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COMPANY NAME: Cascade Natural Gas Corporation

DOES REPORT CONTAIN CONFIDENTIAL INFORMATION? ■ No ☐ Yes If yes, submit a redacted public version (or a cover letter) by email. Submit the confidential information as directed in OAR 860-001-0070 or the terms of an applicable protective order.

Select report type: ☐ RE (Electric) ■ RG (Gas) ☐ RW (Water) ☐ RT (Telecommunications)
☐ RO (Other, for example, industry safety information)

Did you previously file a similar report? ☐ No ■ Yes, report docket number: RG-65

Report is required by: ☐ OAR
☐ Statute
☐ Order
Note: A one-time submission required by an order is a compliance filing and not a report (file compliance in the applicable docket)
☑ Other Requested by OPUC Staff
(For example, federal regulations, or requested by Staff)

Is this report associated with a specific docket/case? ☐ No ■ Yes, docket number: RG-65

List Key Words for this report. We use these to improve search results.

Cascade Natural Gas Corporation, Gas Meter Statistical Sampling Program, Meter, 2016, Meter Testing, Meter Performance

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Send confidential information, voluminous reports, or energy utility Results of Operations Reports to PUC Filing Center, PO Box 1088, Salem, OR 97308-1088 or by delivery service to 3930 Fairview Industrial Drive SE, Salem, OR 97302.

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CASCADE NATURAL GAS CORPORATION
A Subsidiary of MDU Resources Group, Inc.
In the Community to Serve®

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March 13, 2017

Oregon Public Utility Commission
Attn: Filing Center
P.O. Box 1088
Salem, OR 97308-1088

RE: RG-65, Cascade's Gas Meter Statistical Sampling Program, 2016 Results

Enclosed is Cascade Natural Gas Corporation's (Cascade's or Company's) Gas Meter Statistical Sampling Program for all residential and small commercial meters in service as of December 31, 2016. These meters fall within the scope of the Company's Statistical Sampling Program as established in Rule 8, Meter Testing in the Company's Tariff.

All larger meters were tested according to their required periodic schedule. The total number of meters Cascade had in service in Oregon at the end of 2016 was 73,325.

If you have any questions, please call me at (509) 734-4573.

Sincerely,

/s/ Brett Hudson

Brett Hudson
Manager, Measurement

cc: Lori Koho, OPUC
Mike Parvinen, Regulatory Affairs, CNG
Mike Eutsey, Operation Services, CNG

CASCADE NATURAL GAS

GAS METER STATISTICAL SAMPLING PROGRAM

2016 RESULTS

GAS METER STATISTICAL SAMPLING PROGRAM

TABLE OF CONTENTS

GAS METER PERFORMANCE FOR THE PERIOD JANUARY 1, 2016 – DECEMBER 31, 2016

SCOPE

This report covers the methodology, test results, and proceedings of Cascade Natural Gas Company gas meter statistical sampling program for residential and small commercial meters in the states of Washington and Oregon for the period of January 1, 2016 through December 31, 2016.

Sampling Summary

Meters in the program at the beginning of the plan year	*281,919*
Meters in the program at the end of the plan year	*277,233*
Total meters removed during the year	*6634*
Meters qualifying for analysis (not uniquely defective)	*5502*
Uniquely defective meters	*1,129*

GENERAL

COMPLIANCE

Gas meter testing requirements for Cascade Natural Gas are promulgated by the Washington Administrative Code (WAC), Chapter 480-90, Section 348 "Frequency of Periodic Meter Tests" and by the Oregon Administrative Rules (OAR), Chapter 860, Division 023 "Service Standards", Section 0015 (Testing Gas and Electric Meters). Cascade's sampling program complies with Part IV ('In Service Performance") of the 1992 version of ANSI standard B109.1 and B109.2 as specified in its Tariff Rule No. 7, part B filed in the state of Washington and Tariff Rule No. 6, part 1 filed in the state of Oregon. Cascade's plan also conforms to generally accepted statistical methods within the industry for predicting the sampling distribution of the proportion of a population with a 90% degree of confidence.

TESTING METHODOLOGY

Cascade Natural Gas current random meter measurement performance program is in accordance with its plan document entitled "Statistical Sample Program" dated August 18, 1995 (appendix). Random sampling and testing is conducted for all domestic meters rated at 1000 CFH and smaller.

METER PERFORMANCE REQUIREMENTS

Random Sampling – Meters in this program are randomly selected for inspection by attribute per the plan document. Conforming meters are found to register accurately with a tolerance of ±2.0%. The intent of the testing standard is to verify the following two parameters:

Overall Performance – Verify with approximately 90% certainty, that the portion of non-conforming meters does not exceed 20% of any installed meter population. For overall performance, equal weight is given to both the upper and lower specification limit (i.e. check and open reads are equally weighted and are averaged).

Fast Direction Performance – Verify with approximately 90% certainty that the portion of non-conforming fast meters (i.e. meters that register in excess of 102% of accuracy) does not exceed 10% of any installed meter population. For testing, equal weight is given to both the upper and lower specification limit (i.e. check and open reads are equally weighted and are averaged).

DEFINITIONS

Meter Population (Meter Family) – Grouping of meters as defined by each company, may include reference to sub families as allowed by ANSI B109.1 and B109.2

Open Test – Meter proof test completed between 80 and 100 % of meter rated capacity or the maximum rated capacity of the test equipment.

Check Test – Meter proof test completed at approximately 20% of the meter rated capacity.

Size / Class – Grouping of meters, based on capacity, that display similar performance characteristics for all meters within the grouping. Size/Class may, at the company's discretion, include multiple-sized meters within the same size class as long as the meter performance testing of the individual meters is consistent with all meter in the size class.

Random Meters – Meters that are a selected at random to provide a statistically representative sample of a meter family.

Beginning of Report Year 2016, In-Service Meters on 1/1/16

Total Number of Meters For Random Sampling	***281,919***
Total Number of Test Families [(a)]	***176***
Number of Test Families ≥ 10 yrs old [(b)]	***99***
Number of Test Families to be Voluntarily Removed for Admin. Purposes[(c)]	**7**

End of Report Year 2016 Meter Testing Quantities & Results

Number of Meters Tested	***6,631***
Number of Meters Passed, (+/-) 2%	***5180***
Number of Meters Failed, (+/-) 2%	***322***
Number of Meters, Uniquely Defective Test Result, (+/-) 10%	***1129***
Meter Families With an Overall Fail Result	***0***
Meter Families With a Fast Fail Result	***0***
Meter Families Removed/Depleted During Report Year [(d)]	***16***

Transition to 2017 Test Year

Total Number of Meters For Random Sampling	**277,233**
Total Number of Test Families [(a)]	**168**
Number of Test Families ≥ 10 yrs old [(b)]	**92**
Number of Test Families to be Voluntarily Removed for Admin. Purposes[(c)]	**4**

a) Total number of meter populations includes meter test families that are less than 10 years old and are not yet subject to test requirements.

b) Number of Meter Test Populations ≥ 10 years old (i.e. includes meters manufactured in the year 2007 and earlier for the 2017 test year). Small populations less than 20 years old are tested but with the restriction that a meter will not be retested within five (5) years.

c) Number of meter families that were voluntarily removed for administrative reasons. Includes families with less than 10 meters in population and meter populations that were observed to be trending towards failure

d) Total number of meter families depleted during the report year including those removed for administrative purposes.

Cascade Natural Gas Corp.

2016 METER SAMPLING PROGRAM

YEAR-END STATUS REPORT

FAMILY STATISTICS				SAMPLE STATISTICS			'ACCURACY' TEST RESULTS					NOT FAST' TEST RESULTS					FURTHER ACTION OR STATUS	
YEAR	MAKE	CLS	SIZE	MAX. SAMP	NO. RMVD	SAMP CNT	OK. CNT	PCT. OK	OK. LMT	MIN. SAMP	CTL. RGN	NF. CNT	PCT. NF	NF. LMT	MIN. SAMP	CTL. RGN	ADD. REQ	DISP. OF FAMILY
1982	ROCKW	1	12	12	12	10	9	90	0	10	I	10	100	0	8	I	0	FAMILY DEPLETED
1982	SPRAG	1	12	12	8	8	8	100	14	6	I	8	100	10	8	I	0	ACCEPTABLE
1983	SPRAG	1	290	80	90	82	75	91	6	32	I	81	98	5	34	I	0	ACCEPTABLE
1986	AMERI	1	517	90	93	90	79	87	6	76	I	80	88	5	90	IIb	0	MONITOR IN 2017
1986	ROCKW	1	1496	100	45	26	25	96	13	17	I	26	100	10	24	I	0	ACCEPTABLE
1986	SPRAG	1	990	90	35	26	26	100	13	11	I	26	100	10	24	I	0	ACCEPTABLE
1987	AMERI	1	2305	100	40	28	27	96	12	17	I	28	100	9	24	I	0	ACCEPTABLE
1987	ROCKW	1	2678	100	123	107	98	91	6	35	I	100	93	5	100	IIa	0	ACCEPTABLE
1987	SPRAG	1	1071	90	36	29	29	100	12	11	I	29	100	9	24	I	0	ACCEPTABLE
1988	AMERI	1	3240	125	148	132	126	95	6	19	I	127	96	4	66	I	0	ACCEPTABLE
1988	ROCKW	1	2253	100	119	97	94	96	7	17	I	94	96	5	66	I	0	ACCEPTABLE
1988	SPRAG	1	1771	100	58	42	39	92	10	30	I	42	100	8	24	I	0	ACCEPTABLE
1989	AMERI	1	5059	125	88	78	76	97	7	15	I	76	97	6	49	I	0	ACCEPTABLE
1989	ROCKW	1	4767	125	79	58	56	96	9	17	I	58	100	6	24	I	0	ACCEPTABLE
1989	SPRAG	1	3024	100	100	79	73	92	7	30	I	79	100	5	24	I	0	ACCEPTABLE
1990	AMERI	1	3733	125	52	36	36	100	11	11	I	36	100	8	24	I	0	ACCEPTABLE
1990	ROCKW	1	5444	125	168	140	132	94	5	22	I	139	99	4	30	I	0	ACCEPTABLE

1990	SPRAG	1	2475	100	54	37	36	97	11	15	I	37	100	8	24	I	0	ACCEPTABLE
1991	AMERI	1	4436	125	47	29	29	100	12	11	I	29	100	9	24	I	0	ACCEPTABLE
1991	ROCKW	1	3136	100	126	105	96	91	6	35	I	105	100	5	24	I	0	ACCEPTABLE
1991	SPRAG	1	2015	100	121	103	85	82	6	100	IIa	103	100	5	24	I	0	ACCEPTABLE
1992	AMERI	1	2910	100	46	32	32	100	12	11	I	32	100	9	24	I	0	ACCEPTABLE
1992	ROCKW	1	7864	125	91	60	59	98	8	13	I	60	100	6	24	I	0	ACCEPTABLE
1992	SPRAG	1	1641	100	116	97	89	91	6	35	I	97	100	5	24	I	0	ACCEPTABLE
1993	AMERI	1	3273	125	75	66	63	95	8	19	I	64	96	6	66	I	0	ACCEPTABLE
1993	ROCKW	1	5600	125	53	36	36	100	11	11	I	36	100	8	24	I	0	ACCEPTABLE
1993	SPRAG	1	5758	125	71	44	43	97	10	15	I	44	100	7	24	I	0	ACCEPTABLE
1994	AMERI	1	5389	125	148	136	124	91	6	36	I	124	91	4	125	IIa	0	ACCEPTABLE
1994	AMERI	3	3	3	1	1	0	0	N/A	3	N/A	0	0	N/A	3	N/A	0	**FAMILY DEPLETED
1994	ROCKW	1	3957	125	73	35	34	97	11	15	I	35	100	8	24	I	0	ACCEPTABLE
1994	SPRAG	1	5690	125	74	42	40	95	10	19	I	42	100	8	24	I	0	ACCEPTABLE
1995	AMERI	1	3136	100	80	71	69	97	8	15	I	69	97	6	49	I	0	ACCEPTABLE
1995	AMERI	3	6	6	6	6	6	100	0	6	I	6	100	0	6	I	0	FAMILY DEPLETED
1995	ROCKW	1	2429	100	137	110	100	90	6	43	I	104	94	5	100	IIa	0	ACCEPTABLE
1995	ROCKW	2	16	16	16	15	14	93	0	10	I	14	93	0	15	I	0	FAMILY DEPLETED
1995	SPRAG	1	10151	200	77	44	44	100	10	11	I	44	100	7	24	I	0	ACCEPTABLE
1996	AMERI	1	307	80	44	38	38	100	10	10	I	38	100	8	23	I	0	ACCEPTABLE
1996	AMERI	3	2	2	2	2	0	0	0	2	III	0	0	0	2	III	0	FAMILY DEPLETED
1996	ROCKW	1	920	90	107	89	83	93	7	25	I	86	96	5	63	I	0	ACCEPTABLE
1996	ROCKW	2	8	8	8	8	6	74	0	8	III	6	74	0	8	III	0	FAMILY DEPLETED
1996	SPRAG	1	4311	125	46	33	33	100	11	11	I	33	100	9	24	I	0	ACCEPTABLE

1997	AMERI	1	36	36	18	15	15	100	13	9	I	15	100	10	15	I	0	ACCEPTABLE
1997	AMERI	3	9	9	8	7	7	100	N/A	9	N/A	7	100	N/A	9	N/A	0	**FAMILY DEPLETED
1997	ROCKW	1	429	80	88	79	77	97	7	15	I	77	97	5	45	I	0	ACCEPTABLE
1997	ROCKW	2	14	14	14	11	9	81	0	14	I	9	81	0	10	III	0	FAMILY DEPLETED
1997	SPRAG	1	6879	125	63	41	41	100	10	11	I	41	100	8	24	I	0	ACCEPTABLE
1998	AMERI	1	476	80	50	45	44	97	9	15	I	44	97	7	45	I	0	ACCEPTABLE
1998	AMERI	3	1	1	1	1	1	100	0	1	I	1	100	0	1	I	0	FAMILY DEPLETED
1998	ROCKW	1	7377	125	150	131	121	92	6	30	I	121	92	4	125	IIa	0	ACCEPTABLE
1998	ROCKW	2	153	70	153	118	91	77	0	70	III	92	77	0	13	III	0	FAMILY DEPLETED
1998	SPRAG	1	723	90	30	25	25	100	13	11	I	25	100	10	24	I	0	ACCEPTABLE
1999	AMERI	1	7114	125	90	74	72	97	8	15	I	72	97	6	49	I	0	ACCEPTABLE
1999	AMERI	3	122	60	65	64	56	87	6	51	I	56	87	4	60	IIb	0	MONITOR IN 2017
1999	ROCKW	1	481	80	41	36	34	94	11	21	I	36	100	8	23	I	0	ACCEPTABLE
1999	ROCKW	2	42	40	42	37	32	86	0	31	I	32	86	0	33	III	0	FAMILY DEPLETED
1999	SPRAG	1	441	80	41	35	34	97	11	15	I	35	100	8	23	I	0	ACCEPTABLE
2000	AMERI	1	8230	125	72	40	40	100	10	11	I	40	100	8	24	I	0	ACCEPTABLE
2000	AMERI	3	80	50	51	50	47	94	6	17	I	47	94	4	50	I	0	ACCEPTABLE
2000	ROCKW	1	882	90	57	51	48	94	9	22	I	50	98	7	37	I	0	ACCEPTABLE
2000	ROCKW	2	95	50	97	88	65	73	0	46	III	66	74	0	9	III	0	FAMILY DEPLETED
2000	SPRAG	1	43	40	20	18	18	100	12	9	I	18	100	9	16	I	0	ACCEPTABLE
2001	AMERI	1	6560	125	51	34	34	100	11	11	I	34	100	8	24	I	0	ACCEPTABLE
2001	AMERI	3	211	70	79	77	71	92	6	26	I	71	92	4	70	IIa	0	ACCEPTABLE
2001	ROCKW	1	152	70	49	45	44	97	8	14	I	44	97	6	38	I	0	ACCEPTABLE
2001	ROCKW	2	215	70	73	70	63	90	6	36	I	64	91	5	70	IIa	0	ACCEPTABLE

2001	SPRAG	1	1127	90	36	27	27	100	13	11	I	27	100	9	24	I	0	ACCEPTABLE
2001	SPRAG	3	2	2	2	2	2	100	0	2	I	2	100	0	2	I	0	FAMILY DEPLETED
2002	ACTAR	1	853	90	26	26	26	100	13	11	I	26	100	10	24	I	0	ACCEPTABLE
2002	AMERI	1	7792	125	143	128	119	92	6	30	I	119	92	4	125	IIa	0	ACCEPTABLE
2002	AMERI	3	117	60	63	61	58	95	6	17	I	58	95	4	53	I	0	ACCEPTABLE
2002	ROCKW	1	730	90	91	83	77	92	7	29	I	81	97	5	47	I	0	ACCEPTABLE
2002	ROCKW	2	425	80	53	46	45	97	9	15	I	45	97	7	45	I	0	ACCEPTABLE
2002	SPRAG	1	410	80	42	40	39	97	10	14	I	40	100	7	23	I	0	ACCEPTABLE
2003	AMERI	1	801	90	28	25	25	100	13	11	I	25	100	10	24	I	0	*ACCEPTABLE
2003	AMERI	3	338	80	82	82	71	86	6	80	I	71	86	5	80	IIb	0	MONITOR IN 2017
2003	ROCKW	1	269	70	35	35	35	100	10	10	I	35	100	8	22	I	0	ACCEPTABLE
2003	ROCKW	2	160	70	40	35	35	100	10	10	I	35	100	7	21	I	0	ACCEPTABLE
2003	SPRAG	1	646	90	50	44	40	90	10	41	I	44	100	7	24	I	0	ACCEPTABLE
2004	AMERI	1	840	90	28	26	26	100	13	11	I	26	100	10	24	I	0	*ACCEPTABLE
2004	AMERI	3	306	80	81	80	75	93	6	24	I	75	93	5	80	IIa	0	ACCEPTABLE
2004	ROCKW	1	294	80	40	39	39	100	10	10	I	39	100	7	23	I	0	ACCEPTABLE
2004	ROCKW	2	265	70	43	42	40	95	9	18	I	41	97	7	42	I	0	ACCEPTABLE
2004	SPRAG	1	72	50	26	26	26	100	10	10	I	26	100	8	18	I	0	ACCEPTABLE
2004	SPRAG	3	46	40	20	19	18	94	12	15	I	19	100	9	16	I	0	ACCEPTABLE
2005	AMERI	1	13633	200	245	222	213	95	4	19	I	213	95	3	97	I	0	ACCEPTABLE
2005	AMERI	3	233	70	85	83	79	95	6	18	I	79	95	4	69	I	0	ACCEPTABLE
2005	ROCKW	1	235	70	42	42	41	97	9	14	I	41	97	7	41	I	0	ACCEPTABLE
2005	ROCKW	2	485	80	85	82	76	92	7	28	I	77	93	5	80	IIa	0	ACCEPTABLE
2005	SPRAG	1	218	70	24	23	23	100	13	10	I	23	100	10	22	I	0	ACCEPTABLE

2005	SPRAG	2	6	6	6	6	6	100	0	6	I	6	100	0	6	I	0	FAMILY DEPLETED
2005	SPRAG	3	18	18	11	11	11	100	13	7	I	11	100	10	11	I	0	ACCEPTABLE
2006	ACTAR	1	1	1	1	1	1	100	0	1	I	1	100	0	1	I	0	FAMILY DEPLETED
2006	AMERI	1	13316	200	196	158	155	98	5	13	I	155	98	4	38	I	0	ACCEPTABLE
2006	AMERI	3	438	80	30	26	26	100	13	11	I	26	100	9	23	I	0	ACCEPTABLE
2006	ROCKW	1	142	60	59	57	54	94	7	19	I	55	96	5	46	I	0	ACCEPTABLE
2006	ROCKW	2	501	90	88	82	80	97	7	15	I	80	97	5	45	I	0	ACCEPTABLE
2006	SPRAG	1	183	70	36	34	34	100	10	10	I	34	100	8	22	I	0	ACCEPTABLE
2006	SPRAG	2	13	13	13	9	8	88	0	11	I	9	100	0	9	I	0	FAMILY DEPLETED
2006	SPRAG	3	232	70	77	70	68	97	7	14	I	69	98	5	33	I	0	ACCEPTABLE
2007	ACTAR	1	16	16	0	0	0	NaN	N/A	8	IV	0	NaN	N/A	8	IV	0	ACCEPTABLE
2007	AMERI	1	2627	100	11	4	4	100	<<> >	11	IV	4	100	<<> >	24	IV	0	ACCEPTABLE
2007	AMERI	3	212	70	5	3	3	100	<<> >	10	IV	3	100	<<> >	22	IV	0	ACCEPTABLE
2007	ROCKW	1	311	80	3	2	2	100	<<> >	10	IV	2	100	<<> >	23	IV	0	ACCEPTABLE
2007	ROCKW	2	367	80	4	1	1	100	<<> >	11	IV	1	100	<<> >	23	IV	0	ACCEPTABLE
2007	SPRAG	1	306	80	2	0	0	NaN	N/A	40	IV	0	NaN	N/A	40	IV	0	ACCEPTABLE
2007	SPRAG	2	25	25	3	1	1	100	<<> >	8	IV	1	100	<<> >	13	IV	0	ACCEPTABLE
2007	SPRAG	3	51	40	0	0	0	NaN	N/A	20	IV	0	NaN	N/A	20	IV	0	ACCEPTABLE
2008	ACTAR	1	3	3	1	0	0	NaN	N/A	2	N/A	0	NaN	N/A	2	N/A	0	ACCEPTABLE
2008	AMERI	1	12123	200	45	29	29	100	12	11	I	29	100	9	24	I	0	ACCEPTABLE
2008	AMERI	3	612	90	14	9	8	88	<<> >	61	IV	8	88	<<> >	90	IV	0	ACCEPTABLE
2008	ROCKW	1	239	70	1	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2008	ROCKW	2	663	90	3	1	0	0	66	1	III	0	0	49	0	III	0	ACCEPTABLE
2008	ROOTS	3	1	1	0	0	0	NaN	N/A	1	N/A	0	NaN	N/A	1	N/A	0	ACCEPTABLE

2008	SPRAG	1	90	50	1	1	1	100	<<> >	10	IV	1	100	<<> >	19	IV	0	ACCEPTABLE
2008	SPRAG	2	21	21	0	0	0	NaN	N/A	11	IV	0	NaN	N/A	11	IV	0	ACCEPTABLE
2008	SPRAG	3	39	39	3	1	1	100	<<> >	9	IV	1	100	<<> >	15	IV	0	ACCEPTABLE
2009	ACTAR	1	15	15	0	0	0	NaN	N/A	8	IV	0	NaN	N/A	8	IV	0	ACCEPTABLE
2009	AMERI	1	4879	125	17	11	11	100	20	11	I	11	100	<<> >	24	IV	0	ACCEPTABLE
2009	AMERI	3	380	80	5	3	3	100	<<> >	11	IV	3	100	<<> >	23	IV	0	ACCEPTABLE
2009	ROCKW	1	503	90	3	1	1	100	<<> >	11	IV	1	100	<<> >	23	IV	0	ACCEPTABLE
2009	ROCKW	2	558	90	8	4	4	100	<<> >	11	IV	4	100	<<> >	23	IV	0	ACCEPTABLE
2009	SPRAG	1	474	80	2	1	1	100	<<> >	11	IV	1	100	<<> >	23	IV	0	ACCEPTABLE
2009	SPRAG	2	15	15	0	0	0	NaN	N/A	8	IV	0	NaN	N/A	8	IV	0	ACCEPTABLE
2009	SPRAG	3	37	37	1	0	0	NaN	N/A	19	IV	0	NaN	N/A	19	IV	0	ACCEPTABLE
2010	ACTAR	1	3	3	0	0	0	NaN	N/A	2	N/A	0	NaN	N/A	2	N/A	0	ACCEPTABLE
2010	AMERI	1	3534	125	23	13	11	84	18	125	IV	11	84	<<> >	66	IV	0	ACCEPTABLE
2010	AMERI	3	485	80	8	6	6	100	<<> >	11	IV	6	100	<<> >	23	IV	0	ACCEPTABLE
2010	ROCKW	1	245	70	1	1	1	100	<<> >	10	IV	1	100	<<> >	22	IV	0	ACCEPTABLE
2010	ROCKW	2	215	70	2	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2010	SPRAG	1	329	80	1	1	1	100	<<> >	11	IV	1	100	<<> >	23	IV	0	ACCEPTABLE
2010	SPRAG	2	13	13	1	0	0	NaN	N/A	7	IV	0	NaN	N/A	7	IV	0	ACCEPTABLE
2010	SPRAG	3	147	60	7	2	2	100	<<> >	10	IV	2	100	<<> >	21	IV	0	ACCEPTABLE
2011	ACTAR	1	6	6	0	0	0	NaN	N/A	3	N/A	0	NaN	N/A	3	N/A	0	ACCEPTABLE
2011	AMERI	1	4713	125	14	8	8	100	<<> >	11	IV	8	100	<<> >	24	IV	0	ACCEPTABLE
2011	AMERI	3	370	80	6	6	5	83	<<> >	80	IV	5	83	<<> >	44	IV	0	ACCEPTABLE
2011	ROCKW	1	229	70	1	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2011	ROCKW	2	686	90	6	4	4	100	<<> >	11	IV	4	100	<<> >	24	IV	0	ACCEPTABLE

2011	SPRAG	1	245	70	1	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2011	SPRAG	2	25	25	1	1	1	100	<<> >	8	IV	1	100	<<> >	13	IV	0	ACCEPTABLE
2011	SPRAG	3	26	26	2	1	1	100	<<> >	8	IV	1	100	<<> >	13	IV	0	ACCEPTABLE
2012	ACTAR	1	22	22	0	0	0	NaN	N/A	11	IV	0	NaN	N/A	11	IV	0	ACCEPTABLE
2012	AMERI	1	3785	125	13	10	10	100	<<> >	11	IV	10	100	<<> >	24	IV	0	ACCEPTABLE
2012	AMERI	3	221	70	2	2	2	100	<<> >	10	IV	2	100	<<> >	22	IV	0	ACCEPTABLE
2012	ROCKW	1	225	70	0	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2012	ROCKW	2	523	90	9	5	5	100	<<> >	11	IV	5	100	<<> >	23	IV	0	ACCEPTABLE
2012	ROOTS	3	1	1	0	0	0	NaN	N/A	1	N/A	0	NaN	N/A	1	N/A	0	ACCEPTABLE
2012	SPRAG	1	228	70	3	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2012	SPRAG	2	21	21	1	1	1	100	<<> >	7	IV	1	100	<<> >	12	IV	0	ACCEPTABLE
2012	SPRAG	3	40	40	3	2	2	100	<<> >	9	IV	2	100	<<> >	15	IV	0	ACCEPTABLE
2013	ACTAR	1	22	22	0	0	0	NaN	N/A	11	IV	0	NaN	N/A	11	IV	0	ACCEPTABLE
2013	AMERI	1	5667	125	19	13	13	100	18	11	I	13	100	<<> >	24	IV	0	ACCEPTABLE
2013	AMERI	2	197	70	2	2	2	100	<<> >	10	IV	2	100	<<> >	22	IV	0	ACCEPTABLE
2013	AMERI	3	487	80	7	3	3	100	<<> >	11	IV	3	100	<<> >	23	IV	0	ACCEPTABLE
2013	ROCKW	1	249	70	2	1	1	100	<<> >	10	IV	1	100	<<> >	22	IV	0	ACCEPTABLE
2013	ROCKW	2	210	70	5	3	3	100	<<> >	10	IV	3	100	<<> >	22	IV	0	ACCEPTABLE
2013	SPRAG	1	206	70	2	1	1	100	<<> >	10	IV	1	100	<<> >	22	IV	0	ACCEPTABLE
2013	SPRAG	2	19	19	1	0	0	NaN	N/A	10	IV	0	NaN	N/A	10	IV	0	ACCEPTABLE
2013	SPRAG	3	79	50	8	4	4	100	<<> >	10	IV	4	100	<<> >	19	IV	0	ACCEPTABLE
2014	ACTAR	1	33	33	0	0	0	NaN	N/A	17	IV	0	NaN	N/A	17	IV	0	ACCEPTABLE
2014	AMERI	1	634	90	5	2	2	100	<<> >	11	IV	2	100	<<> >	23	IV	0	ACCEPTABLE
2014	AMERI	2	383	80	3	3	3	100	<<> >	11	IV	3	100	<<> >	23	IV	0	ACCEPTABLE

2014	AMERI	3	488	80	4	4	4	100	<<> >	11	IV	4	100	<<> >	23	IV	0	ACCEPTABLE
2014	ROCKW	1	7838	125	33	24	24	100	13	11	I	24	100	10	24	I	0	ACCEPTABLE
2014	ROCKW	2	276	70	5	2	2	100	<<> >	10	IV	2	100	<<> >	22	IV	0	ACCEPTABLE
2014	ROOTS	3	6	6	2	2	2	100	N/A	6	N/A	2	100	N/A	6	N/A	0	ACCEPTABLE
2014	SPRAG	1	224	70	1	0	0	NaN	N/A	35	IV	0	NaN	N/A	35	IV	0	ACCEPTABLE
2014	SPRAG	2	11	11	2	1	1	100	<<> >	6	IV	1	100	<<> >	8	IV	0	ACCEPTABLE
2015	ACTAR	1	31	31	1	0	0	NaN	N/A	16	IV	0	NaN	N/A	16	IV	0	ACCEPTABLE
2015	AMERI	1	335	80	4	3	3	100	<<> >	11	IV	3	100	<<> >	23	IV	0	ACCEPTABLE
2015	AMERI	2	263	70	2	1	1	100	<<> >	10	IV	1	100	<<> >	22	IV	0	ACCEPTABLE
2015	AMERI	3	337	80	9	9	9	100	<<> >	11	IV	9	100	<<> >	23	IV	0	ACCEPTABLE
2015	ROCKW	1	274	70	7	5	5	100	<<> >	10	IV	5	100	<<> >	22	IV	0	ACCEPTABLE
2015	ROCKW	2	246	70	8	2	2	100	<<> >	10	IV	2	100	<<> >	22	IV	0	ACCEPTABLE
2015	SPRAG	1	1180	90	19	11	11	100	20	11	I	11	100	<<> >	24	IV	0	ACCEPTABLE
2015	SPRAG	2	14	14	0	0	0	NaN	N/A	7	IV	0	NaN	N/A	7	IV	0	ACCEPTABLE
2015	SPRAG	3	1	1	0	0	0	NaN	N/A	1	N/A	0	NaN	N/A	1	N/A	0	ACCEPTABLE
GRAND TOTALS			*260621		6634	5502	5180					5283					0	

* The 2003 and 2004 AMERI1 families had a partial recall due to manufacturers defect on diaphragm curing causing meters to run fast. A total of 8,686 2003 AMERI1 and 12,612 2004 AMERI1 meters are in the process of being recalled. These meters have been removed from their respective family counts so the remaining meters can be sampled.

**One meter in the 1997 AMERI3 family and two meters in the 1994 AMERI3 family were found to have incorrect test dates. Test dates were manually corrected which moved meters into a new family. New meter families are within the last ten years so sampling requirements were not affected.

DOMESTIC METERS 1000 CFH AND SMALLER
STATUS REPORT NOTES

Notes to Year-End Status Report:

1) TEST FAMILY : Naming designation of each family.

a) **YEAR/MAKE/(SIZE) CLASS:** Components of the family designation or name.
b) **FAMILY SIZE:** Count of number of meters in test family at the start of the test year being reported.

2) SAMPLE STATISTICS: Statistics pertaining to representative sample taken from each family.

a) **MAX.SAMP:** Maximum number of meters that would be required in a sample in order to make a valid determination of the family's future disposition.
b) **NO.RMVD:** Number of meters in each family removed during the course of the plan year.
c) **SAMP.CNT**: Total number of meters qualified for use in each sample. Meters determined to be uniquely defective are excluded from the sample count and any sample determination.

3) OVERALL "ACCURACY" TEST RESULTS: Compilation of test results to determine the proportion of the sample meeting the "accuracy" test (i.e. 98.0 to 102.0 percent accurate).

a) **OK.CNT:** Number of meters in the sample found 98.0 to 102.0 percent accurate.
b) **PCT.OK:** Percent or proportion of the sample found "accurate".
c) **OK.LMT:** The control limits above or below the 80% proportion threshold.
d) **MIN.SAMP:** The minimum number of meters required in each sample to provide a statistically valid sample.
e) **CTL.RGN:** Control region in which the sample is determined to be on the "meters accurate" control chart provided in the program document.

4) "NOT FAST" TEST RESULTS: Compilation of test results to determine the proportion of the sample meeting the "not fast" test (i.e. not more than 102.0 percent accurate).

a) **NF.CNT:** Number of meters in the sample found not exceeding 102.0 percent accurate.
b) **PCT..NF:** Percent or proportion of sample found "not fast".
c) **NF.LMT:** The control limits above and below the 90% proportion threshold.
d) **MIN.SAMP:** The minimum number of meters required in each sample to provide a statistically valid sample.
e) **CTL.RGN:** Control region in which the sample is determined to be on the "meters not fast" control chart provided in the program document.

5) FURTHER ACTION OR STATUS: Further action(s) that may be necessary to ensure the sample is of sufficient size and the family remains in compliance with program guidelines.

a) **ADD.REQ:** Additional number of meters required to meet or exceed minimum sample size.
b) **DISP.OF.FAMILY:** Future disposition or status of each family as determined by the decision tree provided in the program document.

RANDOM SAMPLING METER PERFORMANCE DATA

DOMESTIC METERS 1000 CFH AND SMALLER

METER FAMILIES BELOW ACCEPTABLE THRESHOLD LIMITS

No meter families in service ten or more years were found below the acceptable threshold limits (i.e. fall in region III).

Meter Family	Disposition Status	Year Disposition Initiated	Planned Year to Complete Disposition
N/A			

DOMESTIC METERS 1000 CFH AND SMALLER

METER FAMILIES WITH INSUFFICIENTLY SIZED SAMPLE

No meter families in service ten or more years were found to have an insufficient sized sample.

Meter Family	Family Size	Min Sample Size Required	Meters Qualifying for Sample in 2015
N/A			

DOMESTIC METERS 1000 CFH AND SMALLER

STATUS OF METER FAMILIES PREVIOUSLY SCHEDULED FOR REMOVAL

Eleven meter families were previously scheduled for removal in 2016.

Meter Family	Disposition Status	Year Disposition Initiated	Year Disposition Completed
1994 AMERI3	**Recall Family**	**2016**	**2016**
1995 AMERI3	**Recall Family**	**2016**	**2016**
1995 ROCKW2	**Recall Family**	**2016**	**2016**
1996 AMERI3	**Recall Family**	**2016**	**2016**
1996 ROCKW2	**Recall Family**	**2016**	**2016**
1997 AMERI3	**Recall Family**	**2016**	**2016**
1998 ROCKW2	**Recall Family**	**2016**	**2016**
1999 ROCKW2	**Recall Family**	**2016**	**2016**
2000 ROCKW2	**Recall Family**	**2016**	**2016**
2003 AMERI1	**Partial Recall Family**	**2016**	**Scheduled for 2017**
2004 AMERI1	**Partial Recall Family**	**2016**	**Scheduled for 2017**

Cascade Natural Gas Corporation
Statistical Sample Program
August 18, 1995
(Revised November 3, 2014)

Program Description

Using knowledge of the operating histories of similar meters, the company may elect to keep particular meters in service for intervals beyond those specified in applicable state regulations, provided the meter performance meets the criteria of the company's Statistical Sample Program. Eligible meters are diaphragm type meters with a rated capacity of up to 3,000 ft^3/hr.

The maximum permissible error in the registration of meters placed in service is ±2.0% at both the open and check rates. For the purposes of the Statistical Sample Program, the definition of a meter registering with an error of -2.0% is one that registers 98.0% of accuracy and a meter registering with a +2.0% error is one that registers 102.0% of accuracy. A meter, therefore, must register between 98.0% and 102.0% of accuracy at each test rate, before being placed in service.

Each meter in the Statistical Sample Program will be assigned to a meter group or "family" according to its manufacturer, meter size, meter class, and test year. At the option of the company, meters in any family may be further subdivided according to meter type, size, location, age, or other factors that may be disclosed by test data to have an effect on the performance of the meters. Subsequently, meter families may be modified or combined as justified by the performance records.

The program year shall begin on January 1 and end on December 31 of the same year.

Sample Selection and Evaluation

The performance evaluation of each meter family will be based on an evaluation of test results from random sampling of the family. Sample data collected during a given program year will be analyzed, and a decision regarding meter family disposition will be made in the first quarter of the following calendar year. The performance and status, including disposition, of each meter family will be reported to the regulatory commissions as part of the annual meter report.

The random sample for each family will include meters which are removed from service on a routine basis, e.g. meters not in use, too large, too small, damaged index cover, service relocation or replacement, etc. If more meters are required for testing than have been removed from service for routine purposes, a random sample of meters within that family will be removed from service and included in the sample.

All non-contaminated, testable meters will be tested in accordance with ANSI B109.1, and B109.2, using an average of the open and check in-test results to evaluate each meter's performance. For purposes of evaluating the performance of each meter family, the analysis of the test results will exclude data on meters which are damaged, meters which do not register, meters which do not pass gas, and meters which measure either less than 90.0 percent accurate or more than 110.0 percent accurate.

APPENDIX

A meter family will be considered to be acceptable if the sample of the family indicates:

a) a minimum proportion of .80 of the family measures between 98.0 percent and 102.0 percent accurate ("accuracy" requirement); and

b) a minimum proportion of .90 of the family measures no more than 102.0 percent accurate ("not fast" requirement).

To determine the significance of the proportions measured from sampling, the test results will be compared with threshold proportions and control limits on a control chart. The control limits will be defined as follows:

$$P_{.90} = p_t \pm 1.645 * [p_t(1-p_t)/n]^{.5} * [(N-n)/(N-1)]^{.5}$$

where:

$P_{.90}$ is the upper and lower proportion corresponding with an interval which will have a 90 percent probability of including the proportion from a random sample of size n (drawn without replacement) from a population of size N and a proportion equal to p_t. p_t is the threshold proportion, equal to the minimum acceptable proportion of the meter family and is:

= .80 for meters registering between 98.0% and 102% accurate, or

= .90 for meters registering no more than 102% accurate.

n is the sample size.

N is the meter family size prior to sampling.

1.645 is the factor necessary to provide the interval estimate associated with the threshold proportion, such that, nine times out of ten, the sample proportion will be included within that interval.

Each proportion measured from sampling will specify a particular region (I, II, III, or IV) on the control chart within which the sample data would plot. The regions (I, IIa, IIb, III, and IV) are outlined by the control limits and the threshold proportions, and will be as defined by figures 1 and 2. The vertical line between the regions II(a and b) and IV on the control chart will be established according to the following schedule:

Remaining Family Size			Division line between Regions II(a and b) and IV on the Control Chart
1	to	65	40 (or family size if less)
66	to	100	50
101	to	150	60
151	to	280	70
281	to	500	80
501	to	1200	90
1201	to	3200	100
3201	to	10000	125
10001 and over			200

The performance of each family will be characterized by the regions on the control chart according to the following table:

	Meter Family < 10 yrs old	Meter Family ≥ 10 yrs old
Region I	Satisfactory	Satisfactory
Region II a	Satisfactory	Satisfactory
Region II b	Satisfactory	Satisfactory
Region III	At/below Limits	At/below Limits
Region IV	Satisfactory	Insufficient Sample

Meter Family Disposition

Meter family disposition will be determined according to the following steps:

1. The proportion of the meters in the sample that measure between 98.0 percent and 102.0 percent accurate will be calculated, and the respective region on the "Accuracy" control chart determined.

2. The proportion of the meters in the sample which measure not more than 102.0 percent accurate will be calculated, and the respective region on the "Not Fast" control chart determined.

3. If the region is determined to be "IV" on either the "Accuracy" control chart or "Not Fast" control chart, additional random samples shall be taken so that the combined sample is sufficient to move the sample into any region other than "IV". However, if meters tested in the fourth quarter of the plan year cause the family to fall into region “IV” unexpectedly, leaving insufficient time to obtain the additional number of meters required to complete the sample, the company may elect to increase the sample size of the family by combining the current sample with the samples from the previous two years so that a sufficiently sized sample is obtained to cause the family to fall in a region other than “IV”. The disposition of this “multiple year family” shall then be subject to the same rules of the plan as any other family in the plan. “Multiple year families” that fall in region I shall be subject to aggressive sampling in the following plan year so that a follow up determination is made within the first six months without any need to combine multiple years.

4. The results from steps 1 and 2 (provided neither are region "IV") will be applied to the conditions outlined in the decision tree, shown in figures 3a and 3b.

5. Meters in families falling in regions I and IIa are determined to be satisfactory and will be allowed to remain in service, subject to sample testing and review in succeeding years.

6. Meters in families falling in region IIb are subject to change-out at the company's discretion. The decision as to their removal will be based on economic and operating factors. If the meters remain in service, they will be subject to sample testing and review in

succeeding years.

7. Meters in families falling in region III shall be removed from service by December 31 of the second year following the determination (i.e. two years following the program year when the samples were taken.) However, if in any given year the total number of meters to be removed from service exceeds four percent of the number of meters in the Statistical Sample Program, the company may, at its option and with Commission approval, extend the change-out schedule so that each meter family is changed within a maximum of four years from determination that change-out is required (i.e. four years following the program year when the samples were taken).

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Decision Tree for Meter Families in Meter Sample Program

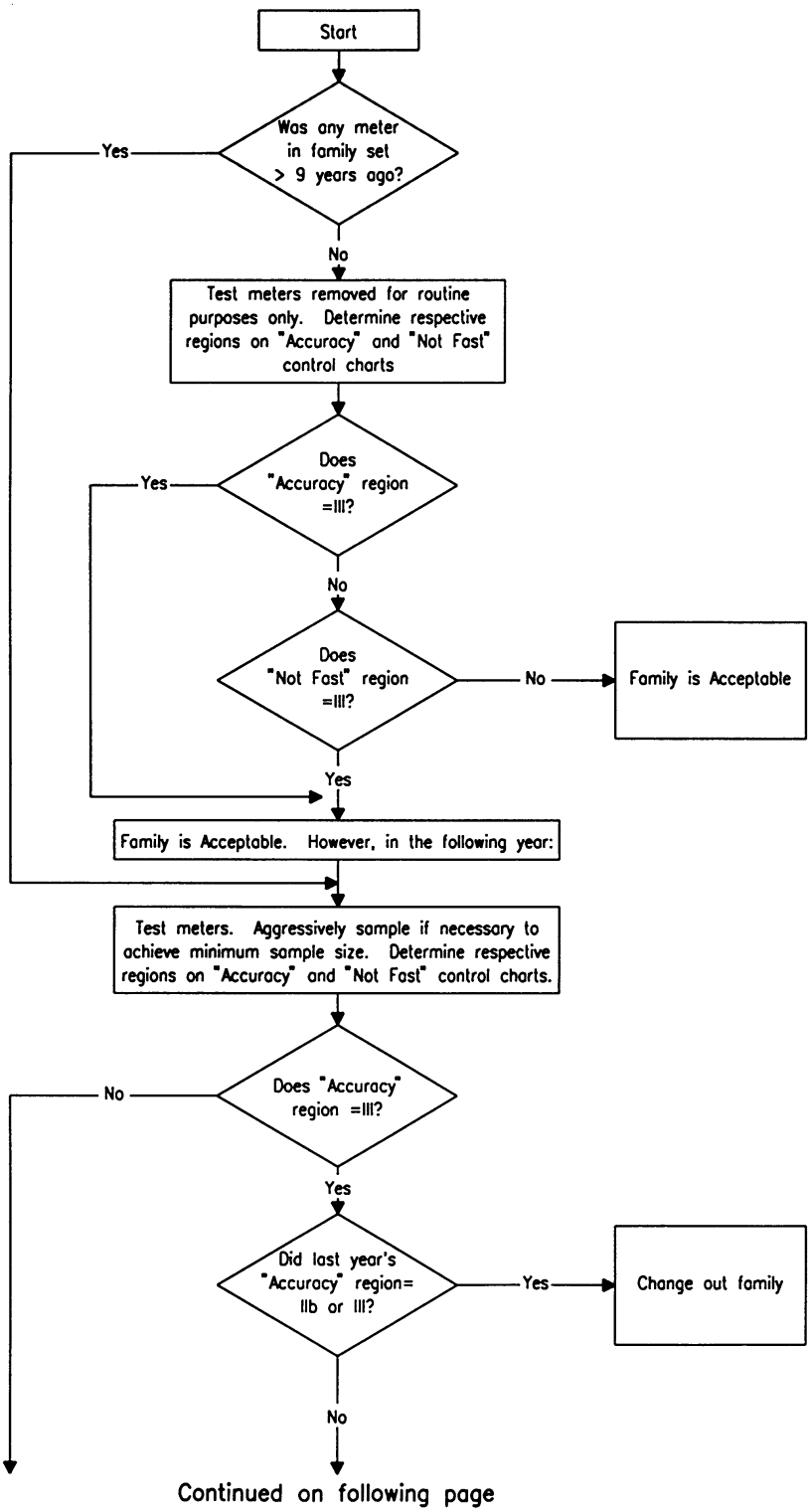


Figure 3.a.

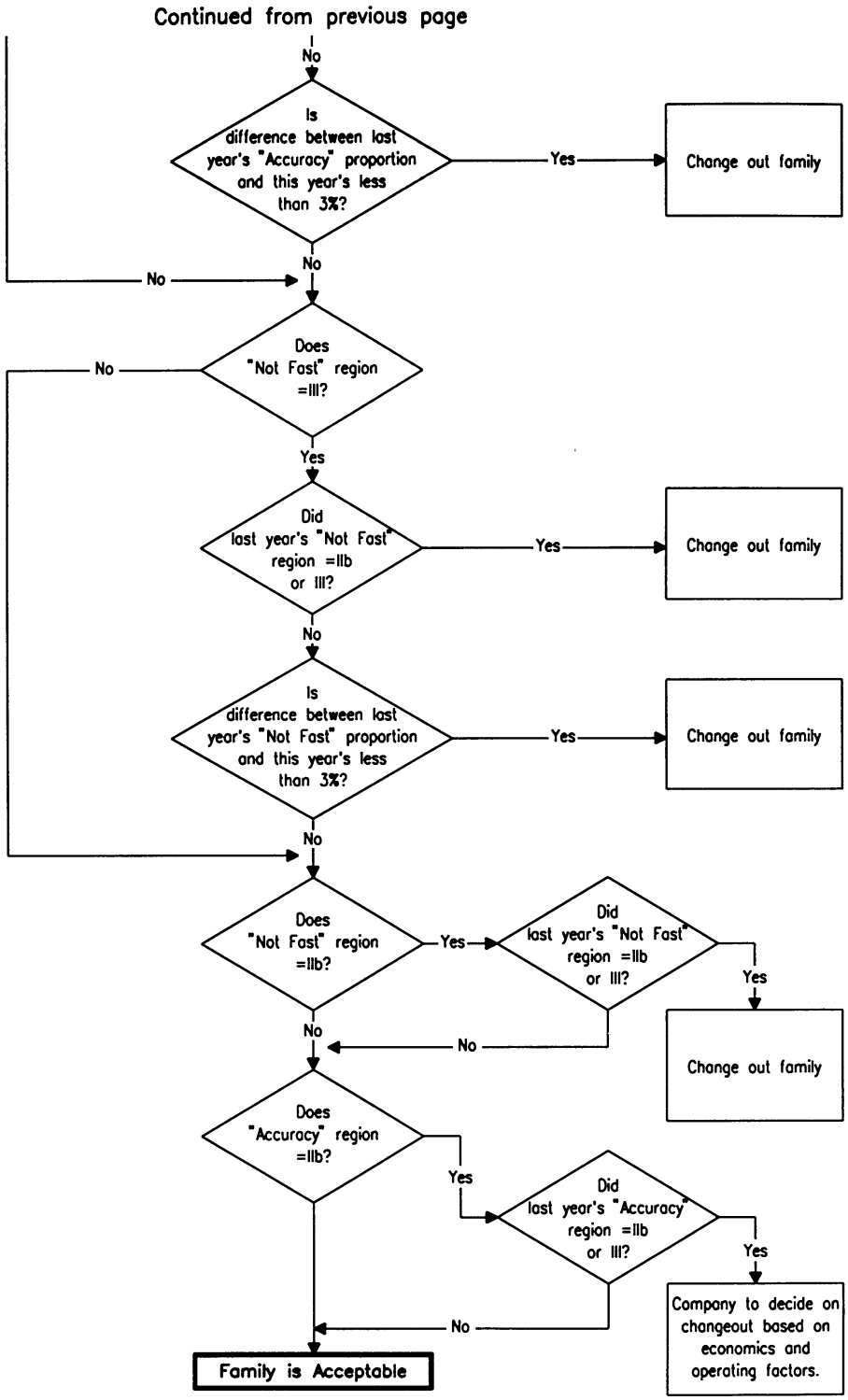

Continued from previous page
No
Is difference between last year's "Accuracy" proportion and this year's less than 3%?
Yes
Change out family
No
No
Does "Not Fast" region =III?
Yes
No
Did last year's "Not Fast" region =IIb or III?
Yes
Change out family
No
Is difference between last year's "Not Fast" proportion and this year's less than 3%?
Yes
Change out family
No
Does "Not Fast" region =IIb?
Yes
Did last year's "Not Fast" region =IIb or III?
Yes
Change out family
No
No
Does "Accuracy" region =IIb?
Yes
Did last year's "Accuracy" region =IIb or III?
Yes
Company to decide on changeout based on economics and operating factors.
No
Family is Acceptable

Figure 3.b.

Meter Performance Control Charts

Figure 1. For Meters Accurate

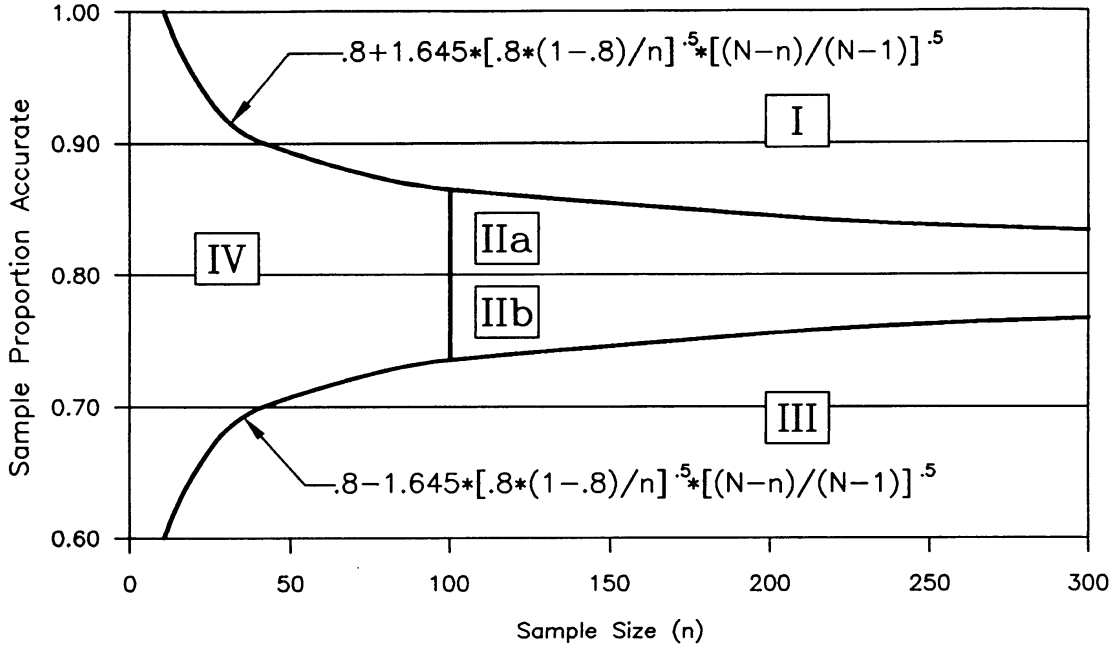
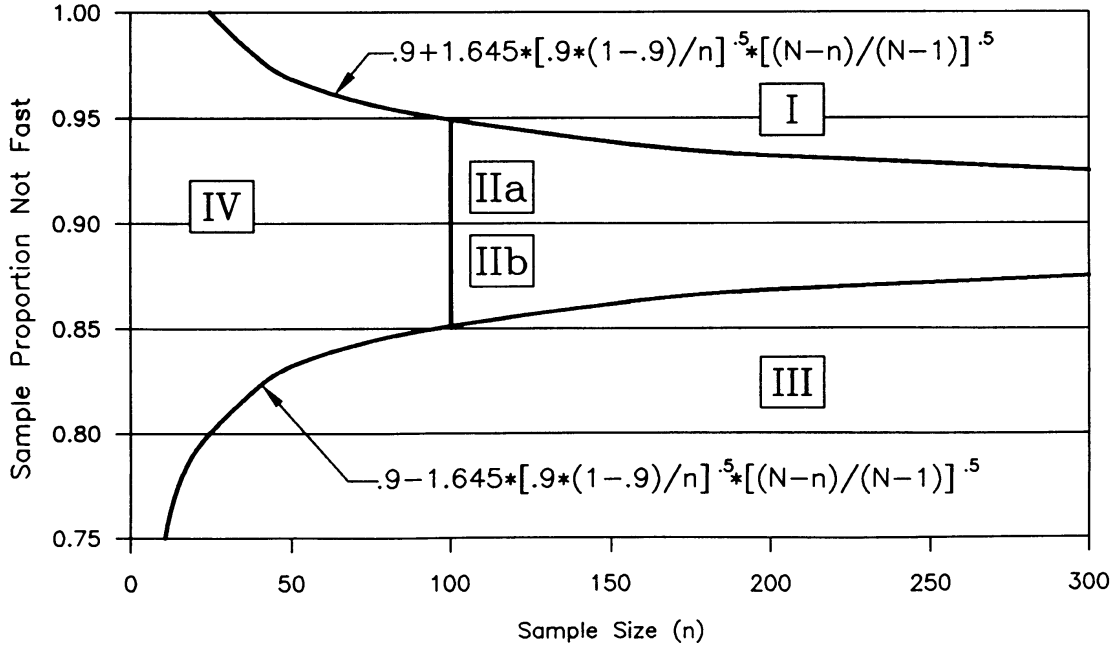


Figure 2. For Meters Not Fast



*Example where family size (N) = 3000