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# **Estimating End-of-Life Failure Probability of 2L53**

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SPPA, BCTC

June 2005

## **Estimating End-of-Life Failure Probability of 2L53**

# Wenyuan Li SPPA, BCTC

This report is to estimate the end-of-life failure probability of 2L53 using the Weibull distribution model.

## **1. Weibull distribution model**

The Weibull distribution has been widely recognized in the power industry to model the aging period of power equipment in the life basin curve. The end-of-life failure probability of 2L53 was estimated using the Weibull model in this report.

## 2. Data

In order to use the Weibull distribution to model end-of-life failure probability, the following three input data are needed: mean life, standard deviation and age.

- (1) The four similar cables of 2L39, 2L40, 2L46 and 2L55 were replaced in the past. The in-service years and replaced years of the four cables are shown in Table 1 and were used to calculate the mean life.
- (2) 2L53 may or may not still survive for other 5 to 8 years. Therefore the standard deviation of mean life was assumed to be 5 to 8 years in the analysis.
- (3) 2L53 was installed in 1960. In other word, its age is 45 years in 2005.

Cable	In-service year	Replaced year	Life			
2L39	1957	2001	44			
2L40	1957	2003	46			
2L46	1957	2003	46			
2L55	1958	2005	47			

## **3.** Computing tool

The computing program called SPARE was used to perform the evaluation. SPARE has several functions, including estimation of failure probability and availability of individual equipment due to both end-of-life and repairable failure modes, evaluation of failure probability for an equipment group and spare analysis. The first function was utilized in the report.

### 4. Results

The end-of-life failure probabilities of 2L53 from 2005 to 2014 were given in Table 2 and shown in the following figure. It can be seen that the end-of-life failure probability of 2L53 will dramatically increase as time advances. In order to cover the uncertainty due to input data, the upper and lower estimates are provided.

Table 2 End-of-life failure probability of 2L53

year	failure probability	v due to end-of-life
	lower estimate	upper estimate
2005	0.09462	0.15572
2006	0.10644	0.19115
2007	0.11933	0.2325
2008	0.13336	0.28003
2009	0.14855	0.33377
2010	0.16495	0.3934
2011	0.18259	0.45817
2012	0.2015	0.52683
2013	0.22168	0.59761
2014	0.24313	0.66826

2L53 end-of-life failure probability 0.8 0.7 lower estimate 0.6 upper estimate probability 0.5 0.4 0.3 0.2 0.1 0 2004 2006 2008 2010 2014 2012 2016 year

#### 5. Notes

It should be appreciated that the results in the report are based on probability calculations. Like any other probability analysis, there is some uncertainty around the results due to input data. However, the results provide the quantified information about the end-of-life failure probability of 2L53 in the future. Note that the future failure probability due to end-of-life generally cannot be estimated using historical repairable failure records.

#### 6. Outputs from running the SPARE program

```
Wed Jun 29 13:08:13 2005
System Input Summary:
Your input file for this run is: 2153-sd5.dat
    Probability Analysis Only
    (No Probabilistic Cost Analysis)
    RELIABILITY MODEL: NON-REPAIRABLE ONLY
    (Only aging failures for non-repairable)
    (Posteriori Weibull distribution for aging failures)
   Analysis starting year: 2005Subsequent operating years: 1.0Component mean life: 45.0Mean life standard deviation: 5.0Number of components: 1
                Component Data
_____
                Fail Repair Chance Adjustment
 Component In-serv Oper Freg. Time Fail rate Coefficient
  ID Year Year (f/yr) (hr/f) (f/yr)
_____
2L53 1960 45
                                          1.000
 _____
 * "Fail Freq." and "Repair Time" are failure frequency
   and repair time for repairable failures.
 * "Chance Fail rate" is chance failure rate for
   non-repairable failures.
 * Adjustment coefficient is a percentage factor for
    probability to failure and unavailability of aging failure
 _____
```

alfa= 47.0983934327366 beta= 11.3899999904633

Output:

Component Availability/Unavailability						
Component ID	Repairable Avail. Unavail	Non- Availability Chance Aging	Repairabl Unavail Chance	e ability Aging	Tota Avail.	al Unavail
2L53		0.9229	90	0.07710	0.92290	0.07710
<pre>* "Availak during a * "Unavail during a * "Chance" * "Aging"</pre>	pility" is average a given period (i lability" is aver a given period. ' refers to non-re- refers to non-re-	e probability k .e., "subsequer age probability epairable chanc pairable aging	peing foun nt years" y being fo ce failure failure.	d availal in input und unava	ble data). ailable	

Component Survival/Failure Probability

Component ID	Cha Surv. Prob.	nce Prob. to Fail.	Agiı Surv. Prob.	ng Prob. to Fail.	Toata Surv. Prob.	al Pro. to Fail.
2L53			0.84428	0.15572	0.84428	0.15572
<ul> <li>* "Surv. Prob." is probability that a component still has survived by the end of the given period (never failed).</li> <li>* "Prob. to Fail." is probability that a component has failed at some point within the given period.</li> <li>* "Chance" refers to non-repairable chance failure.</li> <li>* "Aging" refers to non-repairable aging failure.</li> </ul>						ll has iled). nas

System Input Summary:

Your input file for this run is: 2153-sd5.dat

Probability Analysis Only (No Probabilistic Cost Analysis)

RELIABILITY MODEL: NON-REPAIRABLE ONLY (Only aging failures for non-repairable) (Posteriori Weibull distribution for aging failures)

Analysis starting year	:	2006
Subsequent operating years	:	1.0
Component mean life	:	45.0
Mean life standard deviation	:	5.0
Number of components	:	1

Component Data Fail Repair Chance Adjustment Component In-serv Oper Freg. Time Fail rate Coefficient ID Year Year (f/yr) (hr/f) (f/yr)

2L53	1960	46	1.000
* "Fail and	Freq." and repair time	nd "Repair I me for repai	Time" are failure frequency irable failures.
* "Chan non-	nce Fail ra -repairable	ate" is char e failures.	nce failure rate for
* Adju prob	astment co bability t	efficient is o failure ar	s a percentage factor for nd unavailability of aging failure

alfa= 47.0983934327366 beta= 11.3899999904633

Output:

Component Availability/Unavailability						
Component ID	Repairable Avail. Unavail	Non-R Availability Chance Aging	epairable Unavailabi Chance Ag	Tot ility Avail. ging	al Unavail	
2L53		0.90460	0.	.09540 0.90460	0.09540	
<pre>* "Availak during a * "Unavail during a * "Chance" * "Aging"</pre>	Dility" is average a given period (i. Lability" is avera a given period. ' refers to non-re refers to non-rep	probability be e., "subsequent ge probability : pairable chance airable aging f	ing found a years" in being found failure. ailure.	available input data). d unavailable		

Component Survival/Failure Probability

Component	Cha	ince	Agiı	ng	Toat	al
ID	Surv.	Prob.	Surv.	Prob.	Surv.	Pro.
	Prob.	to Fail.	Prob.	to Fail.	Prob.	to Fail.
2L53			0.80885	0.19115	0.80885	0.19115
<pre>* "Surv. survive * "Prob. failed * "Chance * "Aging"</pre>	Prob." i d by the to Fail. at some " refers refers	s probabi e end of t " is prob point wit s to non-re to non-re	lity that he given ability t hin the g epairable	a compor period ( that a con given per chance : aging fa	nent sti never fa mponent iod. failure. ilure.	ll has iled). has

System Input Summary:

Your input file for this run is: 2153-sd5.dat

Probability Analysis Only (No Probabilistic Cost Analysis) RELIABILITY MODEL: NON-REPAIRABLE ONLY (Only aging failures for non-repairable) (Posteriori Weibull distribution for aging failures)

Analysis starting year	:	2007
Subsequent operating years	:	1.0
Component mean life	:	45.0
Mean life standard deviation	:	5.0
Number of components	:	1

Fail Repair Chance Adjustment Component In-serv Oper Freg. Time Fail rate Coefficient ID Year Year (f/yr) (hr/f) (f/yr) 2L53 1960 47 1.000 \* "Fail Freq." and "Repair Time" are failure frequency and repair time for repairable failures. \* "Chance Fail rate" is chance failure rate for non-repairable failures. \* Adjustment coefficient is a percentage factor for probability to failure and unavailability of aging failure

alfa=	47.0983934327366
beta=	11.3899999904633

Output:

Component Availability/Unavailability

Component ID	Repairable Avail. Unavail	Non-R Availability Chance Aging	epairable Unavaila Chance	bility Aging	Tota Avail.	al Unavail
2L53		0.88288		0.11712	0.88288	0.11712
<pre>* "Availak during a * "Unavail during a * "Chance" * "Aging"</pre>	pility" is averag a given period (i Lability" is aver a given period. ' refers to non-r refers to non-re	e probability be .e., "subsequent age probability epairable chance pairable aging f	ing found years" i being fou failure. ailure.	l availa n input nd unava	ole data). ailable	

Component Survival/Failure Probability	Component	Survival/Failure	Probability
--	-----------	------------------	-------------

Component	Ch	nance	Agiı	ng	Toata	al
ID	Surv. Prob.	Prob. to Fail.	Surv. Prob.	Prob. to Fail.	Surv. Prob.	Pro. to Fail
2L53			0.76750	0.23250	0.76750	0.23250
* "Surv. H	Prob."	is probabil	lity that	t a compo	nent stil	ll has

survived by the end of the given period (never failed). \* "Prob. to Fail." is probability that a component has failed at some point within the given period. \* "Chance" refers to non-repairable chance failure. \* "Aging" refers to non-repairable aging failure. \_\_\_\_\_ System Input Summary: Your input file for this run is: 2153-sd5.dat Probability Analysis Only (No Probabilistic Cost Analysis) RELIABILITY MODEL: NON-REPAIRABLE ONLY (Only aging failures for non-repairable) (Posteriori Weibull distribution for aging failures) Mean life standard deviation : 5.0 Number of components : 1 Component Data \_\_\_\_\_ Fail Repair Chance Adjustment Component In-serv Oper Freg. Time Fail rate Coefficient ID Year Year (f/yr) (hr/f) (f/yr) \_\_\_\_\_ 2L53 1960 48 1.000 \_\_\_\_\_ \* "Fail Freq." and "Repair Time" are failure frequency and repair time for repairable failures. \* "Chance Fail rate" is chance failure rate for non-repairable failures. \* Adjustment coefficient is a percentage factor for probability to failure and unavailability of aging failure \_\_\_\_\_ alfa= 47.0983934327366 beta= 11.3899999904633 Output:

Component Availability/Unavailability									
Component ID	Repa Avail.	irable Unavail	Availa Chance	Non-R bility Aging	epairabl Unavail Chance	e ability Aging	Tota Avail.	al Unavail	
2L53				0.85736		0.14264	0.85736	0.14264	

\* "Availability" is average probability being found available during a given period (i.e., "subsequent years" in input data).

- \* "Unavailability" is average probability being found unavailable during a given period.
- \* "Chance" refers to non-repairable chance failure.

\* "Aging" refers to non-repairable aging failure.

Component Survival/Failure Probability Component Chance Aging Toatal ID Surv. Prob. Surv. Prob. Surv. Pro. Prob. to Fail. Prob. to Fail. Prob. to Fail. 2L53 0.71997 0.28003 0.71997 0.28003 \* "Surv. Prob." is probability that a component still has survived by the end of the given period (never failed). \* "Prob. to Fail." is probability that a component has failed at some point within the given period. \* "Chance" refers to non-repairable chance failure. \* "Aging" refers to non-repairable aging failure.

System Input Summary:

Your input file for this run is: 2153-sd5.dat

Probability Analysis Only (No Probabilistic Cost Analysis)

RELIABILITY MODEL: NON-REPAIRABLE ONLY (Only aging failures for non-repairable) (Posteriori Weibull distribution for aging failures)

Analysis starting year	:	2009
Subsequent operating years	:	1.0
Component mean life	:	45.0
Mean life standard deviation	:	5.0
Number of components	:	1

	Component Data									
Component ID	In-serv Year	Oper Year	Fail Freg. (f/yr)	Repair Time (hr/f)	Chance Fail rate (f/yr)	Adjustme Coeffici	nt ent			
2L53	1960	49				1.000				
<ul> <li>* "Fail Freq." and "Repair Time" are failure frequency and repair time for repairable failures.</li> <li>* "Chance Fail rate" is chance failure rate for non-repairable failures.</li> </ul>										
* Adjusti probabi	ment coe ility to	fficient failure	e and t	percent unavaila	tage facto ability of	r for aging fa	ilure			

alfa= 47.0983934327366 beta= 11.3899999904633

Output:

Component Availability/Unavailability \_\_\_\_\_ Component Repairable Non-Repairable Total Avail. Unavail Availability Unavailability Avail. Unavail TD Chance Aging Chance Aging \_\_\_\_\_ \_\_\_\_\_ 0.82774 0.17226 0.82774 0.17226 2L53 \_\_\_\_\_ \* "Availability" is average probability being found available during a given period (i.e., "subsequent years" in input data). \* "Unavailability" is average probability being found unavailable during a given period. \* "Chance" refers to non-repairable chance failure. \* "Aging" refers to non-repairable aging failure. \_\_\_\_\_ Component Survival/Failure Probability \_\_\_\_\_ Component Chance Aging Toatal Surv. Prob. Surv. Prob. Surv. Pro. TD Prob. to Fail. Prob. to Fail. Prob. to Fail. \_\_\_\_\_ 21,53 0.66623 0.33377 0.66623 0.33377 \_\_\_\_\_ \* "Surv. Prob." is probability that a component still has survived by the end of the given period (never failed). \* "Prob. to Fail." is probability that a component has failed at some point within the given period. \* "Chance" refers to non-repairable chance failure. \* "Aging" refers to non-repairable aging failure. \_\_\_\_\_

System Input Summary:

Your input file for this run is: 2153-sd5.dat

Probability Analysis Only (No Probabilistic Cost Analysis)

RELIABILITY MODEL: NON-REPAIRABLE ONLY (Only aging failures for non-repairable) (Posteriori Weibull distribution for aging failures)

Analysis starting year	:	2010
Subsequent operating years	:	1.0
Component mean life	:	45.0
Mean life standard deviation	:	5.0

Component Data \_\_\_\_\_ Fail Repair Chance Adjustment Component In-serv Oper Freg. Time Fail rate Coefficient ID Year Year (f/yr) (hr/f) (f/yr) \_\_\_\_\_ 2L53 1960 50 1.000 -----\* "Fail Freq." and "Repair Time" are failure frequency and repair time for repairable failures. \* "Chance Fail rate" is chance failure rate for non-repairable failures. \* Adjustment coefficient is a percentage factor for probability to failure and unavailability of aging failure \_\_\_\_\_ alfa= 47.0983934327366 beta= 11.3899999904633 Output: Component Availability/Unavailability \_\_\_\_\_ Component Repairable Non-Repairable Total Avail. Unavail Availability Unavailability Avail. Unavail ID Chance Aging Chance Aging \_\_\_\_\_ \_\_\_\_\_ 2L53 0.79381 0.20619 0.79381 0.20619

\* "Availability" is average probability being found available during a given period (i.e., "subsequent years" in input data).
\* "Unavailability" is average probability being found unavailable during a given period.

\* "Chance" refers to non-repairable chance failure.

\* "Aging" refers to non-repairable aging failure.

\_\_\_\_\_

Component Survival/Failure Probability

Component	Component Chance			ng	Toatal	
ID	Surv. Prob.	Prob. to Fail.	Surv. Prob.	Prob. to Fail.	Surv. Prob.	Pro. to Fail.
2L53			0.60660	0.39340	0.60660	0.39340
* "Surv. survive * "Prob. failed * "Chance * "Aging"	Prob." i d by the to Fail. at some " refers refers	s probabi end of th " is proba point with to non-re to non-re	lity that he given ability t hin the g epairable pairable	t a compor period (1 that a cor given per: e chance f aging fa:	hent stil hever fa: mponent h iod. failure. ilure.	ll has iled). nas

System Input Summary: Your input file for this run is: 2153-sd5.dat Probability Analysis Only (No Probabilistic Cost Analysis) RELIABILITY MODEL: NON-REPAIRABLE ONLY (Only aging failures for non-repairable) (Posteriori Weibull distribution for aging failures) Analysis starting year : 2011 Analysis starting year2011Subsequent operating years1.0Component mean life45.0Mean life standard deviation5.0 Number of components : 1 Component Data \_\_\_\_\_ Fail Repair Chance Adjustment Component In-serv Oper Freg. Time Fail rate Coefficient ID Year Year (f/yr) (hr/f) (f/yr) \_\_\_\_\_ 2L53 1960 51 1.000 \_\_\_\_\_ \* "Fail Freq." and "Repair Time" are failure frequency and repair time for repairable failures. \* "Chance Fail rate" is chance failure rate for non-repairable failures. \* Adjustment coefficient is a percentage factor for probability to failure and unavailability of aging failure \_\_\_\_\_ alfa= 47.0983934327366 11.3899999904633 Output: Component Availability/Unavailability \_\_\_\_\_ Non-Repairable Component Repairable Total ID Avail. Unavail Availability Unavailability Avail. Unavail Chance Aging Chance Aging \_\_\_\_\_ 0.75550 0.24450 0.75550 0.24450 2L53 \_\_\_\_\_ \* "Availability" is average probability being found available during a given period (i.e., "subsequent years" in input data). \* "Unavailability" is average probability being found unavailable during a given period. \* "Chance" refers to non-repairable chance failure. \* "Aging" refers to non-repairable aging failure. \_\_\_\_\_

Component Survival/Failure Probability

Component	Component Chance			ng Drob	Toatal	
10	Prob.	to Fail.	Prob.	to Fail.	Prob.	to Fail.
2L53			0.54183	0.45817	0.54183	0.45817
<pre>* "Surv. survive * "Prob. failed * "Chance * "Aging"</pre>	Prob." is d by the to Fail. at some p " refers refers	s probabi end of t " is prob point wit to non-re to non-re	lity that he given ability t hin the g epairable	t a compor period (1 that a con given per e chance : aging fa	nent sti never fa mponent l iod. failure. ilure.	ll has iled). nas

System Input Summary:

Your input file for this run is: 2153-sd5.dat

Probability Analysis Only (No Probabilistic Cost Analysis)

RELIABILITY MODEL: NON-REPAIRABLE ONLY (Only aging failures for non-repairable) (Posteriori Weibull distribution for aging failures)

Analysis starting year	:	2012
Subsequent operating years	:	1.0
Component mean life	:	45.0
Mean life standard deviation	:	5.0
Number of components	:	1

Component Data

Co	mponent ID	In-serv Year	Oper Year	Fail Freg. (f/yr)	Repair Time (hr/f)	Char Fail (f/y	nce rate yr)	Adjustment Coefficier	t nt
2L5	3	1960	52					1.000	
*	"Fail Fi and rep	req." and pair time	d "Repa e for r	ir Time epairal	e" are i ole fai:	failur lures.	ce fre	equency	
*	"Chance non-rep	Fail rat pairable	ce" is failur	chance es.	failur	e rate	≗ for		
*	Adjustr probabi	ment coef ility to	ficien failur	t is a e and 1	percent unavaila	tage f abilit	actor y of	r for aging fail	lure

alfa= 47.0983934327366 beta= 11.3899999904633

Output:

Component Availability/Unavailability									
Component ID	Repairable Avail. Unavail	Non-R Availability Chance Aging	epairable Unavaila Chance	e ability Aging	Tota Avail.	al Unavail			
2L53		0.71292	?	0.28708	0.71292	0.28708			
* "Availak during a * "Unavail during a * "Chance" * "Aging"	pility" is average a given period (i. ability" is avera a given period. refers to non-re refers to non-re	probability be e., "subsequent age probability epairable chance pairable aging f	ing found years" i being fou failure.	d availal in input und unava	ble data). ailable				

Component Survival/Failure Probability

Component ID	Cha Surv. Prob.	nce Prob. to Fail.	Agiı Surv. Prob.	ng Prob. to Fail.	Toata Surv. Prob.	al Pro. to Fail.
2L53			0.47317	0.52683	0.47317	0.52683
<pre>* "Surv. survive * "Prob. failed * "Chance * "Aging"</pre>	Prob." i d by the to Fail. at some " refers refers	s probabi end of t " is proba point with to non-re to non-re	lity that he given ability hin the g epairable	t a compo: period (: that a con given per e chance aging fa	nent sti never fa mponent l iod. failure. ilure.	ll has iled). nas

System Input Summary:

Your input file for this run is: 2153-sd5.dat

Probability Analysis Only (No Probabilistic Cost Analysis)

RELIABILITY MODEL: NON-REPAIRABLE ONLY (Only aging failures for non-repairable) (Posteriori Weibull distribution for aging failures)

Analysis starting year	:	2013
Subsequent operating years	:	1.0
Component mean life	:	45.0
Mean life standard deviation	:	5.0
Number of components	:	1

Component Data							
Component ID	In-serv Year	Oper Year	Fail Freg. (f/yr)	Repair Time (hr/f)	Chance Fail rate (f/yr)	Adjustment Coefficient	
2L53	1960	53				1.000	

\_\_\_\_\_ \* "Fail Freq." and "Repair Time" are failure frequency and repair time for repairable failures. \* "Chance Fail rate" is chance failure rate for non-repairable failures. \* Adjustment coefficient is a percentage factor for probability to failure and unavailability of aging failure 47.0983934327366 alfa= 11.3899999904633 beta= Output: Component Availability/Unavailability \_\_\_\_\_ Component Repairable Non-Repairable Total ID Avail. Unavail Availability Unavailability Avail. Unavail Chance Aging Chance Aging \_\_\_\_\_ 0.66642 0.33358 0.66642 0.33358 2L53 \_\_\_\_\_ \* "Availability" is average probability being found available during a given period (i.e., "subsequent years" in input data). \* "Unavailability" is average probability being found unavailable during a given period. \* "Chance" refers to non-repairable chance failure. \* "Aging" refers to non-repairable aging failure. \_\_\_\_\_ Component Survival/Failure Probability \_\_\_\_\_ Component Chance Aging Toatal Surv. Prob. Surv. Prob. Surv. Prob. to Fail. Prob. to Fail. Prob. ID Pro. to Fail. \_\_\_\_\_ 0.40239 0.59761 0.40239 0.59761 2153 \_\_\_\_\_ \* "Surv. Prob." is probability that a component still has survived by the end of the given period (never failed). \* "Prob. to Fail." is probability that a component has failed at some point within the given period. \* "Chance" refers to non-repairable chance failure. \* "Aging" refers to non-repairable aging failure. \_\_\_\_\_

System Input Summary:

Your input file for this run is: 2153-sd5.dat

Probability Analysis Only (No Probabilistic Cost Analysis) RELIABILITY MODEL: NON-REPAIRABLE ONLY (Only aging failures for non-repairable) (Posteriori Weibull distribution for aging failures)

Analysis starting year	:	2014
Subsequent operating years	:	1.0
Component mean life	:	45.0
Mean life standard deviation	:	5.0
Number of components	:	1

Component Data \_\_\_\_\_ Fail Repair Chance Adjustment Component In-serv Oper Freg. Time Fail rate Coefficient ID Year Year (f/yr) (hr/f) (f/yr) -----\_\_\_\_\_ 2L53 1960 54 1.000 \_\_\_\_\_ \* "Fail Freq." and "Repair Time" are failure frequency and repair time for repairable failures. \* "Chance Fail rate" is chance failure rate for non-repairable failures. \* Adjustment coefficient is a percentage factor for probability to failure and unavailability of aging failure \_\_\_\_\_

alfa= 47.0983934327366 beta= 11.3899999904633

Output:

Component Availability/Unavailability \_\_\_\_\_ Component Repairable Non-Repairable Total ID Avail. Unavail Availability Unavailability Avail. Unavail Chance Aging 0.61661 0.38339 0.61661 0.38339 21.53 \_\_\_\_\_ \* "Availability" is average probability being found available during a given period (i.e., "subsequent years" in input data). \* "Unavailability" is average probability being found unavailable during a given period. \* "Chance" refers to non-repairable chance failure. \* "Aging" refers to non-repairable aging failure. \_\_\_\_\_ Component Survival/Failure Probability

Component	Cha	nce	Agiı	ng	Toata	al
ID	Surv.	Prob.	Surv.	Prob.	Surv.	Pro.
	Prob.	to Fail.	Prob.	to Fail.	Prob.	to Fail.
2L53			0.33174	0.66826	0.33174	0.66826
* "Surv. 1 survived * "Prob.	Prob." i d by the to Fail.	s probabi end of th "is proba	lity that ne given ability (	t a compoi period (i that a con	nent stil never fai mponent h	ll has iled). nas

System Input Summary: Your input file for this run is: 2153-sd5.dat Probability Analysis Only (No Probabilistic Cost Analysis) RELIABILITY MODEL: NON-REPAIRABLE ONLY (Only aging failures for non-repairable) (Posteriori Weibull distribution for aging failures) Analysis starting year : 2015 Subsequent operating years : 1.0 Component mean life : 45.0 Mean life standard deviation : 5.0 Number of components : 1

Component Data \_\_\_\_\_ Fail Repair Chance Adjustment Component In-serv Oper Freg. Time Fail rate Coefficient ID Year Year (f/yr) (hr/f) (f/yr) \_\_\_\_\_ 2L53 1960 55 1.000 -----\* "Fail Freq." and "Repair Time" are failure frequency and repair time for repairable failures. \* "Chance Fail rate" is chance failure rate for non-repairable failures. \* Adjustment coefficient is a percentage factor for probability to failure and unavailability of aging failure \_\_\_\_\_

alfa= 47.0983934327366 beta= 11.3899999904633

Output:

	Comp	onent Ava	ailabili	ty/Unava	ailabilit	У			
Component	Repa	irable		Non-F	Repairabl	e	Tota	al	
ID	Avail.	Unavail	Availa	bility	Unavail	ability	Avail.	Unavail	
			Chance	Aging	Chance	Aging			
2L53				0.56436	5	0.43564	0.56436	0.43564	
* "Availak during a	oility" i given p	s average eriod (i	e probab .e., "su	ility be bsequent	eing foun years"	d availa in input	ble data).		

\* "Unavailability" is average probability being found unavailable during a given period.

\* "Chance" refers to non-repairable chance failure. \* "Aging" refers to non-repairable aging failure.

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ComponentChanceAgingToatalIDSurv.Prob.Surv.Prob.Surv.Pro.Prob.to Fail.Prob.to Fail.Prob.to Fail.2L530.263740.736260.263740.73626* "Surv.Prob." is probability that a component still has survived by the end of the given period (never failed).* "Prob. to Fail." is probability that a component has failed at some point within the given period.* "Chance" refers to non-repairable chance failure.* "Aging" refers to non-repairable aging failure.		(	Component	: Survival	l/Failure	e Probabil	lity		
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