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LTR 1 ENCL 1

ATT COMPLETED COPY OF QUESTIONNAIRE CONCERNING THE EMERGENCY DIESEL
GENERATORS TO SUPPL PREVIOUS INPUT DTD 01/20/78.

PLANT NAME: NINE MILE PT - UNIT 1

REVIEWER INITIAL: XBT
DISTRIBUTOR INITIAL:

***** DISTRIBUTION OF THIS MATERIAL IS AS FOLLOWS *****

RELIABILITY OF STANDBY DIESEL GENERATOR UNITS.
(DISTRIBUTION CODE A014)

FOR ACTION: BR CHIEF LEAR**W/3 ENCL

INTERNAL:

REG FILE**W/ENCL
I&E**W/2 ENCL
HANAUER**W/ENCL
F CLEMENSON**W/ENCL

NRC PDR**W/ENCL
OELD**W/ENCL
F ROSA**W/ENCL
DIS SER BR-MC**W/ENCL

EXTERNAL:

LPDR'S
OSWEGO, NY**W/ENCL
TIC**W/ENCL
NSIC**W/ENCL
ACRS CAT B**W/10 ENCL

DISTRIBUTION: LTR 25 ENCL 25
SIZE: 23P

CONTROL NBR: 780520308

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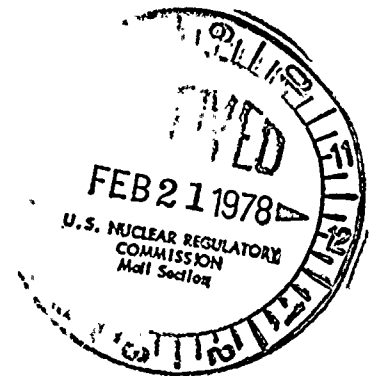


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February 14, 1978

Director of Nuclear Reactor Regulation
Attn: Mr. Karl R. Goller
Assistant Director of Operating Reactors
Division of Operating Reactors
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555



Re: Nine Mile Point Unit 1
Docket No. 50-220
DPR-63

Gentlemen:

Our letter of January 20, 1978 submitted a partially-completed questionnaire concerning the emergency diesel generators at Nine Mile Point Unit 1. Attached is a completed copy of that questionnaire. Changes and additions are denoted by vertical marginal markings.

Please contact Mr. W. R. D'Angelo should further information regarding this questionnaire be desired.

Very truly yours,

NIAGARA MOHAWK POWER CORPORATION

Donald P. Dise

Donald P. Dise
Vice President-Engineering

MGM/szd

Attachment

780520308

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Questionnaire

for

NUCLEAR REGULATORY COMMISSION
RELIABILITY STUDY

of

Standby Diesel Generator Units

Date Questionnaire Completed: February 7, 1978

Plant Name: Nine Mile Point Unit No. 1

Diesel Manufacturer: Electro-Motive Model: 20-645-E4

Number of Units: 2

Size Kw/Unit: 2560 KW @ .8 PF Rated Speed: 900 RPM

Average Operating Hours Per Unit to Date: 510 hours

DIESEL GENERATOR STATUS

A. Engine:

1. Problems are caused chiefly by (give estimated number)

- a. Defective parts X (10)
- b. Installation errors: _____
- c. Failure of system to respond properly in function or sequence: _____
- d. Faulty adjustment: _____

2. Would more stringent inspection and testing requirements during acceptance or preoperational tests significantly improve the diesel-generator power plant performance?
Yes _____ No X

B. Starting Systems (indicate which):

- 1. Air-to-cylinder cranking. _____
- Air cranking motor X Mfr. Ingersoll Rand Model No. D89RH-46
- Electric cranking motor _____ Mfr. _____ Model No. _____



2. If air cranking, then:

Give size of starting air tank: Length 84" Diameter 24"

Normal standby air tank pressure 220 psi.

Is pressure reducer used? Yes X No

Reducer pipe size? 1.5 inches.

Starting air control admission valve pipe size in air piping system, 1.5 inches.

Minimum air tank pressure for engine cranking 175 psi.

Number of five-second cranking periods between above pressures with no tank recharging 5.

Number of air tanks per engine 5.

Can starting air tanks serve more than one engine?

Yes No X

Is air pipe to engine from top of air tank? Yes X No

Does starting air tank have water condensate drain?

Yes X No

Does starting air pipe have water condensate trap and drain near engine? Yes X No

Is starting air piping horizontal? Yes X No

Does it slant toward drain? Yes No X*

If water condensate drains are provided, then is draining:

a. Automatic through float valve? Yes No X

b. Manual by hand valve? Yes X No

c. If manual, then is draining water condensate done:

*Drops vertically 3' to air starting motors.



daily? _____
weekly? X
monthly? _____
before each start if manual? _____
no procedure? _____

Is dirt and rust filter provided in starting air pipe?
Yes X No _____

If provided, where installed? At the suction end of the air
motors.

How is it cleaned? Air blow off

How often and when? Upon routine check

Give pipe size of filter: 1.5 inches.

How is it known whether filter is plugged or has high pressure drop? low air pressure to starting motors.

Is starting air pipe to engine positioned:

- a. Below floor? _____
- b. On the floor? _____
- c. Overhead? X

What is air pressure drop from air tank to engine during cranking 15 psi

Give approximate length (nearest ten feet) of starting air pipe for individual engine or all engines from air tank to:

- a. Nearest engine 30 feet
- b. Furthest engine 30 feet



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Diameter of starting air pipe from:

- a. Air tank to starting valve 1.5 inches
- b. At air starting valve 1.5 inches
- c. At engine 1.5 inches

What is the primary source of power for the starting air system? 600 volt A.C. supply to motor driven comp.

Is there a duplicate and redundant motor and air compressor set? Yes X No

What is the time required to recharge one air tank?
less than 30 minutes

Does starting air supply system have independent secondary power supply for compressor? Yes No X

If yes, then by:

- a. Gasoline engine?
- b. Motor driven?
- c. Other? (Specify)

3. If electric (Battery powered) cranking, then: N.A.

a. Battery charging: Continuous trickle charger
Intermittent charging

If so, how is charging requirement determined?

Time cycle
Test
Other

b. Battery used: Common Plant
Individual Unit
Other

Starting cable size ; Length: Battery to engine
(longest)



C. Fuel Oil System: Bulk Tank to Day Tank

1. Does the bulk tank to day tank fuel supply system (viz: pump, motor, etc.) have redundant independent power supplies? Yes No

Does this system have a hand-operated emergency fuel pump? Yes No

If yes, is this hand-operated pump and piping in immediate operating condition? Yes No

2. Is there a water and sediment drain from the very bottom of the:

a. Bulk tank? Yes No
b. Day tank? Yes No

3. Is the regular functional fuel oil outlet slightly above (two to three inches) the bottom of the:

a. Bulk tank? Yes No
b. Day or integral tank? Yes No

4. Is bottom of day tank and/or integral tank above all parts and piping of the engine fuel injection systems?
Yes No

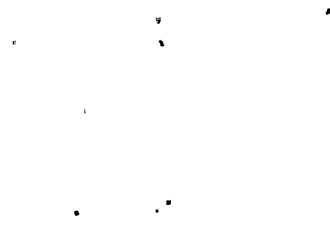
If yes,

Give approximate amount inches feet

5. Does the engine fuel system have a fuel bleed return line to the fuel day tank and/or integral tank?
Yes No

During extended operation, such as more than two to three hours, does the fuel in the day tank become: (yes or no)

a. Warm?
b. Hot? (above 130°F)



What is fuel oil return line size (nominal)?

- a. Pipe size .75 inches
- b. Tubing size inches

6. Do engine fuel oil filters have air bleed or vent valves readily accessible? Yes No X

7. How is fuel transferred from day tank to engine fuel system?

- a. By gravity
- b. Engine driven pump X
- c. Electric motor driven pump X
- d. Is a manual pump also provided for injection system filling and/or air venting after servicing or replacement of parts in the fuel injection system? Yes No X

If yes, is the manual pump in immediate operating condition?
Yes No

8. Type of fuel (e.g., #1, #2, #3, JP-4, etc.) #2

9. Approximate bulk tank capacity, 10,000 gallons.

10. Typical frequency of refilling (weekly, monthly, etc.) twice/year

11. Typical refill (gallons), 4000 approximately

D. Lube Oil System

1. Lube oil

- a. Type Mobil Guard 440
- b. Viscosity SAE 40
- c. Specification number ASTM-1000
- d. Oil change determined by:

Time interval: Yes No X

Give interval N.A. monthly, yearly

By oil analysis: Yes X No



2. Lube oil filters are:

- a. Full flow X
- b. Bypass
- c. Combination

3. Interval and/or basis for changing filter cartridge:

- a. Monthly
- b. Yearly X
- c. By running time hours
- d. By oil analysis. Yes No
- e. By pressure drop. Yes No
- f. Does provisions exist for changing cartridges during engine operation? Yes No X

4. Oil Pressure Monitoring

- a. Normal operating pressure 55 psi
- b. Alarm 43 psi
- c. Shutdown 17 psi

5. Oil temperature control:

- a. By standby heater in engine sump 120 °F.
- b. Heating means for maintaining standby temperature:

Direct in oil
Oil-to-water heat exchanger X
Other (Specify)

E. Cooling System - Engine Water

1. Temperature control by:

- a. By thermostat in water? Yes X No

If yes, then:

Bypass thermostat? Yes X No
Throttle thermostat? Yes No



b. By radiator shutter: N.A.

Automatic _____
Manual _____
Other (give type) _____

2. Corrosion control (water additive)? Yes X No _____

If yes, give chemical additive or name of compound.

Sodium Chromate (Na₂ Cr O₄)

Proportion or concentration control:

a. By additive measurement? Yes _____ No X

b. By water coolant analysis? Yes X No _____

3. Engine cooling water cooled by:

a. Radiator? No

b. Heat exchanger from sea, river or other water? X

c. Other? (give type) _____

4. Engine cooling water temperature-monitoring

a. Standby temperature 120 °F

b. Normal operating temperature 155 °F

c. Alarm temperature 195 °F

d. Shutdown temperature N.A. °F

e. Water circulation during standby:

Thermo-syphon X

Pump _____

5. Water Pressure Monitoring: Yes X No _____

a. Alarm N.A.

b. Shutdown 35 psig falling

c. Both _____



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6. Water temperature Sensor Position:

- a. In piping from engine _____
- b. In engine piping X
- c. In engine direct _____

7. Water surge or supply tank in system. Yes X No _____

If yes, then bottom connected to:

- a. Water pump suction? Yes X No _____
- b. Top of system? Yes X No _____
- c. Both of above? Yes X No _____
- d. Is bottom of surge tank above top of engine system? Yes X No _____
- e. Does engine have constant air bleed from top of engine water piping to surge or supply tank? Yes X No _____
- f. Give size of bleed or vent line, 1 inches.
- g. Manual air bleed only? Yes _____ No X

F. Governor - Speed Control

Manufacturer Woodward

Electric (speed sensing) _____

Hydraulic X

Type or code (such as EGB-35, LSG-10, etc.) UG8

Automatic load sharing? Yes X No _____

1. Is compensation or stability control and/or speed of response manually adjustable? Yes X No _____

If yes, adjusted by:

- a. Eye and ear?
- b. Test and specification? X
- c. Other? (Specify) _____

2. Engine - generator normal shutdown or stopping means and method.



Is the engine stopped:

a. Manually? Yes ___ No X*

If yes, then:

Directly at engine? Yes ___ No ___
Through local control panel? Yes ___ No ___

b. Automatically through the controls in the control room? Yes X No ___

c. By setting governor to "fuel-off" position? Yes ___ No X

d. By over-ride of governor settings and control position directly to fuel injection pumps? Yes ___ No X

e. Other means. Describe briefly. _____

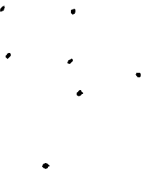
3. When engine is stopped, is fuel control in:

- a. Full fuel or maximum fuel position? Yes
- b. Full off or no fuel position? No
- c. Intermediate? No
- d. Random? No

(If not consistent and typical in above, then give the usual.)

4. When starting from the standby condition after shutdown for at least 24 hours, give number of seconds from start-to-crank to full fuel or maximum fuel position of governor and fuel control, 10 seconds.

*Normally it started and stopped from the Control Room.



G. Governor - Overspeed (shutdown)

1. Speed sensing?

- a. Electrical _____
- b. Flyball X
- c. Other (Specify) _____

2. Fuel shutoff force generated by:

- a. Spring? X
- b. Air? _____
- c. Hydraulic? _____
- d. Electrical? X
- e. Other? (Specify) _____

3. Overspeed sensing setting? (in terms of full speed).

- a. 115% _____
- b. 110% _____
- c. Other (Specify) 118%

4. Is overspeed tripping set point tested periodically?
Yes X No _____

If yes, then how often? yearly (yearly, monthly, etc.)

H. 1. Generator Mfr. Electro Motive Model No. A-20-C1
Single bearing or two bearings? Single Bearing
Does generator have damper windings? Yes X No _____

2. Does generator have any obvious fault or difficulty?
Yes _____ No X

Is problem repetitive? Yes _____ No _____

If yes, then describe briefly. _____



I. Exciter and Voltage Regulator

1. Exciter Manufacturer: Vickers Model _____

Type: Rotating _____ Static X

If rotating drive? Direct _____
Belt or Chain _____
DC with field control _____
Brushless with rectifier _____

2. Voltage Regulator: Manufacturer Vickers Model 35D870-2

Type: Mechanical _____ Static X

3. Are paralleled units of automatic load sharing control of fully automatic type? Yes _____ No X
We do not parallel the diesel generators
If yes, has any obvious influence or interrelationship been noted between the stability and response time of the engine governor and the stability and voltage control of the generators? Yes _____ No _____

4. Have engine governor and voltage regulator/exciter adjustments been made on the site or under any conditions since any of the units have been placed in service? Yes _____ No X

If yes, by means of what tests and what standards? Give name or very brief description. _____

5. If any difficulties have occurred, give approximate number of problems. No Difficulties

- a. Components _____
- b. Wiring _____
- c. Other (damage in service or dropping of miscellaneous hardware into switchboard, etc.) _____



J. Paralleling: Engine-Generator Units See I.3.

1. Do all units consistently have the proper voltage output?
Yes No
2. Do all units automatically share both the "real" or in-phase load and also the reactive load reasonably well? Yes No
3. At the same Kw load, are both the field and the armature line currents of the several units consistently close to the same value? Yes No

If no, approximate percent difference. _____

4. Synchronizing

- a. In automatic synchronizing do circuit breakers close immediately after reaching full synchronous speed?
Yes No
- b. If "no" above then, does speed of some units drift slowly while failing to synchronize and close circuit breakers?

How many seconds? _____

Occasionally _____

Always _____

Never _____

K. Switch Gear and Electrical Con (other than exciter/
voltage regulator)

1. If any difficulties have occurred, then give approximate number of problems. No Difficulties
 - a. Components _____
 - b. Wiring _____
 - c. Other (damage in service or dropping of miscellaneous hardware into switchboard, etc.) _____
 - d. Design concept faults. That is, does the switch gear and its controls perform the proper functions and in proper sequence and timing. _____

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2. a. Do the on-site diesel generator units and related support equipment have any storage battery power systems for any service whatsoever? Yes X No
- b. Identify each storage battery power system associated with the on-site diesel generator unit and its function. Two 125 V.D.C. station batteries

- c. Does each system identified above adequately fulfill the service requirements for which it is intended? Yes X No
If no, briefly describe. _____

- d. Is there a -DG battery maintenance program? Yes X No
station

L. Safety Shut downs

Give safety shut down settings compared to equilibrium operating conditions.

1. Engine and generator speed. Give rpm or hertz:
- a. Synchronous and usual 900 rpm or 60 Hz
b. Overspeed shutdown setting 1060 rpm or Hz
2. Engine cooling water (see E.4)
- a. Equilibrium 155 °F
b. Alarm 195 °F
c. Shut down No Trip °F
3. Lube oil pressure (see D.4)
- a. Equilibrium 55 psi
b. Alarm 43 psi
c. Shut down 17 psi

4. Lube oil temperature

- a. Equilibrium 150 °F
- b. Alarm 52 °F
- c. Shutdown No Trip °F

5. Indicate all other protective interlocks (give name and;)

- a. Usual or proper condition Low water pressure
switch, closes 45 psig rising pressure, generator
lock relay.
- b. Shutdown condition opens 35 psig. Falling
pressure, generator lockout relay operated.

6. a. What source of power is provided to operate alarms and shutdown controls? (See G.2) 125 V.D.C.

- b. Do the generator units automatically shutdown in case of the electrical power loss to its control system? Yes X No

M. Emergency or Alert Conditions

1. Are all safety shutdown and safety interlocks bypassed during emergency conditions? Yes No X

2. If "no" above, then which are not bypassed. Name items.

low water pressure switch*, bearing oil pressure switch,*
overspeed switch*. The differential relay and direction ground relay
are not bypassed.

3. For each interlock not bypassed is coincident logic used? Yes No X

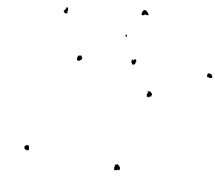
If yes, is it testable? Yes No

N. Maintenance

1. Does plant have regularly scheduled maintenance procedures? Yes

If so, return copy of these procedures with questionnaire.
Request procedure NI-PM-C6 from Nine Mile Point, T. J. Perkins-Superintendent.

*These are bypassed for 2 minutes under emergency starting conditions.



2. When need for minor adjustments obviously exists, then:

- a. Is remedial action taken immediately or at earliest practical opportunity? Yes X No
- b. Is remedial action taken only at periodic prescheduled or programmed times and conditions? Yes No X
- c. For best performance record which of above appears better:
immediate or early action? X
as scheduled only?
- d. Must permission for minor maintenance be obtained from some higher out-of-plant authority? Yes No X
- e. Is maintenance referred to above allowed and encouraged? Yes X No
- f. In periodic surveillance tests, simulated alert standby tests, etc., is the criteria "pass/not pass" the test used? Yes X No
- g. Is there a conscious continuing policy to detect and remedy marginal conditions or imminent trouble: for examples: lube oil pressure shutdown only two to five psi below operating pressure or, perhaps overspeed governor setting only one or two percent above starting speed surge or etc.? Yes X No
- h. Are efforts to remedy marginal or questionable conditions as mentioned above encouraged by plant management?
Yes X No
- i. Are remedial steps on items similar to the above taken or allowed when the unit has started and operated satisfactorily within specified limits or conditions? Yes X No

0. Starting Conditions

1. Give starting or necessary cranking time as experienced.

- a. Starting time per specification 10 seconds
- b. Usual starting time 5 seconds
- c. Maximum starting time observed 8 seconds



2. Give usual time intervals as follows:

- a. Time from start-to-crank to first firing of any cylinder. 3 seconds
- b. Time from start-to-crank to approximate full firing of all cylinders. 5 seconds

*3. Give maximum speed surge when starting; use both tachometer and frequency meter if possible.

- a. Usual conditions _____ rpm
- b. Maximum observed _____ Hz
- _____ rpm
- _____ Hz

*4. During a surveillance test, give time from start-to-crank to when steady synchronous speed is attained and maintained.

- a. Usual _____ seconds
- b. Maximum _____ seconds
- c. As specified _____ seconds.

5. Give briefly the most troublesome problems in starting.
No problems in starting.

- a. Most troublesome _____.
- b. Next to most troublesome _____.

P. Air Cleaner or Air Filter - Combustion Air

1. Combustion air source: taken from engine room or inside the building, or from outdoors?

- a. Indoors _____
- b. Outdoors X

*This information is not obtained during surveillance testing.



2. Give type and make of air cleaners or air filters:

- a. Oil bath Make Electro Motive
- b. Oil wetted screen _____ Make _____
- c. Paper _____ Make _____
- d. Other _____ Make _____
- e. Precleaner: Yes _____ No _____

3. Excessive air flow restriction and servicing need determined by?

a. Instrument such as:

manometer
If other give type _____

- b. Personal judgement by appearance, etc.
- c. By smoking exhaust _____
- d. Time schedule _____
- e. Other (Specify) _____

4. Are climatic extremes normally experienced such as:

- a. Air heavily loaded with water mist, high humidity and low temperature? Yes _____ No
- b. Blowing sand and dust? Yes _____ No
- c. Blowing snow (blizzards)? Yes No _____
- d. Other-Name _____

5. Are climatic extremes potentially possible such as:

- a. Air heavily loaded with water mist, high humidity and low temperature? Yes _____ No
- b. Blowing sand and dust? Yes _____ No
- c. Blowing snow (blizzards)? Yes No _____
- d. Other-Name _____

Q. Temperature Conditions

- 1. Ambient outside hottest 100 °F.
- 2. Ambient outside coldest -30 °F.
- 3. Engine-generator room hottest 100 °F.
- 4. Engine-generator room coldest 50 °F.
- 5. Inside switch gear hottest 100
- 6. Inside voltage regulator or ambient near voltage regulator hottest 100 °F
- 7. Ambient at exciter hottest 100 °F



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R. Operator Qualifications (as presently exists, and suggested minimums if different)

1. Minimum education required (check)

	<u>Existing</u>	<u>Suggested</u>
a. High School	<u>X</u>	<u> </u>
b. Trade School	<u> </u>	<u> </u>
c. Technical School	<u> </u>	<u> </u>
d. No minimum	<u> </u>	<u> </u>

2. Minimum Years of operating experience (diesel electric generator)

	<u>Existing</u>	<u>Suggested</u>
a. 0-3	<u>X</u>	<u> </u>
b. 3-6	<u> </u>	<u> </u>
c. 6-10	<u> </u>	<u> </u>
d. 10-15	<u> </u>	<u> </u>

3. Operator training

	<u>Existing</u>	<u>Suggested</u>
a. Military	<u>X</u>	<u> </u>
b. Industrial	<u> </u>	<u> </u>
c. On-the-job	<u>X</u>	<u> </u>
d. Combination of a, b, and c. (indicate which)	<u> </u>	<u> </u>

4. Licensing required

	<u>Existing</u>	<u>Suggested</u>
a. State	<u> </u>	<u> </u>
b. Federal	<u> </u>	<u> </u>
c. Utility or self	<u> </u>	<u> </u>
d. None	<u>X</u>	<u> </u>

- S. Are any foreign gases such as propane, freon, halon, carbon dioxide, etc. stored in the: Diesel Engine room?
Yes _____ No X or adjacent buildings? Yes _____ No X

If yes, (other than hand portable fire extinguishers), then identify gases and give approximate tank size.

3

Gases _____	Volume (ft) _____
_____	_____
_____	_____
_____	_____
_____	_____

- T. Does control system automatically bypass, in emergency starting, any engine temporarily out of service for maintenance? Yes _____ No X ; There is only one diesel generator on each emergency bus.

If yes, then how many failures to bypass have occurred?

- U. Does the control system automatically override the test mode under emergency conditions? Yes X No _____

- V. Have repetitive mechanical failures occurred in any component part or subsystem of the engine, generator, or switch gear, etc.?
Yes _____ No X

If yes, then which part or subsystem? _____

How many failures? _____

Give nature of failure. _____

- W. Would periodic (yearly or other) evaluation and/or testing by "outside experts" contribute significantly to the diesel-generator reliability? Yes X No _____

Give brief reasons for the answer. The vendor serviceman is more likely to spot developing troubles. He also has knowledge of current unit problems on similar units.



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- X. 1. Give the accumulated time-load operating record for each diesel-generator unit from installation to the present (Running Hours):

Preoperational test Date 7/69

: Engine : Serial No. :	: Surv. Testing & : Maintenance Hrs. : No Load :	: : Loaded :	: Emergency : and Other : Service Hrs. :	: Total : Hours :
: 102 :	: 20* :	: 200* :	: 290** :	: 510*** :
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2. Surveillance test load (percent of continuous rating) 100

3. Give the projected or planned time-load operation for each diesel-generator unit during the next 12 months.

: Surveillance & : Maintenance Hrs. :	: Emergency : and other : Service Hrs. :	: Total : Hours :
: 1 hr/month : per unit :	: none :	: 24 :

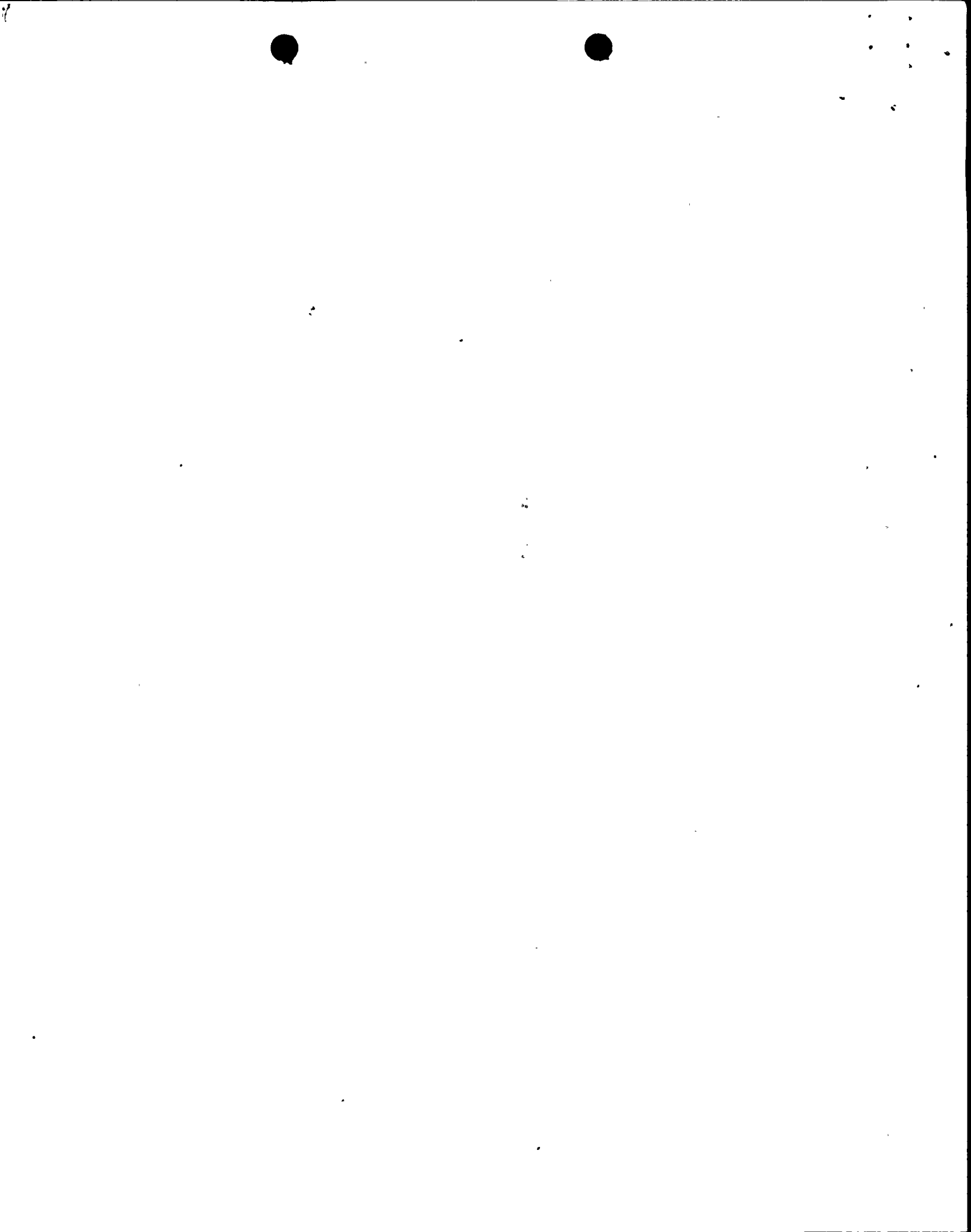
4. Provide the following summary of the periodic surveillance testing experience:

- a. Starting date of surveillance testing (OL date) 8/69
 b. Periodic test interval monthly
 c. Total number of surveillance tests performed 129
 d. Total number of test failures none

failure to start none failure to accept load none
 failure to carry load none failures due to operator error none
 failure due to equipment not being operative during emergency conditions none

- e. Supply a copy of the surveillance test procedures with this completed questionnaire. Request procedures R2 and NL/SI/M4 from Nine Mile Point, T. J. Perkins-Superintendent.

* These are estimated hours.
 ** Units were used for peaking prior to operation.
 *** Actual elapsed times.



Additional Comments

none

Y. General Suggestions

Briefly give constructive criticism or suggestions as to improvement in reliability of the diesel generators. These remarks may cover tests, maintenance, practices, orders, policy, adjustments, etc.

none

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