전압 크기의 품질 및 전력수요 변동모델을 고려한 배전계통의 통합적인 신뢰도 및 비용 평가

論 文
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Unified Reliability and Its Cost Evaluation in Power Distribution Systems Considering the Voltage Magnitude Quality and Demand Varying Load Model

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Abstract - In this paper, we propose new unified methodologies of reliability and its cost evaluation in power distribution systems. The unified method means that the proposed reliability approaches consider both conventional evaluation factor, i.e. sustained interruptions and additional ones, i.e. momentary interruptions and voltage sags. Because the three voltage quality phenomena generally originate from the outages on distribution systems, the basic and additional reliability indices are summarized considering the fault clearing mechanism. The proposed unified method is divided into the reliability evaluation for calculating the reliability indices and reliability cost evaluation for assessing the damage of customer. The analytic and probabilistic methodologies are presented for each unified reliability and its cost evaluation. The time sequential Monte Carlo technique is used for the probabilistic method. The proposed DVL(Demand Varying Load) model is added to the reliability cost evaluation substituting the average load model. The proposed methods are tested using the modified RBTS(Roy Billinton Test System) form and historical reliability data of KEPCO(Korea Electric Power Corporation) system. The daily load profile of the each customer type in domestic are gathered for the DVL model. Through the case studies, it is verified that the proposed methods can be effectively applied to the distribution systems for more detail reliability assessment than conventional approaches.

Key Words : Reliability evaluation, reliability cost, voltage magnitude quality, demand varying load, analytic method, probabilistic method, Monte Carlo Method, interruptions, and voltage sags.

1. Introduction

The reliability evaluations of power distribution systems are defined as the assessment of power supplying quality and are used to decide the system state of present and future, and the important order of investments and maintenances for power system facilities. Over the past few decades, sustained interruptions have received to the unique tool for reliability modeling and evaluation of distribution systems. Therefore the distribution system reliability is recognized as the assessment of sustained interruptions. Billinton and Allan propose the reliability and its cost/worth evaluation using the analytic method[1]. Billinton and Li propose the probabilistic method of reliability evaluation using the time sequential Monte Carlo simulation[2]. Billinton and Wang present a method which related to the reliability cost evaluation of distribution system using the analytic and probabilistic technique [3].

The conventional reliability concept that related to the sustained interruptions meets a strong challengers, the short duration variations of voltage magnitude. In the end of 1970s, the study that related to the voltage magnitude quality is started with Key [4]. In the IEEE Std. 1159 [5], the definitions of terms are appeared. Sekine et al.[6] describe the present state of interferences of voltage sag and the countermeasures in Japan. Yun et al.[7] describe the present state of customers' effect by voltage sag in Korea. The customers' opinions for power quality are surveyed and the experiments for sensitive customers' loads are also accomplished. Conrad and Bollen presented a method to assess the effect of individual loads using the contours of voltage sag performance[8]. Yun and Kim propose the evaluation methodology of voltage sag using a fuzzy risk assessment model [9]. Brown develops the evaluation indices and methodologies of momentary interruptions [10]. Until this point of time, reliability indices that contain the indices of momentary interruption is not treated to the formal standard in distribution system. It make possible to authorize the distribution system reliability indices of sustained and momentary

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interruptions in IEEE Std 1366[11].

The previous studies of distribution system reliability did not unify the three voltage quality phenomena. In this paper we propose a new methodologies of unified reliability evaluation. Unified method means that the proposed methods simultaneously evaluate the each phenomenon because they have same origin, the faults on distribution system. The basic and additional indices of each voltage quality phenomena are summarized. The unified reliability and its cost evaluation methods are proposed. The proposed methods are divided into the analytic and probabilistic approach, and the time sequential Monte Carlo simulation is used for the probabilistic method. Then the evaluation methodology of reliability cost adding the DVL(Demand Varying Load) model is proposed. The proposed methodologies are tested using the modified RBTS (Roy Billinton Test System) form and historical reliability data of KEPCO (Korea Electric Power Corporation) system. For the DVL model, representative daily load profiles of low-voltage customer in domestic are gathered.

2. Voltage Magnitude Quality in Power Distribution Systems

When a fault occurs as shown in the model system of Fig. 1, the automatic recloser opens to clear the fault and automatically recloses after a time delay. This reclosing behavior can take place several times in an effort to establish continuous service for a temporary fault. If the fault is temporary in nature, the reclosing operation on the breaker should be successful and the interruption will only be momentary. For this case, the customers of LP(Load Point) A on faulted feeder experiences a momentary interruption and the customers of LP B on neighbor feeder experiences a voltage sag or series voltage sags and it is shown in the right-side of Fig. 1(b). However, if the fault is permanent in nature, reclosing operations on the automatic recloser should be failed and the reclosing operation will be locked-out. For this case, the customers of LP A and LP B will be experienced a sustained interruption and a series voltage sags respectively as shown in Fig. 1. As shown in these examples, three phenomena(sustained and momentary interruptions, and voltage sags) are related to the reductions of voltage magnitude and originate from the faults on distribution systems.

3. Proposed Unified Methods of Reliability Evaluation Using Analytic and Probabilistic Method

In this section, the unified reliability evaluation methods are proposed. The terms of unified means that the proposed methods simultaneously evaluate the three

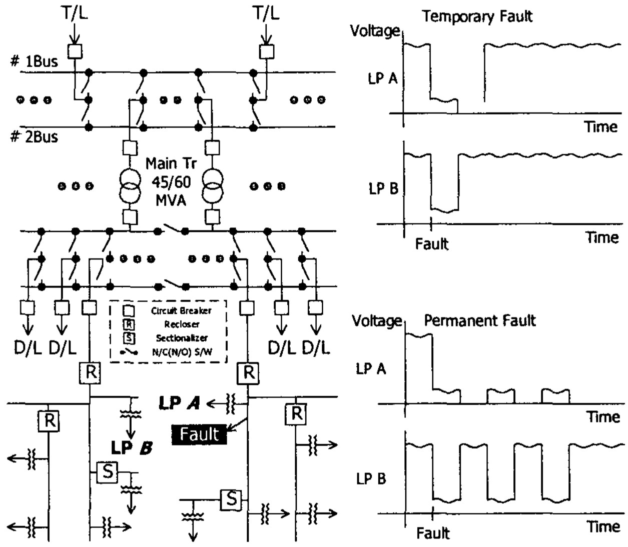


Fig. 1 Occurrence of voltage magnitude quality phenomena

voltage quality phenomena according to the fault occurrence.

3.1 Basic and Additional Evaluation Indices of each Voltage Quality Phenomenon

The basic parameters of reliability evaluation for sustained interruptions are the average permanent failure rate, λ_S, average outage time, γ, average annual outage time, U, and the average load of a load point, L_a [1]. The additional reliability indices of sustained interruptions that are most commonly used are basically divided into the customer oriented and load & energy oriented indices[1].

The average temporary failure rate, λ_M and the duration of momentary interruptions, t_M are proposed for the basic reliability parameters of momentary interruptions[12]. The two additional reliability indices of momentary interruptions are defined in the IEEE Std. 1366. One is related to the momentary interruptions (MAIFI) and the other is related to the momentary interruption events ($MAIFI_E$).

The duration of voltage sag, t_{VS} and the magnitude(%) of voltage sag, M_{VS} are proposed for the basic reliability parameters of voltage sags[9]. The duration of the voltage sag is determined by the clearing time required to a protective device. If a three-phase fault occurs in Fig. 1 and the fault is cleared at the first reclosing of the automatic recloser, then the total duration of the voltage sag for a load point i, t_{VSi}, is

$$t_{VSi} = t_R \tag{1}$$

Here, t_R is the operation time of automatic recloser. The magnitude of the voltage sag is related to the fault current. For the radial distribution system in Fig. 1, the magnitude of voltage in a neighbor feeder is almost equal to the voltage magnitude of the distribution bus point. The positive negative, and zero sequences voltage at bus point can be calculated as

$$V^i_{bus} = V^i_f + I^i_f Z^i_L \quad p.u. \quad (i=1,\ 2,\ \text{and}\ 0) \tag{2}$$

where the superscript 1, 2 and 0 mean positive, negative and zero sequence element, respectively. he bus point voltage for faulted phase, V^{fp}_{Bus}, is an addition of the three sequence elements of the distribution bus voltage.

$$V^{fp}_{Bus} = V^1_{Bus} + V^2_{Bus} \times V^0_{Bus} \tag{3}$$

Finally, the percentage (%) of voltage sag magnitude in the faulted phase, M_{VS}, can be computed as

$$M_{VS} = (1 - |V^{fp}_{Bus}|) \times 100\% \tag{4}$$

The additional index of voltage sags is defined as SAVSRI (System Average Voltage Sag Risk Index) [9]. SAVSRI represent the annual average risk for voltage sags per customer. If SAVSRI is 1, the whole loads of customers may run the risk of shutdown or malfunction due to voltage sags at least once a year.

$$SAVSRI = \frac{Total\ Risk\ of\ Voltage\ Sags}{Total\ No.\ of\ Customer\ Served} \tag{5}$$

The risk of the individual customer by the voltage sag as following equation:

$$R_{VS} = (\mu_D[t_{VS}] + \mu_M[M_{VS}])/2 \tag{6}$$

where $\mu_D[t_{VS}]$ and $\mu_M[M_{VS}]$ are the degrees of membership for t_{VS}(voltage sag duration [ms]) and M_{VS} (voltage sag magnitude [%]).

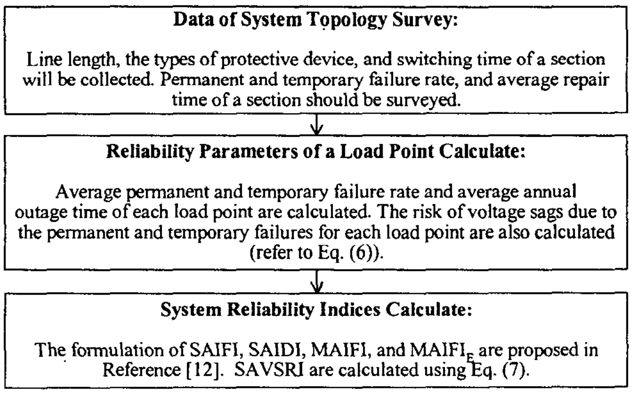


Fig. 2. Analytic methodology of unified reliability evaluation

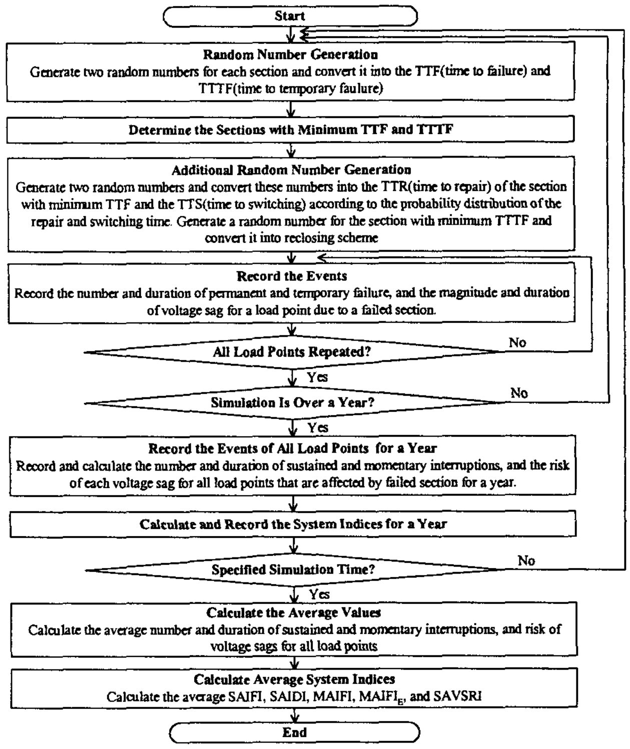


Fig. 3. Probabilistic methodology of unified reliability evaluation

3.2 Unified Reliability Evaluation Using Analytic Technique

Analytic techniques of reliability evaluation are generally used to assess the mean or expected values of basic and additional indices for a load point and a system. The typical process of analytic reliability evaluation methodologies for sustained and momentary interruptions, and voltage sags are summarized as Fig. 2.

$$SAVSRI = \frac{\sum_{i=1}^{N_{LP}} R_{VSi} NC_i}{\sum_{i=1}^{N_{LP}} NC_i} = \frac{\sum_{i=1}^{N_{LP}} \left(\sum_{j \in VS(i)} \lambda_{Sj} R_{VSSi} + \lambda_{Mj} R_{VSMi} \right) \times NC_i}{\sum_{i=1}^{N_{LP}} NC_i} \tag{7}$$

where N_{LP} is the number of load points for a system and NC_i is the number of customer for a load point i. λ_{Sj} and λ_{Mj} are the permanent and temporary failure rate for a section j. R_{VSSi} and R_{VSMi} represent the risk of voltage sag for a load point i due to the permanent and temporary failure of a section j.

3.3 Unified Reliability Evaluation Using Probabilistic Technique

In order to obtain the annual variability, it is necessary to include probability of frequency distribution concepts in the evaluation process. The time sequential Monte Carlo simulation approach [2] provides the opportunity to develop an appreciation of the variability associated with the annual indices. The simulation processes of a unified reliability evaluation using Monte Carlo method are shown in Fig. 3. The important changes that compared with conventional reliability evaluation is the consideration of permanent and temporary failure at once.

4. Proposed Unified Methods of Reliability Cost Evaluation Using Analytic and Probabilistic Method

In this section, we propose the unified methods of reliability cost evaluation using analytic and probabilistic method. SAIFI, SAIDI, MAIFI, $MAIFI_E$ and SAVSRI are calculated through the unification methods in previous section. Although they individually evaluate the impact of sustained interruptions, momentary interruptions, and voltage sags, do not assess the whole impact of a system. If the simulation results of SAIFI and MAIFI for a load point have '1.0/yr · customer', then it is impossible to evaluate the total impact of the load point. It is because the intermediation parameter between two indices is not exist. Therefore, the terms of unify for the reliability cost evaluation means that the results of unified reliability evaluation for three phenomena as proposed in section 3 are merged using intermediation parameter, i.e interruption cost. In order to reflect the severity or significance of integrated system damages due to each voltage quality phenomenon, the CIC(Customer Interruption Cost) are introduced. Unified reliability cost of three phenomena for a load point is calculated as following equation.

$$CIC_i = CIC_{Si} + CIC_{Mi} + CIC_{VSi} \qquad (8)$$

where CIC_{Si}, CIC_{Mi}, CIC_{VSi} represent the customer interruption cost of sustained and momentary interruption, and voltage sag.

4.1 Customer Interruption Cost

Customer interruption cost is the effect degree of whole economic, social activities, and etc. due to a failure of electrical energy supply. This cost is generally divided into preparation cost and impact cost. The impact cost is equal to the interruption cost, and the meaning of interruption has been identified the sustained interruptions. The prediction methods for interruption cost are commonly divided as follows.

One convenient way to display customer interruption costs is in the form of the customer damage function (CDF). CDF can be determined for a given customer type and aggregated to produce sector customer damage functions for the various classes of customers in the

Table 1 Survey results of interruption cost (US$/kW) in Canada

Customer types	Duration of Interruption				
	1min	20min	1hr	4hr	8hr
Residential	0.021	0.093	0.482	4.914	15.69
Commercial	0.881	2.969	8.552	31.32	83.01
Office building	4.778	9.878	21.06	68.83	119.2
Industrial	1.625	3.868	9.085	25.16	55.81

system. It is to model the outage cost as a function of interruption duration. Lots of surveys conduct in many countries. The results of survey show that the cost of an interruption depends on the type of customer interrupted, and on the magnitude and the duration of the interruption. The linear equations of linking points (i.e (1min, 0.021$) and (20min, 0.093$)) in Table 1 [13] represent the CDF of each customer type.

4.2 Proposed Unified Methodology of Reliability Cost Evaluation

The proposed unified method of reliability cost evaluation is also divided into the analytic and probabilistic method. Fig. 4 and Fig. 5 shows the analytic and probabilistic method, respectively.

$$C_{Sij} = f(r_{Sij}) \qquad (9)$$

$$C_{Mij} = f\left(\sum_{k=1}^{N_r} \lambda_{Mij} \times P_{r_k} \times t_{R_k}\right) \qquad (10)$$

$$C_{VSSij} = C_{VSMij} = f(t_{VSW}) \qquad (11)$$

where t_{r_k} is total duration of k^{th} reclosing interval. t_{VSW} denotes the duration which occur the shutdown or malfunction of whole loads due to a voltage sag.

$$ECOST_{ij} = L_i(C_{Sij}\lambda_{Sij} + C_{Mij}\lambda_{Mij} + C_{VSSij}R_{VSSij} + C_{VSMij}R_{VSMij}) \qquad (12)$$

where L_i is the average load of load point i.

$$ECOST_i = \sum_{j=1}^{N_j} ECOST_{ij} \qquad (13)$$

where N_j is the total number of sections in the system.

$$ECOST = \sum_{i=1}^{N_{LP}} ECOST_i \qquad (14)$$

$$COST_{ij} = L_i(C_{Sij} + C_{Mij} + C_{VSij}R_{VSij}) \qquad (15)$$

$$COST_i = \sum_{j=1}^{N_S} COST_{ij} \qquad (16)$$

where N_S is the total number of failure events in the specified simulation period.

$$ECOST_i = \frac{COST_i}{TST} \tag{17}$$

where TST is the total specified simulation time in years.

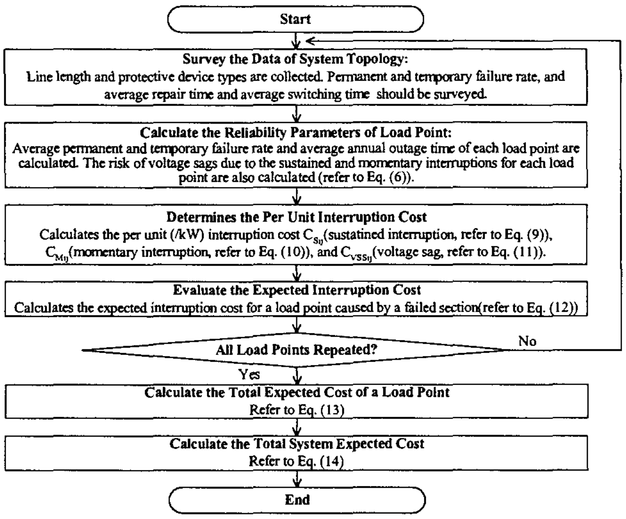


Fig. 4. Analytic method of unified reliability cost evaluation

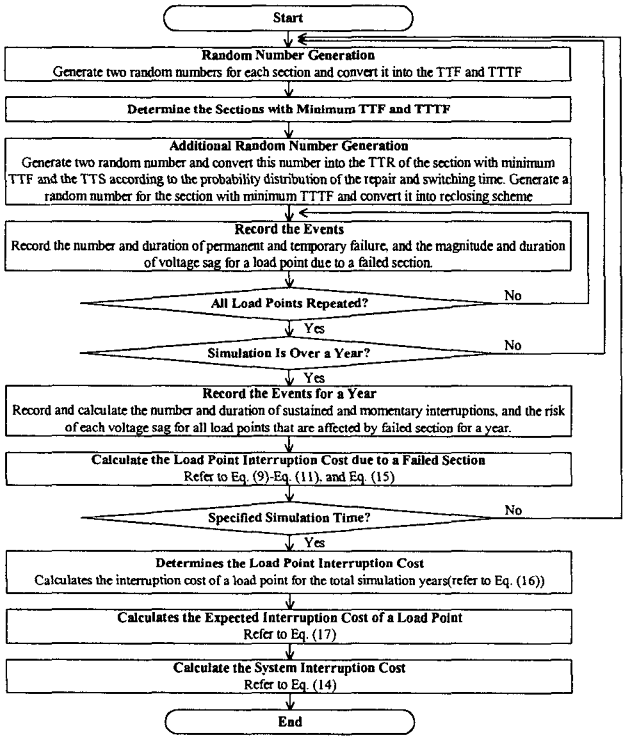


Fig. 5. Probabilistic method of unified reliability cost evaluation

4.3 Proposed Unified Methodology of Reliability Cost Evaluation Considering Demand Varying Load Model

The load models in previous mentioned method of reliability cost are the average load models. In these models, the actual time varying nature of the load and of the cost are not considered. The average load is only an approximate representation of the actual load. A more accurate representation is provided by a DVL(demand varying load) model which incorporates the load for each hour. The average load model has a fixed load which regardless of the time but the demand varying load model has the different magnitude of electric load due to the time. A detailed customer load profile varies with the type of customer, the location and time of the day, the day of the week and the week of the year.

It should be noted that the interruption cost considering the demand varying load models may change with customer geographic location, and the social and economic standing. It is not realistic to attempt to create a universal demand varying cost profile that is suitable for all customers within a particular sector. Demand varying cost models, therefore, should be developed for different systems. This paper presents a general methodology for considering the demand varying nature in the cost analysis and to illustrate how this affects the predicted customer interruption costs. The demand varying load at hour t of load point i is obtained using the following formula:

$$DVL_i(t) = W_L(t) \times L_i \tag{18}$$

where $W_L(t)$ is the appropriate weighting factor for a customer sector type and is the ratio of actual and average load value. L_i denotes the average load of load point i. The basic procedure of interruption cost evaluation using DVL model is same to the probabilistic reliability cost evaluation as shown in Fig. 5, except Eq. (14) should be modified to as following equation.

$$COST_{ij} = DVL_i(t)\,(C_{Sij} + C_{Mij} + C_{VSij}R_{VSij}) \tag{19}$$

5. Case Study

5.1 Data of Case Study

5.1.1 Test System and Historical Reliability Data

The modified RBTS(Roy Billinton Test System) Distribution Bus #2 is used for the simulations [9]. The historical reliability data used in the case studies are shown in Table 2. The annual distribution system reliability data of KEPCO in the Kyeongin region is used [14].

5.1.2 Specification of System Components

The specification of test system components are shown in Table 4 of Reference [9]. The duration of sustained and momentary interruption are calculated using these data. It also used for calculating the duration (t_{VS}) and magnitude (M_{VS}) of the voltage sag, and the risk of voltage sag. The fuzzy membership functions of voltage sag for each customer type are also shown in Fig. 6 of Reference [9].

Table 2 Reliability data for case studies

Fault type / Components	Permanent		Temporary
	Failure rate per failure	Repair time per failure	Failure rate per year
Line	0.034 /km	0.5 hour	0.160 /km
Circuit breaker	0.002	3 hour	-
Reclosers	0.002	3 hour	-
Switches	0.002	3 hour	-

Table 3 CIC for case study and customer information data

CIC for case study								
Customer Types	Voltage Sag	Momentary Interruption		Sustained Interruption				
		0.5sec	15sec	1min	20min	1hr	4hr	8hr
Residential	0.0021	0.00068	0.0052	0.021	0.093	0.482	4.914	15.69
Commercial	0.0880	0.02932	0.2198	0.881	2.969	8.552	31.32	83.01
Office Building	0.4775	0.15912	1.1923	4.778	9.878	21.06	68.83	119.2
Industrial	0.1624	0.05412	0.4055	1.625	3.868	9.085	25.16	55.81

Customer load level				
Load points	Customer type	Load level per load point (MW)		Number of customers
		Average	Peak	
1-3, 10, 11	Residential	0.535	0.8668	210
12, 17-19	Residential	0.450	0.7291	210
8	Industrial	1.00	1.6279	1
9	Industrial	1.15	1.8721	1
4, 5, 13, 14, 20, 21	Office building	0.566	0.9167	1
6, 7, 15, 16, 22	Commercial	0.454	0.7500	12

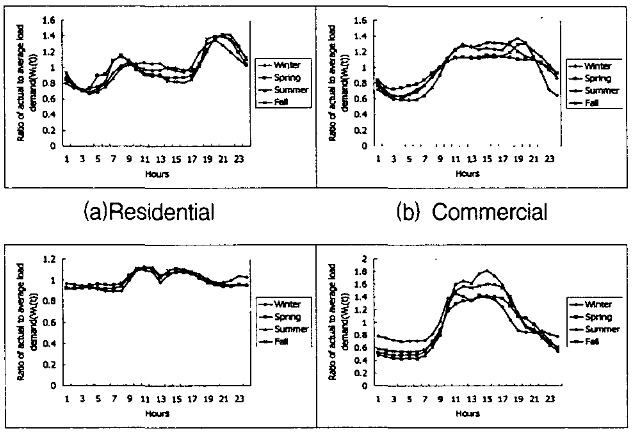
5.1.3 Data for Calculation of Customer Interruption Costs

The data related to the customer interruption costs for each undervoltage disturbance and customer load level data are shown in Table 3. The customer interruption costs of momentary interruptions are calculated from the equation using the SCDF of Table 1. The durations of momentary interruption in Table 3 is shown in 0.5sec and 15sec. It is the reclosing dead-time of protective devices of distribution systems in Korea.

The interruption cost of voltage sag is calculated on condition that the risk of voltage sag (R_{VS}) is 1. This means that whole loads of customers may run the risk of shutdown or malfunction due to voltage sag. We assume that the risk that occur most of customers' load is similar to the momentary interruption, which occur the shutdown or malfunction of whole customers' load. We also assumed that the duration of 3 sec is enough to this assumption. This is the duration of temporary interruption specified in IEEE Std. 1159-1995 [5].

5.1.4 Customer Load Profile

For the data of DVL model, the daily load profiles are obtained from the Reference [15]. Fig. 6 shows the appropriate weighting factor($W_L(t)$) for four customer type and is the ratio of actual and average load value.



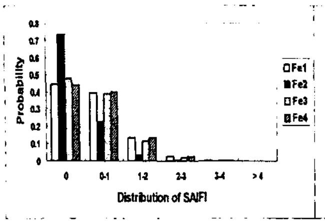
(a)Residential (b) Commercial

(c) Industrial (d) Office building

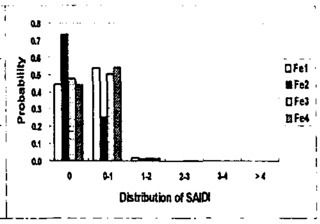
Fig. 6. Demand varying weights of each customer type

5.2 Results of Case Study

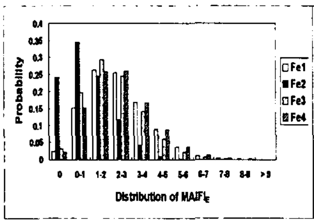
The test system is simulated by analytic method and the time sequential Monte Carlo simulation, respectively. The random number generation function for the time sequential Monte Carlo simulation is selected the exponential function. The total simulation time is determined by 20,000 years. The simulation results shows in Table 4. SAIFI, SAIDI, MAIFI, $MAIFI_E$, and SAVSRI are compared for each load point and feeder using the analytic method. SAIFI, SAIDI and MAIFI, and $MAIFI_E$ are influenced by the system configuration, while SAVSRI is influenced by not only the system configuration (network topology, line lengths, relay setting, and so on), but also the load composition according to kinds of customers. For verifying the appropriateness of simulation methodology, we confirm that the comparison of analytic method and the average of Monte Carlo simulation have similar value. Fig. 7 shows the results of time sequential Monte Carlo simulation.



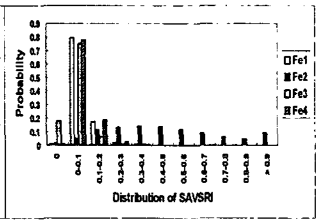
(a)SAIFI



(b) SAIDI



(c) MAIFI

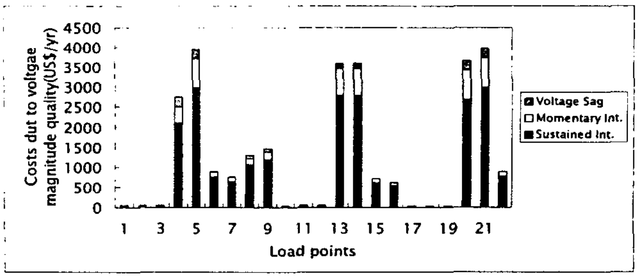


(e) SAVSRI

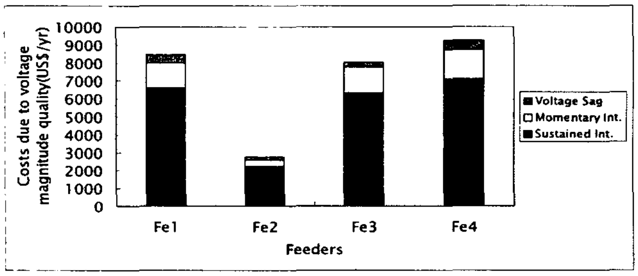
Fig. 7 Simulation results of unified reliability evaluation using probabilistic technique

In case of the SAIFI, SAIDI, and MAIFI, the feeder 1, 3 and 4 have more highly probability than feeder 2. However, in case of SAVSRI, the feeder 2 has more highly probability than feeder 1, 3 and 4.

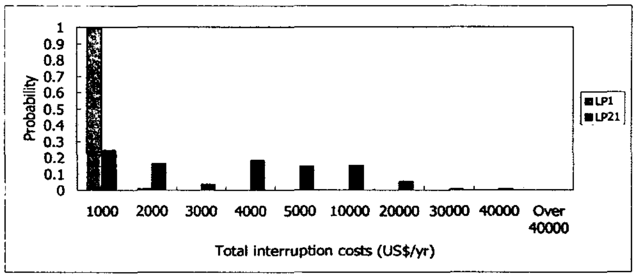
The simulation results of interruption cost using analytic and probabilistic method for each load point and feeder are shown in Fig. 8. As shown in Fig. 8(a) and Fig. 8(b), the cost due to the momentary voltage quality phenomena(momentary interruptions and voltage sags) is quite a few comparing with the total interruption cost. The probability distributions of total interruption costs for LP1 and LP21 are shown in Fig. 8(c). We can find that the total interruption cost considering three voltage quality phenomena much differ to the each customer type because the CDF is much affected for each customer type. Fig. 9 show the comparison of the result of average



(a) Total interruption cost for each load point



(b) Total interruption cost for each feeder



(c) Probability distribution of LP1 and LP21

Fig. 8 Simulation results of unified reliability cost evaluation using analytic and probabilistic technique

Table 4 Simulation results of unified reliability evaluation using analytic technique

Load points	Sustained interruption (occ/ yr/customer)	Sustained interruption duration (hr/ yr/customer)	Momentary interruption (occ/ yr/customer)	Risk of voltage sag (R_{VSi}/ yr/customer)	Risk of voltage sag (mean of Monte Carlo simulation)	Load points	Sustained interruption (occ/ yr/customer)	Sustained interruption duration (hr/ yr/customer)	Momentary interruption (occ/ yr/customer)	Risk of voltage sag (R_{VSi}/ yr/customer)	Risk of voltage sag (mean of Monte Carlo simulation)
LP1	0.4416	0.1266	2.4215	0.0635	0.0656	LP12	0.3820	0.1387	2.0916	0.0386	0.0386
LP2	0.4416	0.1266	2.4215	0.0635	0.0656	LP13	0.7405	0.1594	4.0635	0.4700	0.4703
LP3	0.4436	0.1326	2.4215	0.0635	0.0656	LP14	0.7405	0.1594	4.0635	0.4700	0.4703
LP4	0.4436	0.1326	2.4215	0.8909	0.8874	LP15	0.7425	0.1287	4.0635	0.0589	0.0590
LP5	0.8217	0.1704	4.4942	0.8909	0.8874	LP16	0.4382	0.1266	2.4224	0.1038	0.1034
LP6	0.8217	0.1704	4.4942	0.0971	0.1004	LP17	0.4382	0.1266	2.4224	0.0679	0.0676
LP7	0.8237	0.1351	4.4942	0.0971	0.1004	LP18	0.4402	0.1326	2.4224	0.0679	0.0676
LP8	0.3040	0.0922	1.6642	0.4758	0.4763	LP19	0.4402	0.1326	2.4224	0.0679	0.0676
LP9	0.3060	0.0913	1.6642	0.4758	0.4763	LP20	0.8218	0.1359	4.4928	0.9059	0.9028
LP10	0.3800	0.0868	2.0916	0.0386	0.0386	LP21	0.8238	0.1695	4.4928	0.9059	0.9028
LP11	0.3820	0.1387	2.0916	0.0386	0.0386	LP22	0.8238	0.1695	4.4928	0.1038	0.1034
Feeders	SAIFI	SAIDI	MAIFI	SAVSRI	SAVSRI (mean of Monte Carlo simulation)	Feeders	SAIFI	SAIDI	MAIFI	SAVSRI	SAVSRI (mean of Monte Carlo simulation)
Feeder1	0.4567	0.1295	2.5004	0.0673	0.0695	Feeder3	0.3891	0.1216	2.1345	0.0404	0.0405
Feeder2	0.3050	0.0917	1.6642	0.4759	0.4764	Feeder4	0.4477	0.1282	2.4666	0.0718	0.0716

load model and demand varying load model. As shown in Fig. 9, the interruption costs of demand varying load model are less than the results of average load model. The reasons are assumed that the peak load duration is relatively less than the base load duration and the relation of interruption cost between peak and base load is not linearly.

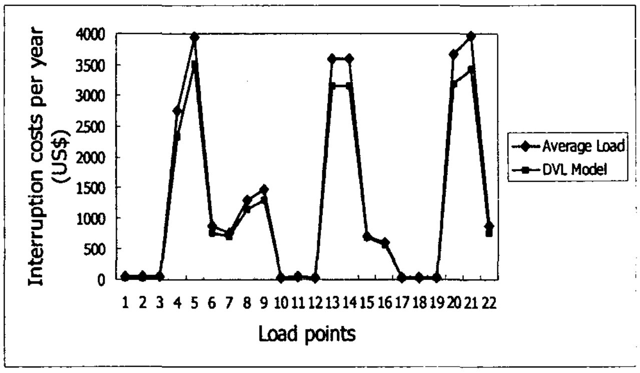


Fig. 9 Result of reliability cost evaluation using DVL model

6. Conclusion

In this paper, new reliability evaluation methodologies of distribution systems are proposed. The proposed contents of this paper are summarized as follows. First, we present the indices and methodologies of distribution system reliability. For this, reliability evaluation methods that related to the momentary voltage quality, momentary interruptions and voltage sags, are proposed. Second, we present the unified reliability and its cost evaluation method. The proposed reliability evaluation method coordinates the momentary interruptions and voltage sags which related to the momentary voltage magnitude quality, and the sustained interruption that is the element of conventional reliability analysis. Finally, the reliability cost evaluation methodology adding the DVL model is proposed. Through the case study, we verify that the proposed evaluation methodologies can be used to evaluate the actual reliability of distribution systems.

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