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Constellation Generation Group
Nine Mile Point Nuclear Station

October 7, 2002
NMP1L 1692

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: Nine Mile Point Unit 1
Docket No. 50-220
Request for Additional Information (RAI) - Amendment Application Re: Diesel Generator Allowed Outage Time (TAC NO. MB4612)

Gentlemen:

By letter NMP1L 1656, dated March 27, 2002, Nine Mile Point Nuclear Station, LLC, (NMPNS) transmitted an application for amendment to the Nine Mile Point Unit 1 (NMP1) Technical Specifications (TSs). The proposed amendment would revise Specification 3.6.3.c to extend the allowed outage time (AOT) for an inoperable diesel generator (DG) from 7 days to 14 days.

On August 6, 2002, the NRC staff transmitted by e-mail a list of questions regarding the proposed TS amendment and requested a conference call with the NMPNS staff to discuss the issues. As requested, a telephone conference was held on August 9, 2002 between NRC and NMPNS staff representatives to discuss the questions and disposition the corresponding issues and responses. As a result of the telephone conference, the NRC staff issued a formal RAI on August 20, 2002, which included five questions. The attached information provides the NMPNS responses to the five questions.

I declare under penalty of perjury that the foregoing is true and correct. Executed on October 7, 2002.

Sincerely,

John T. Conway
John T. Conway
Site Vice President

JTC/CDM/jm

A001

Attachments:

1. Response to Request for Additional Information
2. Woodward Governor Post-Repair/Replacement Testing Recommendations

cc: Mr. H. J. Miller, NRC Regional Administrator, Region I
Mr. G. K. Hunegs, NRC Senior Resident Inspector
Mr. P. S. Tam, Senior Project Manager, NRR (2 copies)
Mr. John P. Spath, NYSERDA

# ATTACHMENT 1

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

On August 9, 2002, the NRC staff held a telephone conference with the Nine Mile Point Nuclear Station, LLC, (NMPNS) staff to discuss previously e-mailed questions regarding the Technical Specification (TS) amendment request to extend the allowed outage time (AOT) for an inoperable diesel generator (DG). As a result of the telephone conference, the NRC staff issued a formal Request for Additional Information (RAI) on August 20, 2002, which included five questions. As requested, the following information provides the NMPNS responses to the questions. Note that for each of the five questions, the question is repeated verbatim (italics added) from the RAI, followed by the NMPNS response.

*NRC Question*

(1) *Discuss the reasons and bases to extend the present AOT for an inoperable EDG from 7 to 14 days.*

NMPNS Response

The reasons for the proposed extension of the DG AOT from 7 to 14 days are discussed in Attachment B, Section 1.2, of the TS amendment request submittal. The proposed AOT extension would improve DG availability during refueling outages and avert unnecessary unplanned plant shutdowns, where there would be less impact on plant risk by continued operation. The 14-day duration of the AOT was judged to be necessary to accommodate planned DG inspections, maintenance, and overhauls. In particular, the proposed 14-day AOT would permit the required 2-year DG inspections and 6-year overhauls to be performed online and reduce the potential for requests for enforcement discretion needed to complete emergent DG repairs. The 2-year DG inspections typically require 2 to 3 days to complete, with the 6-year overhauls typically requiring 5 days to complete. Additional programmatic risk-management controls are invoked when planned Limiting Condition for Operation (LCO) entries could exceed 50 percent of the AOT. As a result, the 6-year DG overhauls and 2-year inspections are currently administratively restricted from performance online with the present 7-day AOT. In addition, the duration for unplanned repairs resulting from either the 2-year inspection or the 6-year overhaul could reasonably be expected to exceed the present 7-day AOT.

The bases for the proposed extension of the DG AOT from 7 to 14 days are discussed in Attachment B, Sections 2.1 through 2.3, of the TS amendment submittal. The 14-day duration of the AOT is based primarily on the Probabilistic Risk Assessment (PRA) discussed in Section 2.3, with the online risk-management and Maintenance Rule programs providing assurance that the PRA assumptions remain valid. Furthermore, the proposed 14-day AOT maintains consistency with the defense-in-depth philosophy, and continues to comply with the Station Blackout (SBO) Rule (10 CFR 50.63) and the applicable General Design Criteria and Regulatory Guides (except for 72-hour AOT specified in Regulatory Guide 1.93) as required by the acceptance guidance provided in Regulatory Guide 1.177.

NRC Question

(2) *It is the Nuclear Regulatory Commission (NRC) staff's understanding that the purpose of the requested amendment is to allow an increased outage time during plant power operation for performing EDG inspection, maintenance, and overhaul, which would include disassembly of the EDG. EDG operability verification after a major maintenance or overhaul may require a full-load rejection test. If a full-load rejection test is performed at power, please address the following:*

*a. What would be the typical and worse-case voltage transients on the 4160-V safety buses as a result of a full-load-rejection?*

*b. If a full-load rejection test is used to test the EDG governor after maintenance, what assurance would there be that an unsafe transient condition on the safety bus (i.e., load swing or voltage transient) due to improperly performed maintenance or repair of a governor would not occur?*

*c. Using maintenance and testing experience on the EDG, identify possible transient conditions caused by improperly performed maintenance on the EDG governor and voltage regulator. Discuss the electrical system response to these transients.*

*d. Provide the tests to be performed after the overhaul to declare the EDG operable and provide justification of performing those tests at power.*

NMPNS Response

The NMP1 TSs do not require periodic performance of a DG full load rejection test as is required by the standard TSs for Boiling Water Reactors (NUREG-1433 and NUREG-1434). Furthermore, as discussed in the August 9, 2002 conference call with the NRC staff, the DG governor manufacturer, Woodward Governor Co., does not provide any recommendations suggesting that a full load rejection test would be necessary following the repair or replacement of a governor. As requested by the NRC staff, the governor manufacturer's testing recommendations are provided for information as Attachment 2.

*NRC Question*

(3) *What type of communication has been established between the control room operator of NMP1 and the System Load Dispatcher? Will the System Load Dispatcher be notified in advance that the EDG is going to be out for an extended period of time?*

NMPNS Response

Communication with the Niagara Mohawk system load dispatcher is controlled by procedures S-ODP-OPS-0112 and GAP-PSH-03. Communication with the system load dispatcher is accomplished either by a written work authorization request for routine scheduling of work activities affecting the offsite power system, or by a dedicated telephone line for verbal notifications and the coordination and planning of emergent work activities.

Existing procedural controls would require notification of the system load dispatcher for planned or emergent entries into the TS LCO for an inoperable DG when it is necessary to protect the available offsite power sources. Attachment B, Sections 2.2.1 and 2.3.5, of the TS amendment request identifies the compensatory measures required for entry into the proposed extended DG AOT (greater than 7 days and up to 14 days). Implementation of the compensatory measure controlling elective testing and maintenance activities affecting the offsite power system (identified as second bullet in TS amendment request) will address notification of the system load dispatcher prior to entry into the extended DG AOT since the offsite power sources will be required to be protected.

*NRC Question*

(4) *It is the NRC staff's practice to approve an EDG AOT extension for those licensees who have either installed an alternate AC source that can be substituted for an inoperable EDG, or have excess power capacity from the existing EDGs supplied through bus cross-ties that can be temporarily used to compensate for an EDG in an extended AOT. Please indicate if you have an extra power source that can be used in this capacity.*

NMPNS Response

NMP1 does not have an extra power source that can be substituted or cross-tied to compensate for an inoperable DG. However, based on the discussion in Attachment B, Section 2.2.1, of the TS amendment request, and as further discussed below, NMPNS believes that adequate defense-in-depth is achieved without an extra power source due to the passive safety system design of the NMP1 Emergency Cooling System (ECS). Consistent with Regulatory Guide 1.177, the ECS and diesel driven fire pump (DFP), when considered in combination, maintain consistency with the defense-in-depth philosophy by preserving a reasonable balance among prevention of core damage, prevention of containment failure, and consequence mitigation without the need of an extra power source. The ECS and DFP are described in detail in the NMP1 Updated Final Safety Analysis Report (UFSAR), Sections I.A.3, V.A - C and E, VIII.A and C, IX.B.6, X (Appendix 10B, Section 5), and XV.B and C.

NMP1 is a General Electric BWR/2 product line Boiling Water Reactor (BWR) and, unlike later BWR plant designs, there are no High Pressure Core Spray (HPCS), Reactor Core Isolation Cooling (RCIC), or Residual Heat Removal (RHR) Systems. In addition, the NMP1 design uses dedicated Core Spray, Containment Spray, and Shutdown Cooling Systems to perform the comparable functions of the low pressure core spray (LPCS), containment/suppression pool spray, suppression pool cooling, and shutdown cooling modes of a typical RHR System NMP1 does not have a system or required function comparable to the Low Pressure Coolant Injection (LPCI) mode of the RHR System. Also, in contrast to later BWRs with single train High Pressure Coolant Injection (HPCI) Systems using a single steam driven turbine pump, the HPCI System at NMP1 is an operating mode of the Condensate and Feedwater Systems using redundant motor driven pumps. At NMP1, the HPCI System is not a safeguards system, nor is it credited in any loss of coolant accident (LOCA) analyses.

The NMP1 ECS, in conjunction with the Automatic Depressurization System (ADS) and Core Spray System, perform the comparable functions of the HPCS/HPCI, RCIC, ADS, and RHR (LPCS mode) Systems of later design BWR plants. The aforementioned NMP1 systems are described in the NMP1 UFSAR, Sections V.E, VII.A, B, and I, and X.A.

The ECS is credited for fission product decay heat removal without the loss of reactor water inventory following a reactor scram when the main condenser is not available as a heat sink, or in the event of a loss of reactor feedwater. The ECS is also capable of decay heat removal during a LOCA to aid in reactor depressurization and core cooling. In addition, the ECS is credited for the Anticipated Transient Without Scram event to aid in heat removal and to help maintain vessel inventory, and is relied upon as the principal means to bring the plant to a hot shutdown condition under such unanticipated occurrences as SBO and a 10 CFR 50, Appendix R, event.

The ECS consists of two independent loops, each with two emergency condensers, and operates by natural circulation, without the need for electrical power. The system is initiated manually or automatically on high reactor pressure, if the high-pressure persists for 12 seconds, or on low-low reactor water level, after a 12-second time delay. In the event of an isolation of the reactor from the main condenser, the emergency condensers of the ECS will condense the steam generated by decay heat and limit the reactor pressure rise, thereby limiting the loss of reactor water inventory which may occur through the opening of the ADS electromatic relief valves (ERVs). Similarly, by removing decay heat following a loss of feedwater event, the ECS will reduce reactor pressure below the ADS ERV setpoint, thereby limiting the amount of water loss and assuring core coverage and cooling. As discussed in Question 5 below, the DFP is capable of providing reactor vessel makeup when necessary.

The later design BWR plants requiring a HPCS System also require an additional onsite emergency AC power source (typically a DG) to operate the HPCS pump for the performance of credited safety functions. A primary safety function of HPCS is serving as a backup to the RCIC System to assure reactor depressurization and decay heat removal following a reactor vessel isolation accompanied by a loss of reactor feedwater. The RCIC pump is steam driven and does not require electrical power. However, since RCIC is only a single train system, HPCS (which requires electrical power to operate its pump) is required as a backup. As described above, the NMP1 ECS does not require electrical power for operation, and it performs reactor depressurization and decay heat removal functions that are comparable to RCIC. However, in contrast to RCIC, the NMP1 ECS consists of redundant trains, with each train being independently capable of satisfying the credited decay heat removal safety functions. Accordingly, the NMP1 ECS is considered much more reliable than the single train RCIC System and does not require a backup system such as HPCS. Moreover, in contrast to later BWR plant designs, NMP1 does not credit an additional system, such as HPCS, to assure core cooling following a small break LOCA. Thus, no additional AC power source is required for the mitigation of a small break LOCA at NMP1. Note that the ECS (which does not require electrical power for operation) would be effective in assisting the ADS in depressurizing the reactor vessel for small line breaks, but is not required for this event. Also note that the NMP1 HPCI System, although not an engineered safeguards system, would provide core cooling following a small break LOCA if offsite power is available.

For plants with a HPCI System in lieu of HPCS, the LPCI and RCIC Systems are required backup systems, in addition to the ADS and Core Spray System. As previously discussed, NMP1 does not require either a LPCI System or a RCIC System in addition to the ADS and Core Spray System, and does not credit the HPCI System in any LOCA analyses.

In summary, NMP1 is a BWR/2 plant design, which is capable of satisfying all required design basis and functional requirements without a HPCS/HPCI System and the associated additional AC power source requirements. NMP1 credits the passive safety system design of the ECS (operates by natural circulation) and a DFP for required license basis functions, including safe shutdown for SBO and 10 CFR 50, Appendix R, events. Therefore, adequate defense-in-depth is maintained during the proposed extended DG AOT with operability of the NMP1 ECS and a DFP. NMP1 TS 3.1.3 assures operability of the ECS during power operating conditions and whenever the reactor coolant temperature is greater than 212° F, except for hydrostatic testing with the reactor not critical. As committed in Attachment B, Sections 2.2.1 and 2.3.5, of the TS amendment submittal, the

NMP1 DFP and the NMP2 DFP and cross-tie to NMP1 will be operable for reactor vessel makeup when entering the proposed extended DG AOT.

*NRC Question*

(5) *You stated that fire pumps can be used to deliver water as a feedwater make-up source to the reactor vessel. Please discuss in detail, how this will be accomplished.*

NMPNS Response

Specific direction regarding the connection and use of the DFPs for reactor vessel makeup currently exists in the NMP1 Emergency Operating Procedure N1-EOP-1 and Special Operating Procedures N1-SOP-18 and N1-SOP-20. As applicable, these procedures provide the necessary instructions to install the dedicated spoolpiece to intertie the required feedwater and fire system lines for reactor vessel injection using either the NMP1 or NMP2 DFP. Additional details regarding the crediting of this action for SBO and 10 CFR 50, Appendix R, are available in the NMP1 UFSAR, Sections IX.B.6.2 and X (Appendix 10B, Sections 5.4 and 5.6).

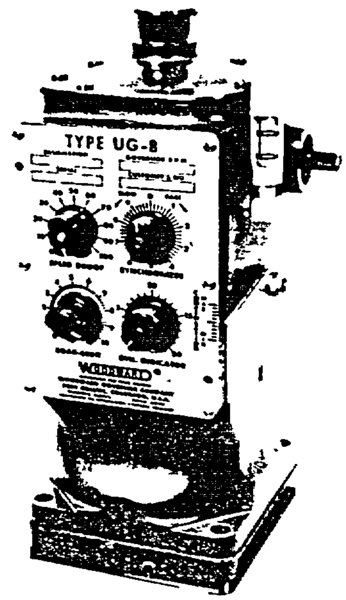
## ATTACHMENT 2

## WOODWARD GOVERNOR POST-REPAIR/REPLACEMENT TESTING RECOMMENDATIONS

03040D

WOODWARD®

# UG DIAL GOVERNOR




## WOODWARD GOVERNOR COMPANY

MANUAL 03040D

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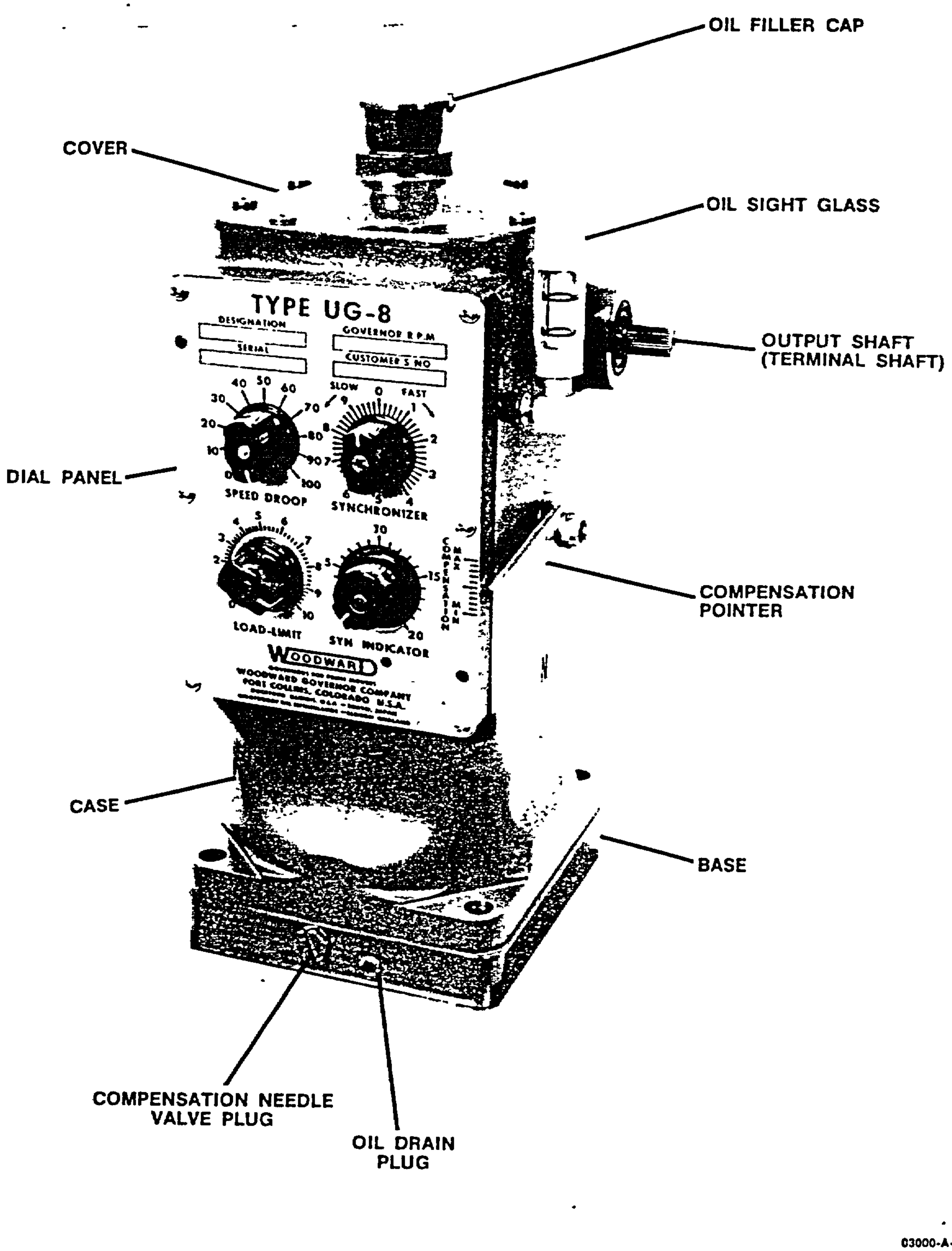


UG8 Dial Governor

# SECTION 4

# GOVERNOR OPERATION AND ADJUSTMENTS

## INTRODUCTION

This section describes initial operation and basic adjustments of the UG Dial for putting a new or repaired governor into service.

## INITIAL OPERATION FOR A NEW GOVERNOR

Before initial operation of the UG Dial Governor, check that all previous installation steps have been correctly accomplished and all linkages are secure and properly attached. See Section 2, Installation Procedures. Also, read all of Section 4.

Fill the governor with oil to the top mark on the oil sight glass. Close the needle valve carefully (cw) using a Phillips screwdriver and open it (ccw) 1/2 to 3/4 turn. Loosen the nut holding the compensation adjusting pointer enough to move the pointer and set the pointer in the center of the scale. Tighten the nut.

If replacing a governor, the initial compensation setting can be that of the governor just removed.

**WARNING**

**TO PROTECT AGAINST POSSIBLE PERSONAL INJURY, LOSS OF LIFE AND/OR PROPERTY DAMAGE WHEN STARTING the engine, turbine or other type of prime mover BE PREPARED TO MAKE AN EMERGENCY SHUTDOWN to protect against runaway or over-speeding should the mechanical-hydraulic governor(s) or electric control(s), the actuator(s), fuel control(s), the driving mechanism(s), the linkage(s), or the controlled device(s) fail.**

Use the prime mover manufacturer's instructions to start the engine.

### *ADJUSTMENTS*

Normally, the only adjustments for putting a new governor into service are bleeding entrapped air and adjusting compensation to obtain satisfactory stability and response. All other operating adjustments were made during factory calibration in accordance with the manufacturer's specifications and should not require further adjustments.

**NOTE**

*Do not attempt internal adjustment of the governor unless you are thoroughly familiar with the proper procedures.*

### *COMPENSATION ADJUSTMENTS*

The compensation needle valve and pointer are adjustable parts of the compensation system. Their settings directly affect governor stability.

Compensation must be properly adjusted to the particular engine and load to provide stable operation.

When the engine, turbine or other type of prime mover is started for the first time after the governor has been filled with oil, the governor may be stable at constant speed, yet the governor may need adjustment. High overspeeds and underspeeds after load changes and slow return to normal speed indicate the need for compensation adjustment.

**NOTE**

*Maximum compensation settings generally provide stable steady state operation, but result in greater offspeeds on load changes.*

After the oil in the governor has reached its normal operating temperature, make the following compensation adjustments without load on the prime mover to be certain that the governor gives optimum control. See figure 1-1 for location of the adjustment parts.

1. To bleed trapped air from the governor oil passages, first loosen the nut holding the

compensation adjusting pointer and set the pointer at its extreme upward position for maximum compensation. Tighten nut.

Next, remove the needle valve access plug and open the needle valve two turns ccw. Use a Phillips screwdriver to avoid damage to the threads inside the bore and to the needle valve.

Damage to the threads or to the needle valve will cause the governor to change fuel rhythmically. This is called governor hunt. See Section 5 for more information on hunting.

There are two screwdriver slots in the needle valve, a shallow and a deep slot, located at right angles to each other. The deeper slot is used to expand the head of the needle valve and increase friction to prevent vibrations from changing the needle valve setting. If a plain screwdriver must be used, be sure to use the shallow slot of the needle valve.

Allow the prime mover to hunt for approximately one-half minute to bleed trapped air from the governor oil passages.

2. Loosen nut holding the compensation pointer and set the pointer as far as it will go towards minimum compensation. Tighten nut.

3. Gradually close the needle valve until hunting just stops. If hunting does not stop, open the needle valve one turn and move the compensation pointer up by one mark on the front panel indicator scale. Again gradually close the needle valve until hunting stops.

   If hunting does not stop, set needle valve 1/4 turn open and repeat setting the compensation pointer up by one mark. Retest governor until hunting stops.

**NOTE**

*The objective of the compensation adjustment procedure is to find the particular settings for the compensation needle valve and compensation adjustment pointer at which the engine, turbine or other type of prime mover, will return quickly to speed (needle valve adjustment) after a speed disturbance with only a slight over or undershoot (compensation pointer adjustment).*

4. From this setting, open the needle valve one turn and momentarily disturb governor stability by turning the load limit knob to increase the load slightly and bringing it back quickly to the original position. Gradually close the needle valve until governor returns to speed with only a small overshoot or undershoot and:

   a. The needle valve is between 1/8 to 1/4 turn open on a governor with an oil sight glass located in the center of the dial panel.

   b. The needle valve is between 3/8 and 3/4 turn open on a governor with an oil sight glass located on the side of the governor.

Compensation adjustment determines offspeed and needle valve adjustment determines recovery time

**NOTE**

*For most responsive governor control, use as little compensation as possible. Too much compensation causes excessive speed overshoots and undershoots upon load changes.*

**NOTE**

*Closing the needle valve more than indicated in a. and b. above makes the governor slow to return to normal speed after a load change.*

*Opening the needle valve more than indicated above decreases governor stability and can cause hunting.*

Once the needle valve adjustment is correct, it is not necessary to change the setting except for large, permanent changes in temperature which affect governor oil viscosity.

When the compensation adjustment is correct, tighten the compensation pointer nut and install the needle valve access plug with a copper washer. The plug and the washer will seal oil seepage around the needle valve.

## INITIAL OPERATION FOR A REPAIRED OR REASSEMBLED GOVERNOR

After disassembly or repair, it is very important to test the governor on a test stand. If a test stand is not available, testing of the governor can be done on t engine.

**WARNING**

**If testing of the governor is done on the engine, the operator must be careful to manually control the engine speed until he has proven that the governor will control engine speed.**

**Attach a serration wrench to the output shaft in addition to the normal linkage to manually control engine speed with the serration wrench.**

**When satisfied that the governing system is fully operative, remove serration wrench.**

If accurate tests and adjustments are to be made, it is best to use a test stand since it is difficult to make them when the governor is mounted on an engine. Write or phone the Woodward Governor Company for a test specification for the governor part number shown on the nameplate fastened to the governor.

Table 4-1 is a list of tools that are necessary only if a large number of governors is being tested. For a small number of governors, only the pressure gauge is needed to check oil pressure during testing.

Table 4-1. Test Stand Tools

| Tool Description | Woodward Number | Application |
|---|---|---|
| Woodward Test Stand | | Engine Simulator. Drives Governor. Supplies pressure oil. Includes gauges for testing. |
| Electronic Counter and Frequency Pickup | | Indicates governor drive speed. Must have an output of at least 60 cycles per revolution, on a one second time base. Must indicate speed to within ± 1 rpm. Readouts of display time must not exceed 5 seconds. |
| Pressure Gauge (0 to 200 psi) | | To check governor oil pressure. |
| Dial Indicator | 8995-037 | To check and adjust droop setting. |

Before installation be sure speed droop is not negative. To check droop, first set the speed droop control knob to zero.

1. Put a dial indicator (tool 8995-037) on the governor with the indicator rod touching the top of the speed setting gear.
2. Place the serration wrench on the governor output shaft.
3. Rotate the governor output shaft from minimum to maximum fuel position, and check the dial indicator.
4. No movement of the indicator is zero droop. If movement is greater that .002 in, adjustment is needed (Cw movement of the indicator is positive droop. Ccw movement of the indicator is negative droop).

Loosen the locknut (190) on speed droop screw (189) and turn the screw ccw to reduce droop. Turn the screw cw to increase droop.

When zero droop is obtained (.002 in or less ccw movement), tighten the locknut again (190).

Check again the adjustment by moving the governor output shaft from minimum to maximum fuel position. Droop can be zero or positive, it must not be negative. Check the final droop setting with the governor operating on the prime mover as shown in "Test Procedures" in this Section.

Before operating a repaired governor for the first time, check that all installation steps have been correctly completed. See Section 2, Installation Procedures. Also, read all of Section 4.

**WARNING**

**TO PROTECT AGAINST POSSIBLE PERSONAL INJURY, LOSS OF LIFE AND/OR PROPERTY DAMAGE WHEN STARTING the engine, turbine or other type of prime mover BE PREPARED TO MAKE AN EMERGENCY SHUTDOWN to protect against runaway or overspeeding should the mechanical-hydraulic governor(s) or electric control(s), the actuator(s), fuel control(s), the driving mechanism(s), the linkage(s), or the controlled device(s) fail.**

## TEST PROCEDURES

1. Remove pipe plug (33) in the base of the governor on the side to the left of the needle valve plug (30), and attach a 0-200 psi pressure gauge. (See Figure 1-2 for Pressure Test Point.)

2. Install governor on a test stand or on the engine pad. See Section 2, Installation Procedures.

3. Fill the governor with oil. See Section 2, Oil Supply. The oil level must be to the mark on the oil sight glass.

4. If the governor is tested on the engine, start the prime mover according to the instructions from the manufacturer.

   Run the governor until it is at operating temperature.

5. Check that the governor has a 110-120 psi oil pressure at normal operating speed.

6. Close the needle valve (32) and open it just enough to cause a small hunt, using a Phillips screwdriver. If a plain screwdriver must be used, make sure to use only the shallow slot of the needle valve to avoid damage to the threads inside the bore and to the needle valve.

   Let the prime mover hunt for approximately one half minute to remove trapped air from the governor oil passages.

7. Close needle valve and open it again one half turn. If governor continues to hunt, repeat step 6.

8. Adjust the compensation system. See Compensation Adjustments in this Section.

**NOTE**

*Maximum speed for constant operation for the UG Dial Governor is 1500 rpm.*

9. While the engine is running, re-check the governor for zero droop. Turn speed droop knob to zero and run the governor at normal operating speed near 0% load. Then load engine near 100% load. Speed must be within 0 to 3 rpm lower.

   If the engine cannot be run at full load and it is to be run at partial load only, the rpm decrease must be proportional to the partial load.

10. If adjustment is needed to obtain zero droop, follow this procedure:

    Loosen the locknut (190) on speed droop screw (189) and turn the screw (189) ccw to reduce droop. Turn the screw cw to increase droop. Tighten the locknut.

    Repeat the above procedure until speed is within 0 to 3 rpm lower when running the engine from no load to full load positions.

11. To prevent speed setting changes because of engine vibrations, a friction drive (255) is installed in the speed setting mechanical drive of the UG Governor.

    The friction drive (255) must be tight enough to avoid a speed setting change due to vibrations, and also tight enough to permit the speed setting motor, if used, to turn the speed setting gear.

    If the friction drive is too tight, the synchronizer (speed setting) knob can no longer be turned manually.

    To adjust the friction on the friction drive, first remove the governor cover (214), then the retaining ring (250) on the friction drive using a No. 1 Truarc pliers. Do not let the cover (214) or the spring (252) fall into the governor as the friction drive cover is under spring compression.

    Place a torque wrench in the slots in top of the friction drive case (255) and check the torque of the friction drive and set it at 1 ½ to 2 ½ lb.in. with manual speed setting or 4½ to 5½ lb.in. with speed setting motor. To increase friction, turn the nut of the shaft cw while holding the speed setting knob. To decrease friction, turn the nut ccw. REV 2 REV. 2

12. Reassemble the friction drive.

13. Set the maximum and/or minimum speed limit on the governor. This adjustment can also be made with the prime mover running. To make the adjustment, first remove the governor dial plate (see figure 4-1).

Turn the synchronizer (speed setting) knob cw to increase the speed setting of the governor from its specified maximum plus 10 rpm.

If the friction drive slips before reaching the required high speed setting, mark the intermediate (278) and the synchronizer (269) (speed setting) indicator gears, disengage synchronizer (speed setting) gear (269), index it one tooth ccw to allow a higher speed setting and engage gear again.

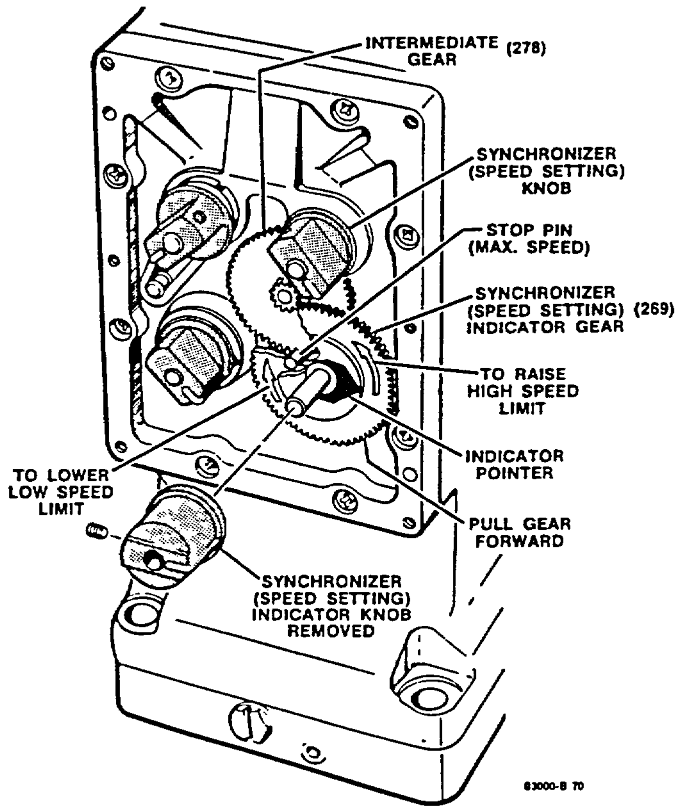


Figure 4-1. Maximum and/or Minimum Speed Stop Adjustment On The UG Dial Governor

The amount of rpm change is not the same if the speeder screw (177) has a coarse thread (18 threads/inch) or a fine thread (32 threads/inch).

Engage again the synchronizer indicator gear (269) with the high-speed stop pin, engaging the intermediate gear (278) to prevent further increase in speed. The high-speed stop pin is the pin closest to the gear center.

On governors equipped with an electric speed-adjusting motor, be sure the motor can run the governor up to its maximum-speed stop and down to its minimum speed. Reset torque on the friction drive, if necessary as in 11 above.

On governors equipped with a two-position high-speed stop (overspeed test device), set the overspeed-test speed as described above, then the lever catch will provide the normal high-speed stop for the governor. If necessary set the high-speed stop to the lever engaged position and then disengage the lever and advance to the normal high-speed stop position to achieve the overspeed-test speed.

14. To set the minimum speed limit, turn the synchronizer (speed setting knob) ccw to decrease the speed setting of the governor to its minimum speed position.

15. Set the synchronizer knob at zero on the dial.

16. Set the synchronizer indicator dial panel pointer at zero.

17. Position the synchronizer indicator knob about 1/16" from the surface of the dial. This prevents the knob from binding the synchronizer system gear train.

18. On governors equipped with micro switches, operate the governor at the required high and low speeds to verify correct positioning of the cams that operate the micro/switches.

    Adjust the cams by loosening the screws and turning the cams on the shaft. Tighten screws again.

19 On governors equipped with solenoid shutdown, please refer to Woodward Governor Company manual 03013 for set-up procedures.

20. Turn the load limit knob to zero. The load limit indicator must move to zero. The governor output shaft will move to its minimum fuel position. Reset the load limit knob to maximum load.

21. Shut down the engine. Remove the pressure gauge and install a 1/8" socket pipe plug. Apply a pipe sealer to the threads, and torque pipe plug down to 90 lb-in.

22. Install the governor cover and dial plate.

## TEST COMPLETION

For operation of units running alone, set droop at zero. Reducing droop to zero allows the unit to change load without changing speed (zero droop operation is also called isochronous operation).

On units connected in parallel or to a single shaft, set the least amount of droop possible to provide satisfactory load division. Droop allows load division between two or more prime movers that drive the same shaft or are paralleled in an electrical system.

For ac generating units tied in with other units, set droop sufficiently high (reference number 30 to 50 or more on the dial) to prevent interchange of load between units.

If one unit in the system has enough generating capacity, set its governor on zero droop, and it will regulate the frequency of the prime mover system. If its capacity is not exceeded, this unit will handle all load changes.

Operate the SYNCHRONIZER of the governor with zero droop to adjust the system's frequency. Operate the SYNCHRONIZERS of the governors that have speed droop to distribute load between units.

When two units are set up for optimum single unit performance, paralleling problems can be encountered. For example, governor response can be too fast on one governor, requiring too high a speed droop setting to prevent a constant load interchange between the two governors. When this occurs, the compensation setting should be moved towards maximum, reducing the single unit transient performance capability but allowing stable parallel operation within the allowable speed droop range. Also, check amount of output shaft travel on each governor (see NOTE, p. 12). Too little output shaft travel on a governor can require too high a droop setting on that governor to obtain steady state control.

When UG governors are used on generator sets operating in parallel and the lead unit is shifted to slave and vice versa, zero droop must be set on the lead unit to maintain the frequency for which it is set, and droop must be set on the slave unit for load distribution between the two units.

For more information on load sharing, please refer to manual 25031, the Control of Prime Mover Speed, Part III, Parallel Operation of Alternators.