

- 1 a continuation ... no, it's not, it's a new paragraph. It says
2 that, "RCM processes are being explored by Hydro in their
3 planning of maintenance with pilot projects at three
4 locations."
- 5 MR. REEVES: Yes.
- 6 MS. BUTLER, Q.C.: And you've already given a definition
7 yourself on RCM, so I don't think we need to look through
8 the definition. The pilot projects were, as I understand it,
9 Rigolet isolated diesel plant.
- 10 MR. REEVES: Yes.
- 11 MS. BUTLER, Q.C.: Come By Chance station and
12 transmission lines?
- 13 MR. REEVES: That's correct, yes.
- 14 MS. BUTLER, Q.C.: And the L'anse au Loup distribution
15 system.
- 16 MR. REEVES: That's correct, yes, that's my recollection as
17 well.
- 18 MS. BUTLER, Q.C.: Okay, now on the next page of the
19 report, 55, the last paragraph, the authors indicate that
20 RCM is not an unqualified success story and calls for a
21 level of dedication that may be difficult to achieve, calls for
22 additional human resources over an extended period, and
23 that utilities entering on RCM must recognize these
24 requirements, so you'd be aware of that forewarning.
- 25 MR. REEVES: Yes.
- 26 MS. BUTLER, Q.C.: And the recommendation at the
27 bottom of that page was a recommendation to this Board to
28 ask Hydro to submit reports on each of the RCM pilot
29 projects, as well as justification for plans that expand the
30 RCM process at Hydro. Can I ask you first, has this Board
31 asked you to submit reports on each of the RCM pilot
32 projects?
- 33 MR. REEVES: We gave an overview, actually a
34 presentation to this Board during one of our regular
35 meetings, a presentation and a review of the pilots and the
36 results that we achieved, and answered any questions that
37 they would have regarding our RCM program.
- 38 MS. BUTLER, Q.C.: And approximately when was that?
- 39 MR. REEVES: Oh that was at least, more than a year ago,
40 I would say. Probably a bit longer than that actually.
- 41 MS. BUTLER, Q.C.: In relation to the second part of that
42 recommendation then, justification for plans that expand
43 the RCM process, first of all, does Hydro have plans to
44 expand the RCM process beyond the three pilot projects?
- 45 MR. REEVES: Yes, and we are currently implementing that.
- 46 MS. BUTLER, Q.C.: Okay, and was that also the subject
47 addressed in the presentation to the Board more than a year
48 ago?
- 49 MR. REEVES: Yes, it was. We told them then the results
50 of our pilots, if I remember correctly.
- 51 MS. BUTLER, Q.C.: Yes, but did you address in the
52 presentation any plans or justification for plans to go
53 forward?
- 54 MR. REEVES: Oh yes, yes.
- 55 MS. BUTLER, Q.C.: Do we have a copy of the
56 presentation?
- 57 MR. REEVES: It's not in this documentation that's been
58 filed.
- 59 MS. BUTLER, Q.C.: Would it be any difficulty getting it?
- 60 MR. REEVES: I don't think so, but I think it's still available.
- 61 MS. BUTLER, Q.C.: Perhaps I could just ask Ms. Greene
62 for an undertaking on that?
- 63 MS. GREENE, Q.C.: Yes, we'll certainly do that. I was just
64 thinking the Board would have a record as well. I'm sure if
65 it was a presentation that was given to the Board, the
66 Board may be able to provide it as well, and we can
67 certainly check our records for that presentation, and
68 there's also a ...
- 69 MR. NOSEWORTHY, CHAIRMAN: We will as well.
- 70 MS. GREENE, Q.C.: And there would be a transcript of that
71 meeting.
- 72 MR. NOSEWORTHY, CHAIRMAN: Whoever comes up
73 with it first, I guess.
- 74 MS. GREENE, Q.C.: There also would be a transcript of
75 that meeting that was recorded.
- 76 MS. BUTLER, Q.C.: Hydro's specific plans then to go
77 forward with the RCM program include plans to implement
78 it in your division?
- 79 MR. REEVES: That's correct, yes.
- 80 MS. BUTLER, Q.C.: Okay, now the report we saw was
81 dated March of '99, and it's now 2001, so is there still a
82 study ongoing in terms of the feasibility of RCM or was a
83 final decision made to implement RCM throughout all
84 divisions of Hydro?
- 85 MR. REEVES: What was addressed at that point in time
86 was only in TRO.
- 87 MS. BUTLER, Q.C.: Okay.
- 88 MR. REEVES: And it was agreed at that time that we would
89 implement within TRO.
- 90 MS. BUTLER, Q.C.: Alright, and no other divisions have

1 all of the units are able to be started from the black
2 start, and we have actually, you know, we do this, we
3 simulate a black start at Holyrood at a number of
4 times, I think it's actually done on each unit yearly.
5 But the specific recommendation asked us to revise the
6 operating instruction. It's actually system operating
7 instruction T022, and I have copies here if the Board
8 would like to have them, to show you that, in fact, we
9 have revised this, this operating instruction for our
10 operations, and it sets out the steps that we go through
11 if we encounter such a situation again where the two
12 systems, i.e., the Avalon system, is separated or
13 isolated from the rest of the island generation and we
14 have an outage on the Avalon and we have to start to
15 rebuild the system without assistance from Bay
16 d'Espoir generation, and that's what this procedure
17 attempts to set out, to try and assure a more rapid
18 restoration of service. That's essentially what it is ...
19 and there are copies here which the Board members
20 may like to have.

21 One of the things that we had mentioned to
22 QUETTA and to the Board, I think at a subsequent
23 meeting after the QUETTA Report, was that we had
24 intended to change the governors (*phonetic*) on unit
25 one and unit two, such that they could be, that they
26 could pick up load from a black start condition, and in
27 fact, we have changed the governor on unit number
28 two at Holyrood last year, and that really is what
29 triggered the timing for this revised operating
30 instruction. They said to us, once you get a unit done,
31 modified, then you should revise your operating
32 instruction, and that unit actually was installed, the
33 new governor, was last November, and we are
34 proposing to do unit one next year in 2001. So I'm
35 not sure if the Board ... I don't think it would serve
36 much purpose to go through the steps, step-by-step in
37 this thing. This is fairly technical, so this has been
38 done. Newfoundland Power are aware of it as well,
39 and our operators.

40 MS. WHALEN, ACTING CHAIRPERSON: Thank
41 you.

42 [Agenda Item 2(ii)]

43 MS. GREENE, Q.C.: So the next item then that we'd
44 like to address today from the QUETTA Report is the
45 RCM Pilot that had been referred to in the QUETTA
46 Report. We have completed the pilot and Tom
47 Vatcher, as Director of TRO, will now review with
48 the Board the information from the pilot.

49 MR. VATCHER: Okay, what you have in front of
50 you is a ... it's about, it's 12 slides and it's meant as
51 a, as an overview of the RCM initiative that we've
52 embarked upon. I want to give you a little bit of
53 history of RCM and then get into a short overview of
54 the RCM initiative that we're doing within TRO.

55 Starting with the question of is RCM new, the
56 answer is no. It goes back to the 1960's. It had its
57 birth in the airline industry, and at the time when the
58 wide bodied jets came out, and a new system was
59 required in order to be able to keep the traditional
60 maintenance costs down, so that this type of airplane
61 could be competitive in the market. In the nineties
62 this concept was modified and utilities started to adopt,
63 and the nuclear industry were the first, followed by
64 the more traditional electricity producers.

65 It migrated from the airline industry into the
66 utilities, and we look in Canada today, utilities that are
67 very involved in this, and then given the technical
68 papers to either the Canadian Electrical Association or
69 consultants like the Electrical Utility Consultants
70 Conference held in Denver, Colorado each year ... or
71 BC Hydro, Ontario Hydro, Trans Alta Utilities in
72 Alberta, Hydro Quebec, and other utilities that are
73 involved, of course, are a number of US utilities that
74 are involved, which I am, I can't give you the list here
75 today, but I could if you were to request it.

76 I'd like to make it clear that RCM is
77 essentially a maintenance philosophy, as any
78 maintenance philosophy is. I mean traditionally we've
79 taken the OEM Manual from the manufacturer.
80 We've taken the manufacturer's recommendations.
81 We have incorporated that into, into a PM program,
82 and we're essentially now in industry, in phase three
83 of the evolution from what we had back in the very
84 early years before World War II, which was a highly
85 mechanized industry, a lot of safety into designs and
86 really reliability was not that important. As the World
87 War II came on, of course, there was a demand for
88 goods, the complex systems came in, and then there
89 was a requirement for a different approach to
90 maintaining equipment, and of course, that's the onset
91 of the preventative maintenance program, as we know
92 it today. But then in the mid-seventies, with
93 automation and so on, and computer-aided design,
94 there was ... we didn't have as much built-in safety
95 factors as we did earlier. The standards were
96 changing with respect to the quality of service and
97 reliability that customers wanted, so there was a

1 demand for a different system, hence the reason why
2 the utilities are starting to go with the RCM approach.

3 RCM is nothing more than reviewing your
4 maintenance program but as with the safety program
5 we talked about earlier, there are certain programs
6 that have an approach or a philosophy that is
7 international, and it has been developed through a
8 need, and it makes sense. You don't have to go and
9 re-invent the wheel again, and I think that's what
10 we've found in Hydro that as we, as we saw the need
11 to review our, our maintenance program, we put a
12 group together to research what type of philosophies
13 were available out there, and we did that with our
14 operating people and engineering people, and of
15 course we came back with a recommendation of the
16 RCM program. So it's a proven concept essentially.
17 It is sound, it's consistent, and well documented. It's
18 certainly an effective approach optimizing equipment
19 maintenance activities.

20 With RCM, of course, the equipment
21 maintenance is performed to maintain the function of
22 the system, and not just to maintain the equipment. In
23 the traditional maintenance program, you use the
24 OEM Manual to maintain your piece of equipment
25 essentially. There is a danger to that, and I want to go
26 to this, these next two slides, starting with slide
27 number four, just to emphasize that point. We're
28 looking at a failure here, which is essentially system
29 versus equipment, and if you'll notice, we've got, on
30 the left hand side we've got (inaudible) called a
31 transmission line or a feeder or something, and then
32 we come to a breaker into a transformer, and then
33 we've got a load at the end. Our load in this case is
34 20 megawatts, but we're coming through an 18 and 25
35 megawatt transformer ... 18 megawatts without fans,
36 and 25 megawatts with fans. So if we had a
37 transformer cooling fan failure, does our component
38 fail? Yes. Does our system fail? Yes. Because we
39 are, our load is 20 megawatts, and if our fans go
40 down, then we're only capable of producing 18
41 megawatts.

42 If we were to turn the page and with the same
43 system, and we looked at changing that load now from
44 20 megawatts to 16 megawatts, and then we asked the
45 same questions about the, about the system, we have
46 a component failure, yes. Do we have a system
47 failure, no. So essentially then in RCM it's our, the
48 objective is to try to maintain system function. If we
49 have a failure it's the inability of the system to

50 perform its function and not the inability of a piece of
51 equipment. It depends on how that piece of equipment
52 fits into the delivery of that service, whether you're
53 talking about pumping water or you're talking about
54 delivering electricity through a transmission line.

55 So our objective when we review our
56 maintenance program is to try to optimize our
57 maintenance versus the cost of an outage, so there is,
58 there's got to be an optimum point there where we get
59 our maintenance at least cost but still be able to
60 maintain acceptable asset performance. In other
61 words, customer service. So the primary measures of
62 failure when we look at an RCM program is the mean
63 time to failure, and the mean time to repair. Our
64 secondary measures of performance in our
65 maintenance program are the statistics or indices that
66 we report to you here today, such as SAIFI, CAIDI,
67 and SAIDI, which is what the customer sees.

68 So why RCM? It certainly improves the
69 effectiveness of our maintenance spending. We spend
70 the money where it's absolutely necessary. We don't
71 maintain the equipment that doesn't need to be
72 maintained on a frequency that is not required. The
73 other thing about RCM is that it tends to lean towards
74 condition based monitoring and away from preventive
75 maintenance, so instead of using intrusive methods to
76 take your equipment apart to see if you've got a
77 problem inside, you use diagnostic equipment in order
78 to be able to accumulate data on your equipment so
79 that you can get into analysis and try to get into more
80 of a predictive mode, because every time you take
81 your equipment apart and you put it back together
82 again, you essentially start all over again with respect
83 to your initial (inaudible) failure rate.

84 It's certainly a consistent approach that we
85 can apply to all of TRO across our three regions.
86 bring all our areas together using the same thought
87 processes, and identifying maintenance tactics. The
88 templates that we use on a piece of equipment, and
89 we've got two fans, we've got the same fan in the
90 northern region as we do in the central region, and
91 that template ... what we should be doing to maintain
92 that piece of equipment is the same. The thing is that
93 when you analyze your system for its function and
94 how that piece of equipment fits into the system to
95 deliver the product, then that could change from
96 region to region and system to system. It's a living
97 program and it has a continuous feedback loop, as we
98 get failures, or our performance starts to drop off, it

1 feeds back and we pull out our thinking or our logic
2 when we identify that tactic, and we ask the question
3 of why we did it, and whether or not we should have
4 done something different at that time.

5 The history then of what we've gone through,
6 this started back in 1997, and as I said earlier, with
7 the ... when we put a team together to start the
8 research the different philosophies and approaches that
9 were out there to do maintenance, and we identified at
10 that time, of course, the need to do an indepth review
11 of our maintenance program. It's something that's
12 done all the time. Anybody that's got a maintenance
13 program does a certain level of review. But very few
14 companies get into really questioning the philosophy
15 that you've used over the years in coming up with
16 your maintenance tactics, so we added the review of
17 philosophy with that and the theme came back, of
18 course, as I said earlier, with the recommendation for
19 RCM.

20 We then prepared and approved the pilots to
21 go ahead and test the philosophy in our environment.
22 We started those pilots, we completed them in 1999,
23 went forward to the management committee for
24 approval, and then in 2000 we've got our
25 implementation team in place and they're starting to
26 draft the templates for equipment.

27 We chose pilot locations in Rigolet, which is
28 a diesel, an isolated diesel system, and we chose that
29 one because we thought it would be most
30 representative of, of our three regions, and the result
31 of that pilot, we would be able to apply very easily to
32 the other systems. We chose L'anse au Loup as a
33 distribution system, as being representative of our
34 distribution systems across the island and into
35 Labrador. And Come By Chance is a good
36 representation of a thermal station and transmission.
37 So those were the three distinct pilots that we, that we
38 chose and did.

39 They were chosen, as I said, to be
40 representative of the rest of TRO, so the benefits that
41 we saw in the ... when we did the pilots and did the
42 RCM analysis of the equipment and systems there, it
43 was extrapolated to the rest of TRO. The actual
44 payback resulting from RCM full scale implementation
45 may vary a bit from that because of the assumptions
46 that we made. There may be some differences but
47 they should be slight based on our criteria for choosing
48 the pilots up front.

49 So our timeframe to implement this program
50 is anywhere from three to five years, and this is based
51 on the implementation times that other companies have
52 used in implementing the program, and based on our
53 costs that we envisage taking in implementing this
54 program. We see a 1.2 to 2.1 year payback
55 depending on how long it takes us to implement it.

56 So our first build (*phonetic*) is in progress
57 right now which is essentially the, putting the
58 templates in place for equipment, and then after,
59 between 2000 and 2001, we will get into analyzing our
60 systems and then identifying the maintenance tactics
61 that we should have in place. This may be, if we're
62 lucky, be the same as what we've got in place right
63 now. I seem to doubt that it would be because
64 traditionally we tend to stay with a PM program that
65 has worked in the past and we're very reluctant to
66 back off from it so we could end up spending money
67 that we don't need to spend.

68 Our objectives when we started out were to
69 prove the concept of RCM as it applied to our diesel
70 generation, our distribution systems, and our terminal
71 stations and transmission systems, and to do an
72 estimate of the benefit and the time required to
73 implement the program, and at the same time
74 familiarize and get feedback from our employees with
75 respect to this philosophy and concept and to see how
76 well that they could work with it. So that's about it on
77 a very high level overview.

78 MS. WHALEN, ACTING CHAIRPERSON: Is there
79 any ... I mean if other utilities are using RCM as a
80 maintenance philosophy, is there a transfer of, of
81 knowledge that can happen between utilities? You
82 know, if you're drafting templates, do you have to
83 draft new templates for equipment that's in use at
84 Nova Scotia Power or some other utility?

85 MR. VATCHER: At one time, I think that the
86 movement of information between utilities were pretty
87 free, and with deregulation we find it's very difficult
88 to get detailed information from them. What we do do
89 though is that we send people out to RCM conferences
90 such as the one I mentioned in Denver earlier, where
91 they rub shoulders and elbows with the people who are
92 into the implementation and maintaining of the
93 program, so they learn a lot from that, but it's very
94 difficult to get that type of detail. You've got to work
95 through it yourself.

1 MS. WHALEN, ACTING CHAIRPERSON: So
2 you're starting from scratch?

3 MR. VATCHER: We're not really, we're starting
4 from scratch when it comes to building the template,
5 yes, but we did retain PSS, Power Systems Solutions,
6 which is an RCM consultant out of Calgary, Alberta,
7 so we're building on a lot of their experience with
8 respect to implementing other RCM programs in other
9 companies.

10 MS. WHALEN, ACTING CHAIRPERSON: Is it, do
11 you have any knowledge as to whether ... I mean I say
12 this will be the case, but other utilities have
13 recognized a decrease in their maintenance costs as a
14 result of implementing this RCM ...

15 MR. VATCHER: The RCM approach is fairly new
16 within utilities so they, as we did, started with the
17 pilot programs, and from the pilot programs
18 recognized the potential for significant savings and
19 implemented across, some of them more aggressive
20 than others.

21 MS. WHALEN, ACTING CHAIRPERSON: Uh
22 hum.

23 MR. VATCHER: But there is no question about it
24 that there is a definite opportunity here to maintain the
25 equipment at the desired level of performance and at
26 the same time be able to reduce the cost of doing that.

27 MS. WHALEN, ACTING CHAIRPERSON:
28 Commission Crosbie, do you have any questions?

29 COMMISSIONER CROSBIE: No.

30 MS. WHALEN, ACTING CHAIRPERSON:
31 Commissioner Saunders?

32 COMMISSIONER SAUNDERS: No, nice to hear.

33 *[Agenda Item 2(iii)]*

34 MS. GREENE, Q.C.: Okay, the next item then on
35 the agenda is the Nain Diesel Plant Update, which will
36 be a verbal update by Dave Reeves.

37 MR. REEVES: In the QUETTA Report, there was
38 some comments on, I guess, the performance of our
39 Nain plant, basically in 1996 and '97, and the
40 recommendation, I guess, was that we would perform

41 maintenance audits on an individual diesel plant basis.
42 We looked at that recommendation and what we
43 thought would be probably more appropriate to do
44 would be to do them on the business asset basis and
45 Mr. Wells will be going through that in a second. In
46 response, in our responses to the Board, and yours
47 back to us, you also asked us to give you an update as
48 to what, what has transpired in Nain since 1996 and
49 '97, which I plan to do right now. Yes, in 1996 and
50 '97, we did have some reliability problems with a
51 couple of our units, and it caused quite a number of
52 outages, more than we would normally expect for a
53 diesel system. Resulting from that, in 1998 we
54 installed two new units, one that we bought as a brand
55 new unit, and another one that we had leased, and we
56 bought it as a lease purchase and did some work on
57 that, and moved those into Nain in 1998.

58 In 1997, just to give you some statistics in
59 regard to our interruptions, we had 20. In 1998 we
60 had 27. We had a couple of extra ones in 1998,
61 primarily we had a problem with the leased unit that
62 required it to be rewired, which we did, but in 1999
63 we've had a significant increase, or decrease in that
64 we've only had 16. So there is an improvement to our
65 service in Nain.

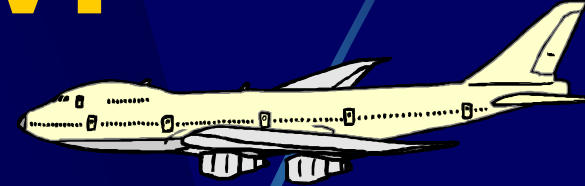
66 We see as a long term solution for the
67 problems in Nain a new powerhouse, and in our 1999
68 capital plan we brought forward the design
69 construction of a new powerhouse and as I reported to
70 you, I guess, last fall, during our capital plan, when
71 we were giving you an update on that work, we did
72 apply for environmental approval to develop that, and
73 we talked to the counsel up there, and the counsel had
74 a number of concerns which took about a year to
75 resolve and it's only within the last month or so that
76 we got resolution from the town council. They have
77 now released the project for us to begin and with some
78 conditions. We feel that we can meet the conditions.
79 However, we are currently waiting for the
80 environmental approval, which we anticipate that we
81 will receive shortly. Following that, we will be going
82 to tender for a design build (*phonetic*) plant, and this
83 is the first time that we'll be actually doing that. We
84 will be getting the outside party to actually design our
85 plant for us. We're hoping to take advantage of their
86 technology along with what we know, to build a very
87 good plant for Nain. So we anticipate on the current
88 schedule that we should be able to complete the new
89 plant for Nain by the next, late next year, which is our
90 current, in our current capital plan.



Maintenance Program Review Using The Reliability Centered Maintenance (RCM) Process

A Presentation to the Public Utilities Board

Is RCM New?



- RCM was developed in the 60's by the airline industry that needed to trim maintenance requirements
- In the 90's the concept was modified and adopted by electrical power utilities
- By now, most Canadian Utilities are adopting the RCM concept for their maintenance optimization efforts



What is RCM?

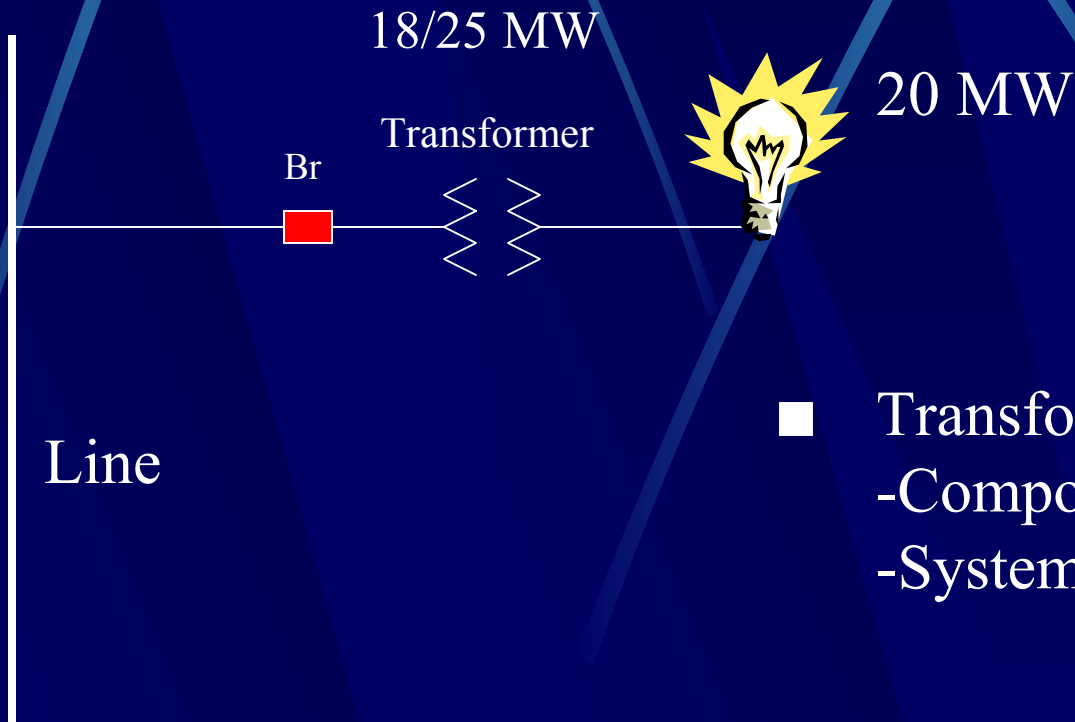


- RCM is a proven concept with a sound, consistent, well documented and effective approach to optimizing equipment maintenance activities
- Under RCM, equipment maintenance is performed to maintain power system functions

(and not to preserve equipment at any cost)

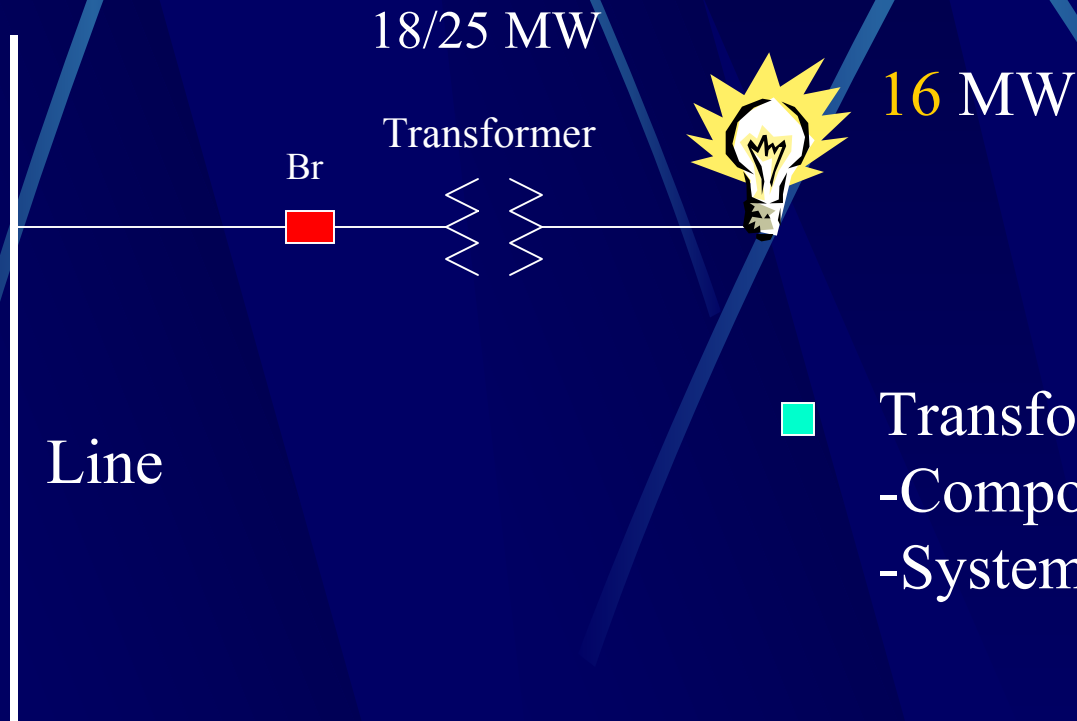


Failure – System vs. Equipment



- Transformer cooling fails:
 - Component failure YES
 - System failure YES

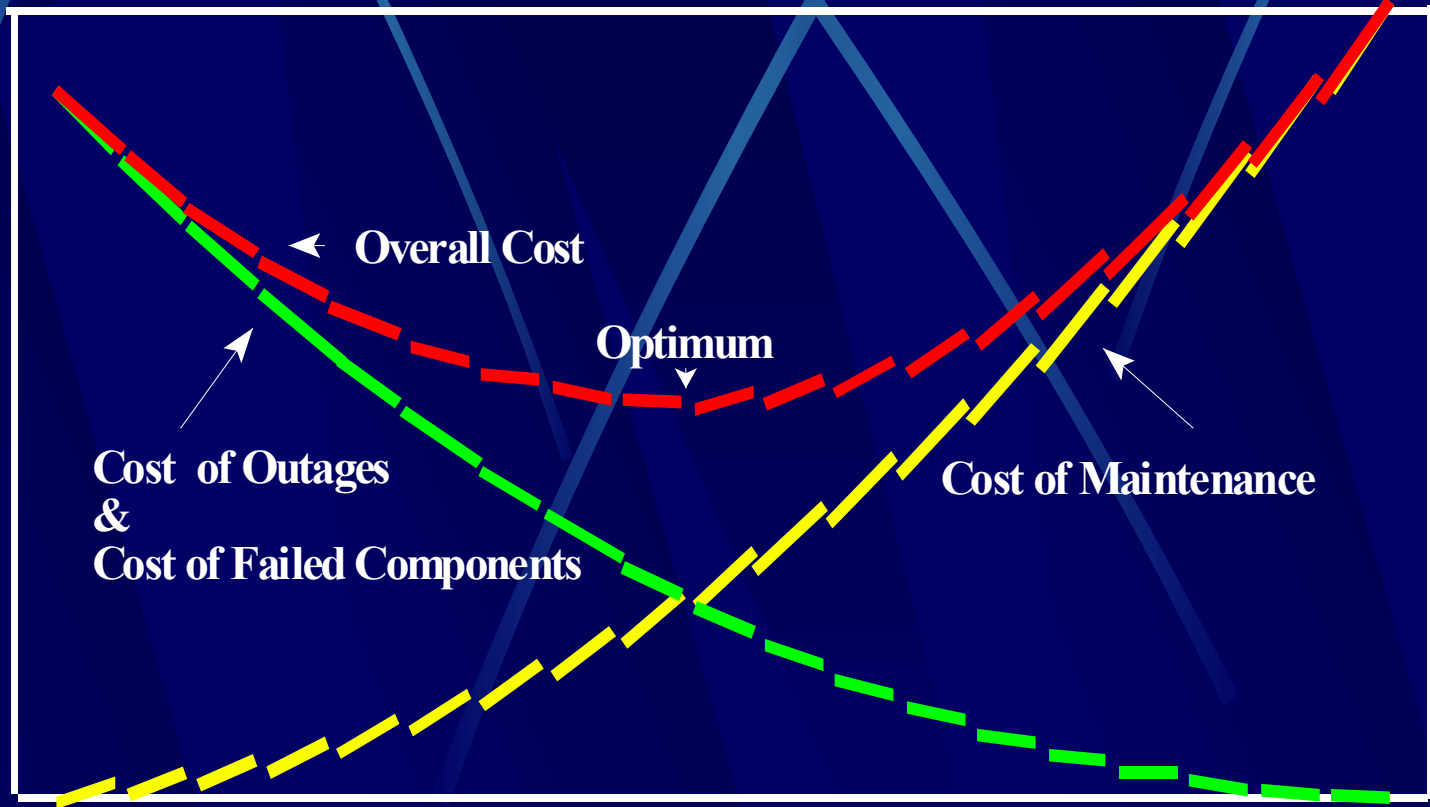
Failure – System vs. Equipment



- Transformer cooling fails:
 - Component failure YES
 - System failure NO

Optimizing Inspection and Maintenance Intervals

Cost



Level of Maintenance

Why RCM?



- **To improve effectiveness of our maintenance spending**
- **To determine the appropriate level of maintenance spending**
- **To have a consistent, accepted and well documented justification for maintenance spending**
- **To have a continuous (“Living”) program**

History



1997

1998

1999

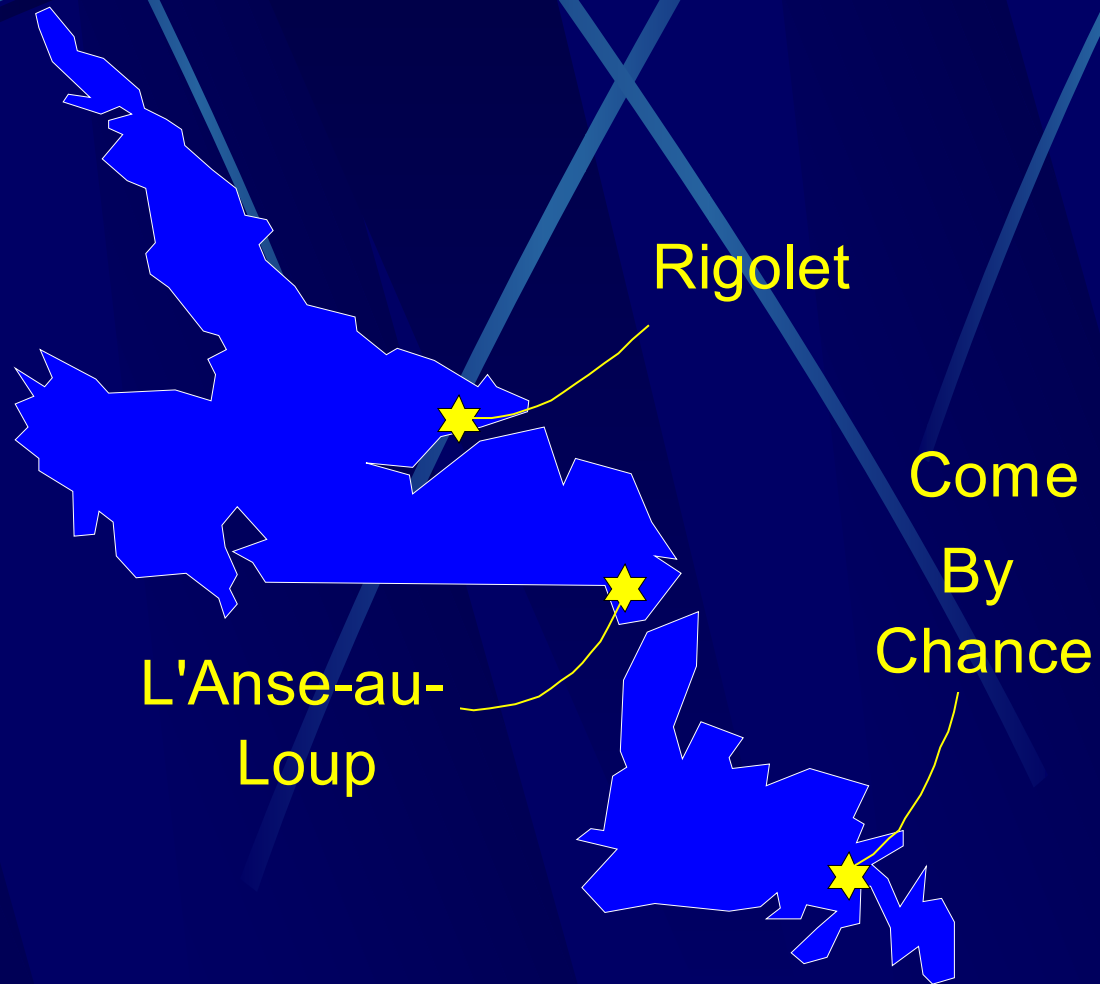
2000



2004

- ★ Identified need to review maintenance strategies
 - ★ Selected RCM
 - ★ Prepared and approved the pilots
 - ★ Started Pilots
 - ★ Pilots completion
 - ★ Implementation

Pilot Projects



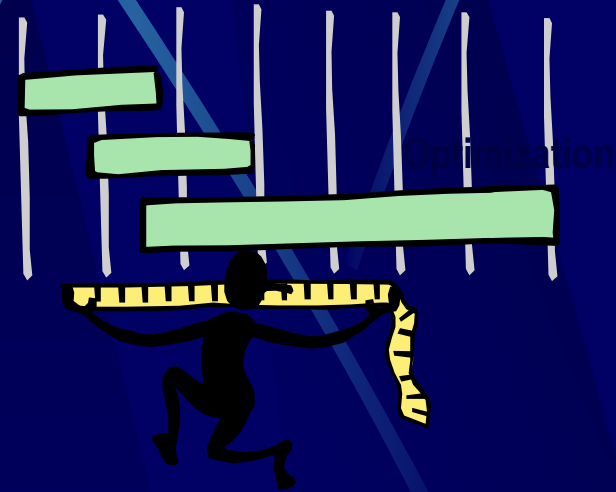
Pilot Projects - Assumptions



- Pilot project sites were chosen to be representative of the rest of TRO
- The benefits are extrapolated from the pilot sites to the rest of TRO
- The actual payback resulting from RCM full scale implementation may differ

Implementation/Payback

- Time frame: 3 to 5 years
- Payback: 1.2 – 2.1 yrs



Objectives Achieved From Pilot Projects



- To prove the concept of RCM as it applies to
 - Diesel generation
 - Distribution
 - Terminal stations and transmission
- To estimate the benefit and time requirement for full scale implementation
- To familiarize employees with the concept of RCM