# STUDY ON THE POSSIBILITY OF DESIGNING PROTECTION SYSTEM FOR FAST AND SLOW RISING VOLTAGE SURGE IN RING MAIN UNIT (RMU) 11 kV

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# ABSTRACT

Ring main unit (RMU) is one of the important equipment that is used in electrical ring network, which function as switching device for a network. The RMU normally employs circuit breaker with fuse or relay protection circuit. This project addresses the possibility of designing a protection system for both fast and slow rising voltage surge in the RMU by combining fuse, relay and circuit breaker into one RMU. When the performance of this equipment is increase, it will defense better against the instant or gradual destruction of electrical equipment at the load.

This design of the new protection design has been simulated in MATLAB Simulink and PSpice softwares. Based on simulation results, recommendations regarding new protection design will be made. All protective devices are first simulated separately and then combined into one integrated system. The newly protection system has been examined and recommendation for future development is given.

Through the simulations made, it was found out that the parameters that operate the fuse, relay, and circuit breaker are time, overcurrent, and overvoltage, respectively. The fuse has been successfully modeled and functions as per expected. On the other hand, it has been found that circuit breaker does not operate solely on overvoltage. Other factors such as recovery voltage, capacitive current and resistive must also be taken into account.

**Keywords:** Ring main unit(RMU), fuse, relay, circuit breaker.

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# CHAPTER 1

# INTRODUCTION

## 1.1 Ring Main Unit

Nowadays the popular and the best way to distribute electrical power supply from a substation to consumer is by using ring network. All this condition can be controlled by using ring main unit (RMU). In this case RMU is used as an isolator. The consumer can still get electricity even though maintenance work is being conducted at an area adjacent to that having a RMU. RMU is intended to be used in medium/high voltage (11kV to 36 kV) ring distribution system in any power supply or distribution utilities. RMU offers greater flexibility in supply system in maintaining continuity and offers practically maintenance free operation. The RMUs are very compact in size compared to medium/high voltage switchgear panels. In Malaysia, the RMU that are in use of the 11kV and 33 kV type. This project will concentrate details about protection in 11 kV RMU only.

Other than operating as a switching device for the ring network, this equipment also serves as a protection apparatus and thus it must have suitable protection to prevent itself and connecting network from slow and fast rising surge. Nowadays RMU normally consist of switches on both sides of the T-off, one to open the ring and another at the connection to the distribution transformer using one of the following either switch-fuse combination or circuit breaker. It is important to prevent the power system from overvoltage caused by lightning, utility switching operations, and other appliance switching. So in this project will look into the upgrading of the protection in this equipment by combining fuse, relay and circuit breaker in one RMU. Figure 1.0 (a) and figure 1.0 (b) shows the ring main unit 11kV from front and side view.