
Total	357	93.5	25	6.5	382	100.0

Pearson Chi-square 0.00

Table 3.56. The Chi-square Test Result of Question No. 14. Related to the Education. (Choice 11)

Choice 11: Teacher.

Education	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Below high school	5	1.3	1	0.3	6	1.6
High school	26	6.8	10	2.6	36	9.4
Vocational degree	33	8.6	6	1.6	39	10.2
Bachelor degree	242	63.4	35	9.2	277	72.5
Master degree	21	5.5	2	0.5	23	6.0
Doctorate degree		-	1	0.3	1	0.3
Total	327	85.6	55	14.4	382	100.0

Pearson Chi-square 0.02

Table 3.57. The Chi-square Test Result of Question No. 14. Related to the Education. (Choice 12)

Choice 12: Brothers / sisters.

Education	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Below high school	5	1.3	1	0.3	6	1.6
High school	34	8.9	2	0.5	36	9.4
Vocational degree	35	9.2	4	1.0	39	10.2
Bachelor degree	276	72.3	1	0.3	277	72.5
Master degree	22	5.8	1	0.3	23	6.0
Doctorate degree	1	0.3	-	-	1	0.3
Total	373	97.6	9	2.4	382	100.0

Pearson Chi-square 0.00

Table 3.58. The Chi-square Test Result of Question No. 15. Related to Gender. (Choice 2)

Your activities on energy saving.

Choice 2: Always check the wheels because the soft wheels would waste more fuel.

Gender	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Male	84	22.0	53	13.9	137	35.9
Female	189	49.5	56	14.7	245	64.1
Total	273	71.5	109	28.5	382	100.0

Pearson Chi-square 0.00

Table 3.59. The Chi-square Test Result of Question No. 15. Related to Gender. (Choice 5)

Choice 5: Use electric fan instead of air conditioning when it is not too hot.

Gender	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Male	62	16.2	75	19.6	137	35.9
Female	84	22.0	161	42.1	245	64.1
Total	146	38.2	236	61.8	382	100.0

Pearson Chi-square 0.03

Table 3.60. The Chi-square Test Result of Question No. 15. Related to Gender. (Choice 6)

Choice 6: Take out the iron plug before finishing because there is still the left energy.

Gender	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Male	91	23.8	46	12.0	137	35.9
Female	127	33.2	118	30.9	245	64.1
Total	218	57.1	164	42.9	382	100.0

Pearson Chi-square 0.00

Table 3.61. The Chi-square Test Result of Question No. 15. Related to Gender. (Choice 7)

Choice 7: Always check and repair the electric devices to be in good condition.

Gender	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Male	96	25.1	41	10.7	137	35.9
Female	194	50.8	51	13.4	245	64.1
Total	290	75.9	92	24.1	382	100.0

Pearson Chi-square 0.04

Table 3.62. The Chi-square Test Result of Question No. 15. Related to the Age. (Choice 1)

Choice 1: Not start engine while parking. Shut the engine while carry belongings and waiting for others.

Age	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Under 20 years old	46	12.0	18	4.7	64	16.8
20-30 years old	109	28.5	78	20.4	187	49.0
31-40 years old	31	8.1	20	5.2	51	13.4
41-50 years old	23	6.0	35	9.2	58	15.2
Over 50 years old	11	2.9	11	2.9	22	5.8
Total	220	57.6	162	42.4	382	100.0

Pearson Chi-square 0.00

Table 3.63. The Chi-square Test Result of Question No. 15. Related to the Age. (Choice 2)

Choice 2: Always check the wheels because the soft wheels would waste more fuel.

Age *	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Under 20 years old	62	16.2	2	0.5	64	16.8
20-30 years old	134	35.1	53	13.9	187	49.0
31-40 years old	35	9.2	16	4.2	51	13.4
41-50 years old	30	7.9	28	7.3	58	15.2
Over 50 years old	12	3.1	10	2.6	22	5.8
Total	273	71.5	109	28.5	382	100.0

Pearson Chi-square 0.00

Table 3.64. The Chi-square Test Result of Question No. 15. Related to the Age. (Choice 7)

Choice 7: Always check and repair the electric devices to be in good condition.

Age	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Under 20 years old	55	14.4	9	2.4	64	16.8
20-30 years old	145	38.0	42	11.0	187	49.0
31-40 years old	43	11.3	8	2.1	51	13.4
41-50 years old	36	9.4	22	5.8	58	15.2
Over 50 years old	11	2.9	11	2.9	22	5.8
Total	290	75.9	92	24.1	382	100.0

Pearson Chi-square 0.00

Table 3.65. The Chi-square Test Result of Question No. 15. Related to the Age. (Choice 9)

Choice 9: Separate the different garbage for reducing energy to destroy them.

Age *	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Under 20 years old	49	12.8	15	3.9	64	16.8
20-30 years old	145	38.0	42	11.0	187	49.0
31-40 years old	46	12.0	5	1.3	51	13.4
41-50 years old	42	11.0	16	4.2	58	15.2
Over 50 years old	13	3.4	9	2.4	22	5.8
Total	295	77.2	87	22.8	382	100.0

Pearson Chi-square 0.04

Table 3.66. The Chi-square Test Result of Question No. 15. Related to the Education. (Choice 2)

Choice 2: Always check the wheels because the soft wheels would waste more fuel.

Education	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Below high school	6	1.6	-	-	6	1.6
High school	31	8.1	5	1.3	36	9.4
Vocational degree	23	6.0	16	4.2	39	10.2
Bachelor degree	202	52.9	75	19.6	277	72.5
Master degree	11	2.9	12	3.1	23	6.0
Doctorate degree	-	-	1	0.3	1	0.3
Total	273	71.5	109	28.5	382	100.0

Pearson Chi-square 0.00

Table 3.67. The Chi-square Test Result of Question No. 15. Related to the Education. (Choice 7)

Choice 7: Always check and repair the electric devices to be in good condition.

Education	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Below high school	5	1.3	1	0.3	6	1.6
High school	29	7.6	7	1.8	36	9.4
Vocational degree	22	5.8	17	4.5	39	10.2
Bachelor degree	219	57.3	58	15.2	277	72.5
Master degree	15	3.9	8	2.1	23	6.0
Doctorate degree	-	-	1	0.3	1	0.3
Total	290	75.9	92	24.1	382	100.0

Pearson Chi-square 0.01

Table 3.68. The Chi-square Test Result of Question No. 15. Related to the Education. (Choice 10)

Choice 10: Choose proper octane with your car.

Education	Unaccepted		Accepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Below high school	6	1.6	-	-	6	1.6
High school	29	7.6	7	1.8	36	9.4
Vocational degree	24	6.3	15	3.9	39	10.2
Bachelor degree	165	43.2	112	29.4	277	72.5
Master degree	8	2.1	15	3.9	23	6.0
Doctorate degree	-	-	1	0.3	1	0.3
Total	232	60.7	150	39.3	382	100.0

Pearson Chi-square 0.04

Table 3.69. The Chi-square Test Result of Question No. 17. Related to Gender.

Do you understand the meaning of octane value (87, 91, 95) and choose the suitable one with your car ?

Gender	Understand and choose the suitable one		Understand and choose the highest-octane value		Not understand but can choose the suitable one		Not understand and not know that the used one is suitable		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%
Male	46	11.5	91	22.8	146	36.5	9	2.3	146	36.5
Female	69	17.3	176	44.0	254	63.5	9	2.3	254	63.5
Total	115	28.8	267	66.8	400	100	18	4.5	400	100

Pearson Chi-square 0.00

Table 3.70. The Chi-square Test Result of Question No. 21. Related to Gender. (Choice 4)

Why do you think that energy saving is unnecessary?

Choice 4: Not live longer till the terminated energy occurs.

Gender	Accepted		Unaccepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Male	4	22.2	5	27.8	9	50.0
Female	-	-	9	50.0	9	50.0
Total	4	22.2	14	77.8	18	100.0

Person Chi-square 0.02

Table 3.71. The Chi-square Test Result of Question No. 21. Related to Age. (Choice 1)

Choice 1: Energy resource (crude oil, coal, water etc.) is plenty.

Age	Accepted		Unaccepted		Total	
	Count	Percent	Count	Percent	Count	Percent
Under 20 years old		-	4	22.2	4	22.2
20-30 years old	1	5.6	4	22.2	5	27.8
31-40 years old	1	5.6	2	11.1	3	16.7
41-50 years old	-	-	4	22.2	4	22.2
Over 50 years old	2	11.1	-	-	2	11.1
Total	4	22.2	14	77.8	18	100.0

Person Chi-square 0.05

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