Utilities Regulatory Authority

Pre-payment Meter Technology Trial Review

ISSUES PAPER

JUNE 2009
The Utilities Regulatory Authority (the Authority) is Vanuatu's economic regulator of essential utility services in Vanuatu. The Government of Vanuatu established the Authority on 11 February 2008 under the Utilities Regulatory Authority Act No. 11 of 2007.

The Authority is responsible for the regulation of certain services in the electricity and water sectors. Our role differs in each regulated industry but generally involves regulating prices, service standards, and market conduct and consumer protection. We also investigate and advise the Government on regulatory matters that affect Vanuatu's essential utilities.

The Utilities Regulatory Authority Act No. 11 of 2007 states that our primary objective is to regulate certain utilities to ensure the provision of safe, reliable and affordable regulated services and maximise access to regulated services throughout Vanuatu.

Further, the Authority is responsible for approving metering apparatus for measuring and controlling energy and power to consumers and which is supplied by UNELCO.

UNELCO has requested that the Authority consider and approve the implementation of a pre-payment meter trial within the Port Vila concession area. The trial is due to commence August 2009 and scheduled for completion by December 2009.

Johnson Naviti
Chairperson
2  How to respond to this paper

Stakeholders are invited to comment on the issues set out in this paper. Responses and information received will be considered in the formulation of a decision and final advice provided to the relevant Ministers.

Submissions are due on 3 August 2009 and can be emailed to tmael@vanuatu.gov.vu or mailed to:

Electricity Pre-payment Meter Technology Trial – Issues Paper
Utilities Regulatory Authority
PMB 9093
Port Vila, VANUATU

Submissions may also be made in person at the Office of the Utilities Regulatory Authority located at Level 3 Constitutional Building Lini Highway Port Vila, Vanuatu.

Submissions will be made available on the Authority’s website in accordance with the Authority’s website policy. Any material that is confidential should be clearly marked as such.
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The Utilities Regulatory Authority Act Number 11 of 2007 (the Act) establishes the Utilities Regulatory Authority (the Authority) of Vanuatu. The Authority is a body corporate with perpetual succession, acting independently from the Government. The Authority’s Commission consists of three Commissioners, a Chairperson and two part time Commissioners of which one is the Chief Executive Officer of the Authority.

The Act empowers the Authority to regulate certain utilities, in particular, the provision of electricity and water services in Vanuatu.

The Authority’s core functions with respect to the existing water and electricity utility include:

- Monitoring and enforcing existing concession contracts which include checking monthly price adjustments made by the utility, monitoring service standards and technical performance, reviewing yearly financial reports and auditing operating report processes;
- Renegotiating tariffs with the utility in accordance with the relevant concession contracts;
- Manage consumer complaints by assisting consumers resolve grievances and/or complaints with the utilities;
- Advise Government on utility-related matters as requested; and
- Communicating with the Government, utilities, customers and the general public in order to provide information about matters or updates relating to utilities.

The Vanuatu Government has awarded concession contracts for the provision of water and electricity services to a private operator. These contracts delegate the exclusive responsibility for the provision of water and electricity services in Port Vila, and electricity services in Luganville, Tanna Island and Malekula to UNELCO (a subsidiary of the SUEZ Group). The contracts specify rules regarding service coverage, the quality of service to be provided, and the maximum tariffs that may be charged for these services. As the counterparty to each of these contracts, the Government has been responsible for monitoring the utility company’s compliance with the contractual provisions.

The Act empowers the Authority to exercise the functions and powers of the Government relating to the existing concession contracts for electricity and water supply services.

Further, the Authority is responsible for approving metering apparatus for measuring and controlling energy and power to consumers and which is supplied by UNELCO.

In May 2009, UNELCO requested that the Authority consider and approve the implementation of a pre-payment meter trial within the Port Vila concession area. UNELCO intends to implement a trial project to assess and promote the implementation of an electricity pre-payment system for its customers within the concessions of Port Vila and Luganville.
The trial is expected to commence in August 2009 and scheduled for completion by December 2009.

3.1 Pre-payment meter review regulatory framework

Section 20 of the Utilities Regulatory Authority Act No 11 of 2007 sets out that the rights exercisable by the Government in the concession contracts described in Part A of Schedule 1 that are assigned to the Authority.

In accordance with sections 11, clause 57 of the specification relating to the concession for the generation and supply of electric power in Port Vila and section 12, clause 57 of the specification relating to the concession for the generation and supply of electric power in Luganville, the Authority will undertake a review of the pre-payment meter trial.

To assist the Authority in evaluating and assessing the implementation and suitability of pre-payment meter technology, the Authority will seek UNELCO's assistance in providing the Authority with all relevant specifications and reports.

3.2 Purpose of this paper

The purpose of this paper is to seek stakeholder comment on the proposed introduction of electricity prepayment meters within the concession of Port Vila and Luganville.

The paper seeks comment on the following key issues:

- The Authority's proposed approach and methodology in conducting the review of pre-payment meter technology for electricity consumers within Vanuatu;
- In regards to the social, economic and technical aspects of introducing pre-payment meters stakeholders are invited to comment on the suitability, benefits and/or negative impact of pre-payment meters within Vanuatu.

The Authority has set out specific issues on which stakeholders are invited to comment. However, stakeholders should make any other comments that they wish that may not be covered by the issues raised in this consultation paper.

3.3 Structure of this paper

This paper sets out the Authority's proposed approach to the pre-payment meter trial review.

Chapter 4 presents UNELCO's proposed approach in conducting and undertaking an assessment of the pre-payment meter in the Melemaat area; and

Chapter 5 discusses the Authority's approach to undertake a review of the pre-payment meter trial, assessing the suitability, benefits and/or negative impact of pre-payment meters within Vanuatu.

Appendix A: UNELCO response dated 29 May 2009 to information requirements for pre-payment meter technology trial


Appendix C: Manufacturer's information relating to multi-tariff prepayment meter

Appendix D: Prepayment meter operation principle and management flow
In May 2009, UNELCO requested that the Authority consider and approve the implementation of a pre-payment meter trial within the Port Vila concession area.

UNELCO intends to implement a trial project to assess and promote the implementation of an electricity pre-payment system for its customers within the concessions of Port Vila and Luganville. Over the past 10 years, UNELCO has offered its customers in Malekula and Tanna Islands the use of pre-payment meters and has recently introduced another model of pre-payment meter customers in Port Olry, Santo.

In conducting this trial, UNELCO intends to promote the use of prepaid system for its electricity customers in the concessions of Port Vila and Luganville. The proposed trial is pursuing several goals:

In regards to the Customer:
- Evaluate the appreciation and level of satisfaction of its customers on the use a pre-payment system;
- Evaluate the easiness of use and the appropriateness of the system by its customers; and
- Evaluate the savings in energy consumption with the introduction of this new system in comparison to use of post payment system.

In regards to the UNELCO:
- Assess the operational issues associated with replacing the current meters with the new pre-payment meter type within the existing meter box and on UNELCO’s exiting posts and fittings;
- Validate the suitability of the DDSY23 pre-payment meter, in terms of its technical characteristics (i.e. accuracy, reliability, maintainability, and UV and water resistance) and associated software and pricing management;
- Validate the metering system management according to existing pricing system (fixed charge and step tariff)
- Validate the compatibility of the pre-paid system with UNELCO’s existing billing software system; and
- Evaluate the saving in terms of meter reading, billing, disconnection / reconnection costs

UNELCO has proposed a pilot area in Melemaat where one hundred households on small domestic consumers (PCD) tariffs have been selected for the trial.

Appendix B provides a description of the pilot area and the low voltage network within Melemaat.
Pre-payment meter review

The Utilities Regulatory Authority is responsible for approving metering apparatus for measuring and controlling energy and power to customers and which is supplied by UNELCO.

To assist the Authority in effectively assessing the proposal, it has set out a number of questions and information that will need to be considered by the Authority. This information will assist the Authority in evaluating UNELCO's proposal for the development and implementation of pre-payment meter technology for domestic customers in Vanuatu.

The information will provide both technical and economic justification for pre-payment meter technology implementation and acceptance by consumers and interested stakeholders.

5.1 Information and data collection

In April 2009 the Authority set out the following assessment criteria for the development and implementation of UNELCO's proposed pre-payment meter technology trial and economic assessment.

This data will be used to assist the Authority in assessing the suitability of the pre-payment meter, establishing the required level of service for consumers within the concessions of Port Vila and Luganville and assist the Authority in its final decision.

Information requirements for pre-payment meter technology trial assessment:

5.1.1 Technical: Purpose and background

- Provide a report summarising the assessment of findings. This report would be required to be submitted at the end of the trial;
- Capabilities of the technology and what it is designed to deliver, performance levels, service levels including functionality;
- Provide an explanation on how the trial will establish the appropriateness of the meter;
- Operational issues associated with procurement, installation and operation of the technology;
- Detailed plan for the technology trials, including the nature, scale, funding, timing, operation, transparency, and performance reporting of the trial. (Includes commencement date, duration and location of trial. Number of customers impacted by the trial etc);
- Provide details on the design and specify the trial, coordination, implementation and conduct of the trial;
- Interim report on progress, key issues and outcomes;
- Provide forum for discussion of trial operation, progress and results, and resolution of issues;
- Commencement, duration and location of trial. Number of customers impacted by the trial;
- Whether design of the technology allows for bench testing and field testing of the technology. (e.g. recovery from power failure – test);
• During the trial, installation of meters will result in disruption of supply for concerned households. 1. Will there be any compensation for supply disruption; 2. Will there be any changes to their billing arrangements and tariffs during the trial?
• How will the new technology allow consumers to better manage their energy usage?
• Will the technology provide consumers detailed information about their consumption with the opportunity to save money on their power bill?

5.1.2 General: issues and enquiry
• Are there any installation issues at customer premises been identified and how are they being addressed;
• Do the trial meters replace the customer’s previous meter or are they installed in addition to customer’s existing revenue metering;
• Will the trial concern only existing customers?
• How will the participating households be selected? Will they be participating based on self selection (i.e. households have the choice) or will UNELCO do the trial in a given area for all?
• Meter ownership, payment and/or rental charges?
• Whether there is any provision for ensuring that no household included in the trial will be adversely affected i.e. in the case of existing customers. Those that self select or are chosen by UNELCO to participate in the trial need to have a guarantee that for equal consumption their bill will not increase.
• Does the technology allow for instant pre-payments at any time?
• Does it eliminate the need for manual readings?
• What does the technology display to the consumer?
• Does the consumer have access to information regarding household electricity cost, power consumption?
• Unit price of the meter?
• What empowerment does a pre-payment meter give to the hands of the consumer?
• How the new technology will meet the specific needs of the Vanuatu market?
• How will UNELCO work with local communities, consumer groups, education groups and those best positioned to ensure consumers can make optimal use of the technology?
• Does it apply to domestic, small business consumers or domestic only?
• The pre-payment meter can be charged up by using a chip-based smart card. Are consumers able to recharge using (mobile) phone, internet, and after normal business hours?
• Will the new technology reduce monitoring and billing costs and how will this be passed on to small consumers?
• Will the technology reduce disconnection and reconnection charges?
• Are there any credit maintenance costs that will be imposed on the small consumer?
• Does the technology enable continued electricity use if the credit runs out outside of normal business hours? i.e. ‘friendly credit’
• Is the customer able to see how much credit is remaining and how many more days it is likely to last based on household consumption? Is there an alert system when credit is low?
• Will this pay- as-you- go system have practical applications in flats, apartments and holiday homes?
• Will the customer have an option to maintain the current system of buying electricity and paying monthly bills?
• What is the likely maintenance of these meters and if they breakdown, how is maintenance and repairs being paid for – by the consumer?

Appendix A sets out UNELCO's response to the Authority's information requirements for pre-payment meter technology trial.

5.1.3 Regulatory and pricing issues
The Authority will need to issue a decision on the regulation of revenue to be earned by UNELCO in connection with the provision, installation, maintenance and operation of pre-payment meter technology and associated services and systems.

The Authority will need to obtain cost information on the installation and operation of the meters so that the Authority can determine the required revenue; how UNELCO is compensated and/or can recover costs for the pre-paid meters.

For the purposes of the trial, the Authority will need to consider if there a cost pass through of expenses to be requested by UNELCO. The Authority would require sufficient documentation to assess that the installation costs are competitive. Similar verification issues would need to be addressed in the case of a permanent system being implemented.

The Authority will need to consider the pricing principles to be applied by UNELCO in the setting of any metering charges for, or in connection with, the provision, installation, maintenance and operation of pre-payment meter technology and associated services and systems. (This is not required in the initial stages of the trial but would need to be considered later in the project).
Appendix A: UNELCO response dated 29 May 2009 to information requirements for pre-payment meter technology trial

<table>
<thead>
<tr>
<th>Title</th>
<th>Description</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose and background</td>
<td>Provide a report summarising the assessment of findings. This report would be required to be submitted at the end of the trial.</td>
<td>Report will be submitted at the end of the trial.</td>
</tr>
<tr>
<td>Capabilities of the technology and what it is designed to deliver, performance levels and service levels. Functionality, performance and service level.</td>
<td>Mono - 220V - 50 Hz – 5 to 60 A – Class 1&lt;br&gt;Tri - 380/220V - 50Hz – 20 to 100 A – Class 1&lt;br&gt;Card Reader&lt;br&gt;LC Display&lt;br&gt;Infrared communication&lt;br&gt;Non rechargeable Lithium battery (life time = 10 to 15 years)&lt;br&gt;5.1.4 IEC 62052-11: Electricity metering equipment (AC) General requirements, tests and test conditions Part 11: Metering equipment&lt;br&gt;5.1.5 IEC 62053-21: Electricity metering equipment (a.c.) Particular requirements Part 21: Static meters for active energy (classes 1 and 2)&lt;br&gt;IEC 62056-21: Electricity Metering - Data Exchange for Meter Reading, Tariff and Load Control - Part 21: Direct Local Data Exchange&lt;br&gt;ISO 7816&lt;br&gt;IEC60529-4 : IP 54&lt;br&gt;The design features good sealing performance, good insulation property and good security:&lt;br&gt;· Protection Class: IP 54&lt;br&gt;· Fireproofing class: Vo&lt;br&gt;· Anti-ultraviolet radiation&lt;br&gt;Find enclosed specifications (star instrument.pdf; prepayment Energy Meter.ppt).</td>
<td></td>
</tr>
</tbody>
</table>
| Provide an explanation on how the trial will establish the appropriateness of the meter | - Level of satisfaction of our customers  
- Easiness of use for our customer  
- Suitability of DDSY23 prepaid meter, in terms of technology. (Accuracy, reliability, maintainability, UV and water resistance etc.) and associated soft (pricing management).  
- metering system management according to existing pricing system (mixture of fixed charge and step tariff) which couldn't be managed by the old model of prepayment meters.  
- compatibility of the pre-paid system with our existing billing software system. |
| --- | --- |
| Operational issues associated with procurement, installation and operation of the technology | Procurement:  
Customized software according to our tariff structure: 2 months  
Delay of meter supply: 2 weeks ex works  
Installation:  
The existing meter box including protection devices and meter will be replaced as is where is by the new box. |
| Detailed plan for the technology trials, including the nature, scale, funding, timing, operation, transparency, and performance reporting of the trial. (Includes commencement date, duration and location of trial. Number of customers impacted by the trial etc). | Melemaat project  
target 100 households  
small consumption customer (Low consumer tariff)  
Trial period: 4 – 6 month including promotion and installation  
June – July: promotion  
August: installation  
September – December: observation |
| Provide details on the design and specify the trial, coordination, implementation and conduct of the trial. | Installation of 100 prepaid meter DDSY24 mono phases in Mele Maate village  
1st phase: promoting the prepayment system to villagers( 1 meeting with chiefs, 2 forum meetings with customers)  
2nd phase: survey / explanation for every customer.  
3rd phase: installation of 100 meters  
4th phase: trial of the prepaid system  
5th phase: evaluation |
| Interim report on progress, key issues and outcomes. | Report at each phase if necessary or if required |
| Provide forum for discussion of trial operation, progress and results, and resolution of issues | Forum in June, July.  
A customer forum will be held in November. |
<table>
<thead>
<tr>
<th>Issues and enquiry</th>
<th>Are there any installation issues at customer premises been identified and how are they being addressed.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Replacement of the existing meter box at no charge for the customer.</td>
</tr>
<tr>
<td></td>
<td>Do the trial meters replace the customer’s previous meter or are they installed in addition to customer’s existing revenue metering.</td>
</tr>
<tr>
<td></td>
<td>Existing meter will be replaced.</td>
</tr>
<tr>
<td></td>
<td>Will the trial concern only existing customers?</td>
</tr>
<tr>
<td></td>
<td>For new customer during the trial period, UNELCO will try to promote the installation of pre payment meter.</td>
</tr>
<tr>
<td></td>
<td>How will the participating households be selected? Will they be participating based on self selection (i.e. households have the choice) or will UNELCO do the trial in a given area for all?</td>
</tr>
<tr>
<td></td>
<td>Customer will have the choice to refuse the new system.</td>
</tr>
<tr>
<td>Regulatory and Pricing Issues</td>
<td>The URA will need to issue a decision on the regulation of revenue to be earned by concessionnaire in connection with the provision, installation, maintenance and operation of pre-payment meter technology and associated services and systems. The URA will need to obtain cost information on the installation and operation of the meters so that the URA can determine the required revenue: how UNELCO is compensated and /or can recover costs for the pre-paid meters. For the purposes of the trial, the URA will need to consider if there a cost pass through of expenses to be requested by UNELCO. The URA would require sufficient documentation to assess that the installation costs are competitive. Similar verification issues would need to be addressed in the case of a permanent system being implemented.</td>
</tr>
<tr>
<td>The URA will need to consider the pricing principles to be applied by the Concessionaire in the setting of any metering charges for, or in connection with, the provision, installation, maintenance and operation of pre-payment meter technology and associated services and systems. (This is not required in the initial stages but would need to be considered later in the project)</td>
<td>Idem as above.</td>
</tr>
<tr>
<td>Meter ownership, payment and/or rental charges?</td>
<td>No charge for customers. Meter belongs to UNELCO. Customer is supposed to pay a rental fee included in monthly fix charge.</td>
</tr>
<tr>
<td>Whether there is any provision for ensuring that no household included in the trial will be adversely affected i.e. in the case of existing customers. Those that self select or are chosen by UNELCO to participate in the trial need to have a guarantee that for equal consumption their bill will not increase.</td>
<td>No over charge for the customers having chosen the prepayment system compare to the others.</td>
</tr>
<tr>
<td>General</td>
<td>Does the technology allow for instant pre-payments at any time?</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Does it eliminate the need for manual readings?</td>
<td>No, at least one visit to the meter is needed per year to cross check readings, confirm safety and absence of theft.</td>
</tr>
<tr>
<td>What does the technology display to the consumer?</td>
<td>History of their consumption, overload, credit remaining, etc. The meter screen can display more than 70 bits of information: Accumulative power consumption, credit amount remaining, accumulative purchase amount, load control, monthly tariff, monthly maximum demand (including date and time), real time and date, real time power etc.</td>
</tr>
<tr>
<td>Does the consumer have access to information regarding household electricity cost, power consumption?</td>
<td>Yes. The consumer can have access to all information mentioned above by pressing the scroll button on the meter. However all information will be display automatically.</td>
</tr>
<tr>
<td>Unit price of the meter?</td>
<td>16 000 VUV with accessories. 6 000 VUV for the meter only. To be compared with traditional system: 20 000 VUV.</td>
</tr>
<tr>
<td>What empowerment does a pre-payment meter put in the hands of the consumer?</td>
<td>Reading meter, consumption, reminding credit, etc.</td>
</tr>
<tr>
<td>How the new technology will meet the specific needs of the Vanuatu market?</td>
<td>Customer pay to get electricity when they get money. The customer can choose the level of ‘refill’ according to its cash availabilities.</td>
</tr>
<tr>
<td>How will UNELCO work with local communities, consumer groups, education groups and those best positioned to ensure consumers can make optimal use of the technology?</td>
<td>1. promoting prepaid meter 2. demonstrating how it works at a public place in the village 3. teaching how to charge meter when it is installed 4. inform what customer gets from the LC display as information useful for saving energy</td>
</tr>
<tr>
<td>Does it apply to domestic, small business consumers or domestic only?</td>
<td>For all tariffs including three phases customers.</td>
</tr>
<tr>
<td>The pre-payment meter can be charged up by using a chip-based smart card. Are consumers able to recharge using (mobile) phone, internet, and after normal business hours?</td>
<td>Rechargeable with chip card. Possibility to charge via Internet. Refill on ATM machine under development.</td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Will the new technology reduce monitoring and billing costs and how will \this be passed on to small consumers?</td>
<td>Billing cost reduced. But control is necessary at least once a year. This reduction of cost will be assessed during the trial.</td>
</tr>
<tr>
<td>Will the technology reduce disconnection and reconnection charges?</td>
<td>Disconnection/reconnection charges will no longer apply.</td>
</tr>
<tr>
<td>Are there any credit maintenance costs that will be imposed on the small consumer?</td>
<td>No.</td>
</tr>
<tr>
<td>Does the technology enable continued electricity use if the credit runs out outside of normal business hours? i.e. 'friendly credit'</td>
<td>No disruption during weekends and national holidays. See overdraft function above.</td>
</tr>
<tr>
<td>Is the customer able to see how much credit is remaining and how many more days it is likely to last based on household consumption? Is there an alert system when credit is low?</td>
<td>KWh remaining on LC display. Two levels of warning depending on the credit remaining (can be programmed by soft)</td>
</tr>
<tr>
<td>Will this pay-as-you-go system have practical applications in flats, apartments and holiday homes?</td>
<td>Yes.</td>
</tr>
<tr>
<td>Will the customer have an option to maintain the current system of buying electricity and paying monthly bills?</td>
<td>Yes.</td>
</tr>
<tr>
<td>What is the likely maintenance of these meters and if they breakdown, how is maintenance and repairs being paid for – by the consumer?</td>
<td>For the trial purpose, no extra maintenance fee for customers. Meter will be replaced at UNELCO's charge if normal failure.</td>
</tr>
</tbody>
</table>
Appendix C: Manufacturer’s information relating to multi-tariff prepayment meter

STAR INSTRUMENT
Professional Manufacturer of Utility Meters

BRIEF:
Single/Three electronic multi-tariff prepayment energy meter box is the new product of our company which has obtained national patent. The new appearance design has considered novelty style, convenience to operate and anti-tamper features. The design also features with good sealing performance, good insulation property and good security. It is applicable to many kinds of energy meters, and can be used with single/three phase electronic prepayment energy meter and single/three electronic multi-tariff prepayment energy meter (CPU card energy meter). The three-phase energy meter box can not only be used with three-phase prepayment/multi-tariff energy meter, but also be used as a unit of large energy meter which integrates the function of prepayment/multi-tariff measuring and load control.

MAIN TECHNICAL CHARACTERISTICS:

- Protection Class: IP54
- Double Insulation Class: ...
- Fireproofing class: V4 (Meter box uses fireproof material)
- Anti-ultraviolet radiation.
MAIN MODELS

MAIN FEATURES
Multi-tariff Prepayment energy meter is a multi-tariff active energy measurement instrument with CPU card communication interface. It realizes the functions of multi-tariff measurement and prepayment controlling of active energy meter. The meter can fulfill the functions of energy measurement, data processing and customer energy consumption control based on energy consumed at different predefined time intervals, TOU (time of day) tariffs (predefined for energy used in respective time intervals), and prepayment credit management method (credit management in monetary terms or in terms of energy). Infrared communication and RS485 communication is also provided in the meter.

MAIN FUNCTIONS
1. Cutting users' load automatically to remind customer about no balance.
2. Anti-boarding of credit (in terms of power and in terms of money)
3. Programmable functions of monthly minimum energy consumption and automatic deduction at month end, post payment energy consumption and overdraft energy consumption facility.
4. Statistics of monthly energy consumption and functions of meter data written back to system.
5. Event record for time calibration events, energy-tariff events and power-off events
6. Function of meter reading and meter replacement.

ADDITIONAL FUNCTIONS
1. Measuring power in normal case of reverse current, and keep the reverse energy consumption measurement separately.
2. MID measurement function
3. Data management of monthly energy consumption and twelve month energy consumption data storage.
4. Flexible programmable multi-tariff structure ensures TOU (time of day) measurement.
5. Function of consumer load checking and controlling.
6. Capable to be integrated into "one card" prepayment collection system which is adopted by prepayment water meter and prepayment gas meter.
7. With proper programming, meter can also be used as post payment meter.
8. Multi-tariff Prepayment energy meter adopts CPU card on which encrypted key management systems is applied. It has an integrated security management system with high security level and can be used as a multi-purpose card.

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Appendix D: Prepayment meter operation principle and management flow

1. Prepayment Meter & Management Flow
2. Prepayment Meter Operation Principle
3. Prepayment Meter Calculation Method
4. Prepayment Meter Terms

1. Prepayment Meter and Management Flow

Meter Appearance

Multi-brief Prepayment energy meter
1. Prepayment Meter and Management Flow

1. Upper cover plastic seal   15. Terminal block fix screw
2. Upper cover screw seal    16. Terminal block
3. Upper cover               17. Pulse test output
4. Warning indication        18. Infrared communication port
5. Pulse indication          19. LCD display
7. CPU card and Card socket  21. Base
8. Scrolling display button  
9. Upper cover screw seal    
10. Upper cover lead seal (mark A)
11. Terminal block
12. Terminal cover screw seal
13. Terminal cover
14. Setting button

Meter Structure

1. Prepayment Meter and Management Flow

**LCD Display**

1. Display code: Indicate different power using data, purchasing and power using record data as well as meter setting parameter. Refer to explanation in attachment.
2. Mark: Indicate presently the stepped price calculated.
3. Unit: Data display unit (Energy unit kWh, Currency unit AZN, Active Power unit kW).
5. Date Display: Measure data, purchasing and using data as well as display for setting parameters.
6. Communication Mark: Indicates meter in the state of communication.
7. Tampering mark: Indicates meter in the state of reversing or tampering, please handle it immediately.
1. Prepayment Meter and Management Flow

**Functions**

- Prepayment
- Over-load control
- Warning
- Stepped price
- Record of reversing (accumulated reversing energy)
- Communication (IC card and infrared communication port) infrared ray communication, 2400bps, distance exposure 3-4 meters, indoor 6-7 meter.
- Overdraft
- Power meter (real-time power display real-time load)
- Tick and tick load control (Power off 5 minutes after overload)
- Monthly basic using money
- Monthly using energy/money storage (store energy using money for recent 12 months)
- Minimum Monthly Consumption

**Prepayment Function**

Basic function of prepayment meter, first purchase then use. When purchasing, load money and stepped price into prepayment meter, when using, prepaid money in the meter will reduce gradually to zero, then power off. Please refer to operation manual 4.4 chapter.
1. Prepayment Meter and Management Flow

• **Load control Function**

Though the power selling system, meter can be equipped with a load threshold to control the load. When the load over the threshold and continue for a certain period, meter will switch off automatically. Please refer to Operation Manual 4.2 chapter.

(Max Demand of present month [36]-Power-using load control threshold [16], and real-time power [94]-continue over the control threshold [16], switch off in 5 minutes after over-load)

Motor will start over-load warning (warning light shining and LCD display indicates the power) when both the measured max-demand are higher than the load threshold. If the warning state continues for 5 minutes, the meter will switch off load and add 1 to the actual over load record, at the same time, start over-load warning (warning light shining and LCD display indicates the power before switch off)

When the meter is in the overload power off state and the actual power off times is no more than the allowed overload power off times, then the power supply can be recovered by pressing the button or inserting the card; otherwise, the meter will not recover the power supply.

When the meter is in the overload power off state, the actual power off times is more than the allowed overload power off times and the meter can’t recover the power supply, the user has to insert the purchase card into the meter and let the meter related information ready by the card. Then the user can apply capacity enlargement or other related business in the selling energy department. And the power supply can be recovered after inserting the capacity enlarged card.

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1. Prepayment Meter and Management Flow

• **Warning Function**

Warning Function of the meter: Overload warning, Residual amount pre-warning, Residual amount power off warning.

When the current max demand and the power are no less than user’s load limit, the meter will run the overload warning function (the indicator flashing as well as the LCD displays the real-time power). If the warning is lasting for five minutes, the meter will cut off the power and the actual overload power off ammeter will plus another one time accordingly. Meanwhile, running overload power off warning function (the indicator flashing as well as the LCD displays the real-time power)

• **Residual amount pre-warning**

The meter can set up residual amount pre-warning. When the residual amount is not more than the pre-warning, the meter will run the pre-warning function automatically, the indicator flash. The user can press the button or insert the card to cancel the warning.
1. Prepayment Meter and Management Flow

- **Residual amount power off warning**

  The meter can set up residual amount power-off warning function. When the residual amount is not more than the power-off warning, the meter will run the power-off warning automatically, cutting off the load and the indicator will flash all the time. At this time, the user can press the button or insert the card to recover the power supply, then the warning is cancelled.

  If the residual amount of power off warning is set to zero, it shows that the meter has no power off warning function.

  Sound warning

  The meter can set up the lasting time of the sound warning, the unit is minute. When the meter is in sound warning, if without the user’s interruption (not pressing the button or not inserting the card), when reaches the warning setting time, the sound will stop automatically. If the sound warning lasting time is set to zero, it shows that the meter has no sound warning function.

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2. Prepayment Meter and Management Flow

- **Step Tariff Function**

  In each month, the power consumption can be divided into 4 different phases. Then the meter can calculate the amount in 4 different power prices. Therefore, the use restrict and use encouragement can be realized.

  - If the monthly current power consumption is less than step load 1(E1), the meter will calculate the amount in power price 0(P0);
  - If the monthly current power consumption is not less than step load 1(E1) and less than step load 2(E2), the meter will calculate the amount in power price 1(P1);
  - If the monthly current power consumption is more than step load 2(E2) and less than load 3(E3), the meter will calculate the amount in Price 2(P2);
  - If the monthly current power consumption is not less than step load 3(E3), the meter will calculate the amount in Price 3(P3);

  And the step load can meet: 0 ≤ E1 ≤ E2 ≤ E3
1. Prepayment Meter and Management Flow

- **Function of reactive power consumption recording**
  (total reactive power consumption)
  The reactive power consumption of prepayment multi-tariff energy meter is measured by active consumption and will be accumulated to the total active consumption and the total active consumption of every accounting month. At the same time, the meter will measure the total reversed active power consumption independently.

- **Communication function**
  (IC card and infrared communication port) infrared communication, 2400bps, 3–4 m from the strong ray, 6–7 m indoor.
  The energy meter has modulated infrared communication port. By using the palm computer with modulated infrared communication port, the function of calibration and data reading of the meter can be realized. Refer to section 4.8 in the manual instruction.

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1. Prepayment Meter and Management Flow

- **Overdraft function**
  According to the agreement between the power supply bureau and the consumer, the energy overdraft gate can be processed. When the remaining amount of money decreases to 0, the overdraft consumption can be processed uninterruptedly. The used power amount will increase to over 0 amount and overdraft amount by 0.01KWh step energy tariff until it reach to the overdraft gate. If the overdraft gate is programmed as 0, the meter will not have the function of overdraft.

- **Frequency function**
  Frequency function (real-time frequency displays real-time load.)
1. Prepayment Meter and Management Flow

- **The function of debt and debt load control (trips 5 minutes after the overload)**

  Function of debt power consumption.

  The energy meter can be programmed to a time zone that no power failure exists during 24 hours everyday or on holidays and whether Sunday power interruption is allowed. After the remaining amount and overdraft amount are used up, the amount of money transferred from the energy during no power failure permitting period will be the debt money, the meter can be programmed to define the gate of debt money.

  When the remaining amount and overdraft amount are used up and the meter operates in the time that no power failure is permitted, the meter will automatically resume the supply. The energy generated will increase to over 0 amount and overdraft amount by 0.01KWh step energy tariff until it reach to the overdraft gate. If the meter operates at the time that power failure is permitted, the meter will cut the supply automatically.

  If the debiting gate is set with 0, the meter will not have the debt function. The power supply will be cut out after the remaining amount and overdraft amount is used out no matter it is permitted or not.

  Debt load control gate refers to the maximum power load allowed when the consumer is in the state of debt. The reference of debt, please refer to “4.4.6 debt function”

1. Prepayment Meter and Management Flow

- **The function of monthly basic power consumption sum**

  The meter can be programmed to set the monthly basic sum. When the meter accounts the monthly energy consumption, if the amount is less than the monthly basic sum, the meter will deduct the shortage from the remaining sum automatically. (no modification of the sum of power consumption). If the basic monthly sum of power consumption is set as 0, the meter will not have the deduction ability.

- **The function of storing monthly energy /sum (keeping energy and sum of 12 months.)**

  Having the function of transferring and storing the month data and being able to store the power consumption data of 12 months.
1. Prepayment Meter and Management Flow

**Advantages of prepayment energy meter.**

Why Utilities Switch To PREPAYMENT SYSTEM?

- No delayed payments and bad debts.
- 100% advance payment.
- No disconnection problems.
- No meter tampering.
- Transparency in bill calculation.
- No billing costs.
- Demand management and control.

**WHY CONSUMERS PREFER THE PREPAYMENT SYSTEM?**

- Consumption control /control of energy usage
- Set monthly budget /budget management
- No reconnection fees (no cost for disconnection/reconnection and no waiting for reconnection)
- No deposits
- Ability to pay back debts

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1. Prepayment Meter and Management Flow

**Management Flow**

**Basic Flow:**
1. Definition of basic parameter (such as price, type of consumption, means of payment etc.)
2. Opening account
3. Purchasing
4. Loading
5. Using
6. Alarming
7. Purchasing

**Card type:**
- Customer card: held by the customer. Purchasing, loading
- PSAM Card: held by the vendor. Power vending
- Checking Card: held by the people in power corporation.
  Used in data collecting, meter exchanging and parameter setting

**Palm Computer:**
Used in data reading, calibration etc.
1. Prepayment Meter and Management Flow

Registration: customer information registration.

After giving the customer card and money to the vendor, the vendor will transfer the sum you want to buy to your card through the special vending management system of the power corporation. Then the vendor will return the card to you with the receipt and the process finished. Please put the card in the card protection cover with good care and install the sum to the energy meter as soon as possible.

Insert the customer card which has bought energy into the IC card socket according to the direction indicated by the arrow. When “ok” displayed as the left chart on the screen as well as ringing sound is heard, it means the loading is completed! You can pull out the card and congratulations to your completion. You can check your information of power purchasing and consumption by the keys of the meter. For the data displayed on the meter, you can refer to the attached instructions.

If it is not “ok” but other information displayed and you can hear “ringing” sound three times, that means the failure of the installation. Take it easy, you can have another try after pulling it out! This is mainly caused by wrong operation. If the error occurs again, please consult at the vending port with your card and the service man will deal with the problem for you.
1. Prepayment Meter and Management Flow

3: Power Consumption

1. Pay attention to the load of the electrical equipment and avoid overload. If you use many electrical appliances whose load is higher than the Gate set by the power corporation, the prepayment energy meter will start its function of alarming and tripping at overload. Phenomenon: the green light of meter twinkle as well as rings. The screen displays the active frequency, which means the appliance load is higher than the set load. Now, please shut some appliances to lower the load. Otherwise, the meter will cut the power until it rings for 5 minutes. Now, if you need resume power supply, please shut some appliances and press the key or insert the card, then the energy meter will resume power supply automatically.

2. Pay attention to the times of trips at overload, if it is more than the times set previously, the customer will not resume the power supply by pressing the key or inserting the card. Now you should insert the user card into meter and get the consumption information and then take it to selling center to enlarge capacity and purchase power, after that you can recover the power only.

3. When you turn on the facility the red light start glitter. The more facilities are used, the faster glitter is. It is normal work.

4: Warning

When residual credit is not much enough the meter alarm will take pre-warning and power-off warning effect. reminding user to purchasing power and loading power as soon as possible in order to avoid incapable power using accident.

1. When the residual credit is less than the alarming limit, the meter alarm indicator will flash as well as sound of "di, di, di,..." reminding the user to purchasing power and loading power as soon as possible. The buzzer sound can be stopped by pressing the button or inserting the card.

2. When the residual credit is less than the alarming limit, the meter power-off alarm and meter green light alarm will continue flash as well as sound of "di, di, di,...". The buzzer sound can be stopped by pressing the button or inserting the card. It calls for user to purchase power and load power as soon as possible. Otherwise power will be off again after residual money becomes zero that will take much inconvenience for your work and life arrangement.

3. If you didn't apply for overdraft or tick function the meter will be cutoff from circuit when the residual money becomes zero. And now you should go by selling center purchasing and loading the power to avoid such inconvenience for your work and life.
1. Prepayment Meter and Management Flow

**Common problems disposition:**

- Replace card when card lost
- a) Card data disorder - card maintenance
- b) Card damage-change meter (The power supply department can change the meter by checking card and the switch on the meter. No matter change-in or change-out operation, the set key must be pressed. The LCD and card base, if broken during the replace, must be manned).
- d) Adding capacity
- e) Overdraft setting (The overdraft gate is set higher than 0)
- f) Debt setting (The debt gate is set higher than 0)
- g) Cancellation - recycle

2. Operation Principles of Prepayment Energy Meter

The system is mainly made up of power, measurement, and MCU. The function of power part is to provide the system with operation power, the measurement mainly calculates the total consumed energy and the MCU part mainly deals with the process of data and output of all kinds of control communication.

The part that different from prepaid energy meter is: the prepaid energy meter has the function of power cutting and prepaid charge. (The left chart correspond to IC card reading circuit and MCU.)

The energy stores the prepaid money and decreases as the customer use the power. The power will be cut off when the money decreases to 0. (power will be cut off according to the correspondent conditions if it has the function of overdraft and debt.)
2. Operation Principles of Prepayment Energy Meter

**Power Supply**

DDSYF23 energy meter adopt linear power supply, e.g. linear transformer power supply. For sake of safety, isolated power supply need to adopt where people may touch it, while in order to measure the power consumption, the measuring circuit need to locate on the phase line. So two way power supply is adopted, one way is automatic and another with auto transformer, separately supply power to measuring unit and card slot. After half wave rectifying the part with auto transformer, and stabilize to voltage to 5V by voltage regulator to supply for the measuring circuit; isolated part will supply 12V voltage to relay after rectified by bridge rectifier, then stabilized to 5V by the stabilizing module and supply to the MCU and other function modules.

The stability of power supply part is the base for the whole system.

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**Measuring Part**

The measuring part realize the cumulative of power consumption, and transform the cumulative energy to corresponding impulse. This system adopt 7751 as the measuring IC, which support double channel measure and could realize multifold anti-tamper. While offer measuring impulse, it could also detect irregular power consumption status such as reversal and imbalance of the two circuits.

Measuring part is the base of completing the measuring of power consumption, the accuracy of the meter is closely relating to this part.
2. Operation Principles of Prepayment Energy Meter

**MCU**

MCU controlling unit is the core of the whole system, all the functions such as: energy accumulation, data display, working status judgment, inserting card, data storage, bad control, data communication are controlled by MCU, the following is an introduction of the controlling functions could be realized by the MCU with each function module as unit.

3. Collecting mode of prepayment energy meter

**Collecting mode of non Prepayment meter:**

Meter reading staff reading meter->calculating charges according to power consumption->post the bill to customer->User pay in the business depot or collection by bank.

**Present collection mode of Prepayment meter:**

User buy power in business hall or vending depot->Insert the IC card to the meter, load the prepaid credit to the meter->Customer user the power, the prepaid credit decrease automatically.

**Star collection mode of Prepayment meter:** Credit Collection. Load the credit and price to the meter, after user consume each 0.01kWh, the meter will calculate the credit available remaining credit [2], until the credit available remaining credit [2] decrease to 0, then cut off the power.

In addition, Star Prepayment Meter also have the step tariff collection function.

**Step tariff Collection:** step tariff collection mode is designed to realize energy company encourage consume or save energy management, offer different price according to different power consumption amount, adopt the same price in a basic consumption scope, the excessive part will adopt another price.

For example: Power company regulate save power: Per month power consumption ≤100kWh, the price is 0.08AZN; 100kWh ≤ and 200kWh>, price is 0.08AZN; 200kWh ≤, the price is 0.12AZN. If a customer consume 320KWH, then the credit consume is: 100*0.08+(200-100)*0.08+ (320-200)*0.12=28.4AZN.
3. Collecting mode of prepayment energy meter

**Step tariff**

1. During each collection month, calculate according to the power consumption in the different step, the meter could calculate according to different price to realize encourage or limit power consumption.

   - If the monthly current power consumption is less than step load 1 (E1), the meter will calculate the amount in Price 0 (P0)
   - If the monthly current power consumption is not less than step load 1 (E1) and less than load 2(E2), the meter will calculate the amount in Price 1(P1)
   - If the monthly current power consumption is more than step load 2 (E2) and less than load 3(E3), the meter will calculate the amount in Price 2(P2)
   - If the monthly current power consumption is not less than step load 3 (E3), the meter will calculate the amount in Price 3(P3)
   
   And the step load can meet: 0 ≤ E1 ≤ E2 ≤ E3

2. The energy meter could program 4 sets of step tariff list, each set of step tariff appoint 4 steps and each step adopt the relevant price, E1, E2, E3, P0, P1, P2, P3

3. The energy meter could program 4 time intervals, and specify the step tariff list of each interval (one of the four sets)
3. Collecting mode of prepayment energy meter

The step tariff setting while adopting single price
Price: P3=P2=P1=P0
Quantity: E3=E2=E1

About the switch of setting the step tariff
Step tariff list: Setting specific value for P0,P1,P2,P3,E1,E2,E3, we call it one set of step tariff list
Time interval: We could appoint one to four different time intervals to use the same or different step tariff list during one year
Through the setting of time intervals, the switch of step tariff could be realized.
For example, adopt single price step tariff list, and adopt save energy step tariff list

Example:

Step tariff setting as: P0=P1=P2=P3=0.06AZN E1=E2=E3=0
User buy 30AZN, load in the meter. The credit in commission (remaining credit [2]) is 30AZN, each 1kWh power consumed, remaining credit decrease 0.06AZN, after 500kWh consumes, the remaining credit decrease to 0.

Step tariff setting as: P0=0.06AZN, P1=P2=P3=0.08AZN E1=100, E2=E3=200
User buy 30AZN, load in the meter. The credit in commission (remaining credit [2]) is 30AZN,
Power consumption of the first month is 150kWh, Remaining credit 30- 100*0.06 - 50*0.08 = 20AZN
Power consumption of the second month is 180kWh, Remaining credit 20- 100*0.06 - 80*0.08 = 7.6AZN
During the third month, when consume 100kWh, remaining credit 1.6AZN, after consume 120kWh, remaining credit 0.
4. Interpretation of phrase for prepayment energy meter

1. **Cumulative power consumption [1]**
   The total energy consumption from meter setting up, when accumulative energy consumption over "99999999kWh", it will automatically display"000000.00kWh", write back when insert card.

2. **Remaining credit[2]**
   the credit prepaid by user, when user buy and loading power, the amount will increase, when user consumes it decrease, power will be cut off from it decrease to 0, and write back when insert card if over draft allowed, power will be cut off until over draft use up, if debt allowed, then power will not be cut off in the allowed debt scope.

3. **Cumulative reversal power consumption[3]**
   The total reversal energy consumption from meter setting up, when accumulative reversal energy consumption over "99999999kWh", it will automatically display"000000.00kWh", write back when insert card.

4. **Over zero amount[4]**
   Over zero amount is the amount used by user after the credit use up, usually happens under overdraft, debt or relay failure, will write back when insert the card.

5. **Overdraft amount[5]**
   The amount consumed under overdraft status, will write back when insert card.

6. **Emergency debt amount [6]**
   The amount consumed under emergency debt status, will write back when insert card.

7. **Total credit purchased [7]**
   The total energy consumption from meter setting up, when accumulative energy consumption amount over "999999.00AZN", it will automatically display"000000.00AZN", write back when insert card.

8. **Pre-warning amount[9]**
   one of the warning limit to remind user purchase power as soon as possible, including pre-warning amount and warning amount, pre-warning amount more than warning amount. When the remaining credit equal or less than pre-warning amount, the warning indicator flash to give the first warning. When remaining amount equal or less than warning amount, the meter will cut off the power to remind the remaining credit too less. Then user could insert the card (or press scroll button) to restore power. Pre-warning amount and warning amount could be set at random.

9. **Warning amount[10]**
   same as above.

10. **Excessive accumulation limit[11]**
    the threshold amount to restrict user input the power purchased to the meter. When the remaining amount and amount purchased this time more than excessive accumulation limit, will reject the amount purchased this time, that is power can't be loaded and show error indication"cd_Lim08". Excessive accumulation limit could be set freely, if don't want to limit, the amount will be: 999999.9999999999AZN

11. **Minimum monthly power consumption[12]**
    minimum monthly power consumption and excessive accumulation limit could be set freely, if not adopt just set 0.(basic monthly consumption amount is similar with basic changes)

12. **Over draft amount limit[13]**
    the amount limit for overdraft in emergency offered by the meter, when set it 0 user can't overdraft.

13. **Debt amount limit[14]**
    the debt amount limit offered by meter during the time or date can't power off, when this value set max. (999999.9999999999AZN), user will have no limit during the time or date can't power off, when it is set min 0, user can't consume on debt.
4. Interpretation of phrase for prepayment energy meter

14. Electricity load times [15]
   The loading times since the meter set up, add one after loading each time, if loading times is 9999, then when load the next time it will become 0 write back when insert card.

15. Load control limit [16]
   the load limit the control user consume power, when the average power exceed this value continuously, power will be cut off. When max. demand (display item 36) exceeds this value and the real time power (04 display item) last for 5 minutes, then the meter will cut off power.

16. Allowed overload trip times [17]
   While power off for overload, user could restore by pressing button or insert card, when the times of power off for overload reaches a value allowed overload trip times, if power off occurs again for overload, user can't restore by insert card or press button, he need to restore power in the business center or electricity company. When overload power off times set to 0, power could not be restored after power off for overloading the times of power off for overload not exceed 9999.

17. Actual overload trip times [18]
   Recording trip times when overload. When actual overload trip times [18] exceeds allowed overload trip times [17], user can't restore by himself, must go to business center for treatment purchase power and clear trip times, and power will be restore. write back when insert card.

18. Accumulative tamper times [19]
   Recording the tamper times when relay disconnected and user short the phase in phase out. This value will be write back to system by detecting card. When detecting card reading meter, if this value exceeds 0, there will be sound warning indication, this value will be copied after press confirm button. write back after inserting card.

19. Accumulative tamper time [20]
   Recording the tamper time when relay disconnected and user short the phase in phase out, unit is minute. This value will be write back to system by detecting card. When detecting card reading meter, if this value exceeds 0, there will be sound warning indication, this value will be copied after press confirm button. write back after inserting card.

20. Total calibration times [23]
   Recording the calibration times to meter clock through infrared port. write back after inserting card.

21. The real date of the latest calibration [24]
   Recording the real date of the latest calibration through infrared port. Write back when insert card.

22. The real time of the latest calibration [24]
   Recording the real time of the latest calibration through infrared port. Write back when insert card.

23. The real date after the latest calibration [25]
   Recording the real date after the latest calibration through infrared port. Write back when insert card.

24. The real time after the latest calibration [25]
   Recording the real time after the latest calibration through infrared port. Write back when insert card.

25. Current month power consumption [28]
   Recording the total power consumption from the first day to the date inquire the data, which is the basic data items to realize step tariff.
4. Interpretation of phrase for prepayment energy meter

28. Current month power consumption amount[27]
   Recording the total power consumption amount from the first day to the date inquire the data, which is the basic data items to realize step tariff.

27. The present step tariff [28]
   This item display the power price adopt currently. T1 means adopt P0, currently; T1 means adopt P0, T2 means adopt P1, T3 means adopt P2, T4 means adopt P3

28. Step tariff E1 of current time interval[29]
   This value display the step tariff of the current time interval E1.

29. Step tariff E2 of current time interval[30]
   This value display the step tariff of the current time interval E2.

30. Step tariff E3 of current time interval[31]
   This value display the step tariff of the current time interval E3.

31. Step tariff E4 of current time interval[32]
   This value display the step tariff of the current time interval E3.

32. Step tariff P1 of current time interval[33]
   This value display the step tariff of the current time interval P1.

33. Step tariff P2 of current time interval[34]
   This value display the step tariff of the current time interval P2.

4. Interpretation of phrase for prepayment energy meter

34. Step tariff P3 of current time interval[35]
   This value display the step tariff of the current time interval P3.

35. Max. demand of current month[36]
   Recording the max demand from the first day of the month to the time of detecting the data. This value is related to overload trip, write back when insert card.

36. Current month max. demand occurred date [37]
   Recording the date of the max demand occurs from the first day of the month to the time of detecting the data.

37. Current month max. demand occurred time[37]
   Recording the time of the max demand occurs from the first day of the month to the time of detecting the data.

38. Previous month power consumption[38]
   The meter could store 12 months' power consumption data, including year month, current month power consumption, current month power consumption amount, current month max.demand, current month max.demand occurred date, current month max.demand occurred time. The meter could display power consumption data of the previous 6 months, user card could also returns the data of previous 6 months. Display items 38 to 85 are this items write back when insert card.

39. Previous month power consumption amount[39]
   same as above

40. Previous month max. demand[40]
   same as above
4. Interpretation of phrase for prepayment energy meter

41. Previous month max. demand occurred date [45]
   same as above
42. Previous month max. demand occurred time [45]
   same as above
43. Previous two months power consumption [48]
   same as above
44. Previous two months power consumption amount [47]
   same as above
45. Previous two months max. demand [52]
   same as above
46. Previous two months max. demand occurred date [53]
   same as above
47. Previous two months max. demand occurred time [53]
   same as above
48. Previous three months power consumption [54]
   same as above
49. Previous three months power consumption amount [55]
   same as above

50. Previous three months max. demand [60]
    same as above
51. Previous three months max. demand occurred date [61]
    same as above
52. Previous three months max. demand occurred time [61]
    same as above
53. Previous four months power consumption [62]
    same as above
54. Previous four months power consumption amount [63]
    same as above
55. Previous four months max. demand [68]
    same as above
56. Previous four months max. demand occurred date [69]
    same as above
57. Previous four months max. demand occurred time [69]
    same as above
58. Previous five months power consumption [70]
    same as above
4. Interpretation of phrase for prepayment energy meter

59. Previous five months power consumption amount[71]
   same as above
60. Previous five months max. demand [76]
   same as above
61. Previous five months max. demand occurred date[77]
   same as above
62. Previous five months max. demand occurred time[77]
   same as above
63. Previous six months power consumption[78]
   same as above
64. Previous six months power consumption amount[79]
   same as above
65. Previous six months max. demand[84]
   same as above
66. Previous six months max. demand occurred date[85]
   same as above
67. Previous six months max. demand occurred time[85]
   same as above

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4. Interpretation of phrase for prepayment energy meter

68. Variation Proportion [88]
   The variation value while meter connect with current transformer and voltage transformer. When there is no transformer, the value equals 1.
69. Impulse constant[87]
   Number of impulse for each unit of power consumption, usually adopt imp/kwh, that is impulse numbers of one KWH. Write back when insert card.
70. Meter number [88]
   The number of meter from the manufacture, the rule of coding: year two digit + month two digit + production serial number six digit. Set by the manufacturer. Which is the single ID number when carry on infrared communication.
71. ID number[89]
   Allocated by the utility when register the meter, transfer the ID number to the meter when user purchase power for the first time, which is the evidence of judging one meter one card.
72. Energy meter collection mode[90]
   Data item set by STAR. The mode of this meter is D0.
73. Version no. of setting files[91]
   The various parameters of energy meter is defined as setting files, energy meter amend the parameter through the setting files, there is a data item (version no.), unless the version no. of the card exceeds the version number of energy meter, the meter will accept the data of the card. Setting files could detecting and revise through the card. write back when insert card.
4. Interpretation of phrase for prepayment energy meter

74. Non-power off time intervals [92]
   Format is: start hour/minute, end hour/minute, e.g. 1000/0100 means, power should not be cut off from 10 am to 11 pm the next morning. The power supply could not be terminated during the time interval, even the remaining credit is 0. While the power consumption of this interval is restrict by debt limit [114]. If don't need this function set it 0000/0000. Note: if remaining credit or allowed overdraft credit not use up power consumption on debt will not occurs.

75. Signal of weekend power off control [93]
   Setting the status character with software to control allow power off at weekend or not. 00: allow power off 01: not allow power off [when display 02, it means allow power off and summer/winter season time switch, when display 03 means not allow power off yet allow summer/winter season time switch]

76. Real time power [94]
   Display current user's load. Unit is KW. Refresh constantly.

77. Real time Clock: date, week [95]
   Display current time of energy meter clock. Accuracy of the clock is 5PPM, that is error in one month less than 15 seconds

78. Real time Clock: time [95]
   Display current time of energy meter clock. Accuracy of the clock is 5PPM, that is error in one month less than 15 seconds

79. Date and time of automatic data-transfer [96]
   Energy meter could store power consumption data for 12 months, the time of remove occurs at the time of automatic data-transfer, usually set as 0100, namely 0 o'clock at the first month of each month. The above mentioned data taking automatic data-transfer date as the terminate time of settlement.

4. Interpretation of phrase for prepayment energy meter

80. Load control limit for power consumption on debt [97]
   The value of load control limit under debt status, it is usually small to ensure basic lighting and watching TV.

81. Meter internal temperature [98]
   Display the internal temperature of meter. Error less than 1 degree.
4. Interpretation of phrase for prepayment energy meter

The items calculate and write back the amount by meter:

- Remaining amount
- Over zero amount
- Overdraft amount
- Debt amount in emergency
- Accumulative purchased amount
- Current month power consumption amount
- Previous month power consumption amount
- Previous two months power consumption amount
- Previous three months power consumption amount
- Previous four months power consumption amount
- Previous five months power consumption amount
- Previous six months power consumption amount

Items for software setting and controlling the meter:

- Pre-warning amount
- Warning amount
- Excessive purchase amount
- Minimum monthly consumption
- Over draft amount limit
- Debt amount limit

4. Interpretation of phrase for prepayment energy meter

**Overdraft power consumption status:**

The amount consumed here reckons in overdraft amount and over zero amount.

- A: Remaining amount 0
- B: Overdraft amount=Overdraft amount limit

**Debt power consumption status:**

The amount consumed here reckons in debt amount and over zero amount.

- A: Remaining amount 0
- B: Overdraft amount=Overdraft amount limit
- C: Debt amount <Debt amount limit
- D: It is non-power off date and time currently