



**PLATEK SERVICES INCORPORATED**  
Engineering Design, Consulting, Management

# **RESIDENTIAL ELECTRICAL SMART METERING BENEFITS**

Prepared for :

**PROPERTY MANAGERS**

Prepared by:

**PLATEK Services Incorporated**  
Engineering Design, Consulting and Management Services

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[www.smartmeterscanada.com](http://www.smartmeterscanada.com)

# RESIDENTIAL ELECTRICAL SMART METERING BENEFITS

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## INTRODUCTION

This introduction is designed to serve as a guide to implementing submetering in master-metered buildings. The simple question and answer format informs private apartment owners and condominium boards, directors and managing agents on the benefits of proceeding with a submetering conversion. This introduction includes discussion of topics of benefits and economic feasibility (cost and savings potential).

## **2. SMART METERING BASICS - WHAT, HOW AND WHY?**

### **1. *What is smart metering or sub-metering?***

Smart metering is the measurement and billing of electric use in individual apartment/condo units in a master-metered multi-family building.

### **1. *What are the different types of metering?***

There are only two different methods by which multifamily buildings are metered for electricity: direct metering and master-metering. In a direct-metered building (also known as individually metered), the utility owns the meter and supplies electricity to each apartment. Residents receive an electric bill from the utility at the residential retail rate. The building receives an electric bill for electric usage in the common areas, typically at a commercial retail rate. In a master-metered building, the utility supplies electricity to the entire building. One utility-owned meter serves the building. The building receives one electric bill from the utility, often at a rate that results in a bill significantly lower than the retail residential rate. Individual apartments are not metered and actual apartment consumption cannot be determined or used as the basis for billing electric charges. In a direct-metered building, residents pay for the electricity they consume. In a master-metered building, the cost of the total electric consumption for the building is divided among apartments, not taking into account actual consumption. Submetering combines the best of both metering systems.

### **2. *How does smart metering (sub-metering) work?***

Smart metering permits the measurement of electric use in individual apartments via a building-owned meter that is installed for each apartment. The building continues to purchase its electricity on the less expensive commercial or bulk residential rate basis, but now the owner is able to bill electric to individual apartments on an actual consumption basis. The relationship between the building and the utility remains exactly the same as before. The building continues to receive one bill from the utility and the owner allocates the utility costs based on the usage recorded by the apartment submeters. The types of multifamily building metering and submetering configurations are illustrated in Figures 1a and 1b on the following pages. Table 1 details the differences among the metering configurations for key elements. The submeters are owned by the building and not the utility. Residents are billed by the owner through its manager or designated vendor. Current submetering technology facilitates reading of the submeters without apartment entry. Available software systems enable automated billing procedures. The owner continues to be responsible for the remaining portion of the utility bill that covers the building's common areas. Electrical submetering in master-metered buildings is unlike virtually any other energy conservation measure that can be undertaken by a building owner.

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When a building undergoes a typical energy conservation measure (installation of a new boiler, etc.), the owner reaps the benefit of lower energy costs. Submetering, as an energy conservation measure, is qualitatively different in two respects. First, it will result in lower electric consumption only to the extent that individual residents decide to reduce consumption. Second, the financial savings flowing from the reduced consumption directly benefit the residents who conserve. To be sure, owners obtain a significant benefit from submetering, by shifting the potentially volatile apartment electricity component of their building's budget to the individual residents. Experience shows that the change from master-metering to submetering typically reduces the consumption of electricity in apartments by 10-26%.

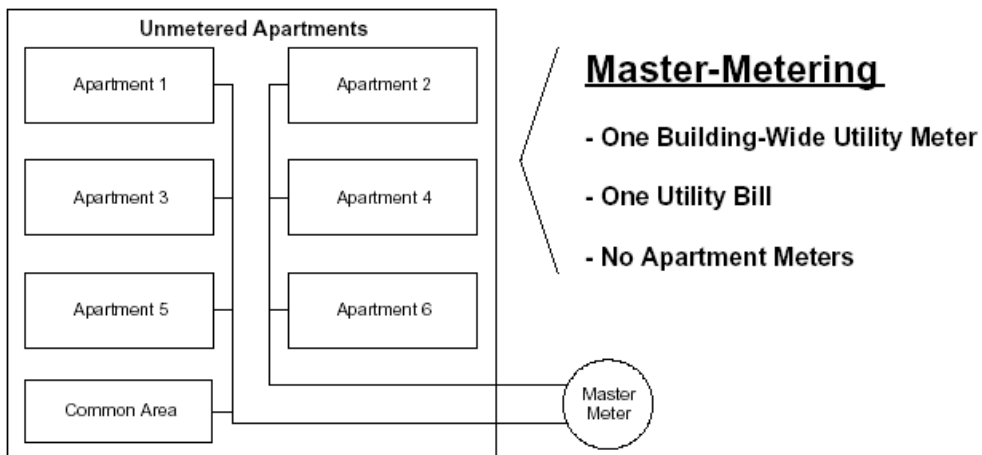
### **3. TYPES OF BUILDING METERING**

Here are the different types of metering options.

- 1) Master metered
- 2) Direct Metered

**Figure 1a**  
**Types of Multi-Family Building Metering**

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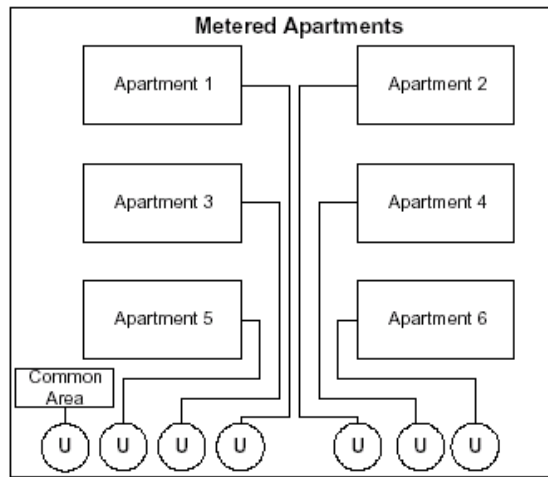


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## Direct (Individual) Metering

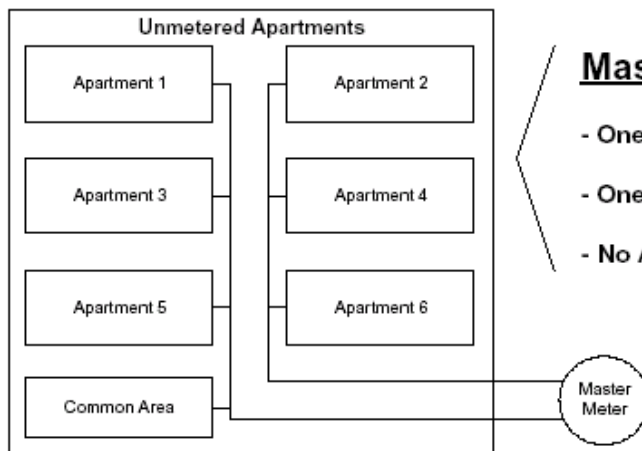
- Each Apartment Metered By Utility
- Common Area Metered By Utility
- Common Area and Each Apartment Billed By Utility

⊙ U = Utility Meter



**Figure 1b**  
**Submetering a Master-Metered Building**

## BEFORE

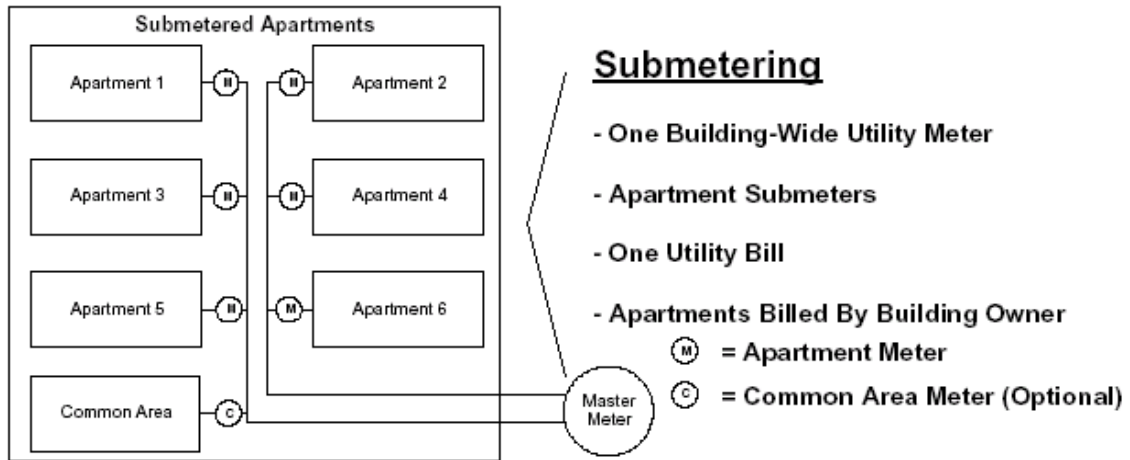


## Master-Metering

- One Building-Wide Utility Meter
- One Utility Bill
- No Apartment Meters

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## AFTER



**TABLE 1 - Multi-Family Metering Options**

	Directly (Individually)-Metered Building	Master-Metered Building <u>without</u> Submetering	Master-Metered Building <u>with</u> Submetering
Building Metering / Ownership	<ul style="list-style-type: none"> <li>Utility meter for each apartment</li> <li>Utility meter(s) for common areas</li> </ul>	One utility meter for entire building	<ul style="list-style-type: none"> <li>Building-owned submeter for each apartment</li> <li>Utility master-meter for building (original)</li> </ul>
Apartment Metering	Utility Meter	None	Submeter
Rate	<ul style="list-style-type: none"> <li>Residents: Retail Residential Rate</li> <li>Common Area: Retail Commercial Rate</li> </ul>	Applicable bulk rate (where available)	<ul style="list-style-type: none"> <li>Owner pays bulk rate</li> <li>Apartments pay allocated portion of owner's bulk rate costs</li> </ul>
Billing	Residents and common areas billed separately by utility	Utility	<ul style="list-style-type: none"> <li>Utility bills owner</li> <li>Owner bills residents</li> </ul>
Resident Payment vs. Use	Residents pay for what they use, as measured by utility meters	Residents do not pay for what they use - costs <u>not</u> allocated based on electric use (e.g. coop shares)	Residents pay for what they use - costs allocated based on <u>actual</u> electric use, as measured by individual submeters

## **4. WHAT ARE THE BENEFITS OF SMART METERING?**

A number of studies and demonstration projects cited below confirm both the short-term and long term benefits of submetering, including:

### **1. Smart Metering (Submetering) saves energy.**

An analysis of submetered buildings (where data has been made available) conclusively illustrates that annual savings of 10-26% of total apartment electric consumption were achieved in the first year.

### **2. Smart Metering energy savings persist over time.**

Smart Metering savings have proven to be maintainable over long periods of time as demonstrated in a number of studies described in this manual . Some likely reasons are:

- a) that conservation is reinforced each month by the resident's receipt of an electric bill;
- b) residents will invest in efficiency (e.g., more efficient refrigerators and lighting) because they will reap the benefits directly.

### **3. Approximately 60 to 70% of residents benefit from Smart Metering**

The only residents who fare worse under submetering than under other means of allocating electric cost are those who use excessive amounts of electricity. Those residents who find that their electric bills are excessive have the ability to reduce cost by reducing consumption. They have joined the vast majority of people who are directly metered, but they often retain a distinct advantage — where applicable, they continue to pay at the bulk rather than the retail rate.

### **4. Smart Metering is eminently fair.**

Smart Metering simply restores the "pay for what you use" concept. Past data reveal that 20-25% of total apartment usage is consumed by only 10% of the residents, yet under master-metering, these excessive users pay the same as other residents. Individual apartment consumption has been shown to vary by a factor of as much as 10:1, and, typically, by approximately 5:1 in apartments of the same size in the same building!

From the point of view of fairness, submetering is equally beneficial to all buildings regardless of type. Analysis of data from buildings that installed submetering as part of previous installed Residential Submetering Programs confirmed this fact quite dramatically. The variability of apartment consumption was consistent regardless of building and resident characteristics, so there were always inequities that submetering would resolve.

### **5. Smart Metering benefits owners**

Smart Metering largely eliminates a volatile, variable, and difficult-to-control factor from a building's operating budget—apartment electric usage costs. Whether the building is a rental, cooperative, or condominium, owners can better predict costs when the only electric usage to be considered is for common areas under management control.

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### 6. Smart Metering benefits utilities and society

Smart Metering benefits utilities and society in the same way: by reducing the waste of energy and deferring the need to site, build, or otherwise acquire electric generating capacity, as well as reduce the use of fossil fuels (e.g., oil), still the primary source of many power generation stations. Reducing fossil fuel use is a giant step toward enhancing the environment by improving air quality. Decreasing our dependence on foreign oil clearly benefits all. These conclusions confirm the benefits of submetering to society, utilities, owners, and consumers, given the appropriate allocation of costs and benefits.

### **5. HOW DOES SMART METERING ACHIEVE ITS ENERGY SAVINGS BENEFITS?**

Smart Metering achieves its savings because residents reduce their own consumption in order to reduce their individual electric costs. Unlike other conservation or load management measures, such as energy management systems, which may force conservation by outside control, submetering savings are the result of a purely voluntary decision by the resident electricity users.

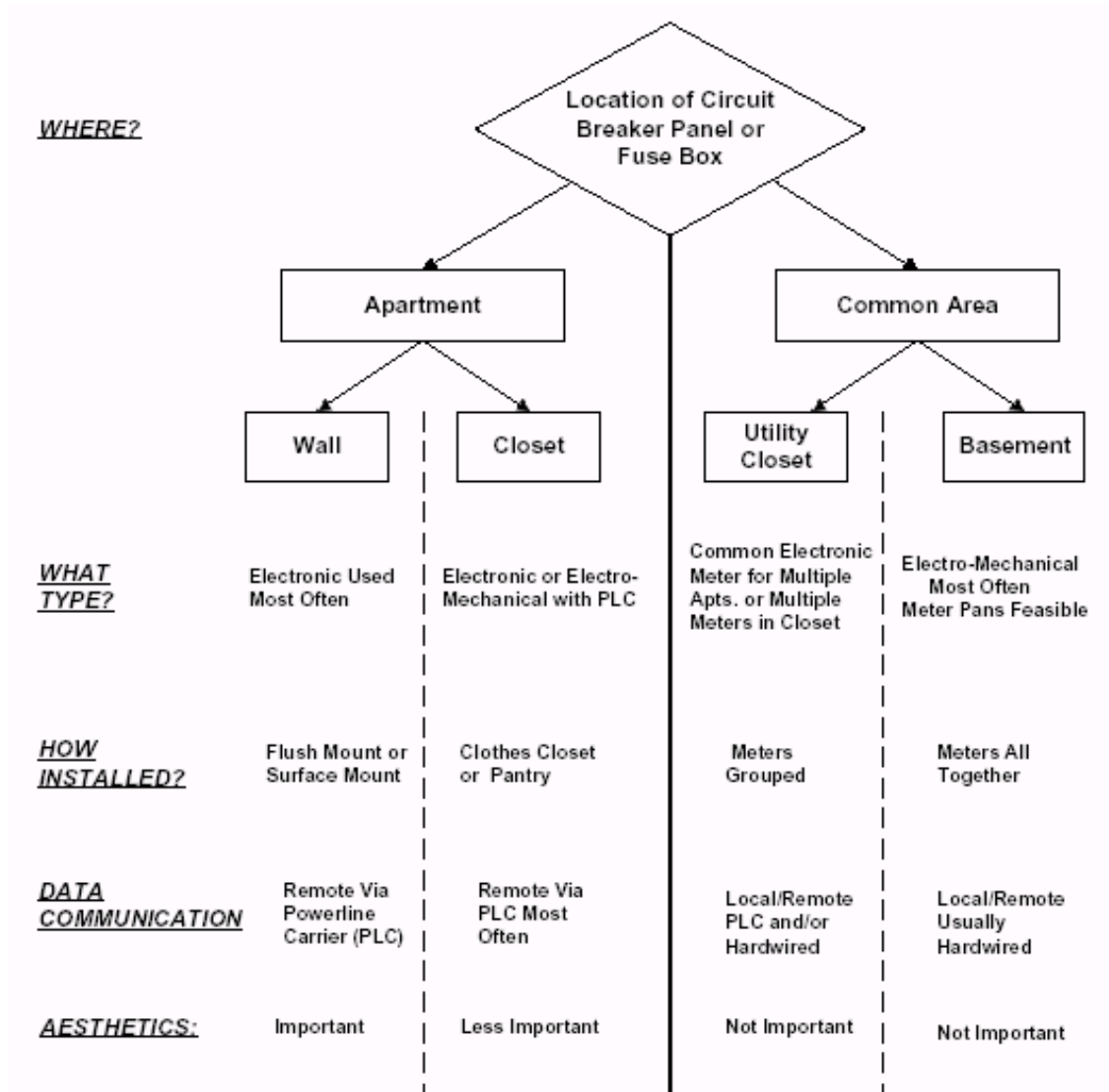
Thus, residents who choose to maintain a wasteful energy use pattern can do so, but will pay for this choice. Because residents are now paying for what they use, they tend to become more aware of their electricity use and, in turn, the monetary benefit they can realize from reducing unnecessary use of electricity. For example, prior to submetering, residents who left their air conditioners running while they were not at home during the day were not specifically penalized for this waste.

This added cost (a function of increased consumption and peak load demand) would be borne by both the conservers and non-conservers. On the other hand, residents who conserved electricity or who were not at home (such as those who spend summers away) for extended periods did not receive any specific benefit. With submetering, residents have an incentive to conserve and to invest in conservation since they can obtain a direct benefit through reduced electric charges.

Short-term conservation means turning off lights, air conditioners, and other appliances when not in use. Long-term conservation also can include purchase of more efficient appliances, lighting, and timers, which results in more persistent energy savings.

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**Figure 2**  
**SUBMETER INSTALLATION:**  
**WHERE, WHAT AND HOW**





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## 6. ASSESSING ECONOMIC POTENTIAL FOR SMART METERING

Here are the issues involved in assessing the economic potential of submetering?

Generally, the owner should consider all the information available, specifically addressing the following points:

- What will it cost to implement submetering?
- What are the overall economic benefits?
- What are the costs and benefits specific to the residents and the owner?

These issues may require an evaluation by a qualified consultant or consulting engineer, especially if no in-house building experience exists, which is typically the case.

This consultant or consulting engineer's expertise should include a high level of knowledge of submetering systems and project economic analysis techniques, as well as some knowledge of multifamily building heating, ventilation, and air-conditioning systems and building codes.

Experience communicating with and obtaining approvals from regulatory and supervisory agencies, such as the Utility and various housing agencies, is invaluable and even critical, particularly if the building includes rental units. The consultant or consulting engineer should be able to prepare an economic feasibility study that addresses the first two items above, as well as an assessment of the third, taking into account legal and regulatory constraints and rules. Experience with equipment vendors and installers is also important.

## 7. CASE STUDY

Please refer to the 2 case studies presented at the end of this document.

## 8. CONCLUSION

The timing may be appropriate to install electronic smart-metering with state of the art automation technology. Studies have shown this to be beneficial and fair to all. Take the initiative to determine if sub-metering is appropriate for your location. Contact an expert to assess your situation as energy costs are rising.

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PLATEK SERVICES INC.

Office: 905-290-2625  
Cell: 416-562-6860  
TollFree Fax/Voice 1-801-998-0904  
Email: vlad@platek.com