

AN INNOVATIVE BUSINESS MODEL TO PROVIDE SERVICES TO DISTRIBUTION COMPANIES THROUGH AN AUTOMATIC METER READING SYSTEM

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ABSTRACT

The Sultanate of Oman is facing a period of strong transformation, characterized by the restructuring of the electricity and water sectors and started with the Law for the Regulation and Privatization of the Electricity and Related Water Sector, entered in force on May 2005. The Law provided for the horizontal and vertical unbundling of the electricity and related water activities, previously undertaken by the Ministry of Housing Electricity and Water. In this way Oman became the first country in the Middle East to perform the vertical unbundling between generation, transmission and distribution activities. In this context, the reforms established in the Sector Law triggered important activities currently on-going, which are the implementation of the Supply Competition at retail level and the privatization of the Distribution Companies (DisCos), with the final goals of improving the efficiency and reduce the costs of the electricity sector. In fact, a strong and constant increase of the demand, together with a strong subsidization of the electricity tariffs paid by the customers, is leading to an important economic burden for the Country. The implementation of Cost Reflective Tariffs (CRT) since 2017, together with the importance of the customers with highest consumptions (In the following High-Value Customers - HVC) in terms of revenues for the DisCos and the opening of the market, pushed for a project to install a centralized Automatic Meter Reading (AMR) system for the 5 DisCos. The Project is implemented by a third-party company under supervision of Nama Holding Company. The AMR operation was assigned to one of Nama Holding Subsidiaries who will provide Services to the five DisCos under an innovative Business Model and Operational Business Model to make the DisCos business more efficient, simple and cost-effective. The objective of this paper is to describe the Business Model implemented by Nama Group Capitalizing on Nama Shared Services (NSS) to provide AMR Services to the five DisCos for their High Value Customers, with the possibility of expanding to other customer segments. The paper describes also the Operational Business Model and the processes implemented to guarantee the services provided to the five DisCos, in a cost effective and ringed

fenced manner, in line with the current regulatory regime. The services are also monitored by Key Performance Indicators (KPI) with a credit/penalty mechanism and an appropriate pricing for each service is defined. All these aspects are reflected in Final Service Level Agreements between the Service Provider (NSS) and the DisCos as discussed in the paper.

INTRODUCTION

The Sultanate of Oman began the restructuring of the electricity and water sectors when the Law for the Regulation and Privatization of the Electricity and Related Water Sector [1] entered in force on May 2005. The Law provided for the horizontal and vertical unbundling of the electricity and related water activities, previously undertaken by the Ministry of Housing Electricity and Water. The DisCos are also under a privatisation process. In this way Oman became the first country in the Middle East to perform the vertical unbundling between generation, transmission and distribution activities and privatise the DisCos.

Currently Nama Holding is the shareholder of five DisCos that supply energy in the Main Interconnected System (MIS), the Rural Areas Electricity Company (RAECO) and the Dhofar Power Company (DPC).

Although there are separate licences for distribution and supply in the regulatory framework, the DisCos have licences for both supply and distribution and have a regional monopoly on these businesses in the areas of jurisdiction. The areas of jurisdiction of the five Distribution Companies is reported in Figure 1.

In addition, Nama Holding has a subsidiary to provide shared information technology and telecommunication services (Nama Shared Services -NSS) and a Subsidiary for competency development.

The Authority for Electricity Regulation (AER) was established by the sector Law on 2005 [1] and, since then, is performing the regulation of the sector and performing the Price Control process every four years establishing efficient targets for operational expenses and energy losses among others.

In November 2016, the Council of Ministers in Oman and the AER made an important initial step to

define a target group with high electricity consumption to be addressed with the denominated Cost Reflective Tariff (CRT), aimed to remove the subsidy. A customer is classified as a CRT Customer if he High Value Customer with a yearly consumption, higher than 150,000 kWh and is part of the industrial, commercial or governmental categories [9]. From January 2017, new cost-reflective electricity tariffs (CRTs) for large Industrial, Commercial and Government customers came into effect and this represents the most substantial change in electricity tariffs in Oman for over two decades.

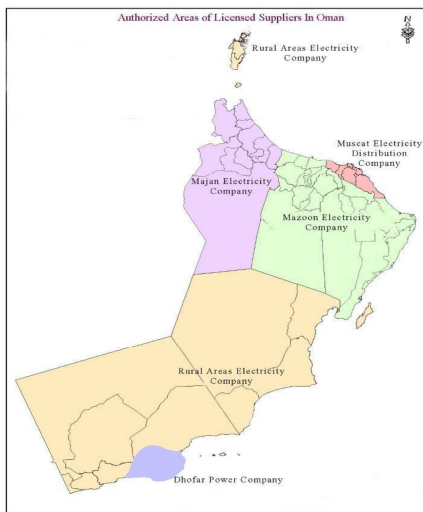


Figure 1 – Geographical areas of responsibilities of the five Distribution Companies in Oman.

This led to re-classification of the customer database considering the regulatory criteria and it was expected that near 50% of the energy consumption fall into the High Value Customers, which in number are near to 2% of the total customers of Oman.

As the CRT was the first tariff of its kind in Oman to use TOU (times of use & with hourly readings), it mandated the installation of smart meters, and implementation of a smart metering solution to read and manage the meters.

In this context, the reforms established in the Sector Law also triggered the implementation of Supply Competition at the retail level, where customers would be able to easily switch between a supplier of electricity in an easy and transparent manner.

The regulatory model for the Supply Competition is under analysis. The final goals are to improve the efficiency in the electricity sector and to reduce the subsidies and prepare the companies for privatization.

The implementation of Cost Reflective Tariffs, together with the importance of the HVC customers in terms of revenues for the DisCos and the opening of the market to supply competition, drove the 5 DisCos along with the Holding Company to install a centralized AMR system & services that will serve the companies under

privatization in a ring fenced and model. The Project is implemented by a third-party company under supervision of Nama Holding Company. It is also assigned to Nama Shared Services (NSS) one of Nama Holding Subsidiaries who will provide AMR services to the 5 DisCos under an innovative Business Model and Operational Business Model to make the DisCos business more efficient, simple and cost-effective, as described in the next sections of the paper.

The rest of the paper is composed as the following:

- Supply Competition in Oman
- AMR Implementation Strategy
- AMR Business Model
- AMR Operational Model, services and the KPIs implemented.

SUPPLY COMPETITION IN OMAN

In general, the main factors for the success of retail competition [4] [5] are: i) Functioning & reliable wholesale market; ii) Easy access by consumers to information about the available choices, their pros & cons, and the procedures to switch supplier; iii) True competition among suppliers without significant barriers or discrimination; iv) Absence of default tariffs or other regulated options that compete with advantage with retailers; v) Adequate metering equipment and data processing to support market transactions; vi) Working institutions to protect consumer rights and to curb irregular commercial practices; vii) Complete, correct & stable set of rules.

The Supply Competition was established as a strategy and policy by the Omani government and it is under the AER the implementation and supervision. The aim is to separate the supply activity that now is merged with the distribution business, so customers can receive electricity supply from any licensed supplier. The final target is avoiding a monopoly on a regional basis.

In general, from the management and data collection point of view, there are two models to implement the Supply Competition: one is a centralised Data Hub model (like Denmark, UK) and another is decentralised in each DisCo (like Italy).

A centralised model with a central Data Hub was recommended for Oman [2] considering their market process opening, privatisation on-going process and their market characteristics. The characteristics of a centralized data hub are:

- One specialised entity manages the data
- Higher degree of transparency
- Timings for switching are controlled by the central entity being clear the responsible for delays
- Foster competition
- Higher Confidentiality of data

AMR IMPLEMENTATION STRATEGY

The strategic drivers that led to implement the

AMR are the following: i) Enable the Supply Competition; ii) Have the Business Intelligence; iii) Facilitate Innovation & Technology; iv) Enhance Services for a Central & Coordinated planning; v) Efficiency of processes derived from the Project (losses, planning, quality of service); vi) Additional Revenue stream to have resources for Innovation & Technology; and vii) Enhance the quality and speed of processing of metering data, to improve billing accuracy.

Bearing in mind such drivers, an appropriate business model for the AMR had to be defined for assuring the most effective technology, implementation and operation. Additionally, the following facts were considered in their development: i) there is no smart meter or smart grid roadmap or a strategic roadmap; ii) there is an open market and competitive market for performing data collection in Oman; iii) the DisCos and the AER have been developing different types of projects that considers remote reading and data collection (solar meters other regions and category of users, etc.), being attracted by the vendors and the everyday new features that are being developed in the market.

This highly competitive environment required a robust business model to survive in a competitive market of data collection and has considered the regulatory and policy constraint of foster supply competition and the future privatisation of the DisCos which unfaillingly will lead to cost optimisation.

At the same time the project had implementation principles that guided its approach i) ensuring interoperability across different meters and systems; ii) development of local capacity and human capital; iii) piloting with small implementation; iv) preparation for expansion of smart meters.

The project has been developed not just as a typical technical tool for smart metering, but as an important tool to deliver services to the DisCos on the basis of an appropriate business model.

Hence, although a central data hub used for competition does not mandate a central meter reading setup, the AER and the 5 DisCos in Oman strategically decided to have a central smart meter reading solution, along with the central data hub for the following reasons:

- A central meter reading solution would establish a baseline for smart meter reading solutions in Oman, where 5 DisCos requirements and collective knowledge is instilled in the system.
- The central solution defined standard configurations of systems and smart meters and data models to ensure interoperability of all smart meters used in Oman. Hence, any smart meter to be installed in Oman, shall comply with the requirements of the central AMR system as also any HES to be integrated should comply with integration requirements.
- Even if the DisCos opt to use other AMR solutions for their own uses, the central solution would be

considered as a fall-back plan to avoid meter supplier locking.

- The system, and its processes, shall allow for piloting and testing of new technologies and meters and small-scale implementations, as well as full-fledged rollouts.

The Automated Meter reading project had been started its implementation in September 2017 in Oman and currently all the CRT customers are remotely read.

AMR BUSINESS MODEL

A business model is understood as the reflections of the realized strategy and the logic of the firm, the way it operates and how it creates value for its stakeholders [6] [7]. Then, the Business model defined comes from Nama strategy and it is the base for defining the operational Model for the AMR system (Figure 2).

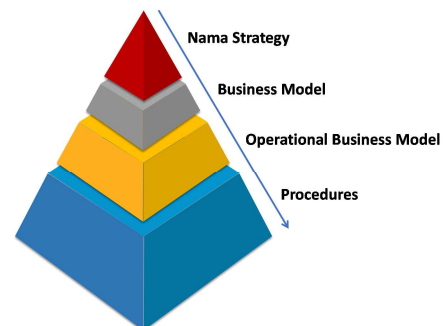


Figure 2- Phases for the full definition of the Business and Operational model of the AMR system

Additionally, the Business Model developed [8] considered the following: i) the central AMR and Data hub are managed in a central manner, ii) the field operations, like meter installation and field support, shall remain under the DisCos scope in a distributed manner with back office support from the central system.

At this point, the strategy of the business model and its targets had crosschecked with the regulation of the electricity sector and with the tariff-setting process, in order to be perfectly aligned with the regulatory framework, be efficient and competitive. The selected business model has the following characteristics:

- It focused on concentrating the knowledge, specialisation of human resources and the innovation & technology.
- It allows building common standards for smart meters.
- It allows determining the common integration rules and conditions of other HES that can be competitively installed by the DisCos or future suppliers.
- It leaves the field work to DisCos where their core experience resides and the relation with field contractors is established.
- The business model could be implemented with

minimum changes in DisCos processes internally and with their contractors.

- The model allowed for ring-fencing the AMR and central data hub operationally, commercially and financially, maintaining neutrality and independence from the DisCos.
- This allows the AMR/Data hub to work at arms-length with the 5 DISCOs, maintaining regulatory obligations.
- The distinction between the “AMR system” and “AMR Services” delivered to the DisCos. NSS have freedom in integrating several AMR systems to deliver any “AMR Service” requested by the companies.

The Business Model defined also the main responsibilities of each stakeholder involved, i.e., NSS and the DisCos. Those responsibilities of the DisCos consider: owners of the smart meters; physical asset management of the meters; physical installation; on-site commissioning & support; Editing at reading level, VEE at billing level, report the yearly volume of new additions to the AMR Project among others.

The responsibilities of NSS (the central service unit) responsible of AMR/MDM systems considers: Validation and Estimation of readings; umbrella for metering chain supply; umbrella for telecommunication contracts; enable of Supply Competition; central Data Hub to facilitate switching of suppliers; metering support services; security services; facilitation between DISCOs on new technologies and changes, certified list of approved devices to be integrated in the system; command services, among others.

OPERATIONAL BUSINESS MODEL & SLA

After the strategic definition of the Business Model, the services were identified and classified as i) Core services and ii) Additional services.

The project is foreseen to be implemented in different stages. Each stage will introduce new services to be provided by NSS to the DisCos. Currently, the service definition led to develop an Operational Model according to the first stage of implementation of the project, but the model is flexible and designed to be suitable also for the future stages.

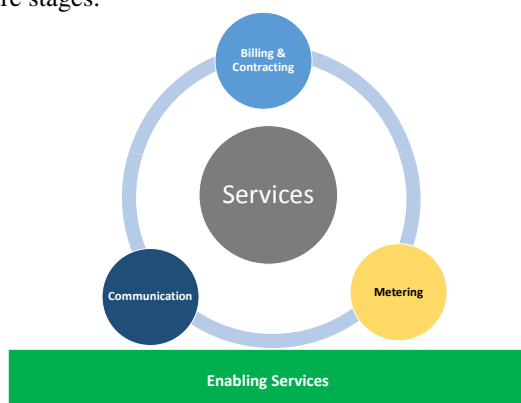


Figure 3 – Main categories of Services

The full operational model considers the following categories of services: 1) Billing & Contracting; 2) Metering; 3) Communication; and 4) Enabling services.

The main structure of the Operational Business Model [3] is presented in Figure 4.

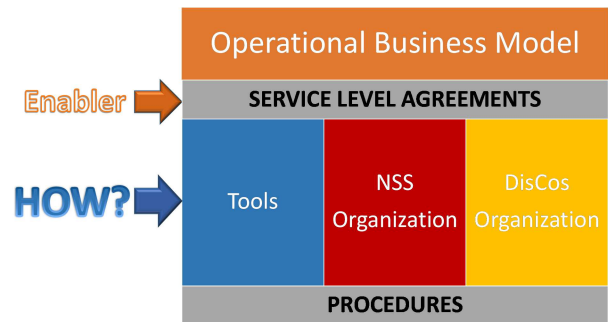


Figure 4 – Main structure of the Operational Business Model

The basis of the model are the procedures to deliver the services supported by the tools of NSS (AMR/MDM system, ticketing system); the organization to support the business (internal organization, specific support 24/7; change management, training); and the DisCos organization to deal with the new scheme and environment (internal reorganization, change of process, change management and SLA monitoring). The enablers of the Operational Business Model are the Service Level Agreements (SLA) which are output-based that were designed considering the main 3 aspects [8]: i) Volume & quality of work; ii) Speed & responsiveness; and iii) Efficiency. The SLA defines Key Performance Indicators (KPIs) for each service delivered and its values and penalties associated in the case of non-compliance.

As reported in Figure 5, every Service may have one or more processes and each Process may have one or more Use Cases. The Use Cases are in this case directly connected with the low-level implementation of the AMR system and the capabilities of the implemented system. Each of the processes and use cases has been developed to deliver a service.

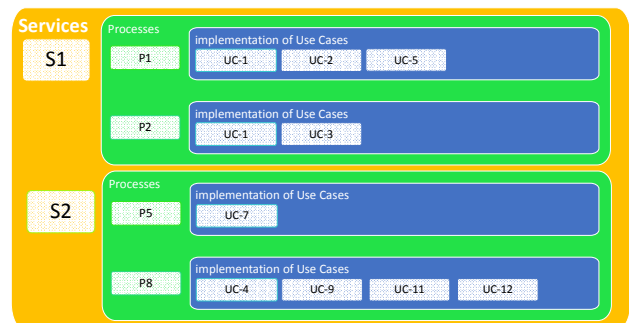


Figure 5 – Relation between Services, Processes and Use Cases

The prices that were initially agreed are those coming

from competitive tenders for two existing Head-end systems performing collection activities in the five DisCos for certain groups of clients. Those competitive prices are also regulatory approved and are the starting point for pricing the services.

One of the challenges and difficulties was that a service-oriented platform, able to track, monitor and automatically report the services to be delivered by the system to the DisCos was difficult to be implemented.

After verifications, this was due to the fact that most of the AMR vendors have not developed business-oriented platforms and do not have the all capabilities required to use these tools for a service-oriented business. Nevertheless, even if the information about the delivery of the services are there, it is very difficult or impossible to get this information in a systematised way required to track a service and to charge for it.

The service SLA included clear KPIs, related to service accessibility, response times, accuracy of data, response to variations on the system or meters, responses to expansions and developments and other operational and evolutionary indicators.

The Operational Business Model and the AMR Project were launched in September 2018 and the SLA was signed in January 2019. The model allows to develop the proper framework to integrate new Head-end systems to the current business and operational model and keep the competition up within a secure environment.

CONCLUSIONS, LESSONS LEARNED AND NEXT STEPS

Oman is the first country in the Middle East that is contemplating privatizing the electricity sector and is progressing towards a Supply Competition at the retail level. Considering this framework, a centralised supply competition model with central Data Hub was recommended for Oman.

The development of the electricity market in Oman required the sector to “collectively” implement a solution that will enable the application of sophisticated tariffs, to enable the supply competition and to facilitate switching of suppliers, to introduce efficiency in the costs, innovation & technology with strong involvement of the human resources through change management.

Given the Omani electricity sector requirements, current regulatory environment and the competition in collection services (HES level), an open structured Business Model and Operational Business Model for the delivery of smart metering services to its participants in a competitive and transparent manner were developed.

The implemented model allows the DisCos to utilize economies of scale and utilize the smart meter reading services, in an easy and efficient manner. It also allows maintaining interoperability across the sector for meters and systems, without locking the sector to a certain technology or manufacturer. The model also allows for a structured introduction of new meter types

and headend systems into the Omani market. The business model does not restrict the usage of AMR services to the Central system but ensures that the central system will remain as the backup solution for smart metering in Oman.

In the model in the first stage, four types of services are considered (Billing & Contracting; Metering; Communication; and Enabling services) and it is foreseen to enlarge them according to the DisCos requests. Such new services will be developed in a later stage and will regard Distribution Planning, Energy Losses, Tariffs and Load Management.

In a competitive environment for AMR services, strong integration within the systems and interoperability in all the levels are highly required. Therefore, the AMR system has been realized to keep the competition as a main driver for future investments and developments.

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