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Cooperatives' Potential to Diffuse Appropriate Solar Technologies in Uganda

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Introduction

Although there is plentiful sunshine across much of Africa, less than 25% of the population effectively utilize solar energy to address their need for electricity (International Energy Agency 2015). Solar energy boosts countries' energy security through reliance on an inexhaustible and import-independent resource. It also increases sustainability, lowers the costs of mitigating climate change, reduces pollution, and keeps fossil fuel prices lower than otherwise might be the case (Ondraczek 2013). Cutting-edge solar technologies are progressively inexpensive, accessible, and manageable for alleviating numerous socio-economic and environmental challenges (Bradford 2014).

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The scarcity of electricity causes excessive reliance on fossil fuel for lighting; such fuel is often expensively imported and has hazardous effects on people's health through inhaled fumes (Eder et al. 2015). These circumstances aggravate global warming through increased emission of carbon dioxide, intense poverty, unemployment, and limiting productivity (IEA 2011). Lack of electricity also impedes social interaction and educational uptake (Barnes 2007).

In Uganda, over 85% of the population do not access grid power and thus depend on non-renewable sources of energy, particularly wood, and fossil fuels. Such prevalent sources of energy are gravely hazardous to the physical environment, economy, and people's health and productivity (Da Silva et al. 2014). Furthermore, only 15% of the population, mainly in urban areas, access the grid while facing irregular and unreliable electricity supplies. Grid-based hydroelectric power costs 18 US cents per unit, which makes it unaffordable for over 95% of the communities, especially the rural poor (Bizzari 2009).

Many people often spend much of their productive time and financial resources on collecting firewood and kerosene for cooking and lighting in Uganda, Ghana, and other countries of Sub-Saharan Africa (Piggins 2014). Also as Uganda's population increases the demand for wood fuel escalates, and this leads to extensive deforestation that may eventually lead to desertification (Twaha et al. 2012). Kerosene lanterns are among the commonest type of lamps used by people who do not access grid electricity. These lamps are relatively dim and emit unhealthy fumes (Neelsen and Peters 2011). Addressing such social and environmental challenges efficiently and sustainably is increasingly handled by social enterprises, such as Cooperatives (Wimmer 2012).

Over 70% of the rural communities are sparsely settled and over 20% of these are nomadic or semi-nomadic pastoralists in many countries of Sub-Saharan Africa (Mann et al. 2014). Consequently, the most appropriate means of alleviating energy crises in Uganda is ostensibly the diffusion of low-cost, robust off-grid solar technologies, which thus forms the focus of this chapter.

The Context of the Study

Appropriate solar technologies can alleviate energy-related challenges in Africa as the continent receives abundant and intense sunshine on most days of the year (Bradford 2014). There is a growing industry engaged in manufacturing and distribution of increasingly affordable, robust, and user-friendly solar technologies that are seemingly appropriate for Africa. There are solar products for lighting, entertainment, and phone charging at approximate US $25 per unit. Many companies have been attempting to sell solar technology in Africa for more than five years now, but with limited impact (IEA 2011).

While most solar equipment vendors in Africa are profit oriented, their products are socially and environmentally essential in Africa (Karekezi et al. 2003). Their business model is generally to take substantial upfront deposit payments for their products with follow-on credit terms met via mobile phone payments. However, the targeted customers for solar equipment largely lack the financial resources and reliable mobile phone networks that are used to buy the vitally needed, and often comparatively expensive, solar equipment being offered, although as we have seen, the costs are tumbling (Mawejje and Okumu 2014). These factors, among others, are apparently responsible for the low diffusion of solar technologies.

It is therefore vital to consider disseminating modern solar technologies through a different business model that is more socially oriented and capable of financially facilitating its customers to buy what they need. This chapter thus delves into the potential of Savings and Credit Cooperatives (SACCOs) to play this role.

A SACCO is a member-driven, democratic, unique, self-help, mutual initiative that is owned, managed, and governed by its members who have a mutual bond such as working for the same employer, belonging to the same social fraternity, labour union, church or mosque, or living in the same community. Membership is open to all who belong to the group, the primary purpose being to save their money together in the SACCO and to extend loans to each other at fair interest rates. Interest charged on loans is usually used to cover administration costs and there is no payment or profit extended to outside interests or internal owners. The members are the owners, and it is they who decide on the allocation

of their money (SACCOL 2015). These basic virtues of SACCOs seemingly qualify them to serve as suitable conduits for spreading socio-economically vital items such as innovative solar technologies.

In Uganda, Cooperatives have been very influential and instrumental in the socio-economic development of the country for over 100 years (Kyazze 2010). By 1900, Cooperatives were functional in various parts of Uganda as informal but well-organized and socio-economically developmental establishments. Cooperatives in Uganda acquired formal status with the advent of the Cooperative Ordinance of 1946 and the Cooperative Societies Act of 1962. Between 1962 and 1977, the performance of Cooperatives in Uganda was particularly remarkable, with the Government offering them a monopoly status in agricultural marketing. Between 1977 and 1999, however, the performance and significance of Cooperatives in Uganda were severely shaken by political meddling, corruption, indebtedness, and grave mismanagement. These devastations led to the disbandment of many Cooperative societies in the country (Kyazze 2010). Since 2006, the Cooperative movement in Uganda has experienced a revival with considerable support and facilitation from the Government and development partners.

Today Uganda boasts of having over 13,179 formally registered Cooperatives, and over 60% of these are SACCOs (Ahimbisibwe 2013). There has been a formation of specialized innovative cooperative enterprises such as rural water, rural electrification, and indigenous community service farms that can boost the socio-economic development of Uganda (Kyazze 2010). The most dominant and influential forms of specialized Cooperatives in Uganda are SACCOs, as they constitute over 60% of the formally recognized Cooperatives (Ahimbisibwe 2013). SACCOs are conventional Cooperatives established to the principles, values, and ethical guidelines decreed by the International Cooperative Alliance (ICA). SACCOs are channels for facilitating citizens financially, to enable them to address their various socio-economic challenges (Mpiira et al. 2014). Hence, there is a countrywide propagation of SACCOs in Uganda, organized under an umbrella organization known as the Uganda Cooperative Savings and Credit Union (UCSCU), which serves as a Governmental regulatory agency. These facts motivated us to explore the feasibility of SACCOs as channels of distribution for appropriate solar technologies.

Methodology

This study is principally a cross-sectional survey that predominantly utilizes a triangulation of qualitative techniques for collecting and analysing data as diffusion of innovations is hard to quantify due to the complexity of humans and human networks. Primary data for the study were gathered through focus group discussions, a few interviews, minimal observations, and a review of the relevant literature. The key informants for both the interviews and focus group discussions were purposively selected from various categories of stakeholders of the solar industry, such as the prevailing solar vendors and merchants, policymakers, solar energy users, and regulatory authorities. Observations focusing on the selling and uptake of solar technologies were also selectively made as part of the field surveys carried out in both Uganda and Ghana. The major sources of secondary data reviewed for this chapter are the existing literature on the theory of diffusion of innovations (Rogers 2003; Miller 2012); the attributes of savings and credit Cooperatives (Ahimbisibwe 2013; Birchall 2004; Kyazze 2010; MacPherson 1995); and the incumbent business models for selling solar technology in Uganda (Mawejje and Okumu 2014; Piggins 2014). The study entailed surveys conducted in Ghana so as to augment the chapter with a comparative analysis of the solar industry in at least two typical African countries. Data collected were analysed qualitatively using thematic, deductive, and inductive approaches.

We compared our findings with the literature on solar technology adoption in Africa, and by considering the issues raised in the adoption of innovation, we have brought together a simple menu of findings and recommendations which are articulated below. In our recommendations for scaling up efforts, we locate the findings in the context of the innovation journey put forward in Phadke and Vyakarnam (2017).

Objectives of the Data Collection

"Potential of the Cooperatives (SACCOs) to sell and diffuse appropriate solar technologies in Uganda" was the main objective of the survey that, thus, guided our focus group discussions and interviews. We set out our findings from the key informants (i.e. focus groups and interviewees) below.

Defining Appropriate Solar Technologies for Uganda

Before we entered the substance of the focus groups and interviews, we asked our respondents to help define what they believed was appropriate solar technology.

Results from most of the respondents with whom we engaged indicate that appropriate solar technologies are defined as solar-powered equipment that are affordable, robust, resilient for rough conditions, simple, and user-friendly for users to install, operate, and maintain with little or no need for hired technicians. Such equipment also ought to be of the highest level of utility and be able to solve day-to-day problems, such as lighting and phone charging, and increasingly able to power televisions.

We found that our respondents in Uganda and Ghana had similar requirements. Having defined the "product" attributes, we progressed to explore what it might take to encourage the wider adoption of solar technologies.

Prerequisites for the Diffusion of Appropriate Solar Technologies in Uganda

Our initial perspective was that solar technologies were rather slow to be accepted in Uganda. And this is broadly in keeping with technology adoption theories (Rogers 2003), which propose that for a technology to diffuse, the market needs to adopt it and that there are three categories of customers: the so-called innovators/early adopters who have the resources and capability to try new technology and do not need to be fully convinced before they try; then comes another category of customers dubbed the early majority—this category helps increase uptake as they become increasingly convinced by the efficacy and, perhaps, as prices begin to drop; and finally for adoption, there is the late majority as the product and market begin to mature (Rogers 2003).

We find that in Uganda, the innovators and early adopters are mainly in the cities where electricity is erratic rather than unavailable. Our focus is on the vast majority that is, in rural and peri-urban Uganda, a low-income population. The findings, based somewhat on the notion of cross-

ing chasms (Phadke and Vyakarnam 2017), indicate that we should ask the question about what is needed to shift our products and services from the early adopters to the majority of customers. There is a clear inflection point—when sales stall because we are unable to convince the majority to buy (Phadke and Vyakarnam 2017). The assumption is that there are barriers to majority adoption and that is what we explore in our study.

Mass Sensitization and Awareness According to Miller (2012), multitudes of people, especially the rural poor, need to be well sensitized, educated, informed, and/or made aware of the existence, accessibility, utilization (i.e. application/operation), and maintenance of appropriate solar technologies for their energy needs. This was generally noted as a basic requirement for the countrywide demand for and uptake of modern solar technologies. In our conversations, we found that there was a misunderstanding about the technologies on the one hand and market entry of low-quality technology that could not sustain long-term usage.

Financial Facilitation According to Miller (2012), affordable financing and credit schemes need to be established to enable all potential and prospective customers, especially the poor rural communities, to buy appropriate solar technologies. Miller (2012) defines this as long-term soft loans, grants from Governments and development agencies, and fair credit terms extended by the vendors of the solar equipment.

Conducive Laws, Policies, and Regulations Specific policy recommendations made by vendors, agencies, and users in our focus groups were to eliminate all forms of taxation on solar technologies, and to have regulations to determine standards for solar technologies being imported into the country to ensure customers' protection. These findings are also corroborated by Miller (2012) who remarks that Government policies that espouse the utilization of solar technologies are crucial for diffusing solar technologies into the poor rural communities in emerging markets.

Repositioning of Solar Technologies Some of the key informants we consulted observed that there is a need for all key stakeholders of the solar industry to regard and treat solar technologies as social and/or public goods, rather than commercial items. This entails Government interven-

tion by exempting taxation of any solar equipment and expanding its distribution channels so as to make it more affordable and accessible countrywide. They note that such measures may drastically reduce the cost of solar technology, make it more accessible, and thus boost its diffusion across the whole country.

Quality Defined as Simple and Affordable Solar Technologies Many respondents asserted that there was a "swamping" of the country with poor quality, overly complicated, expensive, at times delicate, unreliable, unsustainable, and thus very disappointing range of products. This, perhaps, explains the current modest uptake of solar technologies in Uganda. It is important therefore to have Government-driven standards for good quality (i.e. fit for the purpose), to achieve the diffusion of solar technology into the country.

Credible and Accessible Vendors/Suppliers of Solar Technologies Our respondents expressed strong views about the characteristics they wanted from their solar vendors. They need vendors who are technically proficient, reachable, knowledgeable, approachable, honest, plausible, convincing, responsive, trustworthy, reliable, and believable. There is also a need for warranties and guarantees for the solar technologies. Many respondents claimed that the prevailing low uptake of solar technologies in Uganda may be due to vendors not being well-informed and being located mainly in urban or semi-urban centres, while the majority of potential customers live in rural areas. They felt the vendors were more focused on profit-maximization rather than on customer satisfaction.

Widespread Technical Maintenance/Service Centres Several key informants disclosed that there is need to establish accessible countrywide technical support for the installation, servicing or maintenance, and sustainability of solar technologies. From the surveys conducted, it was noted that the present poor uptake of solar technology is partly attributed to failure to access technical assistance, especially for the rural-based customers.

The factors explained above are similar to those revealed by the comparative studies conducted in Ghana and the literature reviewed. We now look at our findings regarding the suitability of SACCOs to act as channels for the diffusion of solar-powered technologies.

The Strengths of Cooperatives in Diffusing Appropriate Solar Technologies in Uganda

Findings from the empirical surveys conducted in Uganda indicate that SACCOs have the following strengths and/or relative advantages in acting as channels for selling and diffusing solar-powered technologies:

Community Outreach Respondents generally observed that, compared to the current marketing channels for solar technologies, SACCOs have a much broader outreach as they are increasingly established and scattered countrywide, networked, and have large memberships of over 250 households on average per SACCO.

Financial Facilitation SACCOs provide credit facilities at less than 15% per annum compared to banks that operate at a minimum of 35% per annum (Munyambonera and Adong 2013). Respondents divulged that beyond banks, there are private sector lenders who charge even higher rates. SACCOs mitigate the lending risks by virtue of being peer lending agencies and can, therefore, afford to charge much less and in keeping with their mandate with members. Private vendors operate on the basis of an upfront payment and regular mobile payments to link with micro-credit formulas, where affordable cash flow is taken into account rather than the interest that is charged. One of the incumbent solar vendors we met requires their customers to make an upfront payment of not less than 50% for whatever solar equipment they wish to purchase. The balance of the cost is then paid via mobile phone networks in equal instalments spread over a period of not more than two years. An unintended consequence has been that customers borrow money for the upfront payment and the project then becomes a serious burden.

Communication Channels Respondents largely state that SACCOs efficiently enable the flow of information amongst all key stakeholders of the solar industry. This strength arises from the fact that SACCOs are widely networked and their respective members often meet and share critical information regarding their Cooperative's business. Hence, SACCOs can utilize this comparative advantage to easily create awareness, sensitization, and marketing of solar technologies.

Credibility and Integrity Respondents also indicated that SACCOs are generally well trusted, respected, and seen to be reliable by their members. They are seen as social enterprises with the improvement of the socio-economic welfare of their members as their core purpose, rather than making profits at their expense.

Credit Rating of Prospective Customers The key informants we engaged generally opined that SACCOs can more easily assess and determine the credit rating of their respective members, which should give confidence to vendors that they will be repaid for their products and services.

The strengths of SACCOs derived from empirical surveys in Uganda, as described above, are buttressed by findings from the literature reviewed in respect to the suitability of SACCOs to diffuse solar technologies, as explained below. According to the literature reviewed, the comparative advantages of utilizing SACCOs to diffuse solar technologies can be appreciated from the perspective of their universal characteristics as well as a Uganda-specific standpoint as discussed below.

In Uganda, the Government, development agencies, and civil society increasingly support, facilitate, bolster, uphold, and endorse SACCOs as exceptional developmental vehicles (Mpiira et al. 2014). The SACCOs have progressively served as prime organizations for the financial facilitation of Ugandans, especially the poor rural communities which constitute the majority of ordinary people, to meet their various socio-economic needs (Ahimbisibwe 2013). As such, SACCOs in Uganda have numerous and distinctive advantages that make them viable channels for diffusing appropriate solar technologies to the communities as reviewed later.

Systematic Propagation The Government and development partners in Uganda are increasingly formulating considered policies and schemes for establishing SACCOs in all regions and socio-economic sectors of Uganda. The process of registering SACCOs is very simple as Cooperatives in Uganda have a specific office for expediting the formal registration of all Cooperatives (Ahimbisibwe 2013). In 2008, the Ugandan Government decided to facilitate the establishment of SACCOs in all parts and sectors of the country (Ahimbisibwe 2013). By 30 August 2012, Uganda had more than 5220 SACCOs registered as formal entities (Ahimbisibwe 2013). Thus this deliberate establishment of SACCOs all over the country makes these Cooperatives suitable structures for diffusing appropriate solar technologies in Uganda.

Ample Financial and Technical Assistance The Ugandan Government and its development partners do progressively provide substantial technical and financial reinforcement to the SACCOs in Uganda (Beisland and Mersland 2012); for example, they have mobilized over US $500 million for the micro-financing of Ugandans directly and indirectly through SACCOs (Munyambonera and Adong 2013). Development agencies that have funded the technical and financial capacities of SACCOs in Uganda include the Swedish International Development Cooperation Agency, the World Council of Credit Unions, and the United Kingdom Department for International Development. The Ugandan Government disburses financial assistance through SACCOs to its citizens, especially the poor rural communities (Ahimbisibwe 2013). Thus, SACCO members are among the few people in Uganda who can access soft and collateral-free loans for meeting their socio-economic needs, such as clean energy (Munyambonera and Adong 2013).

Collateral: Free and Inexpensive Financial Facilities The financial services offered by SACCOs in Uganda are the cheapest and easiest to access in the country as their members do not have to borrow against any tangible collateral other than their social networks and credibility. The SACCOs provide financial facilitation to their members at concessional rates, unlike most commercial banks and money lenders in Uganda (Ahimbisibwe 2013). Thus, many people are motivated to join SACCOs as loyal members and this enhances the potential of SACCOs to diffuse solar technologies in Uganda.

Favourable Governmental Support and Enablement The Ugandan Government directly supports the establishment, operations, and sustenance of SACCOs by constituting several organizations to monitor, regulate, finance, oversee, or manage the establishment of well-managed SACCOs in Uganda. Agencies formed to monitor, regulate, support, and facilitate SACCOs include the UCSCU, Uganda Microfinance Support Centre, and Uganda Cooperatives Alliance, among others (Munyambonera and Adong 2013).

Noble Corporate Values, Ethics, and Principles (Good Corporate Governance Grounds) The International Cooperatives Alliance (ICA) instituted very impressive moral values, standards, and principles for all Cooperatives, including SACCOs (Phelan et al. 2012). If SACCOs uphold these exceptional values, they enhance the SACCOs' viability to serve as conduits for solar technologies.

Notwithstanding the numerous strengths of Cooperatives analysed above, SACCOs have some distinct weaknesses and limitations. They also face challenges which might impede them as organizations for the diffusion of solar technologies. Results from the empirical surveys point to the following issues.

Focus on Savings and Credit Services Respondents generally noted that, currently, SACCOs concentrate on their core business of managing financial savings and credit services for their respective members. Hence, a diversification into the provision of solar technologies may well place them at risk regarding their core activity.

Technical Proficiencies According to most of the respondents contacted, SACCOs lack human resources with the technical and selling skills, competencies, and knowledge that are necessary for the diffusion of appropriate solar technologies.

Basic Facilities/Resources Some respondents remarked that SACCOs lack the necessary logistics and secure storage spaces to hold inventory. SACCOs also lack the ability to handle returns of any faulty equipment.

Mandate The management of SACCOs with whom we interacted stated that they were not mandated to sell or deal with solar technologies, although existing laws and regulations implicitly allow for such transactions. Therefore, there is either a need for a specific and explicit Act or the clarification of existing laws to empower management to take action.

Members' Behaviours According to some of the respondents, some SACCO members lack honesty, integrity, responsiveness, and commitment to all the causes of their respective Cooperatives. Thus, the fear is the risk of default on loans or that they take advantage of affordable technologies and turn it into profiteering ventures. However, some respondents observed that ethical behaviour among SACCO members is generally being increasingly enforced by the UCSCU as one of its mandates.

The literature highlighted the following weaknesses of SACCOs:

Business Acumen SACCOs do not have good mercantile/commercial perspicacity and acumen, such as keeping business secrets, or forceful marketing strategies that provide competitive and survival edges for most business entities (Ahimbisibwe 2013). This may be due to the supreme principles and ethical values imposed by the ICA, which emphasizes utmost transparency, focus on social motives and free access to information by all stakeholders. Lack of business acumen combined with ICA values may compromise the capacity of SACCOs to engage in diffusing solar technologies.

Organizational Management, Leadership, and Governance Most SACCOs are managed by their respective members, the majority of whom lack professional management skills (Mpiira et al. 2014). Such poor management leads to frequent fraud, dysfunctional conflicts, and dishonesty, among other unethical practices (Mpiira et al. 2014). Nevertheless, one of the key roles of the UCSCU is to improve the management, leadership, and governance of all SACCOs through training and other programmes (Ahimbisibwe 2013).

ICA Regulations and Principles A major cause of weaknesses and drawbacks for SACCOs is their apparent failure to adhere to the universal principles, ethics, values, declarations, and standards for all Cooperatives, including SACCOs, that have been established by the ICA. Some of the notable contraventions of ICA recommendations include the violation of Cooperatives' values of honesty and openness (Munyambonera and Adong 2013).

In summary, the literature indicates the outstanding weaknesses of all Cooperatives, as being their vulnerability to weak corporate governance, poor leadership, and poor economic activity by their members. SACCOs particularly suffer from political interference, lack of cooperative member education, and a widespread culture of poor savings. Other challenges include massive fraud, high levels of delinquency, and inadequate security for guarding SACCO premises (Ahimbisibwe 2013). These documented challenges pose a considerable threat to the prosperity of SACCOs and other types of Cooperatives. Hence, these identified weaknesses inhibit the potential of SACCOs to sell and diffuse appropriate solar technologies in Uganda. However, several interventions have been arranged by the Government and development agencies to mitigate these challenges (Ahimbisibwe 2013) and we can look to a more optimistic future.

Conclusions

At the Micro Level Our Findings Suggest

A product range that meets daily requirements and is therefore fit for purpose comprises solar equipment that is simple to access, install, and operate. There is a need for reliable technical maintenance and servicing. Products should go through an approval process so that customers are reassured that they have genuine products. And finally, they need financial assistance to acquire the technologies.

At the Meso Level—Where SACCOs Can Play a Role—Our Findings Suggest

The above criteria are core requirements of users. In addition to these, at a meso level what is needed appears to be a much greater awareness-raising campaign that promotes solar technologies. It is in this context that SACCOs provide a potential solution as they are a Government-approved agency. If they can be empowered to diffuse solar technology solutions for their members, the whole sector can benefit from their wide reach, ability to provide financial aid to their members, and draw on Government support, as well as fit into the spirit of solar technologies as a social good. It is this agency role, we would argue, which has the capacity to scale up the adoption of solar technologies.

SACCOs do of course face challenges as we have observed above. They are "bankers" rather than "retailers" and as a result, they do not have the skills, knowledge, resources, physical attributes, and business acumen to build this activity. They are vulnerable to poor governance procedures and unreliable members who may default on their loans, although this weakness is being ably addressed by the UCSCU. But these are all issues that, with training and investment, can be solved. It is also possible to develop a business model that brings SACCOs together with reliable private sector players who have the knowledge and know-how for the deployment of solar technologies.

At a Macro Level

Appropriate solar technologies ought to be identified, branded, and positioned as essential social goods that serve as solutions to the socio-economic and environmental challenges in Uganda and the rest of Africa. This calls for the repositioning of solar innovations as tax-free, low-cost, social items, rather than conventional commercial (for-profit) merchandise. Hence, practical Governmental policies, laws, and regulations, plus interventions by development partners, are necessary for rebranding, availing and popularizing solar technologies as social goods. Recommendable regulations and policies here include establishing strict

quality assurance authorities to ensure importation, sale, and distribution of only high quality, branded solar technologies from reputable, responsible, responsive, and accountable sources or suppliers. These measures are bound to facilitate making appropriate solar technologies more affordable and readily accessible by all those who need them, thereby increasing their diffusion in Uganda and the rest of Africa. Policies may also be considered that encourage local businesses to invest in partial assembly or other value-adding roles that can also bring down the costs of imports.

In addition to these raised costs are the consequences of import bills, as the Uganda shilling continues to depreciate.

Recommendations for Further Studies

There are significant numbers of issues and stakeholders that need to be investigated. Vendors, manufacturers, and others in the value chain need to be better understood regarding their motivations, barriers, and enablers. Development agencies can contribute to macro-policy recommendations to scale up the adoption of solar technologies. And a wider study of other regions is needed to understand policies, fiscal and other arrangements that have been adopted in order to replicate the best lessons. Such studies are likely to generate lessons that may enlarge the knowledge provided by this chapter.

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