EPRI-MRP Meeting with NRC

Treatment of ISI Flaw Limits in the Alternate PTS Rule

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Treatment of ISI Flaw Limits

- Purpose and Background
- Experience on Flaw Distributions and Limits
- Westinghouse Proposals for APTSR-RG
  - Application of Plate Flaw Limits
  - Application of Weld Flaw Limits
  - Evaluation Procedure if Limits Exceeded
- NDE Experience on ISI of RPV Welds
- Summary and Conclusions

Purpose

- Propose treatment of Alternate PTS Rule (APTSR) flaw limits in New Regulatory Guide based upon Westinghouse PFM and NDE experience.
  - Limits will also be applied to ISI Interval Extension and Risk-Informed Appendix G since both used FAVOR Code.
  - What we would submit for NRR Director's approval if flaw limits were ever exceeded.
  - Will also be documented in more detail in a White Paper for the EPRI Materials Reliability Program (MRP).
- Goal is to avoid any un-necessary burden on utilities and regulators implementing these risk-informed applications,
  - No FAVOR PTS runs with plant-specific flaw distributions.

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Background Information

- Reviewers of Risk-Informed PTS Rule asked that applicability of flaw distribution data used by FAVOR be shown by plant qualified ISI results.
- Memorandum, *Development of Flaw Size Distribution Tables for 10CFR50.61a,* completed by NRC in April 2007 (ADAMS ML070950392).
- Tables 2 and 3 on ISI Flaw Limits for Welds and Plates, respectively, incorporated into the Alternate PTS Rule (APTSR) 10CFR 50.61a.

Comparison of Weld Limits with Shoreham

Nominal Bin Size	Number of Flaws ≥ Bin	Shoreham Flaws	Ratio
0.05	No Limit	228.63	N/A
0.10	166.7	46.66	3.6
0.15	90.8	11.91	7.6
0.20	22.82	5.38	4.3
0.25	8.66	2.67	3.2
0.30	4.01	1.55	2.6
0.35	3.01	0.906	3.3
0.40	1.49	0.541	2.8
0.45	1.00	0.328	3.0
> 0.45	0.00	0.196	N/A

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ISI Flaw Limits in 10CFR50.61a

Table 2 - Allowable Number of Flaws in Welds

Through-Wall Extent, TWE [in.]		Maximum number of flaws per 1000-inches of weld length in the inspection volume that are greater than or equal to TWE_{MIN} and less than TWE_{MAX}
TWE_{MIN}	TWE_{MAX}	
0	0.075	No Limit
0.075	0.475	166.70
0.125	0.475	90.80
0.175	0.475	22.82
0.225	0.475	8.66
0.275	0.475	4.01
0.325	0.475	3.01
0.375	0.475	1.49
0.425	0.475	1.00
0.475	Infinite	0.00

Westinghouse Experience on Flaw Distributions and Limits

- Participated in various NRC-MRP workshops and meetings on development of flaw distribution models for FAVOR.
- Performed V&V of VFLAW models and software that calculate the 1000 flaw distributions input to FAVOR.
- Applied flaw limits to >20 plants for ISI interval Extension with no weld flaw concerns, a few plate flaw size issues.
- Performed the qualified ISI for a number of these plants.

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Concerns with NRC Technical Bases for APTSR Flaw Limits

- The FAVOR flaw distribution output that was used (Palisades for welds*, Beaver Valley for plates) is only the average of the 1000 flaw distributions generated by VFLAW for input to FAVOR:
  - For each 1000 vessel simulations, approximately 50% are above average.
- Conversion of flaw size (TWE) bin width from 1% of wall in FAVOR to 0.05” did not consider that FAVOR uses largest flaw size in each bin.
- Based upon total number of flaws with no distinction between axial flaws that contribute to TWCF and circ. flaws that do not.
- Limits neglect FAVOR simulation of larger weld flaws well above (4 times) the truncation limit for one flaw per vessel.
- One FAVOR run for a plant-specific flaw exceeding the plate size limit gave a TWCF orders of magnitude below the risk limit of 1.0E-06/year.

* Backup slide available

Proposed Application of Plate Flaw Limits

- For ISI Interval Extension, very conservative definition of plate used (next to weld in ISI Volume) and some plants violated size limit but FAVOR showed no effect on TWCF.
- Technical basis for plate flaw model was weld flaw model with reduction factors for density and size truncation limit.
- Reduced size truncation limit was based on plate material being far removed from the effects of any welding.
- Weld ISI volume, including ½ t of adjacent base metal (plates and forgings), was specified by ASME Section XI because of the concern for welding effects on adjacent base-metal flaws.
- Therefore, plate flaw limits should only be used and evaluated if and when RPV base metal far removed from welds is examined by ISI.

Proposed Application of Weld Flaw Limits

- An evaluation* of weld flaw density for 70,000 Palisades RPV simulations by FAVOR 06.1 relative to the mean and maximum weld distributions of the 1000 generated by VFLAW indicated the following:
  - The output average weld flaw distribution from FAVOR is within 0.5% of the mean distribution from VFLAW*.
  - For the size range of the APTR limits, the maximum VFLAW distribution* (99.9%) has twice (2.08) as many flaws as the mean.
  - For the 70,000 RPV simulations, 45% of the weld flaws are axial.
  - The net effect is 93% of the average density for all weld flaws would apply to the maximum density for axial flaws only.
- Therefore, the APTSR weld flaw limits should be used for the axial flaws of concern in any one vessel.

Proposed Evaluation Procedure if Weld Flaw Limits are Exceeded

- Contribution of flaw sizes to failure from FAVPOST output.
- Assumes probability and frequency of failure is directly proportional to number of axial flaws in the RPV beltline.
- Contribution to TWCF by size (TWE) is increased by ratio of ISI flaws to corresponding max. limits from Table 2.
- Developed worksheet procedure* for ISI Flaw Factor and:

$$TWCF_{95\text{-}TOTAL} = \text{ISI Flaw Factor} * TWCF_{95\text{-}AW} + TWCF_{95\text{-}PL} + TWCF_{95\text{-}CW}$$

With: $TWCF_{95\text{-}TOTAL} \leq 1\text{x}10^{-6}$/year.

Where: $TWCF_{95\text{-}AW}$ is calculated for $RT_{MAX\text{-}AW}$,

$TWCF_{95\text{-}PL}$ is calculated for $RT_{MAX\text{-}PL}$ and

$TWCF_{95\text{-}CW}$ is calculated or set equal to $1\text{x}10^{-8}$/year

per equations 3-5 and 3-6 in Section 3.3 of NUREG-1874.

Addition Information on Proposed ISI Weld Flaw Evaluation Procedure

- Worksheet procedure* conservatively treats the following:
  - Difference in FAVOR flaw size bin widths and those in the APTRS max. limits,
  - Contribution of any ISI flaws that exceed the APTSR weld size limit of 0.475”.
- Per NUREG/CR-6817, multiple flaws that are combined into one flaw per the ASME Code proximity rules are included in the VFLAW models and should not be counted as multiple ISI flaws*.
- The percent TWCF distribution by flaw size (TWE) is obtained from the FAVPOST output for Palisades:
  - Table 2 in NRC Technical Basis Memo of April 2007,
  - 70, 000 simulations at 60 EFPY from ISI Interval Extension* or
  - ORNL FAVOR 06.1 run at 60 EFPY for NUREG-1874 results.

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NDE Issues Concerning APTSR

- Proximity Rule for clustering flaws
- Scan Index
- Default depth sizing
- Surface Examination
- Inspection area

Proximity Rule

- If proximity rules are intended to be used, is the proximity rule intended to be used prior to PTS flaw “binning”?
- The proximity rule has changed from an indication length based approach to a depth based approach (IWA-3500)
- Re-analysis of prior data could lead to significant changes in the number of individual indications
- One “long” indication could become several short indications

Scan Index

- The Appendix VIII qualified procedure uses a coarse scan index (12 mm) for detection and sizing
- This index is most likely > proximity rule ligaments, but satisfies the length sizing accuracy requirement of Appendix VIII

Default Sizing

- Appendix VIII near surface examinations rely on tip diffraction for depth sizing
- Theoretical limit for resolution to separate tip signals is approximately 2 wavelengths
  - Default size of 0.125" is used whenever only one tip is resolved
- Accuracy requirement for Appendix VIII is +/-0.15", which is greater than the bin increments
  - Measurement precision can be met, but accuracy does not change

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Surface Examinations

- Visual examinations could be used to find rust if cladding is breached (Yankee Rowe experience)
- Surface riding transducers probably would scrape off any rust prior to any confirmatory VT
- Eddy current testing has been shown to be effective for dissimilar metal welds
  - Index step may need to be reduced or array probes used

Inspection Area

- As stated previously, plate flaw limits are more restrictive than weld flaw limits
- If plate limits must be used, is it acceptable to increase scan area to dilute the flaw density results?

Summary and Conclusions

- Proposed treatment of APTSR ISI flaw limits in the new Regulatory Guide that is consistent with and supported by how the risk-informed technical basis was developed:
  - Application of Plate Flaw Limits,
  - Application of Weld Flaw Limits and
  - Evaluation Procedure if Weld Flaw Limits Exceeded.
- Use of the proposed treatment should avoid any un-necessary burden on utilities and regulators in implementing and reviewing FAVOR based risk-informed applications, such as requiring any additional FAVOR PTS analyses with plant-specific flaw distributions.

Backup Slides

- Weld Flaw Bins and Populations for FAVOR Analyses of Palisades (Table 1 NRC Memo)
- Palisades Embedded Axial Weld Flaw Density Worksheet
- Palisades Mean Weld Flaw VFLAW Output
- Palisades Max. Weld Flaw VFLAW Output
- Westinghouse Proposed Axial Flaw Evaluation Worksheet
- Flaw Proximity in NUREG/CR-6017, Rev. 1
- Palisades FAVPOST Output for 60 EFPY

Weld Flaw Bins and Populations for FAVOR Analyses of Palisades (Table 1 NRC Memo)

Flaw through-wall dimension (inches)	Mean number of Category 2 flaws	Adjusted to 1000" of weld length	Cumulative >/= size
0.088	549.86	546.78	665.62
0.175	108.58	107.94	119.04
0.263	7.86	7.81	11.10
0.350	1.959	1.947	3.29
0.438	0.745	0.741	1.342
0.525	0.295	0.292	0.601
0.613	0.138	0.1370	0.309
0.700	0.0679	0.0675	0.1719
0.787	0.0394	0.0392	0.1044
0.875	0.0230	0.0229	0.0652
0.963	0.0135	0.01346	0.0423
1.050	0.00886	0.00880	0.0289
1.137	0.00509	0.00506	0.0201
1.225	0.00514	0.00511	0.0150
1.313	0.00257	0.00256	0.00988
1.400	0.00200	0.001988	0.00733
1.488	0.00206	0.002045	0.00534
1.575	0.000629	0.000625	0.00330
1.663	0.000743	0.000738	0.00267
1.750	0.000851	0.000852	0.001931
1.873	0.000914	0.000909	0.001079
1.925	0.000171	0.000170	0.000170

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Palisades Embedded Axial Weld Flaw Density Worksheet for 70,000 Simulations

Palisades Embedded Axial Weld Flaw Density for FAVOR 06.1

FAVOR TWE (in)	70,00 Cat. 2 Flaws	Avg. No. Cat. 2 per Vessel	Mean VFLAW No. / Sq. Foot	Mean VFLAW No. Cat 2.	Ratio VFLAW to FAVOR	Max. VFLAW No. / Sq. Foot	Max. VFLAW No. Cat 2.	VFLAW Max. to Mean Ratio	Mean Ax. Flaws in 48 * ISI Vol.
0.088	38465866	549.512	3.6072E+01	549.860	1.00063	4.1899E+01	638.683	1.16154	10020
0.175	7597091	108.530	7.1206E+00	108.542	1.00011	1.4356E+01	218.834	2.01612	1978
0.263	551377	7.877	5.1658E-01	7.874	0.99970	1.5987E+00	24.370	3.09478	144
0.350	137096	1.959	1.2883E-01	1.964	1.00270	1.9965E-01	3.043	1.54972	36
0.438	51294	0.733	4.7871E-02	0.730	0.99583	8.7474E-02	1.333	1.82729	13
0.525	20600	0.294	1.9388E-02	0.296	1.00426	4.1486E-02	0.632	2.13978	5
0.613	9256	0.132	8.7075E-03	0.133	1.00381	2.1384E-02	0.326	2.45581	2
0.700	4674	0.067	4.3642E-03	0.067	0.99631	1.1766E-02	0.179	2.69603	1
Subtotal =	8336858	119.098		119.110	1.00010		247.581	**2.07859**	
Total =	46837254	669.104		669.465	1.00054		887.402	1.32554	
All Total =	46844656	669.209							

Notes:
1) Subtotal is for TWE from 0.175" to 0.438", Total is from 0.088" to 0.7", All Total is from 0.088" to 1.925".
2) Max. TWE of 0.7 " > 17 mm and gives average of 1 axial weld flaw for ISI of all 48 U.S. PWR Plants.

Weld Type	70K Region Weld Flaws	Vessel Length (in.)	ISI Volume Length (in.)	ISI Volume Axial Flaws	
Axial 1	8260605	60.71	48.71	6627805	
Axial 2	8267896	60.71	48.71	6633655	
Axial 3	8264926	60.71	48.71	6631272	
Axial 4	12789082	93.98	81.98	11156086	
Axial 5	12792965	93.98	81.98	11159473	
Axial 6	12788065	93.98	81.98	11155199	
Circum.	77393598		613.93	53363491	Total Axial
Total	140557137		1006.00	0.37966	ISI Axial Ratio
All Axial	63163539				
Axial Ratio	0.44938	* ST Max/Mean	2.07859	is Net Effect of	0.934075

Palisades Mean Weld Flaw VFLAW Output

MEAN OF EACH ELEMENT FOR 1000 SIMULATIONS

N	FLAWS/FT**2	1.0-1.25	1.25-1.5	1.5-2.0	2.0-3.0	3.0-4.0	4.0-5.0	5.0-6.0	6.0-8.0	8.0-10.0	10.0-15.0	>15.0
1	.36072E+02	2.119	2.073	4.014	7.525	6.901	6.329	5.805	10.211	8.595	16.016	30.412
2	.71206E+01	6.204	5.814	10.558	17.431	13.470	10.417	8.062	11.085	6.670	7.295	2.993
3	.51658E+00	12.520	10.868	17.662	23.617	13.833	8.237	4.979	4.944	1.940	1.215	.184
4	.12883E+00	18.733	15.090	22.029	24.028	10.661	4.874	2.294	1.665	.433	.176	.016
5	.47871E-01	23.172	17.596	23.660	22.212	8.070	3.085	1.239	.752	.158	.053	.004
6	.19388E-01	27.179	19.505	24.277	19.874	6.033	1.978	.697	.370	.066	.019	.001
7	.87075E-02	30.800	20.942	24.253	17.529	4.530	1.301	.412	.195	.030	.008	.000
8	.43642E-02	34.132	22.031	23.830	15.345	3.419	.871	.249	.106	.014	.003	.000
9	.24182E-02	37.271	22.856	23.141	13.347	2.580	.586	.152	.059	.007	.001	.000
10	.14516E-02	40.273	23.466	22.263	11.535	1.940	.394	.093	.032	.003	.000	.000
11	.92335E-03	43.158	23.888	21.248	9.912	1.454	.264	.057	.018	.002	.000	.000
12	.57779E-03	45.588	24.121	20.297	8.647	1.119	.182	.035	.010	.001	.000	.000
13	.40273E-03	48.336	24.247	19.112	7.332	.827	.120	.021	.005	.000	.000	.000
14	.28335E-03	50.937	24.231	17.915	6.209	.613	.080	.013	.003	.000	.000	.000
15	.20114E-03	53.398	24.096	16.731	5.256	.456	.054	.008	.002	.000	.000	.000
16	.14401E-03	55.729	23.861	15.579	4.448	.340	.037	.005	.001	.000	.000	.000
17	.10396E-03	57.936	23.543	14.472	3.765	.255	.025	.003	.001	.000	.000	.000
18	.75645E-04	60.027	23.157	13.416	3.189	.192	.017	.002	.000	.000	.000	.000
19	.55457E-04	62.007	22.716	12.416	2.703	.145	.012	.001	.000	.000	.000	.000
20	.40951E-04	63.883	22.229	11.476	2.293	.110	.008	.001	.000	.000	.000	.000
21	.30448E-04	65.660	21.707	10.595	1.948	.083	.006	.001	.000	.000	.000	.000
22	.22788E-04	67.345	21.157	9.773	1.656	.064	.004	.000	.000	.000	.000	.000
23	.00000E+00	99.999	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

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Palisades Max. Weld Flaw VFLAW Output

PALWeld61.txt

LARGEST OF EACH ELEMENT FOR 1000 SIMULATIONS

N	FLAWS/FT**2	1.0-1.25	1.25-1.5	1.5-2.0	2.0-3.0	3.0-4.0	4.0-5.0	5.0-6.0	6.0-8.0	8.0-10.0	10.0-15.0	>15.0
1	.41899E+02	2.799	2.721	5.215	9.581	8.551	7.632	6.812	11.506	9.167	16.113	43.912
2	.14356E+02	8.150	7.484	13.185	20.499	14.585	10.541	8.188	12.284	8.649	12.031	8.625
3	.15987E+01	20.477	16.169	22.892	24.972	14.780	10.230	7.120	8.410	4.084	3.234	.961
4	.19965E+00	30.397	21.008	24.855	24.980	14.552	9.097	5.701	5.843	2.388	1.527	.256
5	.87474E-01	36.219	22.739	24.970	24.912	13.585	7.559	4.230	3.731	1.216	.737	.125
6	.41486E-01	40.185	23.650	24.977	24.789	12.361	6.214	3.151	2.747	.913	.443	.061
7	.21384E-01	45.554	24.701	24.976	24.577	11.193	5.506	2.820	2.233	.617	.243	.029
8	.11766E-01	51.569	24.963	24.988	24.157	10.720	4.980	2.344	1.638	.390	.159	.012
9	.82306E-02	56.892	24.973	24.974	23.778	9.975	4.247	1.872	1.200	.278	.094	.005
10	.63874E-02	61.327	24.991	24.966	23.356	9.047	3.634	1.484	.939	.188	.050	.002
11	.50170E-02	65.154	24.999	24.986	22.586	8.196	3.157	1.252	.702	.116	.025	.001
12	.39515E-02	68.573	25.000	25.000	23.012	8.261	2.966	1.065	.519	.067	.010	.000
13	.31286E-02	71.582	25.000	24.999	22.056	7.243	2.379	.781	.341	.037	.004	.000
14	.24770E-02	74.303	25.000	25.000	21.017	6.314	1.897	.570	.223	.020	.002	.000
15	.19861E-02	76.764	25.000	25.000	19.929	5.477	1.505	.414	.145	.011	.001	.000
16	.16220E-02	78.989	25.000	25.000	18.819	4.731	1.189	.299	.094	.006	.000	.000
17	.13246E-02	81.000	25.000	24.958	17.708	4.072	.937	.215	.061	.003	.000	.000
18	.10818E-02	82.820	25.000	24.829	16.611	3.495	.735	.155	.039	.002	.000	.000
19	.88347E-03	84.465	25.000	24.624	15.541	2.991	.576	.111	.025	.001	.000	.000
20	.72150E-03	85.952	25.000	24.353	14.505	2.553	.449	.079	.016	.001	.000	.000
21	.58922E-03	87.297	24.999	24.026	13.510	2.176	.350	.056	.011	.000	.000	.000
22	.48120E-03	88.514	25.000	23.650	12.561	1.850	.273	.040	.007	.000	.000	.000
23	.00000E+00	100.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

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Westinghouse Proposed Axial Flaw Evaluation Worksheet for the APTSR

Westinghouse Proposed Axial Flaw Evaluation Procedure for the Alternate PTS Rule

Axial Weld ISI Flaw Evaluation for Weld Length (WL, inch) of: 1006

For: Example Plant at 60 Years

Min. TWE (inch)	Max. TWE (inch)	1000" WL Max No.	Actual WL Max No.	No. ISI Ax. Flaws	Percent of TWCF	Percent Increase
0.076	0.125	75.90	76.36	77	20.91	0.18
0.126	0.175	67.98	68.39	69	20.91	0.19
0.176	0.225	14.16	14.24	15	10.25	0.54
0.226	0.275	4.65	4.68	4	10.25	0.00
0.276	0.325	1.00	1.01	1	9.61	0.00
0.326	0.375	1.52	1.53	2	9.61	2.96
0.376	0.425	0.49	0.49	1	9.27	9.54
0.426	0.475	1.00	1.01	1	10.34	0.00
0.476	0.525	0.00	0.00	0	10.34	0.00
0.526	0.613	0.00	0.00	1	7.94	7.94
0.614	0.700	0.00	0.00	0	5.22	0.00
0.701	0.787	0.00	0.00	0	3.86	0.00
0.788	0.875	0.00	0.00	1	1.90	1.90
0.876	0.963	0.00	0.00	0	4.94	0.00
0.964	1.050	0.00	0.00	2	1.60	3.20
1.051	1.137	0.00	0.00	0	2.78	0.00
1.138	1.225	0.00	0.00	0	1.67	0.00
1.226	1.925	0.00	0.00	0	8.03	0.00
					Total =	26.44

Type of Flaw	RT-max (deg. F)	RT-max (deg. R)	ISI Flaw Factor	Alpha Factor	95%TWCF per Year
AW	247	706.67	1.2644	2.010	4.006E-07
PL	209	668.67	1.0000	2.238	5.782E-10
CW	231	690.67	1.0000	2.106	1.511E-11
				Total =	4.012E-07
				Limit =	1.000E-06
				OK?	Yes

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Flaw Proximity in NUREG/CR-6817, Rev. 1, Section 6.1 (p. 6.4) on Weld Approach

Flaw Proximity Considerations - The weld examinations by SAFT-UT gave special consideration to indications that would give the appearance of one or more flaws that may in fact be one larger flaw. Subsequent validation efforts focused on these regions for more accurate characterization of flaw dimensions. ASME Code flaw proximity rules were then applied to the refined NDE results. The dimensions of multiple flaws were tabulated as a single larger flaw if so dictated by application of the code proximity rules. The database on flaws should therefore be considered as accounting for random occurrences of small flaws that are sufficiently close to each other to be properly treated as a single larger flaw in fracture mechanics calculations. The flaws as given by the input files from generalized flaw distribution procedure should be treated as single isolated flaws. There should therefore be no further steps in the fracture mechanics models to simulate random locations of flaws in order to identify occurrences of adjacent flaws that should be treated as a single larger flaw.

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Palisades FAVPOST Output for 60 EFPY

```
*****************************************************************
*     FRACTIONALIZATION OF FREQUENCY OF CRACK INITIATION        *
*       AND THROUGH-WALL CRACKING FREQUENCY (FAILURE) -         *
*          MATERIAL, FLAW CATEGORY, AND FLAW DEPTH              *
*         WEIGHTED BY % CONTRIBUTION OF EACH TRANSIENT          *
*           TO FREQUENCY OF CRACK INITIATION AND                *
*          THROUGH-WALL CRACKING FREQUENCY (FAILURE)            *
*****************************************************************
                      *****************
                      * WELD MATERIAL *
                      *****************
```

FLAW DEPTH (in)	% of total frequency of crack initiation: CAT I flaws	CAT 2 flaws	CAT 3 flaws	% of total through-wall crack frequency: CAT 1 flaws	CAT 2 flaws	CAT 3 flaws
0.088	0.00	3.70	0.00	0.00	1.68	0.00
0.175	0.00	37.45	0.00	0.00	20.91	0.00
0.263	0.00	13.39	0.00	0.00	10.25	0.00
0.350	0.00	10.03	0.00	0.00	9.61	0.01
0.438	0.00	7.97	0.01	0.00	9.27	0.05
0.525	0.00	6.65	0.01	0.00	10.34	0.06
0.613	0.00	5.13	0.01	0.00	7.94	0.06
0.700	0.00	3.58	0.03	0.00	5.22	0.14
0.787	0.00	2.47	0.02	0.00	3.86	0.13
0.875	0.00	1.59	0.00	0.00	1.90	0.02
0.963	0.00	2.29	0.01	0.00	4.94	0.05
1.050	0.00	0.96	0.02	0.00	1.60	0.10
1.137	0.00	1.31	0.01	0.00	2.78	0.03
1.225	0.00	0.78	0.00	0.00	1.67	0.01
1.313	0.00	0.34	0.01	0.00	0.43	0.04
1.400	0.00	0.54	0.00	0.00	1.31	0.03
1.488	0.00	0.40	0.00	0.00	1.14	0.01
1.575	0.00	0.05	0.00	0.00	0.13	0.01
1.663	0.00	0.84	0.01	0.00	3.14	0.04
1.750	0.00	0.13	0.00	0.00	0.42	0.00
1.837	0.00	0.17	0.00	0.00	0.60	0.00
1.925	0.00	0.06	0.00	0.00	0.04	0.02
TOTALS	0.00	99.86	0.14	0.00	99.17	0.83

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