ANALYTICAL SEARCH OF PROBLEMS AND PROSPECTS OF POWER SECTOR THROUGH DELPHI STUDY: POWER SECTOR REFORMS IN MADHYA PRADESH STATE, INDIA

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Abstract

This study attempts to review and analyze the critical issues that afflict the power sector of Madhya Pradesh, a developing State in India, For this purpose a Delphi study, contacting experts in the field was conducted. This Study illustrates the process followed for the Conduct of Delphi survey and evaluates the responses obtained. Consensus among experts could be arrived at on various issues related to Madhya Pradesh power sector in two rounds of Delphi survey. The expert-opinion concluded on various issues is discussed in the context of the present energy shortage faced by the State. The experts participated in the Delphi survey unanimously stressed on urgent need for an integrated approach in the power sector planning process of the State. They also emphasized on the imperativeness for exploiting the demand side management potential of the State to alleviate energy crisis in future. The study fetched informative and revealing results, which may aid to formulate and review future planning strategies for the expansion of power sector of the State.

Introduction

Madhya Pradesh is one of the largest state in India having area of 308,144 km². It is located in the heart of the India and have geographic location of 23° 10'N latitude & 77° 12'E longitude. Its Climatic condition is 42°C or more (summers) 10° C (winters). The population of MP is 60,385,118 (2001 census) and 74,665,118 (Approximated In January 2010). Madhya Pradesh is bounded by the states of Uttar Pradesh, Chhattisgarh, Maharashtra, Gujarat and Rajasthan.

Madhya Pradesh power sector is administered previously by Madhya Pradesh Electricity Board with the help of other state electricity utilities for generation, transmission and distribution of power to the consumers. After power sector reforms other utilities are segregated in to the four parts name as DISCOMs, TRANCO, GENCO and MPSEB itself has become a trading company Ltd. Madhya Pradesh electricity regulatory commission plays a vital role to observe the situation and working of state utilities and determination of rationalized tariff and dispute settlement.

Though remarkable developments could be made in various social spheres, the growth of power sector of the State has not kept pace with this. Striving hard to meet the ever growing demand within the limited energy and economic resources, the electricity sector of the State has been functioning under severe stress in the past few years. The colossal demand growth along with meager capacity additions dragged the State to incessant power cuts and load shedding. As shown in the State experienced shortage of electricity throughout the past decade. The situation leads to various socio-economic issues having direct impact on the development of the State.

This work forms part of a large study carried out by the authors to evolve an optimal planning model for the Madhya Pradesh power sector. The first phase of this study. carried out with the help of mathematical models, examined salient features related to the structure and pattern of energy demand of the State and consumer survey in three DISCOMs region. Time-series projections carried out in these studies reported a three-fold increase in electricity consumption within another two decades. At this point, it is felt that an attempt to consolidate the opinion of experts on critical issues that afflict the Madhya Pradesh power sector as well as to derive a set of 'consensus recommendations' for future would be of benefit to perceive the issue more meaningfully. This study reports such an attempt and presents the results of the Delphi survey carried out contacting a panel of experts. Accordingly, the questions were cast covering important functional aspects of the State power sector. The key finding of the survey has been, reviewed and discussed, especially in the light of current situation of power sector in MP.

The Delphi technique

The Delphi technique is directed to the systematic solicitation of expert opinion by a carefully designed program of sequential individual interrogations conducted through written questionnaires. This technique eliminates open discussions and committee activity and thus reduces the influence of psychological factors such as specious persuasion, unwillingness to abandon publicly expressed opinions, and the bandwagon effect of majority opinion. Information and opinion feedback received from the earlier parts of the program are used in the later stages of the survey. It is designed to consolidate individual judgments systematically and thus obtain a reasoned consensus. The basic characteristics of this technique are anonymity, iteration, controlled feedback and statistical group response.

Objective type options are normally provided as answers for questions in the questionnaire. These answers are assigned with relative scoring or weighted ranks. The responses are then statistically processed, computing various parameters like mean, median, standard deviation, standard error, coefficient of variation, etc. The results of the first round are informed to the experts and for questions in which consensus could not be reached, the experts are requested to reconsider their opinion, if necessary, through a fresh set of modified questions. The process is repeated till consensus is achieved for all questions.

Developed by the Rand Corporation during early 1950s, the Delphi technique was originally devised to determine short- and long-term trends on issues of science and technology and to speculate their probable effects on society. But over decades, rather as a trend-forecasting tool, Delphi has evolved as a powerful analytical method to provide valuable foresight on issues involving high level of uncertainty in various fields including science, engineering and technology. Significant studies have been carried out using Delphi technique to assess the social impacts of developments, especially in new frontiers of Science and technology.

The process of Delphi

As indicated above, this Delphi study was conducted with an aim to arrive at valid consensus among experts on various critical issues that afflict Madhya Pradesh power sector so that these results could be meaningfully adopted for framing future planning strategies. The questions covered broad areas like key policy issues, efficient utilization of energy, tariff, supply and demand side options for conservation, use of non-conventional sources of energy, ecological and environmental impacts, optimal generation mixes, power sector reforms, etc. The socio-economic and technological factors of State also were considered while framing the questionnaire. The questionnaire was initially given to a few renowned energy experts as a preliminary round for their suggestions/comments. The questions were subsequently reframed incorporating necessary modifications suggested by these experts.

The first round of the questionnaire was mailed to 107 selected experts. Due care was taken to ensure that experts were selected from different parts of the State and representing all spheres of the society including academicians, utility professionals, eminent field engineers, researchers, entrepreneurs and officials as well as social activists. Forty-seven experts responded during this round of the survey. The responses were subjected to statistical analysis. After the analysis of the first round of questions, it was found that firm consensus could be concluded on 23 (out of 28) questions. Clear consensus was not obtained for six questions. Hence, six new questions focusing the points for which consensus could not be concluded during the first round, were prepared for second round. The consolidated results of the first round analysis along with the second round questionnaire were sent to all the 47 first round respondents requesting them to express their opinion. Responses were received from 44 respondents during the second round. Firm and clear consensus was arrived at all the points after the second round of the questionnaire. The end results of the survey were informed to all experts participated in the study.

Statistical analysis of responses

While framing the questions, generally a five-point scoring system was adopted. Answers could be expressed as any one of the options among 'strongly agree, agree, unable to comment, disagree, strongly disagree'. Relatively weighted scores were assigned to all these options. The following parameters were also computed:

Range = Mean ±(3 x Standard error),

$$\text{Coefficient of variation} = \frac{\text{Standard deviation}}{\text{Mean}} \times 100$$

After analysis of results of each question, answers to questions which derived mean responses within acceptable range (say for example mean ±0.5) and with acceptable coefficient of variation (say for example 50% variation) were identified as opinion of firm consensus. Questions, which provided

answers outside these ranges, were considered as non-consensused and segregated for framing second round questions. The responses received in the second round also were processed similarly. As consensus was reached on all questions after the second round, the process was terminated in two rounds. Appendix A provides a sample result of the frequency analysis.

Discussion of results

A consolidated abstract of the questions covered in the first and second rounds of this Delphi survey along with the expert-opinion concluded are illustrated in Appendix A.

A brief discussion on the salient aspects of the responses is attempted in this section.

Genesis of the crisis

Till early 1990s, Madhya Pradesh (Undivided Madhya Pradesh and Chhatisgarh) was a State surplus in electricity, exporting power to the neighboring States. However, electricity demand was rapidly growing at a high rate of about 10% annually during this period. This factor along with the decadal population growth of 14.3% during this period and division of Madhya Pradesh—which perhaps left uncared by the energy planners—dragged the situation to power shortage. Thereafter the State, once surplus in electricity, had to resort to importing power from neighboring states and Central power pool. The meager capacity additions effected during subsequent years did not fetch any substantial improvement in the energy situation of the State. The financial situation of MPSEB, which has been continuously operating under heavy commercial loss, barred it from seeking any long-term solution to abate the shortage.

First few questions of the survey were focusing on the general issues related to the power sector. Reviewing the situation, the experts opined that the present power situation of Madhya Pradesh could be rated definitely as in a state of ' *serious crisis'*, "yet another' minor short-term disturbance trifling the State. It has been observed that power sector utilities has so far not explicitly reckoned the power situation as a state of 'crisis', but every year identify adhoc reasons for the energy deficit. For example, (The prime reason projected by the official sources as the reason for the energy shortages experienced till recently was due to inadequate generation mainly due monsoon failures, and factor of production whereas the shortage at present is being attributed to scarcity of power generation and insufficient transmission and improper distribution capability Such citations of partial validity lead to the obvious doubt whether the real depth of the issue is perceived by the utility company. A consensus in opinion could not be emerged among the experts on the question whether the Government as well as MPERC have fully conceptualized the real cause of the present crisis. However, considering the increasing general awareness among the planners and the Government in the issue of energy crisis, they are not sure that with the current pattern the State will eventually stride over the current crisis and by the year 2020. they are not anticipating that the energy situation will be comfortable with the current system.

Socio-economic nexus of electricity demand

The economy and electricity consumption of the Slate during the past decades indicated an average annual growth at the compounded rate of about 6%to 8% for economy and 8% to10% energy consumption respectively. Analytical studies employing the data for the above period, carried out with the help of regression models, showed that energy demand of most of the consuming sectors is sensitive and closely related to the economic development of Madhya Pradesh. The consumption of electricity in residential and service sectors has been found to be related directly to the State income, that is, state domestic product whereas the consumption in industrial sector was found to be correlated to the sectoral share of industries in the state domestic production. Also, it was observed that the population is another key determinant of energy consumption. In the light of the observations, various features of this socio-economic dependency of energy demand have been explored through the Delphi survey.

Experts unequivocally agreed that the energy consumption pattern of Madhya Pradesh is the last part of a long chain of social decisions and actions. Therefore they were of the opinion that rather than dealing energy as a 'technical issue', it is imperative to analyses the energy-related issues within their social structure. Pointing out the strong energy economy interdependence observed in the State, the experts were requested to comment on the acceptability of a future development policy aiming energy economy decoupling, for which a clear consensus emerge. While 43% of the experts were in favour. 46% were not recommending such a policy. Eleven percent of the participants did not comment on this proposal.

Considering the growth rate of economy and

electricity consumption in the past, experts suggested to target a growth rate of 6-8% for economy and 8-10% for electricity in the next decades. This recommended growth rate of economy is synonymous with the targeted GDP growth rate of 8% during the 10th national plan period (2002-2007) set by Government of India (Planning Commission, 2001). Regarding the growth rate of 8-10% recommended for electricity. this corresponds to the forecast results of the high growth scenario. Although technically feasible, this cannot be achieved through a 'business as usual' approach, but requires a high growth action in several sectors of economy, power sector utilities and warrants a radical departure from the present pace of development. By recommending this ambitious target of 8-10% demand growth in electricity sector, the experts are obviously visualizing a development that corroborates with the remarkable achievements in the entire power sector of Madhya Pradesh. Regarding the influence of population, though the decadal growth rate of population, the experts do not anticipate any consequential reduction in the electricity consumption, especially in the domestic sector. This is obviously due to the changing life style, family structure and increase in the rate of urbanization occurring in the State, which attributes to the rapid increase in per-capita consumption.

Vigorous planning - a priority imperative

The planning process of the electricity sector in Madhya Pradesh is now being performed at various agencies within the State like MPERC, Power sector utilities ie. DISCOMs, TRANCOs, GENCOs, MPSEB trading company Ltd etc. Further, they are closely influenced by the policy measures implemented from time to time by various agencies of Government of India like Central Electricity Regulation commission (CERC) Beauro Electricity Authority (BEA), Ministry of Power as well as power producers like National Thermal Power Corporation (NTPC), National hydro power corporation (NHPC) etc. The experts unanimously agreed that the energy crisis is due to the deficiency in the planning system. They observed that the present energy policy of the Stale is sub-optimal and uncoordinated and emphasized and strongly agreed the need for an integrated planning approach. As the issues related to the energy sector have been identified by the experts not only as technical but also as 'socio-economic', it is evident that such complex issues will not yield solutions through any specialized prescription, but require integrated approach involving all spheres of development.

Non-scientific tariff

Study indicated that the electricity-demand in all sectors is not price sensitive, but irrational electricity prices are a major cause for electricity theft. Experts are agree that due to involvement of MPERC tariff and charges consider the interest of consumers in Madhya Pradesh. The social commitments and political compulsion of the State Government resulted in setting under-priced electricity tariffs extending heavy subsidy to agricultural sectors and specific domestic area.. Experts participated in the survey opined that the present tariff in Madhya Pradesh, irrational pricing of electricity due to T & D Losses, will only act as a strong barrier to the efficient use of electricity. They recommend to implement a rational and scientific tariff structure, avoiding irrational-pricing and letting the price reflect the real cost (Excluding T & D losses due to inefficiency of power sector utilities), which will not only improve the financial health of the utility, but will also act as an effective tool for efficient use of energy. The consensus has given that tariff is considered to be an effective tool to promote energy efficiency, if implemented scientifically pricing. Important measures are necessary for making electricity prices move towards true long-term marginal costs of generation + transmission + distribution, ensuring in the transition that consumer expenditures do not increase by making efficiency improvements and reduced consumption offset increasing prices and monitoring prices to ensure that they are not increased to skim profits.

Other barriers to energy efficiency

The experts observed that several other barriers prevail in Madhya Pradesh that substantially hinder the efficient use of energy in the State. Most prominent among them are behavioral barriers, Political berries, organizational, market, -induced and institutional. To improve the present efficiency level in the utilization of electricity, they recommend that the design of new buildings should be scrutinized in the angle of energy efficiency by local bodies before issuing clearance for construction. They also suggested that priority should be assigned to such energy-efficient constructions for funding by agencies. To improve energy efficiency in domestic sector, they suggested that awareness programs and carefully devised incentives will be of help.

Energy savings potential

In the current national power plan of CEA assessed & potential for savings to the order

of 20-30% in electricity consumption through effective implementation of energy conservation and demand side management (DSM) measures. The experts participated in the survey opined that early implementation of conservation schemes are highly imperative in the present context of Madhya Pradesh and more or less same level of potential for energy conservation exists in this State also. However this may warrant an efficient action plan, implemented in a phased and time-bound manner. Here it is worth mentioning that simulation studies carried out showed that the requirement of capacity addition by the year 2020 can not fulfill with current pace of growth in power sector MP, required capacity addition can be match through the reduction in energy consumption which could be achieved through effective implementation of DSM techniques.

Role of non-conventional energy sources

Use of non-conventional energy sources is identified as one of the effective options while facing scarcity of energy from conventional sources. But in spite of best efforts from the agencies of both Central and state Governments and of various non-governmental organizations, the use of non-conventional energy sources and equipment has not been well popularized in Madhya Pradesh Making inquiry into various reasons for this, the experts identified 'cost' as the prime factor. Even with the limited subsidies and incentives offered by the Government, the non-conventional technology still remains to be economically a less preferred option. The other factor for the non-popularity are lack of awareness among general public, poor reliability of related equipment available in the market, inadequacy of incentives as well as the absence of an established marketing system to promote these energy equipments. However, experts are optimistic that the situation may by the year 2020, it is likely that about of 10% to 20% the electrical energy requirement will be met from non-conventional sources of energy which is currently existing only 0.12% in the state.

Reforms, restructuring and legislations

The reform process of power sector in India was initiated in 1991 with a sole objective to mobilize private sector resources for addition of power generating capacity. The salient feature of the intended reforms was unbundling of the generation, transmission and distribution sectors so as to operate in a more competitive and efficient manner. Establishment of independent Central and State regulatory commission for setting tariff and regulating power purchase agreements also forms part of it. The Government Madhya Pradesh State has already initiated steps to adopt institutional reforms but yet to finalize a framework in proper pace and direction is required.

Although doors were opened to private sector for power generation in Madhya Pradesh since last decade and quite a lot Power Purchase Agreements were signed with prospective independent power producers (IPPs) in private sector, the end result was moderate. The major reason for this is the financial ill health of the state Electricity Board and political willingness which fails to provide necessary confidence to entrepreneurs to invest in this sector. Evaluating the scenario, the experts participated in the survey concluded that the future prospects for IPPs in the State is good. This perhaps implies that so far as the present economic development structure and power sector reform policy of Madhya Pradesh, further generation capacity additions and distribution in the State may not be the onus of the Government of Madhya Pradesh.

Among a set of proposed power sector reforms, the expert ranked the need for an integrated resource planning in power sector to assume the highest priority lot implementation. According to them effective measures to conserve energy to the maximum possible extent trough Demand Side Management (DSM) as well as performance of '"dependent State regulatory commission to set right the related issues also assume great priority.

They also opined regarding the effectiveness of existing regulations for private partnership in generation framed to abate the environmental disruptions and association the setting up of new generating station, there were divergent opinions among experts. However, rather than going for more and more environmental legislation, the experts recommended to have the strict enforcement of existing legislation to reduce the environmental disruptions to a great extent. To the establishment of a national power grid also be of benefit to the State. When 39% of the experts were of the opinion that the legislations are not adequate to prevent disruption, 46% were disagreeing.

Suggested solutions

The experts concurring with the say that 'any power is better than no power' recommend to avail energy with view of lower consumption or avail energy at higher cost as a short-term measure from

available sources. It is worth mentioning that government of Madhya Pradesh has already attempted to purchase power from neighboring States. But unavoidable financial burdens associated with such costly options have also emerged simultaneously. To cite an example, due to heavy financial constraints and non efficient control on T & D losses govt. of Madhya Pradesh is currently unsuccessful to draw electricity available at a higher cost also from the neighboring state or center exclusively to meet the power requirement of Madhya Pradesh. While Madhya Pradesh is facing energy shortage, Demand of power forced to import the energy at the higher cost from neighboring Slates or avail energy with view of lower consumption in this hi-tech era seems paradoxical. Short-term solutions, if adopted to perform on long-term basis, are likely to lead to more vicious problems that are difficult to resolve.

As a long-term measure to alleviate the energy shortage, expert stress the need for generation expansion schemes -dispensing with more major Thermal and hydel schemes—but opting for New and renewable energy , Demand Side Management small, mini and micro-hydel stations, biomass power plant as well as non conventional sources. They also recommend strengthening of the transmission and distribution capacity to control T & D losses. An optimal generation mix for the State by the year 2020 visualised by the experts with current factor of power generation is 15% hydel+10% mini-micro-hydel +10% Biomass Plants(Renewable energy)+15% other non conventional sources+ 50% thermal, against the present combination where major share is contributed by thermal power stations (70%).

Table 1

Here two aspects of these suggestions are worth discussing. As a temporary measure, the experts could not identify any better option other than availing power from expensive sources including import or avail energy with view of lower consumption. It was pointed out that DSM of energy can offer more effective immediate solutions to the electricity crisis in Madhya Pradesh conditions. Adoption of effective lighting schemes including providing of compact fluorescent lamps (CFL) can fetch substantial savings in Madhya Pradesh specially in electricity consumption is in the domestic sector. Although the reasons for not recommending this strategy as a feasible solution for the present crisis could not be identified in the survey, it may perhaps be due to various barriers in adopting energy efficient equipment, prevailing in the State.

It can be noted that as a long-term solution, expert recommended addition of future generating capacity from non-conventional sources, though the available Thermal and hydel potential within the State is not tapped to the maximum possible extent so far. Due to massive deforestation and immigration of villagers the State experienced in connection with the establishment of major hydel projects like Sardar Sarovar in the past, there is growing awareness on the environmental issues. Construction of a few major hydel power projects proposed during the last few years have faced lot of hurdles on environmental grounds. Thermal generation stations are also facing severe fuel problems ie. Quality and proper supply of coals etc. Perhaps these considerations tempted the experts to recommend future addition of generating capacity from new renewable energy and other non-conventional sources. The generation mix recommended in that study is shown in Figure. The recommendation emerged from this survey corroborates with that of the available resources.

Another long-term solution suggested by the experts is to strengthen the transmission and distribution capacity. Expert pointed out that by reducing T&D losses to a very feasible level of 12% by the year 2020, from the existing level of around 35%, electricity can be available at competitive price. Hence, as pointed out by the experts, reduction of T&D losses to 'bearable limits' offers one of the best solutions to reduce energy crisis.

General Evaluation

The general consensus derived out of this Delphi study affirmed that a crisis is prevailing in the Madhya Pradesh Power power sector. The experts perceived the dimension of this crisis with high degree of lucidity. They could identify and priorities various solutions to overcome the situation. Valuable recommendations on various point like future mix for generation expansion, requisite in current power sector reforms, etc. also could be evolved in this study. The results of the survey were found to generally corroborate with the previous available data. The forethought on various aspects of the energy sector will be worth when framing a future agenda for the power sector.

Conclusion

Madhya Pradesh is facing a Year issue of energy crisis. Delphi study, which was conducted to consolidate expert opinion on various critical issues pertaining to the power sector of Madhya Pradesh fetched informative revealing results. The study

revealed that the problems and their best possible solutions are almost clear Effective implementation of an integrated planning strategy for revitalizing the Madhya Pradesh power sector assumes highest priority in the present context. This is highly mperative to avoid an 'energy famine" in the near future.

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Web Resources

Central electricity Regulatory commission - www.cercind.gov.in

MP Electricity Regulatory comission www.mperc.org

MP Govt website for energy conservation www.mp.gov.in/energy/mpseb

MP electricity regulatory commission -www.mpseb.org

Energy saving trust at http://www.elsparefonden.dk/.

Translation via web browser http://www.gotoworld.com/trans-late/languages/danish

Danish Energy Agency website: http://www.ens.dk/uk7about.htm

International Institute for Energy Conservation (IIEC). http://www.clasponline.org

Electric Ideas Clearinghouse http://www.energyideas.org/

Lighting Design Lab, http://www.northwestlight ing.com/ldl/.

Appendix A

Example of frequency analysis

As an example, frequency analysis of one of the queations of the Delphi questionnaire is given below;

Question: There is an issue of energy crisis in MP please express an opinion on the this statement .

1 .Crisis is serious 2.Crisis exist but not serious 3. It is only a minor issue

4.There is no crisis at all 5. Unable to comment

Statistics

N -sample size	Missing - 0	46
Mean		1.7261
Std. error of mean		0.1033
Median		1.778
Mode		2
Std.deviation		0.7009
Varience		0.4913
Range		4
Minimum		-2
Maximum		2
Sum		79.4
Percentile	50	1.778

Appendix B

A consolidated abstract of questions covered in the Delphi survey and corresponding statements at which consensus arrived are listed below

Qu. 1 There is an issue of energy crisis in MP please express an opinion on the this statement .

»» Consensus given on – **Crisis is serious**

Qu.2 The present energy problem of the state is merely a short term disturbance ,not a long term crisis Do you agree ?

»» **Consensus given on – Disagree**

Qu.3 Do you anticipate that the state will stride over the current crisis and by the year 2020 our energy situation will be good.

»» **Consensus given on – It may be**

Qu.4In your opinion for a state like Madhya Pradesh , what will be the achievable / desirable rate of growth of economy and energy consumption.

»» **Expert consensus given with full majority on Economic growth will be 6% to 8% where as energy consumption will be 8% to 10%.**

Qu.5 The economic growth of the state will improve the energy situation and similarly the improved energy situation will accelerate the economy . Do you agree?

»» Consensus given on -Agree

Qu.6 The rapid growth of population has been a key deciding factor in the overwhelming consumption of the energy in the domestic sector in the past decade in MP . Do you anticipate a slow down in population in future due to the increasing educational and health standard may occurs.

»» Consensus given on it appears likely to be.

Qu.7 If there is slow down in population growth in future do you anticipate a consequential reduction in the rate of growth of domestic energy consumption?

»» Consensus given on it appears Unlikely to be.

Qu.8 The energy crisis of the state is due to the absence of a total integrated planning . By dividing the issue into pieces and entrusting them to specialists. do you agree?

»». Consensus given on -Agree

Qu.9 The state energy policy is sub optional and uncoordinated . There is need for a better co-ordinated policy. Do you agree.

»» **Opinion consensus given on Agree**

Qu 10 The present electricity tariff is the most important barrier in promoting energy efficiency. Do you agree with this **»»Consensus given on -Disagree**

Qu. 11 The tariff and charges payable, considering the interest of the consumer in MP. Do you agree with this .

»» Consensus given on -Agree

Qu.12 Do you agree that after establishment of MPERC the efficiency, economy and safety in the use of the electricity in the State including in regard to quality, continuity and reliability of service is satisfactory.

»» Opinion consensus was on-Likely to be

Qu.13 Do you agree that current unfair and unreasonable tariff for electricity is the main factor for power theft and T & D losses.

»»Opinion consensus given on - Agree

Qu 14 Do you agree that now a days there is ease of dispute settlement among the state power utilities and consumer**.**

»»Consensus given on - Agree

Qu 15 The periodic Tariff revisions implemented have not reduced the demand growth of electricity . It is implied that demand of the electricity in MP is not price sensitive . a carefully devised electricity tariff will sensitize the demand and will act as an effective tool for conserving energy in Madhya Pradesh. How for do you agree.

»» Opinion Consensus-Agree

Qu16. There are several barriers to the efficient use of electricity. Five important barriers are listed below. Please rank them and classify these barriers empirically in the order (1 to 5) of significance in Madhya Pradesh context.

»»Consensus was on rank order as 1*.Behavioral Barriers 2 *Political Barriers 3* Organizational Barriers 4*Market Barriers 5*.Institutional Barriers

Qu.17 While according approval for new dwelling, the design should be scrutinizes in angle of energy efficiency also by the local bodies and priority should be assigned to energy efficient houses by funding agencies. How far do you agree**.**

»» OpinionConsensus -Strongly agree

Qu 18conducting more awareness programme will lead to improvement of energy usage efficiency in the domestic sector. Do you agree?

»»Opinion consensus-Agree

Qu 19 In addition to the awareness programme , a carefully designed taxation / incentive scheme is likely to improve energy efficiency in the domestic sector. Do you agree.

»»Consensus given on -Agree

Qu20 In the developing state like MP this is not apt time to stress more on energy conservation efforts. Do you agree with this.

»»Consensus was on -.Strongly disagree

Qu 21 It has been assessed that saving of the order of 20% to 30% in electricity consumption in the country is possible by proper implementation of energy conservation and demand side management (DSM) techniques. The same is applicable in MP also . do you agree with this statement

»» **Consensus given on -Strongly agree**

Qu.22 In spite of efforts of the ministry of non conventional energy sources (Govt. of India and MP) non conventional energy has not been well popularized in MP . Please rank the hindering factor given below.

»»Opinion Consensus ranking order was as –

1 * Cost 2 *.Awareness 3 * Availability 4 *Reliability 5 *Incentives

Qu 23 By the year 2020, according to your assessment the likely percentage share of non conventional energy meeting the electrical energy requirement of MP will be

»» Opinion consensus given on an expectation of between 10 % to20 %

Qu 24.Though the door were opened after establishment of MPERC to the private sector for participation in the power sector , the response is poor in MP . According to your assessment , what are the future prospects of independent private sector in MP .

»»Opinion consensus- **end result is Moderate**

Qu25 By the implementation of Regulatory Commission in MP , The energy sector in MP is benefited considerably. Do you agree

»» Opinion consensus given on -Agree

Qu26 In the present economic condition when we experience shortage of low cost energy, which will be a better policy option for immediate future.

»» Opinion consensus given on Avail energy with view of lower consumption or Avail energy at higher cost

Qu 27 By increasing the generation more from more non-conventional sources and strengthening the transmission distribution capacity, the energy situation can be improved .Do you agree

»» opinion consensus given on agree

Qu28 A series of power sector reforms are listed below. Please rank them for implementation in MP.

»»The opinion consensus for the order of ranks are

1. **Integrated resource planning**
2. **Regulatory Commission**
3. **Demand Side management**
4. **Private participation**
5. **National Power grid**

Table 1